Elastic Volume Service

User Guide (ME-Abu Dhabi Region)

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1.1 What Is EVS?

Overview

Elastic Volume Service (EVS) offers scalable block storage for cloud servers. With high reliability, high performance, and a variety of specifications, EVS disks can be used for distributed file systems, development and test environments, data warehouses, and high-performance computing (HPC) applications. Cloud servers that EVS supports include Elastic Cloud Servers (ECSs) and Bare Metal Servers (BMSs).

EVS disks are sometimes just referred to as disks.

EVS Advantages

EVS has the following advantages:

- Various disk types

  EVS provides a variety of disk types for you to choose from, and EVS disks can be used as data disks and system disks for serverss. You can select an appropriate disk type that best suits your budget and service requirements.
- Elastic scalability

  The EVS disk capacity ranges from 10 GiB to 32 TiB. When it no longer meets your needs, you can expand the disk capacity up to 32 TiB in increments of 1 GiB, without interrupting your applications.

  Besides the disk capacity limit, the additional space you can add cannot exceed the remaining quota. You can increase the quota if the remaining quota is insufficient.
- High security and reliability

  Data protection functions, such as backups and snapshots, safeguard the disk data, preventing incorrect data caused by application exceptions or attacks.
- Real-time monitoring

  On Cloud Eye, you can monitor the disk health and operating status at any time.

Differences Among EVS, SFS, and OBS

There are currently three types of storage available for you to choose from: EVS, Scalable File Service (SFS), and Object Storage Service (OBS). See their differences in the following table.

Table 1-1 Differences among EVS, SFS, and OBS

Service	Overall Introduction	Typical Application Scenarios	Storage Capacity
EVS	EVS provides scalable block storage that features high reliability, high performance, and a variety of specifications for servers.	● Enterprise office applications ● Development and testing ● Enterprise applications, including SAP, Microsoft Exchange, and Microsoft SharePoint ● Distributed file systems ● Various databases, including MongoDB, Oracle, SQL Server, MySQL, and PostgreSQL	EVS disks start at 10 GiB and can be expanded as required in 1 GiB increments to up to 32 TiB.
SFS	SFS provides completely hosted shared file storage for cloud servers. Compatible with the Network File System (NFS) protocol, SFS is expandable to petabytes and seamlessly handles data-intensive and bandwidth-intensive applications.	● HPC scenarios, such as gene sequencing, animation rendering, and CAD/CAE ● File sharing ● Media processing ● Content management and web services ● Offline file backup	SFS storage capacity is available on demand and can be expanded to 10 PB at most.

Service	Overall Introduction	Typical Application Scenarios	Storage Capacity
OBS	OBS provides cloud storage for unstructured data, such as files, pictures, and videos. With multiple options for migration to the cloud, OBS provides low-cost, reliable storage access for massive data and supports online multimedia processing.	● Enterprise backup and archive ● Big data analysis ● Enterprise cloud box ● Static website hosting ● Cloud-native applications	OBS has limitless storage capacity, and storage resources are available for linear and nearly infinite expansion.

1.2 Disk Types and Performance

EVS disks are classified based on the disk I/O performance. EVS disks differ in performance and price. Choose the disk type most appropriate for your applications.

EVS Performance

EVS performance metrics include:

- IOPS: Number of read/write operations performed by an EVS disk per second
- Throughput: Amount of data read from and written into an EVS disk per second
- Read/write I/O latency: Minimum interval between two consecutive read/write operations on an EVS disk

  Single-queue access latencies of different types of EVS disks are as follows:

  - High I/O: 1 ms to 3 ms
  - Ultra-high I/O: 1 ms

Table 1-2 EVS performance data

Parameter	High I/O	Ultra-high I/O
IOPS per GiB/EVS disk	6	50
Max. IOPS/EVS disk	5,000	33,000
Baseline IOPS/EVS disk	1,200	1,500
IOPS limit/EVS disk	Min. (5,000, 1,200 + 6 x Capacity)	Min. (33,000, 1,500 + 50 x Capacity)

Parameter	High I/O	Ultra-high I/O
IOPS burst limit/EVS disk	5,000	16,000
Max. throughput	150 MiB/s	350 MiB/s
API name **NOTE** This API name indicates the value of the **volume_type** parameter in the EVS API. It does not represent the type of the underlying hardware device.	SAS	SSD
Typical application scenarios	Mainstream applications requiring high performance and high reliability, such as large-scale development and test environments, web server logs, and enterprise applications. Typical enterprise applications include SAP applications, Microsoft Exchange, and Microsoft SharePoint.	Read/write-intensive applications that require ultra-high I/O and throughput, such as distributed file systems used in HPC scenarios or NoSQL and relational databases used in I/O-intensive scenarios. Typical databases include MongoDB, Oracle, SQL Server, MySQL, and PostgreSQL databases.

Calculating Disk IOPS Limit

To calculate the IOPS limit of a disk, obtain the smaller value of the following two values:

- Max. IOPS/disk
- Baseline IOPS/disk + IOPS per GiB x Disk capacity

The following example uses an ultra-high I/O EVS disk with a maximum IOPS of 33,000.

- If the disk capacity is 100 GiB, the disk IOPS limit is calculated as follows:

  Disk IOPS limit = Min. (33,000, 1,500 + 50 x 100)

  The disk IOPS limit is 6,500, the smaller value between 33,000 and 6,500.
- If the disk capacity is 1,000 GiB, the disk IOPS limit is calculated as follows:

  Disk IOPS limit = Min. (33,000, 1,500 + 50 x 1,000)

  The disk IOPS limit is 33,000, the smaller value between 33,000 and 51,500.

Disk Burst Capability and Principles

The burst capability allows a small-capacity disk to surpass the disk IOPS limit within a certain period of time. The IOPS limit indicates the performance of a single disk.

The burst capability is suitable for improving the server startup speed. Normally, system disks have small capacities. For example, if a 50-GiB ultra-high I/O disk does not have the burst capability, its IOPS limit can reach only 4,000 (1,500 + 50 x 50). However, if the disk has the burst capability, its IOPS limit can burst up to 16,000.

The following example uses an ultra-high I/O EVS disk with the IOPS burst limit of 16,000.

- If the disk capacity is 100 GiB, the disk IOPS limit is 6,500. In this case, the disk maximum IOPS can reach 16,000 in a certain duration.
- If the disk capacity is 1,000 GiB, the disk IOPS limit is 33,000. In this case, the disk IOPS limit already exceeds its IOPS burst limit (16,000), and the disk does not need the burst capability.

The burst IOPS consumption and reservation principles are described as follows:

The burst capability is implemented based on a token bucket. The number of initial tokens in the bucket is calculated as follows:

Number of initial tokens = Burst duration x IOPS burst limit

In the following example, a 100-GiB ultra-high I/O EVS disk is used, and the fixed burst duration is 1800s. Therefore, the number of initial tokens is 28,800,000 (1,800 x 16,000).

- Token production rate: This rate equals the disk IOPS limit, which is 6,500 tokens/s.
- Token consumption rate: This rate is calculated based on the I/O usage. Each I/O request consumes a token. The maximum consumption rate is 16,000 tokens/s, which is the larger value between the disk burst IOPS and IOPS limit.

Consumption principles

When the token consumption rate is greater than the production rate, the number of tokens decreases accordingly, and eventually the disk IOPS will be consistent with the token production rate (the IOPS limit). In this example, the disk can burst for approximately 3,032 seconds [28,800,000/(16,000 - 6,500)].

Reservation principles

When the token consumption rate is smaller than the production rate, the number of tokens increases accordingly, enabling the disk to regain the burst capability. In this example, if the disk is suspended for approximately 4,431 seconds (28,800,000/6,500), the token bucket will be filled up with tokens.

NOTE

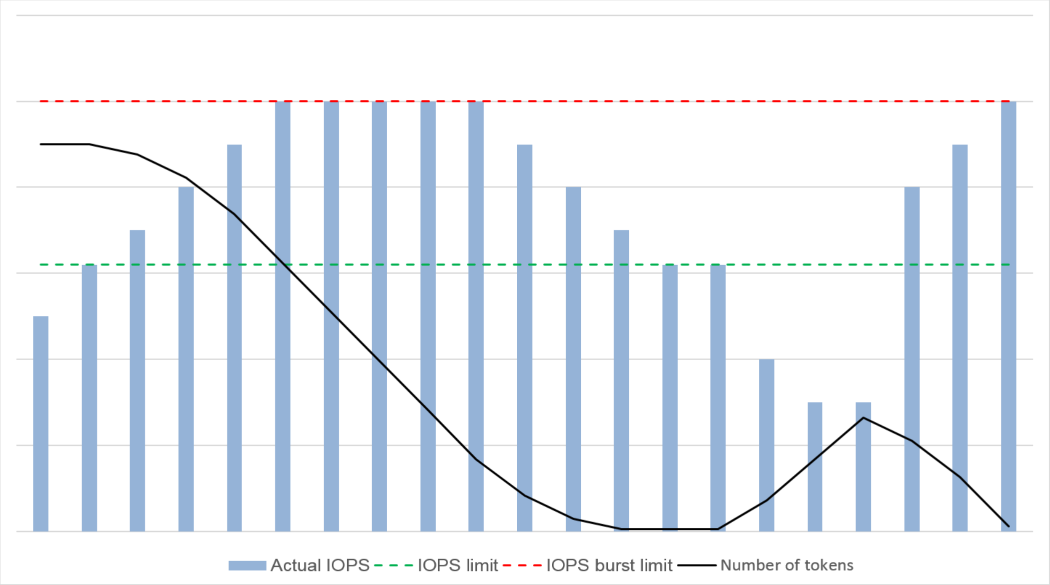
As long as there are tokens in the token bucket, the disk will have the burst capability.

Figure 1-1 shows the token consumption and reservation principles. The blue bars indicate the disk IOPS usage, the green dashed line represents the IOPS limit, the red dashed line indicates the IOPS burst limit, and the black curve indicates the changes of the number of tokens.

- When the number of tokens is greater than zero, the disk IOPS can exceed 6,500 and has the capability to reach 16,000, the IOPS burst limit.

- When the number of tokens is zero, the disk does not have the burst capability, and the maximum IOPS is 6,500.
- When the disk IOPS is less than 6,500, the number of tokens starts to increase, and the disk can regain the burst capability.

Figure 1-1 Burst capability diagram



1.3 Device Types and Usage Instructions

What Device Types Are Available?

There are two EVS device types: Virtual Block Device (VBD) and Small Computer System Interface (SCSI).

- VBD is the default EVS device type. VBD EVS disks support only basic read/ write SCSI commands.
- SCSI EVS disks support transparent SCSI command transmission and allow the server OS to directly access the underlying storage media. Besides basic read/ write SCSI commands, SCSI disks support advanced SCSI commands.

Device type is configured during creation. It cannot be changed after the disk has been created.

Common Application Scenarios and Usage Instructions of SCSI EVS Disks

- BMSs support only SCSI EVS disks.
- Shared SCSI EVS disks: Shared SCSI EVS disks must be used together with a distributed file system or cluster software. Because most cluster applications, such as Windows MSCS, Veritas VCS, and Veritas CFS, require SCSI reservations, you are advised to use shared EVS disks with SCSI.

  SCSI reservations take effect only when shared SCSI EVS disks are attached to ECSs in the same ECS group. For more information about shared EVS disks, see **Shared EVS Disks and Usage Instructions**.

Do I Need to Install a Driver for SCSI EVS Disks?

To use SCSI EVS disks, you need to install a driver for certain server OSs.

- BMS

  Both the Windows and Linux images for BMSs are pre-installed with the required SDI card driver. Therefore, no driver needs to be installed.

- KVM ECS

  You are advised to use SCSI EVS disks with KVM ECSs. Linux images and Windows images for KVM ECSs already have the required driver. Therefore, no driver needs to be installed for KVM ECSs.

  NOTE

  ECS virtualization types are categorized into KVM and Xen. For details, see **Product Introduction** > **ECS Types** in the *Elastic Cloud Server User Guide*.

- Xen ECS

  Due to driver limitations, you are advised not to use SCSI EVS disk with Xen ECSs.

  However, a few images support SCSI EVS disks on Xen ECSs. For the supported images, see **Table 1-3**.

  NOTE

  After confirming that the OS images of Xen ECSs support SCSI EVS disks, determine whether you need to install the driver:

  - Public Windows images are preinstalled with the Paravirtual SCSI (PVSCSI) driver. Therefore, no driver needs to be installed.
  - Private Windows images are not preinstalled with the PVSCSI driver. You need to download and install it explicitly.

    For details, see **(Optional) Optimizing Windows Private Images** in the *Image Management Service User Guide*.
  - Linux images are not preinstalled with the PVSCSI driver. You need to obtain the source code of the open-source Linux driver at **https://github.com/UVP-Tools/SAP-HANA-Tools**.

Table 1-3 OSs supporting SCSI EVS disks

Virtualization Type	OS	
Xen	Windows	See the Windows images listed on the **Public Images** page. Log in to the management console, choose **Image Management Service**, click the **Public Images** tab, and select **ECS image** and **Windows** from the drop-down lists, respectively.

Virtualization Type	OS	
	Linux	• SUSE Linux Enterprise Server 11 SP4 64bit (The kernel version is 3.0.101-68-default or 3.0.101-80-default.) • SUSE Linux Enterprise Server 12 64bit (The kernel version is 3.12.51-52.31-default.) • SUSE Linux Enterprise Server 12 SP1 64bit (The kernel version is 3.12.67-60.64.24-default.) • SUSE Linux Enterprise Server 12 SP2 64bit (The kernel version is 4.4.74-92.35.1-default.)

1.4 Shared EVS Disks and Usage Instructions

What Are Shared EVS Disks?

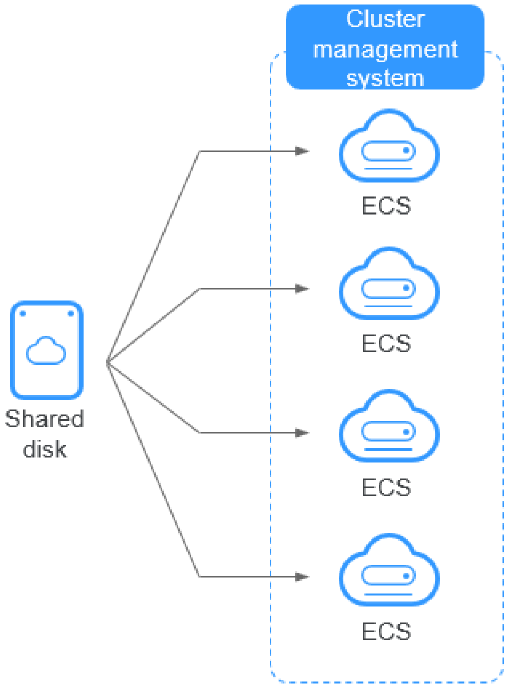
Shared EVS disks are block storage devices that support concurrent read/write operations and can be attached to multiple servers. Shared EVS disks feature multiple attachments, high-concurrency, high-performance, and high-reliability. They are usually used for enterprise business-critical applications that require cluster deployment for high availability (HA). Multiple servers can access the same shared EVS disk at the same time.

A shared EVS disk can be attached to a maximum of 16 servers. Servers that EVS supports include ECSs and BMSs. To share files, you need to deploy a shared file system or a cluster management system, such as Windows MSCS, Veritas VCS, or CFS.

NOTICE

You must set up a shared file system or cluster management system before using shared EVS disks. If you directly attach a disk to multiple servers, the sharing function will not work and data may be overwritten.

Figure 1-2 Application scenario of shared EVS disks



Usage Precautions

Because most cluster applications, such as Windows MSCS, Veritas VCS, and Veritas CFS, require SCSI reservations, you are advised to use shared EVS disks with SCSI. If a SCSI EVS disk is attached to a Xen ECS for use, you must install the driver. For details, see **Device Types and Usage Instructions**.

You can create shared VBD disks or shared SCSI disks. It is recommended that you attach the shared disk to the ECSs in the same ECS group to improve service reliability.

- Shared VBD EVS disks: The device type of a newly created shared EVS disk is VBD by default. Such disks can be used as virtual block storage devices, but do not support SCSI reservations. If SCSI reservations are required for your applications, create shared SCSI EVS disks.
- Shared SCSI EVS disks: These EVS disks support SCSI reservations.

NOTICE

- To improve data security, you are advised to use SCSI reservations together with the anti-affinity policy of an ECS group. That said, ensure that shared SCSI EVS disks are only attached to ECSs in the same anti-affinity ECS group.
- If an ECS does not belong to any anti-affinity ECS group, you are advised not to attach shared SCSI EVS disks to this ECS. Otherwise, SCSI reservations may not work properly, which may put your data at risk.

Concepts of the anti-affinity ECS group and SCSI reservations:

  - The anti-affinity policy of an ECS group allows ECSs to be created on different physical servers to improve service reliability.

    For details about ECS groups, see **Managing ECS Groups** in the *Elastic Cloud Server User Guide*.

  - The SCSI reservation mechanism uses a SCSI reservation command to perform SCSI reservation operations. If an ECS sends such a command to an EVS disk, the disk is displayed as locked to other ECSs, preventing the data damage that may be caused by simultaneous read/write operations to the disk from multiple ECSs.
  - ECS groups and SCSI reservations have the following relationship: A SCSI reservation on a single EVS disk cannot differentiate multiple ECSs on the same physical host. For that reason, if multiple ECSs that use the same shared EVS disk are running on the same physical host, SCSI reservations will not work properly. Therefore, you are advised to use SCSI reservations only on ECSs that are in the same ECS group, thus having a working anti-affinity policy.

Advantages

- Multiple attachments: A shared EVS disk can be attached to a maximum of 16 servers.
- High-performance: The random read/write IOPS of a shared ultra-high I/O disk can reach up to 160,000.
- High-reliability: Shared EVS disks support both manual and automatic backup, delivering highly reliable data storage.
- Wide range of use: Shared EVS disks can be used for Linux RHCS clusters where only VBD EVS disks are needed. They can also be used for Windows MSCS and Veritas VCS clusters that require SCSI reservations.

Specifications and Performance

Shared EVS disks have the same specifications and performance as non-shared EVS disks. For details, see **Disk Types and Performance**.

Data Sharing Principle and Common Usage Mistakes

A shared EVS disk is essentially the disk that can be attached to multiple servers for use, which is similar to a physical disk in that the disk can be attached to multiple physical servers, and each server can read data from and write data into any space on the disk. If the data read/write rules, such as the read/write sequence and meaning, between these servers are not defined, data read/write interference between servers or other unpredictable errors may occur.

Though shared EVS disks are block storage devices that provide shared access for servers, shared EVS disks do not have the cluster management capability. Therefore, you need to deploy a cluster system to manage shared EVS disks. Common cluster management systems include Windows MSCS, Linux RHCS, Veritas VCS, and Veritas CFS.

If shared EVS disks are not managed by a cluster system, the following issues may occur:

- Data inconsistency caused by read/write conflicts

  When a shared EVS disk is attached to two servers (server A and server B), server A cannot recognize the disk spaces allocated to server B, vice versa. That said, a disk space allocated to server A may be already used by server B. In this case, repeated disk space allocation occurs, which leads to data errors.

  For example, a shared EVS disk has been formatted into the ext3 file system and attached to server A and server B. Server A has written metadata into the file system in space R and space G. Then server B has written metadata into space E and space G. In this case, the data written into space G by server A will be replaced. When the metadata in space G is read, an error will occur.

- Data inconsistency caused by data caching

  When a shared EVS disk is attached to two servers (server A and server B), the application on server A has read the data in space R and space G, then cached the data. At that time, other processes and threads on server A would then read this data directly from the cache. At the same time, if the application on server B has modified the data in space R and space G, the application on server A cannot detect this data change and still reads this data from the cache. As a result, the user cannot view the modified data on server A.

  For example, a shared EVS disk has been formatted into the ext3 file system and attached to server A and server B. Both servers have cached the metadata in the file system. Then server A has created a new file (file F) on the shared disk, but server B cannot detect this modification and still reads data from its cached data. As a result, the user cannot view file F on server B.

Before you attach a shared EVS disk to multiple servers, the disk device type needs to be determined. The device type can be either VBD or SCSI. Shared SCSI EVS disks support SCSI reservations. Before using SCSI reservations, you need to install a driver in the server OS and ensure that the OS image is included in the compatibility list.

NOTICE

If you simply attach a shared EVS disk to multiple servers, files cannot be shared between the servers as shared EVS disks do not have the cluster capability. Therefore, build a shared file system or deploy a cluster management system if you need to share files between servers.

1.5 EVS Encryption

What Is EVS Encryption?

In case your services require encryption for the data stored on EVS disks, EVS provides you with the encryption function. You can encrypt newly created EVS disks. Keys used by encrypted EVS disks are provided by the Key Management Service (KMS), which is secure and convenient. Therefore, you do not need to establish and maintain the key management infrastructure.

Keys Used for EVS Encryption

The keys provided by KMS include a Default Master Key and Customer Master Keys (CMKs).

- Default Master Key: A key that is automatically created by EVS through KMS and named **evs/default**.

  The Default Master Key cannot be disabled and does not support scheduled deletion.

- CMKs: Keys created by users. You may use existing CMKs or create new CMKs to encrypt disks. For details, see **Management** > **Creating a CMK** in the *Key Management Service User Guide*.

If disks are encrypted using CMKs and a CMK is then disabled or scheduled for deletion, the disks encrypted by this CMK can no longer be read from or written to and data on these disks may never be restored. See **Table 1-4** for more information.

Table 1-4 Impact of CMK unavailability

CMK Status	Impact	How to Restore
Disabled	● For an encrypted disk already attached: The disk will become inaccessible after a period of time, or the disk data can never be restored. If the disk is detached later, it can never be attached again. ● For an encrypted disk not attached: The disk cannot be attached anymore.	Enable the CMK. For details, see **Managing CMKs** > **Enabling One or More CMKs** in the *Key Management Service User Guide*.
Scheduled deletion		Cancel the scheduled deletion for the CMK. For details, see **Managing CMKs** > **Canceling the Scheduled Deletion of One or More CMKs** in the *Key Management Service User Guide*.
Deleted		Data on the disks can never be restored.

Relationships Between Encrypted Disks, Backups and Snapshots

The encryption function can be used to encrypt system disks, data disks, backups and snapshots. The details are as follows:

- System disk encryption relies on the image that is used to create the server.
  - If an encrypted image is used to create the server, the system disk will be encrypted by default, and the system disk and image share the same encryption method. For details, see **Managing Private Images** > **Encrypting Images** in the *Image Management Service User Guide*.
  - If a non-encrypted image is used to create the server, you can determine whether to encrypt the system disk during the server creation. For details, see **Getting Started** > **Creating an ECS** > **Step 1: Configure Basic Settings** in the *Elastic Cloud Server User Guide*.

- If an empty disk is created, you can determine whether to encrypt the disk or not. The encryption attribute of the disk cannot be changed after the disk has been created.
- If a disk is created from a snapshot, the encryption attribute of the disk will be the same as that of the snapshot's source disk.
- If a disk is created from a backup, the encryption attribute of the disk does not need to be the same as that of the backup.
- If a snapshot is created for a disk, the encryption attribute of the snapshot is the same as that of the disk.

Who Can Use the Encryption Function?

- The security administrator (having Security Administrator permissions) can grant the KMS access rights to EVS for using the encryption function.
- When a user who does not have the Security Administrator permissions needs to use the encryption function, the condition varies depending on whether the user is the first one ever in the current region or project to use this function.
  - If the user is the first one ever in the current region or project to use this function, the user must contact a user having the Security Administrator permissions to grant the KMS access rights to EVS. Then, the user can use encryption.
  - If the user is not the first one ever in the current region or project to use this function, the user can use encryption directly.

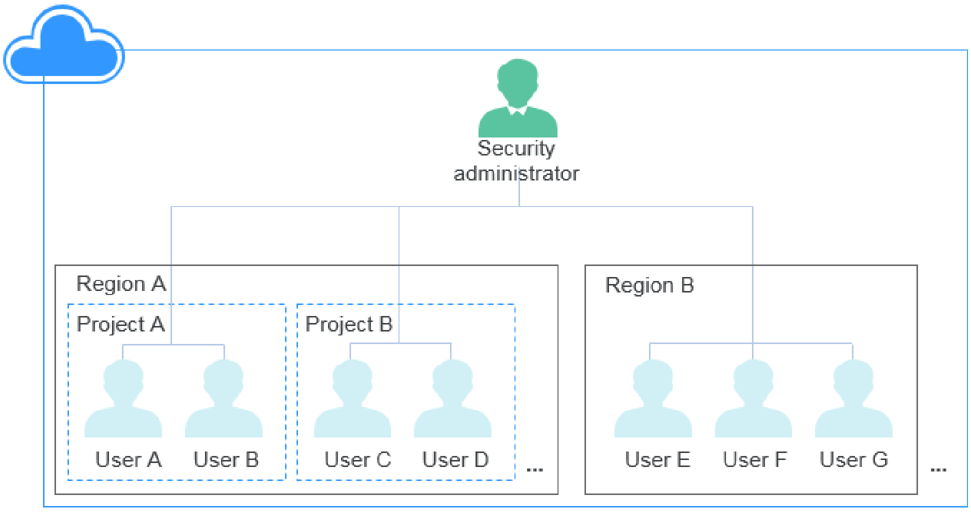
From the perspective of a tenant, as long as the KMS access rights have been granted to EVS in a region, all the users in the same region can directly use the encryption function.

If there are multiple projects in the current region, the KMS access rights need to be granted to each project in this region.

Application Scenarios of EVS Encryption

Figure 1-3 shows the user relationships under regions and projects from the perspective of a tenant. The following example uses region B to describe the two scenarios of using the encryption function.

Figure 1-3 User relationships



- If the security administrator uses the encryption function for the first time ever, the operation process is as follows:

  a. Grant the KMS access rights to EVS.

     After the KMS access rights have been granted, the system automatically creates a Default Master Key and names it **evs/default**. DMK can be used to encrypt EVS disks.

     NOTE

     EVS encryption relies on KMS. When the encryption function is used for the first time ever, the KMS access rights need to be granted to EVS. After the KMS access rights have been granted, all users in this region can use the encryption function, without requiring the KMS access rights to be granted again.

  b. Select a key.

     You can select one of the following keys:

     - DMK: **evs/default**
     - CMKs: Existing or newly created CMKs. For details, see **Creating a CMK** in the *Key Management Service User Guide*.

  After the security administrator has used the encryption function, all users in Region B can directly use encryption.

- If User E (common user) uses the encryption function for the first time ever, the operation process is as follows:

  a. When user E uses encryption, and the system prompts a message indicating that the KMS access rights have not been granted to EVS.

  b. Contact the security administrator to grant the KMS access rights to EVS.

  After the KMS access rights have been granted to EVS, User E as well as all users in Region B can directly use the encryption function and do not need to contact the security administrator to grant the KMS access rights to EVS again.

1.6 EVS Backup

What Is EVS Backup?

Cloud Disk Backup provided by Cloud Backup and Recovery (CBR) allows you to create backups for your EVS disks while servers are running. If data loss or damage occurred due to virus invasions, accidental deletions, or software/hardware faults, you can use backups to restore data, guaranteeing your data integrity and security.

For more information, see the *Cloud Backup and Recovery User Guide*.

Application Scenarios

Create and apply backup policies to schedule periodic backups for your EVS disks. You can use the backup data to create new EVS disks or restore to source disks.

Usage Instructions

For how to back up EVS disks, see **Managing EVS Backups** or the *Cloud Backup and Recovery User Guide*.

1.7 EVS Snapshot

What Is EVS Snapshot?

EVS allows you to create snapshots for disks on the management console or by making API calls. An EVS snapshot is a complete copy or image of the disk data at a specific time point. As a major disaster recovery (DR) approach, you can use a snapshot to completely restore the data to the time point when the snapshot was created.

EVS snapshots are sometimes referred to as snapshots in this document.

You can create snapshots to rapidly save the disk data at specified time points. In addition, you can use snapshots to create new disks so that the created disks will contain the snapshot data in the beginning.

Snapshot Principle

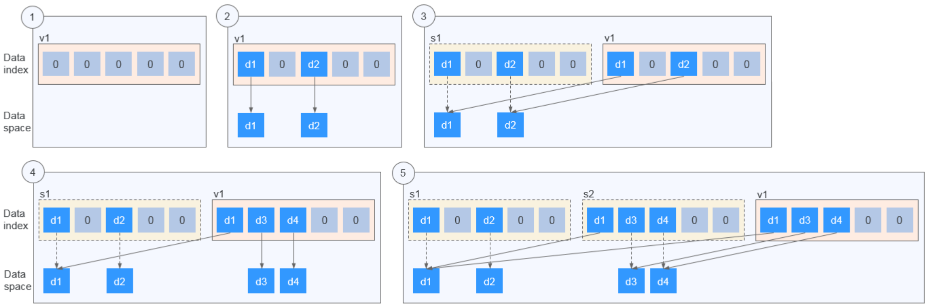
Snapshots and backups are different in that a backup saves the data as another copy in the storage system other than on the disk, whereas a snapshot establishes a relationship between the snapshot and disk data.

The following example describes the snapshot principle by creating snapshots s1 and s2 for disk v1 at different time points:

1. Create disk v1, which contains no data.
2. Write data d1 and d2 to disk v1. Data d1 and d2 are written to new spaces.

3. Create snapshot s1 for disk v1 that is modified in 2. Data d1 and d2 are not saved as another copy elsewhere. Instead, the relationship between snapshot s1 and data d1 and d2 is established.
4. Write data d3 to disk v1 and change data d2 to d4. Data d3 and d4 are written to new spaces, and data d2 is not overwritten. The relationship between snapshot s1 and data d1 and d2 is still valid. Therefore, snapshot s1 can be used to restore data if needed.
5. Create snapshot s2 for disk v1 that is modified in 4. The relationship between s2 and data d1, d3, and d4 is established.

Figure 1-4 Snapshot principle



Application Scenarios

The snapshot function helps address your following needs:

- Routine data backup

  You can create snapshots for disks on a timely basis and use snapshots to recover your data in case that data loss or data inconsistency occurred due to misoperations, viruses, or attacks.

- Rapid data restoration

  You can create a snapshot or multiple snapshots before an application software upgrade or a service data migration. If an exception occurs during the upgrade or migration, service data can be rapidly restored to the time point when the snapshot was created.

  For example, a fault occurred on system disk A of server A, and therefore server A cannot be started. Because system disk A is already faulty, the data on system disk A cannot be restored by rolling back snapshots. However, you can create disk B using an existing snapshot of system disk A and attach disk B to a properly running server, for example server B. In this case, server B can read the data of system disk A from disk B.

  NOTE

  Currently, when rolling back data from snapshots, the snapshot data can be rolled back only to its source EVS disk, and a rollback to another EVS disk is not possible.

- Multi-service quick deployment

  You can use a snapshot to create multiple disks containing the same initial data, and these disks can be used as data resources for various services, for example data mining, report query, and development and testing. This method protects the initial data and creates disks rapidly, meeting the diversified service data requirements.

Usage Instructions

For details about the snapshot usages, see **Managing EVS Snapshots**.

1.8 Differences Between EVS Disk Backup and EVS Snapshot

Both EVS disk backup and EVS snapshot provide redundancies for the EVS disk data to improve reliability. **Table 1-5** lists the differences between them.

Table 1-5 Differences Between Backups and Snapshots

Metric	Storage Solution	Data Synchronization	DR Range	Service Recovery
Backup	Backups are stored in OBS, instead of disks. This ensures data restoration upon disk loss or corruption.	A backup is a copy of a disk at a given point in time and is stored in a different location. Deleting a disk will not clear its backups.	A backup and its source disk reside in different AZs.	To restore data and recover services, you can restore the backups to their original disks or create new disks from the backups.

Metric	Storage Solution	Data Synchronization	DR Range	Service Recovery
Snapshot	Snapshots are stored on the same disk as the original data. **NOTE** Creating a backup requires a certain amount of time because data needs to be transferred to OBS. Creating or rolling back a snapshot consumes less time than creating a backup.	A snapshot is the state of a disk at a specific point in time and is stored in the same disk. If the disk is deleted, all its snapshots will also be deleted. For example, if you reinstalled or changed the server OS, snapshots of the system disk were also automatically deleted. Snapshots of the data disks can be used as usual.	A snapshot and its source disk reside in the same AZ.	You can use a snapshot to roll back its original disk or create a disk from the snapshot.

1.9 Billing

Billing Items

EVS disks are billed based on the disk type, size, and usage duration.

- Billing starts: immediately after you have purchased EVS disks, regardless of whether they are attached or not.
- Billing ends: after a pay-per-use disk is successfully deleted.

Billing Modes

EVS disks are billed by disk capacity on a pay-per-use basis.

Pay-per-use is a postpaid payment model. EVS disks are billed by the second and settled by the hour. For a duration of less than an hour, the payment is based on the actual duration that the service was used for.

Billing Involved in Configuration Modifications

Item	Pay-per-Use
Capacity change	● EVS does not support disk capacity reduction. ● EVS supports disk capacity expansion. Multiple pieces of billing records will be generated within a billing cycle (an hour) when an expansion succeeded. For example, if you expand the capacity of an EVS disk from 100 GB to 200 GB at 01:30:01, two pieces of billing records will be generated in billing cycle 01:00:00-02:00:00. One is the billing record generated for the 100 GB in 01:00:00-01:30:00, and the other is the billing record generated for the 200 GB in 01:30:01-02:00:00.

1.10 Permissions Management

If you need to assign different permissions to employees in your enterprise to access your EVS resources, IAM is a good choice for fine-grained permissions management. IAM provides identity authentication, permissions management, and access control, helping you secure access to your cloud resources.

With IAM, you can use your cloud account to create IAM users for your employees, and assign permissions to the users to control their access to specific service resources. For example, some management personnel in your enterprise need to view EVS resources but should not be allowed to delete the resources or perform any high-risk operations. In this scenario, you can create IAM users for the management personnel and grant them only the permissions required for viewing EVS resources.

If your account does not need individual IAM users, you may skip this chapter.

IAM can be used free of charge. You pay only for the resources in your account. For more information, see section "Service Overview" in the *Identity and Access Management User Guide*.

EVS Permissions

By default, new IAM users do not have permissions assigned. You need to add a user to one or more groups, and attach permissions policies or roles to these groups. Users inherit permissions from the groups to which they are added and can perform specified operations on cloud services based on the permissions.

EVS is a project-level service deployed and accessed in specific physical regions. To assign EVS permissions to a user group, specify the scope as region-specific projects and select a project for the permissions to take effect. If **All projects** is selected, the permissions will take effect for the user group in all region-specific projects. When accessing EVS, users need to switch to a region where they have been authorized to use EVS.

You can grant users permissions by using roles and policies.

- Roles: A type of coarse-grained authorization mechanism that defines permissions related to user responsibilities. This mechanism provides only a limited number of service-level roles for authorization. When using roles to grant permissions, you need to also assign other roles on which the permissions depend to take effect. However, roles are not an ideal choice for fine-grained authorization and secure access control.
- Policies: A type of fine-grained authorization mechanism that defines permissions required to perform operations on specific cloud resources under certain conditions. This mechanism allows for more flexible policy-based authorization, meeting requirements for secure access control. For example, you can grant ECS users only the permissions for managing a certain type of ECSs. Most policies define permissions based on APIs. For the API actions supported by EVS, see section "Permissions Policies and Supported Actions" in the *Elastic Volume Service API Reference*.

Table 1-6 lists all the system-defined roles and policies supported by EVS.

Table 1-6 System-defined roles and policies supported by EVS

Role/Policy Name	Description	Type	Dependency
EVS FullAccess	Full permissions for EVS. Users granted these permissions can create, attach, detach, query, and delete EVS resources, and expand capacity of EVS disks.	System-defined policy	None
EVS ReadOnlyAccess	Read-only permissions for EVS. Users granted these permissions can view EVS resource data only.	System-defined policy	None
Server Administrator	Full permissions for EVS	System role	None

Table 1-7 lists the common operations supported by each system-defined policy of EVS. Select the policies as required.

Table 1-7 Common operations supported by each system-defined policy of EVS

Operation	EVS FullAccess	EVS ReadOnlyAccess
Creating disks	√	x
Viewing disk list	√	√
Viewing disk details	√	√
Attaching disks	√	x
Detaching disks	√	x

Operation	EVS FullAccess	EVS ReadOnlyAccess
Deleting disks	√	x
Expanding disk capacities	√	x
Adding tags for disks	√	x
Modifying tags	√	x
Deleting tags	√	x
Searching for disks by tag	√	√

1.11 EVS and Other Services

- ECS: EVS disks can be attached to ECSs and used as scalable block storage devices.
- BMS: SCSI EVS disks can be attached to BMSs and used as scalable block storage devices.
- CBR: The CBR service allows you to back up EVS disk data to ensure the reliability and security of the server data.
- KMS: EVS disk encryption depends on the KMS service. You can use the keys provided by KMS to encrypt EVS disks (both system and data disks), thus improving EVS disk data security.
- Cloud Eye: After using EVS, you can view EVS performance metrics through Cloud Eye without installing any additional plug-in. The monitored metrics include Disk Read Rate, Disk Write Rate, Disk Read Requests, and Disk Write Requests.
- Cloud Trace Service (CTS): CTS records operations of EVS resources, facilitating user query, audit, and backtracking.

1.12 Basic Concepts

1.12.1 Region and AZ

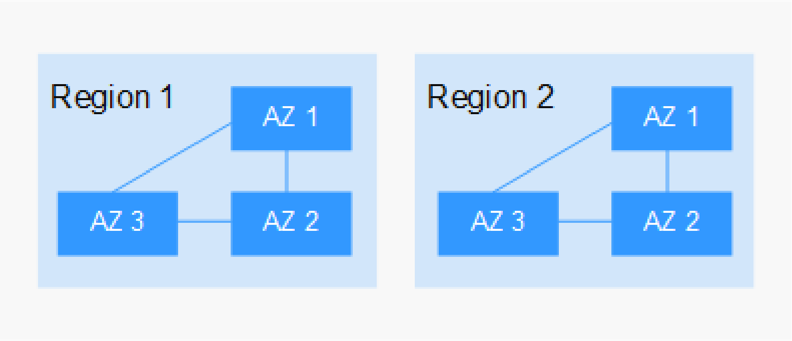
Concept

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

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

Figure 1-5 shows the relationship between regions and AZs.

Figure 1-5 Regions and AZs



Selecting a Region

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

Selecting an AZ

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

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

Regions and Endpoints

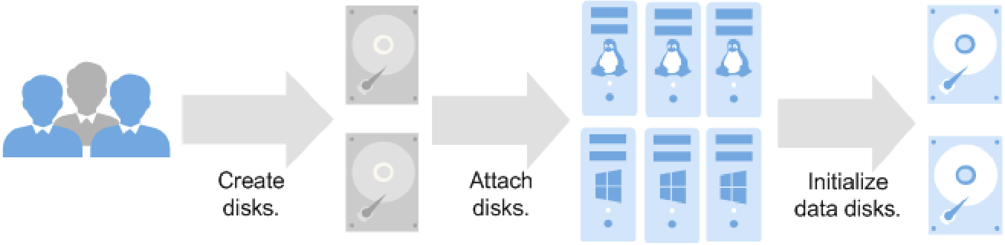
Before you use an API to call resources, specify its region and endpoint. For more details, see **Regions and Endpoints**.

2 Getting Started

2.1 Basic Operation Procedure

Figure 2-1 shows the basic EVS operation procedure.

Figure 2-1 Basic operation procedure



2.2 Create an EVS Disk

Scenarios

EVS disks can be used as system disks or data disks for servers.

- System disks can only be created together with servers and are automatically attached.
- A system disk can have a maximum of 1,024 GiB, and a data disk 32,768 GiB.
- Data disks that created together with servers are automatically attached.
- After servers are created, any data disks added on the cloud server console are automatically attached.
- After servers are created, any data disks added on the EVS console need to be manually attached.

This section describes how to separately create disks on the EVS console.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Click **Create Disk**.

Step 4 Configure basic disk information according to **Table 2-1**.

Table 2-1 Disk parameters

Parameter	Sub-Parameter	Description	Example Value
Region	-	Mandatory Resources are region-specific and cannot be used across regions through internal network connections. For low network latency and quick resource access, select the nearest region.	-
AZ	-	Mandatory The availability zone (AZ) where you want to create the disk. **NOTE** ● Disks can only be attached to the servers in the same AZ. ● The AZ of a disk cannot be changed after the disk has been created.	-
Disk Specifications	Disk Type	Mandatory The available disk types are as follows: ● High I/O ● Ultra-high I/O **NOTE** When a disk is created from a snapshot, the disk type of the new disk will be consistent with that of the snapshot's source disk.	Ultra-high I/O

Parameter	Sub-Parameter	Description	Example Value
	Disk Size (GiB)	Mandatory The disk size. Only data disks can be created on the current page, and the disk size ranges from 10 GiB to 32,768 GiB. **NOTE** ● When you use a backup to create a disk, the disk capacity must be greater than or equal to the backup size. In the condition that you do not specify the disk capacity, if the backup size is smaller than 10 GiB, the default capacity 10 GiB will be used as the disk capacity; if the backup size is greater than 10 GiB, the disk capacity will be consistent with the backup size. ● When you use a snapshot to create a disk, the disk capacity must be greater than or equal to the snapshot size. In the condition that you do not specify the disk capacity, if the snapshot size is smaller than 10 GiB, the default capacity 10 GiB will be used as the disk capacity; if the snapshot size is greater than 10 GiB, the disk capacity will be consistent with the snapshot size.	100 GiB

Parameter	Sub-Parameter	Description	Example Value
	Create from ● Backup ● Snapshot ● Image	Optional ● If you choose **Create from Backup**, the backup data is used to create the disk. Click **Create from** and choose **Backup**. On the displayed page, select the target backup and click **OK**. **NOTE** – One backup cannot be used for concurrent disk creation operations at the same time. For example, if you are creating disk A from a backup, this backup can be used to create another disk only after disk A has been created. – If a disk is created from a backup of a system disk, the new disk can be used as a data disk only. ● If you choose **Create from Snapshot**, the snapshot data is used to create the disk. Click **Create from** and choose **Snapshot**. On the displayed page, select the target snapshot and click **OK**. **NOTE** – The disk type of the new disk is the same as that of the snapshot's source disk. – The device type of the new disk is the same as that of the snapshot's source disk. – The encryption attribute of the new disk is the same as that of the snapshot's source disk. For details about the disk creation from snapshots, see **Creating an EVS Disk from a Snapshot**. ● If you choose **Create from Image**, the image data is used to create the disk. Click **Create from** and choose **Image**. On the displayed page, select the target image and click **OK**.	● Create from Backup: autobackup-001 ● Create from Snapshot: snapshot-001

Parameter	Sub-Parameter	Description	Example Value
		NOTE – The device type of the new disk is the same as that of the image's source disk.	
More	Advanced Settings ● Share ● SCSI	Optional ● Share If you select **Share**, a shared disk is created. A shared disk can be attached to up to 16 servers. If you do not select **Share**, a non-shared disk is created, and the disk can be attached to one server only. If you select both **SCSI** and **Share**, a shared SCSI disk is created. **NOTE** The sharing attribute of a disk cannot be changed after the disk has been created. For details about shared EVS disks, see **Managing Shared EVS Disks**. ● SCSI If you select **SCSI**, a SCSI disk is created. Such disks allow the server OS to directly access the underlying storage media and send SCSI commands to the disks. If you do not select **SCSI**, a VBD disk is created. That said, the disk device type is VBD, the default device type. **NOTE** The device type of a disk cannot be changed after the disk has been created. For details about the ECS types, OSs, and ECS software supported by SCSI EVS disks, see **Device Types and Usage Instructions**.	-

Parameter	Sub-Parameter	Description	Example Value
	Tag	Optional During the EVS disk creation, you can tag the EVS resources. Tags identify cloud resources for purposes of easy categorization and quick search. A tag is composed of a key-value pair. ● Key: Mandatory if the disk is going to be tagged ● Value: Optional if the disk is going to be tagged **NOTE** ● A maximum of 10 tags can be added for an EVS disk. ● Tag keys of the same EVS disk must be unique. For details about tags, see the *Tag Management Service User Guide*.	-
Enterprise Project	-	Mandatory When creating EVS disks, you can add the disks to an existing enterprise project. An enterprise project facilitates project-level management and grouping of cloud resources and users. The default project is **default**.	default
Disk Name	-	Mandatory ● If you create disks individually, this parameter value is used as the actual disk name. The name can contain a maximum of 64 characters. ● If you create disks in a batch, this parameter value is used as the prefix of disk names, and one disk name will be composed of this parameter value and a four-digit number. The name can contain a maximum of 59 characters.	For example, if you create two disks and set **volume** for **Disk Name**, the EVS disk names will be **volume-0001** and **volume-0002**.

Parameter	Sub-Parameter	Description	Example Value
Quantity	-	Optional The number of disks to be created. The default value is set to **1**, which means only one disk is created. Currently, you can create up to 100 disks at a time. **NOTE** ● If the disk is created from a backup, batch creation is not possible, and this parameter must be set to **1**. ● If the disk is created from a snapshot, batch creation is not possible, and this parameter must be set to **1**.	1

Step 5 Click **Next**.

Step 6 On the **Details** page, check the disk details.

- If you do not need to modify the specifications, click **Submit**.
- If you need to modify the specifications, click **Previous**.

Step 7 Go back to the disk list page and view the disk status.

When the disk status changes to **Available**, the disk is successfully created.

----End

2.3 Attach an EVS Disk

2.3.1 Attaching a Non-Shared Disk

Scenarios

Independently created EVS disks are data disks. In the disk list, the function of such disks is displayed as **Data disk**, and the status is displayed as **Available**. In this case, you need to attach the data disks to servers for use.

This section describes how to attach a non-shared disk. A non-shared disk can be attached to one server only.

Constraints

Cloud servers created from ISO images are only used for OS installation. They have limited functions and cannot have EVS disks attached.

Attaching the Disk on the EVS Console

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Locate the target disk in the list and click **Attach**.

Step 4 Select the server and then select a device name from the drop-down list. Ensure that the disk and server are in the same AZ.

Step 5 Click **OK**. A dialog box is displayed, showing "The attaching process is NOT completed yet. You must initialize the disk before using it".

Step 6 Click **OK** to return to the disk list page. The status of the disk is **Attaching**, indicating that the disk is being attached to the server. When the disk status changes to **In-use**, the disk is successfully attached.

Step 7 Initialize the disk.

After the disk has been attached to a server, the disk can be used only after you have initialized it. For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

----End

Follow-Up Operations

If you are attaching a new disk, you must then log in to the server and initialize the disk before it can be used. To learn how to initialize disks, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

2.3.2 Attaching a Shared Disk

Scenarios

Independently created EVS disks are data disks. In the disk list, the function of such disks is displayed as **Data disk**, and the status is displayed as **Available**. In this case, you need to attach the data disks to servers for use.

This section describes how to attach a shared disk.

Constraints

- A shared disk can be attached to a maximum of 16 servers. These servers and the shared disk must be in the same AZ within a region.

NOTICE

If you simply attach a shared disk to multiple servers, files cannot be shared among them. Because there are no mutually agreed data read/write rules among servers, read and write operations from them may interfere with each other, or unpredictable errors may occur. To share files between servers, set up a shared file system or a clustered management system first.

- If a shared disk is in the **In-use** state, ensure that the maximum number of servers that the disk can be attached to has not been reached.
- All the servers attached with a shared disk must run either Windows or Linux.

  For example, if you attach a shared disk to multiple Windows servers and then detach it from these servers, the shared disk cannot be attached to Linux servers later. This is because Windows and Linux support different file systems and cannot identify the original file system on the disk. Improper operations may damage the original file system.
- A shared disk can only be used as a data disk. It cannot be used as a system disk.
- Cloud servers created from ISO images are only used for OS installation. They have limited functions and cannot have EVS disks attached.

Attaching the Disk on the EVS Console

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Locate the target disk in the list and click **Attach**.

Shared disks support batch attachment so that you can attach a shared disk to multiple servers. The left area in the **Attach Disk** dialog box shows the server list. After you select the target servers, the selected servers will be displayed in the right area.

Step 4 Select the target servers and then select a device name from the drop-down list for each server you selected. Ensure that the disk and servers are in the same AZ.

Step 5 Click **OK**. A dialog box is displayed, showing "The attaching process is NOT completed yet. You must initialize the disk before using it".

Step 6 Click **OK** to return to the disk list page. The status of the disk is **Attaching**, indicating that the disk is being attached to the servers. When the disk status changes to **In-use**, the disk is successfully attached.

----End

Follow-Up Operations

If you are attaching a new disk, you must then log in to the server and initialize the disk before it can be used. To learn how to initialize disks, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

2.4 Initialize an EVS Data Disk

2.4.1 Introduction to Data Disk Initialization Scenarios and Partition Styles

Scenarios

After a disk is attached to a server, you need to log in to the server to initialize the disk, that is, format the disk. You must initialize a disk before accessing it.

- System disk

  A system disk does not require manual initialization because it is automatically created and initialized upon server creation. The default partition style is master boot record (MBR).

- Data disk
  - If a data disk is created along with a server, it will be automatically attached to the server.
  - If a data disk is created separately, you need to manually attach it to a server.

  In both cases, you must initialize the data disk before using it. Choose an appropriate partition style based on your service plan.

Constraints

A disk created from a data source does not need to be initialized. Such a disk contains the data of the data source in the beginning. Initializing the disk may clear the initial data on this disk.

Disk Partition Styles

NOTICE

The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

Table 2-2 lists the common disk partition styles. In Linux, different partition styles require different partitioning tools.

Table 2-2 Disk partition styles

Disk Partition Style	Maximum Disk Capacity Supported	Maximum Number of Partitions Supported	Linux Partitioning Tool
Master Boot Record (MBR)	2 TiB	● 4 primary partitions ● 3 primary partitions and 1 extended partition With MBR, you can create several primary partitions and one extended partition. The extended partition must be divided into logical partitions before use. For example, if 6 partitions need to be created, you can create them in the following two ways: ● 3 primary partitions and 1 extended partition, with the extended partition divided into 3 logical partitions ● 1 primary partition and 1 extended partition, with the extended partition divided into 5 logical partitions	● fdisk ● parted
GUID Partition Table (GPT)	18 EiB 1 EiB = 1048576 TiB	Unlimited Disk partitions created using GPT are not categorized.	parted

Partitioning Operation Guide

For a disk smaller than 2 TiB, see the following sections:

- **Initializing a Windows Data Disk (Windows Server 2008)**
- **Initializing a Windows Data Disk (Windows Server 2019)**
- **Initializing a Linux Data Disk (fdisk)**
- **Initializing a Linux Data Disk (parted)**

For a disk larger than 2 TiB, see the following sections:

- **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)**
- **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2012)**
- **Initializing a Linux Data Disk Larger Than 2 TiB (parted)**

2.4.2 Initializing a Windows Data Disk (Windows Server 2008)

Scenarios

This section uses Windows Server 2008 R2 Enterprise 64bit to describe how to initialize a data disk attached to a server running Windows.

The maximum disk capacity supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Therefore, use the GPT partition style if your disk capacity is larger than 2 TiB. For details, see **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)**. To learn more about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Procedure

Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

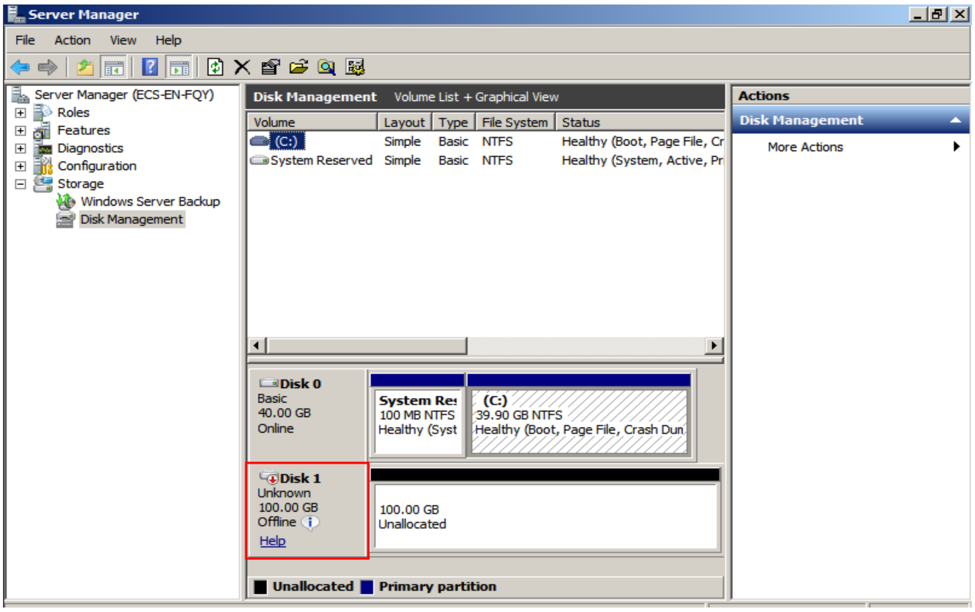
The **Server Manager** window is displayed.

Step 2 In the navigation tree, choose **Storage** > **Disk Management**.

The **Disk Management** window is displayed.

- If **Figure 2-2** is displayed, the new disk is offline. Go to **Step 3**.
- If **Figure 2-5** is displayed, the **Initialize Disk** window is prompted. Go to **Step 5**.

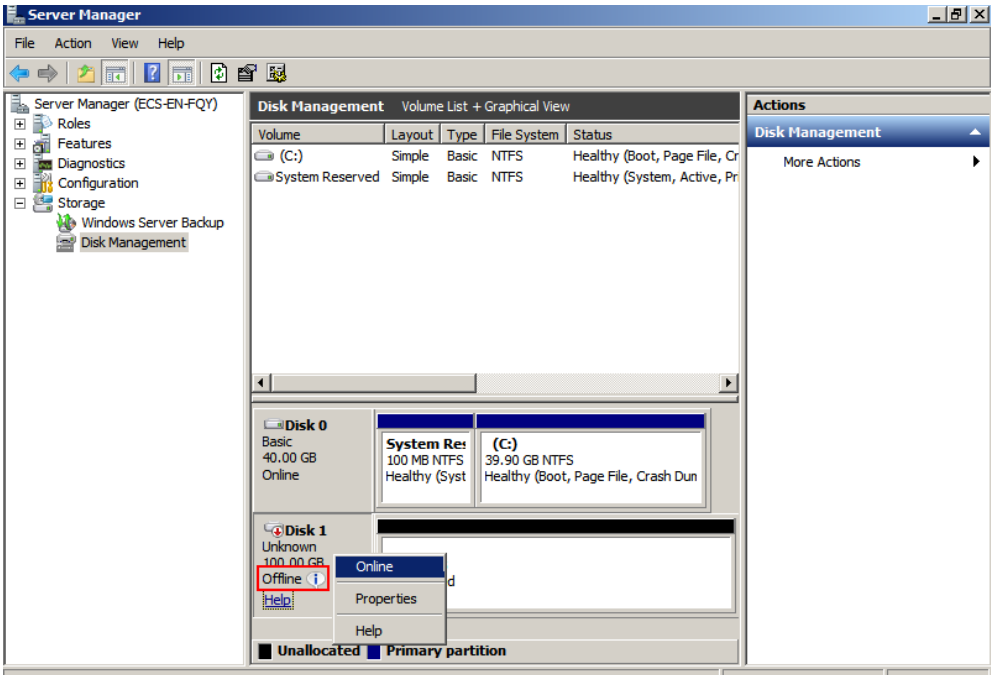
Figure 2-2 Disk Management



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cr
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Pr

Step 3 Disks are displayed in the right pane. In the **Disk 1** area, right-click **Offline** and choose **Online** from the shortcut menu to online the disk.

Figure 2-3 Online the disk



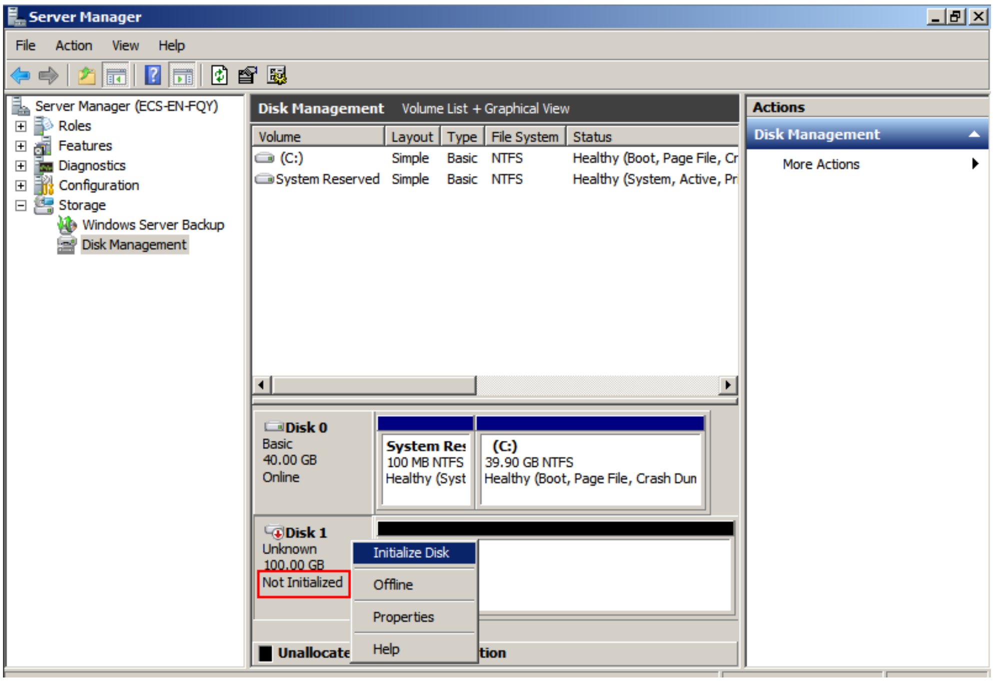
Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cr
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Pr

NOTE

If the disk is offline, you need to online the disk before initializing it.

Step 4 After making the disk online, the disk status changes from **Offline** to **Not Initialized**. Right-click the disk status and choose **Initialize Disk** from the shortcut menu, as shown in **Figure 2-4**.

Figure 2-4 Initialize Disk



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cr
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Pr

Disk 0
Basic
40.00 GB
Online

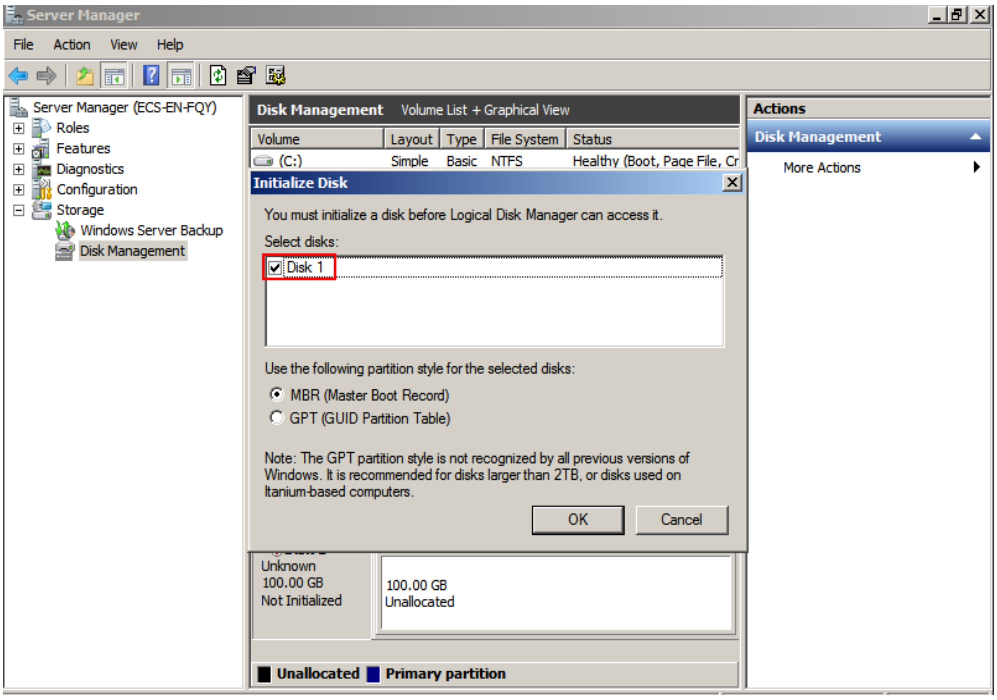
System Res
100 MB NTFS
Healthy (Syst

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dun

Disk 1
Unknown
100.00 GB
Not Initialized

Step 5 In the **Initialize Disk** dialog box, select the target disk, click **MBR (Master Boot Record)** or **GPT (GUID Partition Table)**, and click **OK**, as shown in **Figure 2-5**.

Figure 2-5 Unallocated space



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cr

Initialize Disk

You must initialize a disk before Logical Disk Manager can access it.

Select disks:

☑ Disk 1

Use the following partition style for the selected disks:

● MBR (Master Boot Record)

○ GPT (GUID Partition Table)

Note: The GPT partition style is not recognized by all previous versions of Windows. It is recommended for disks larger than 2TB, or disks used on Itanium-based computers.

Unknown
100.00 GB
Not Initialized

100.00 GB
Unallocated

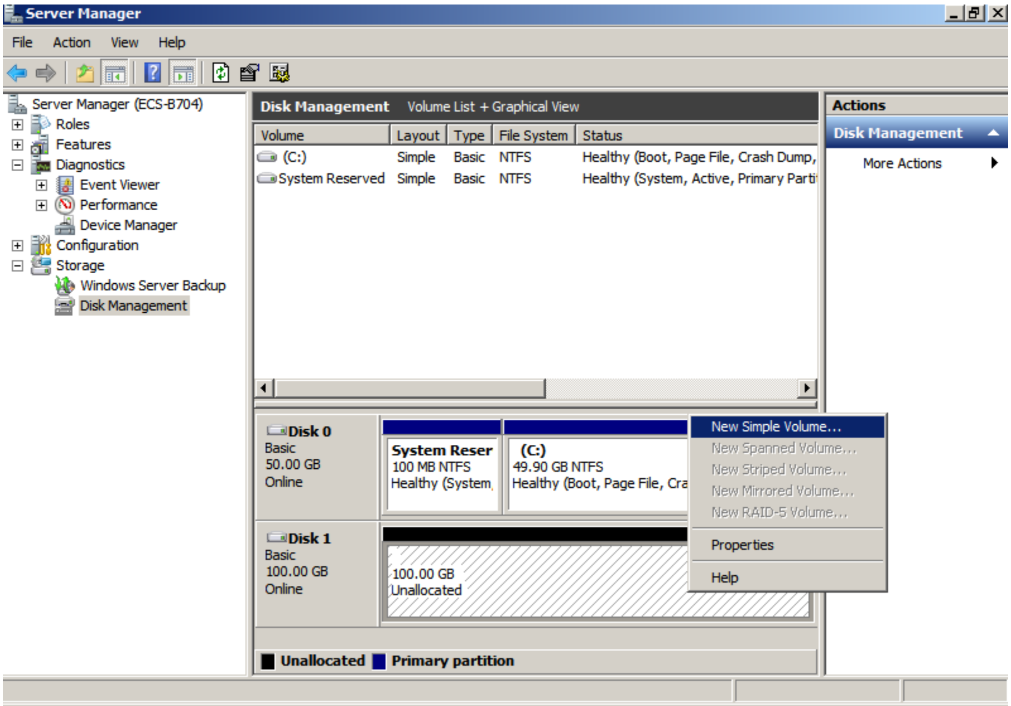
NOTICE

The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

Step 6 Right-click at the unallocated space and choose **New Simple Volume** from the shortcut menu, as shown in **Figure 2-6**.

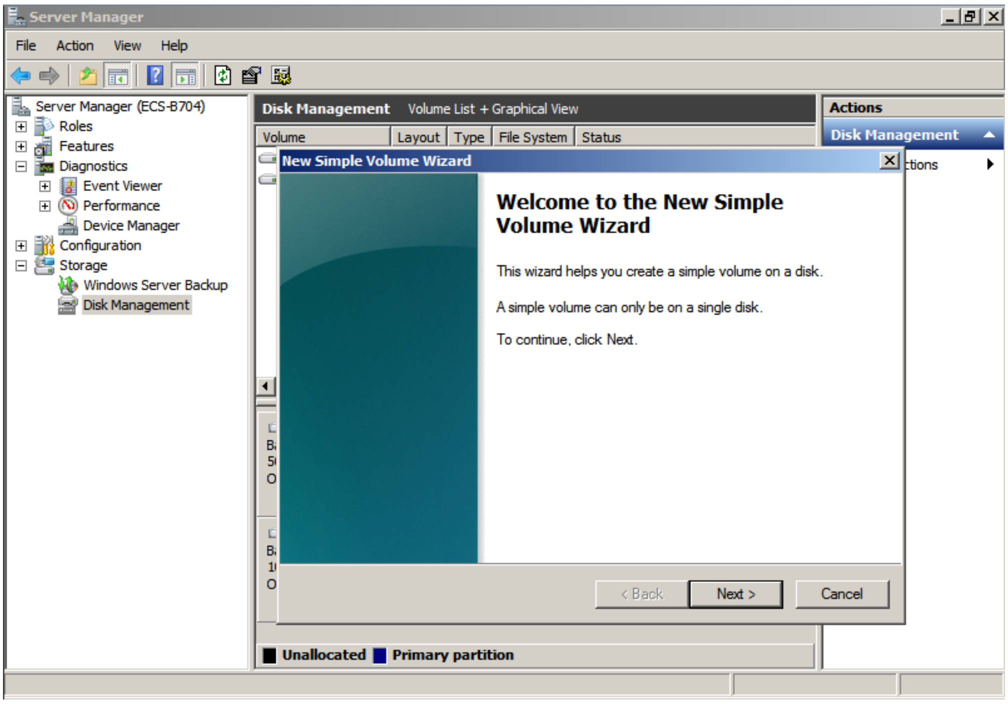
Figure 2-6 New Simple Volume



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Parti

Step 7 On the displayed **New Simple Volume Wizard** window, click **Next**.

Figure 2-7 New Simple Volume Wizard



Welcome to the New Simple Volume Wizard

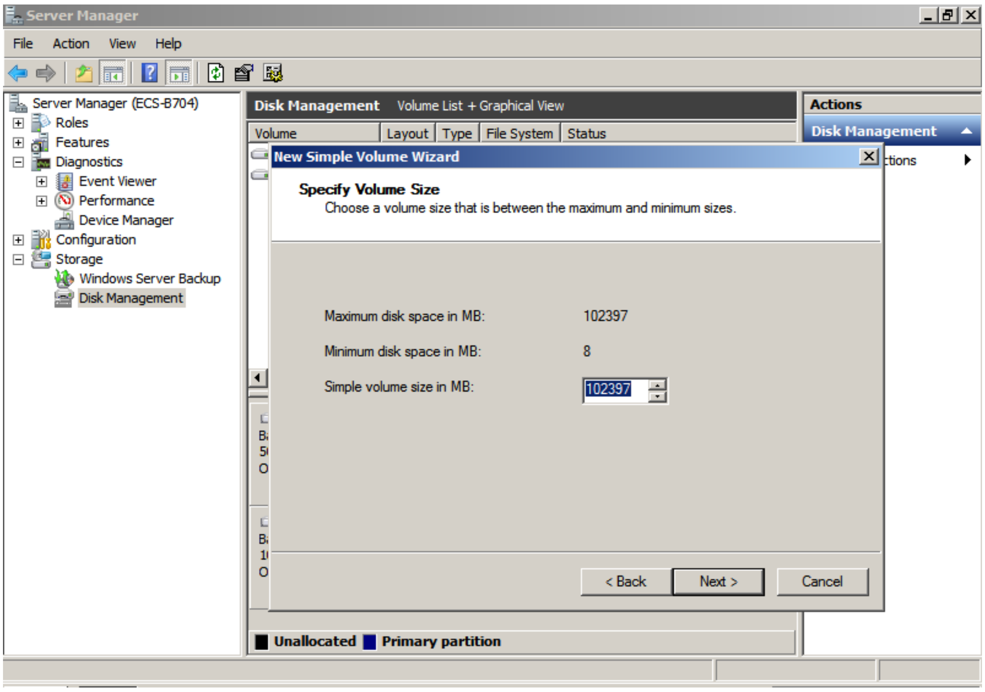
This wizard helps you create a simple volume on a disk.

A simple volume can only be on a single disk.

To continue, click Next.

Step 8 Specify the volume size and click **Next**. The default value is the maximum size.

Figure 2-8 Specify Volume Size



Specify Volume Size
Choose a volume size that is between the maximum and minimum sizes.

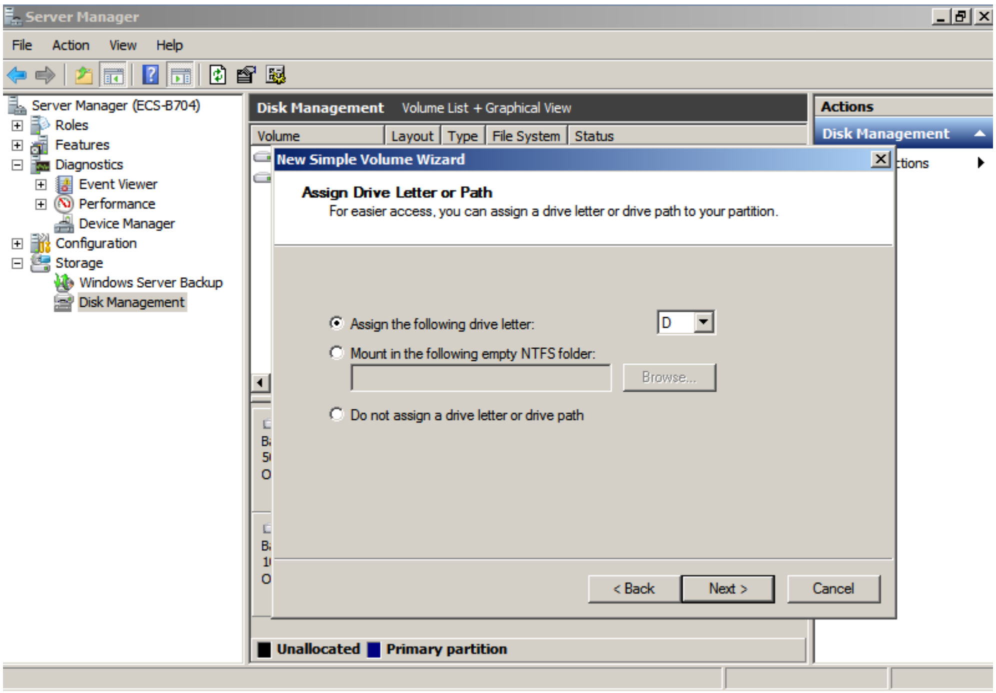
Maximum disk space in MB: 102397

Minimum disk space in MB: 8

Simple volume size in MB: 102397

Step 9 Assign the driver letter and click **Next**.

Figure 2-9 Assign Driver Letter or Path



New Simple Volume Wizard

Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

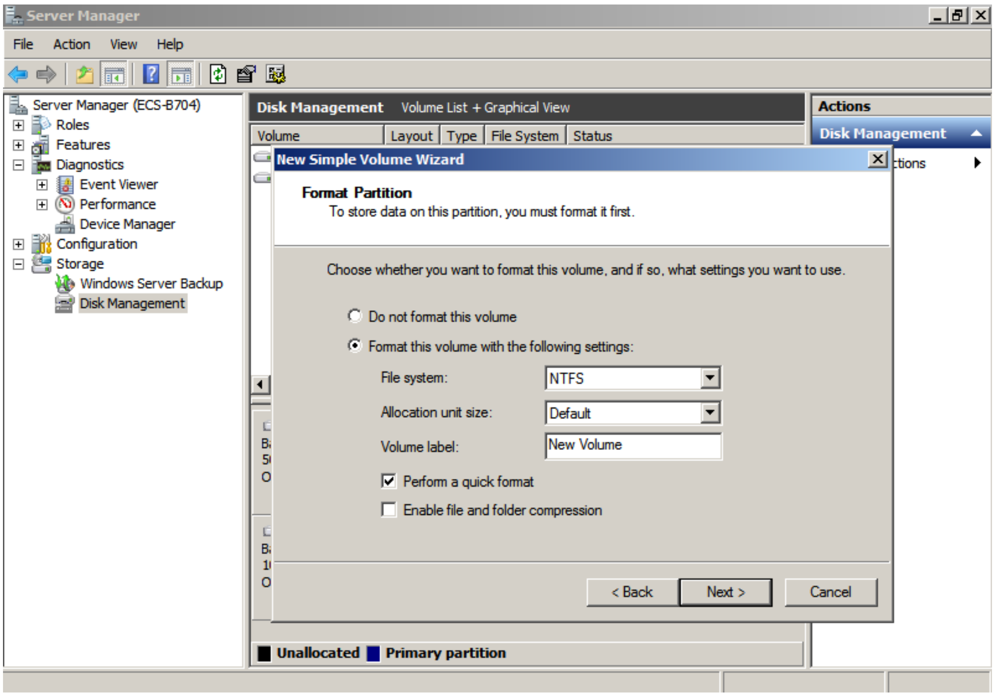
● Assign the following drive letter: D

○ Mount in the following empty NTFS folder:

○ Do not assign a drive letter or drive path

Step 10 On the displayed **Format Partition** page, click **Format this volume with the following settings**, set parameters based on the requirements, and select **Perform a quick format**. Then, click **Next**.

Figure 2-10 Format Partition



New Simple Volume Wizard

Format Partition

To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

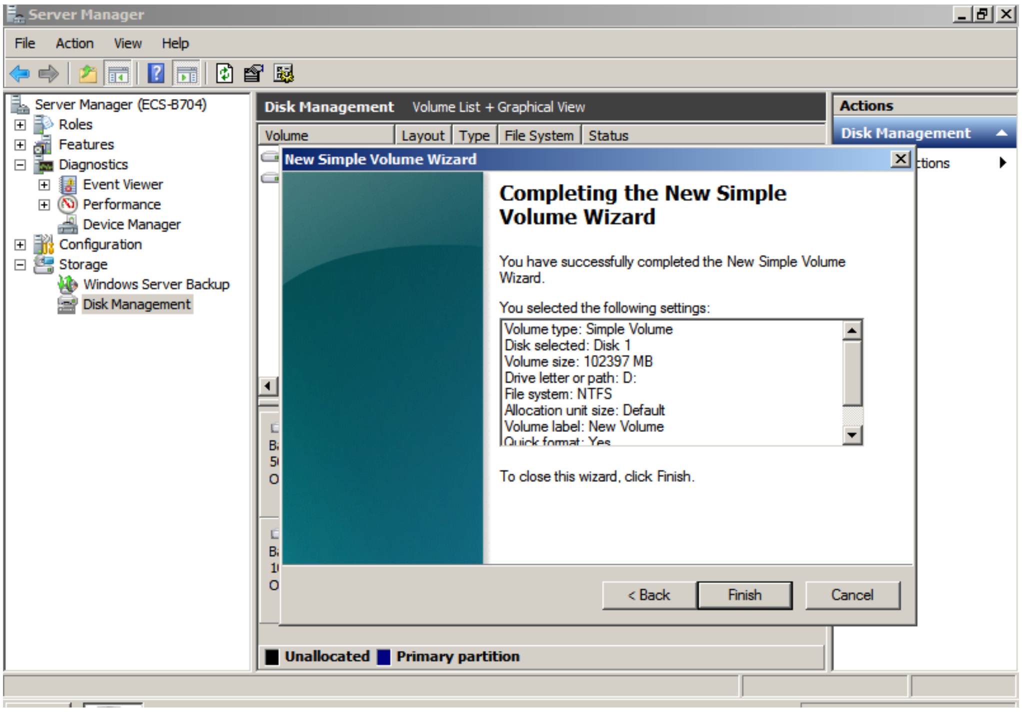
Allocation unit size: Default

Volume label: New Volume

☑ Perform a quick format

□ Enable file and folder compression

Figure 2-11 Completing the partition creation



Completing the New Simple Volume Wizard

You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 102397 MB
Drive letter or path: D:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

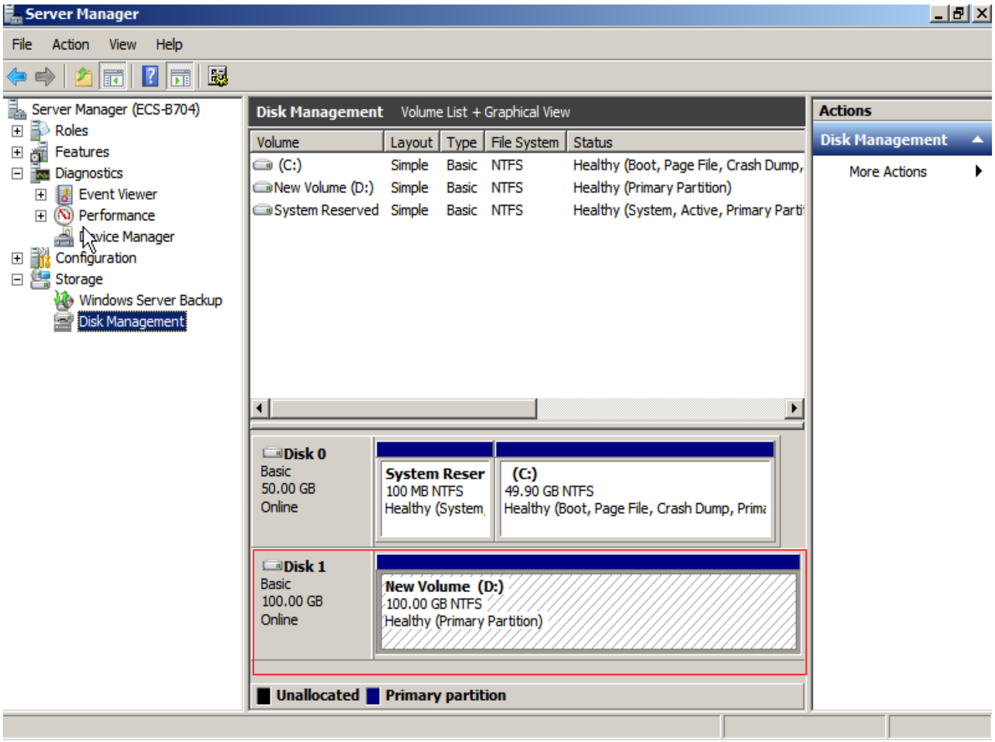
To close this wizard, click Finish.

NOTICE

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

Step 11 Click **Finish**. Wait for the initialization to complete. When the volume status changes to **Healthy**, the initialization has finished successfully, as shown in **Figure 2-12**.

Figure 2-12 Disk initialization succeeded



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Parti

----End

2.4.3 Initializing a Windows Data Disk (Windows Server 2019)

Scenarios

This section uses Windows Server 2019 Standard 64bit to describe how to initialize a data disk attached to a server running Windows.

The maximum disk capacity supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Therefore, use the GPT partition style if your disk capacity is larger than 2 TiB. For details, see **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)**. To learn more about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Procedure

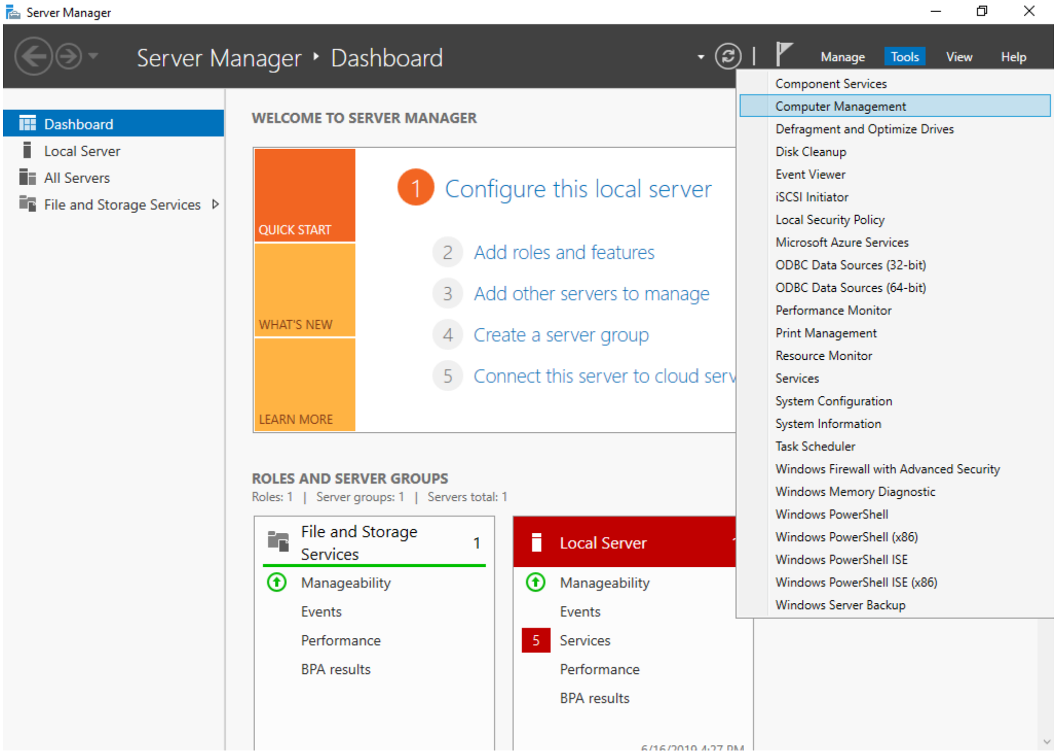
Step 1 On the desktop of the server, click the start icon in the lower left corner.

The **Windows Server** window is displayed.

Step 2 Click **Server Manager**.

The **Server Manager** window is displayed.

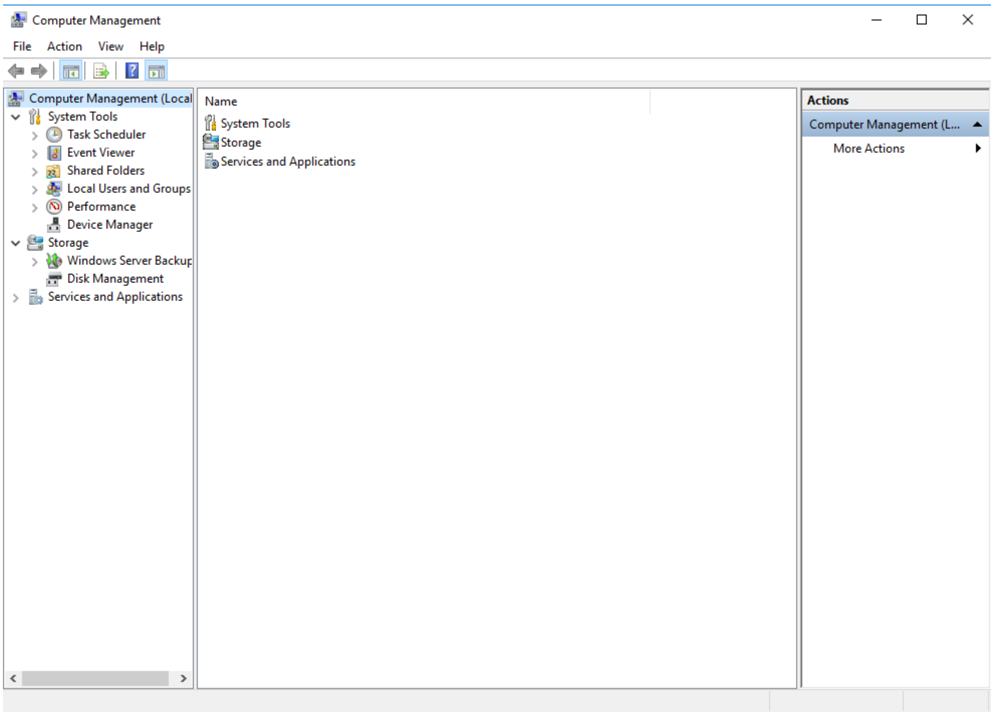
Figure 2-13 Server Manager



Step 3 In the upper right corner, choose **Tools** > **Computer Management**.

The **Computer Management** window is displayed.

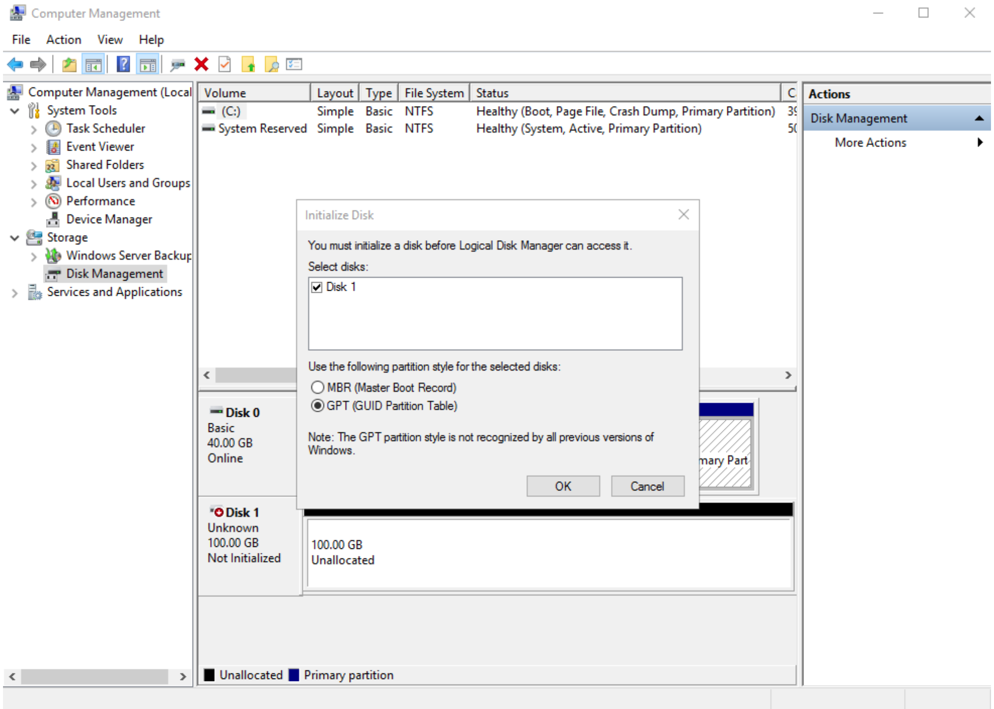
Figure 2-14 Computer Management



Step 4 Choose **Storage** > **Disk Management**.

Disks are displayed in the right pane. If there is a disk that is not initialized, the system will prompt you with the **Initialize Disk** dialog box.

Figure 2-15 Disk list



Volume	Layout	Type	File System	Status	C
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	3
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	5(

Initialize Disk

You must initialize a disk before Logical Disk Manager can access it.

Select disks:

☑ Disk 1

Use the following partition style for the selected disks:

○ MBR (Master Boot Record)

● GPT (GUID Partition Table)

Note: The GPT partition style is not recognized by all previous versions of Windows.

OK Cancel

Disk 0
Basic
40.00 GB
Online

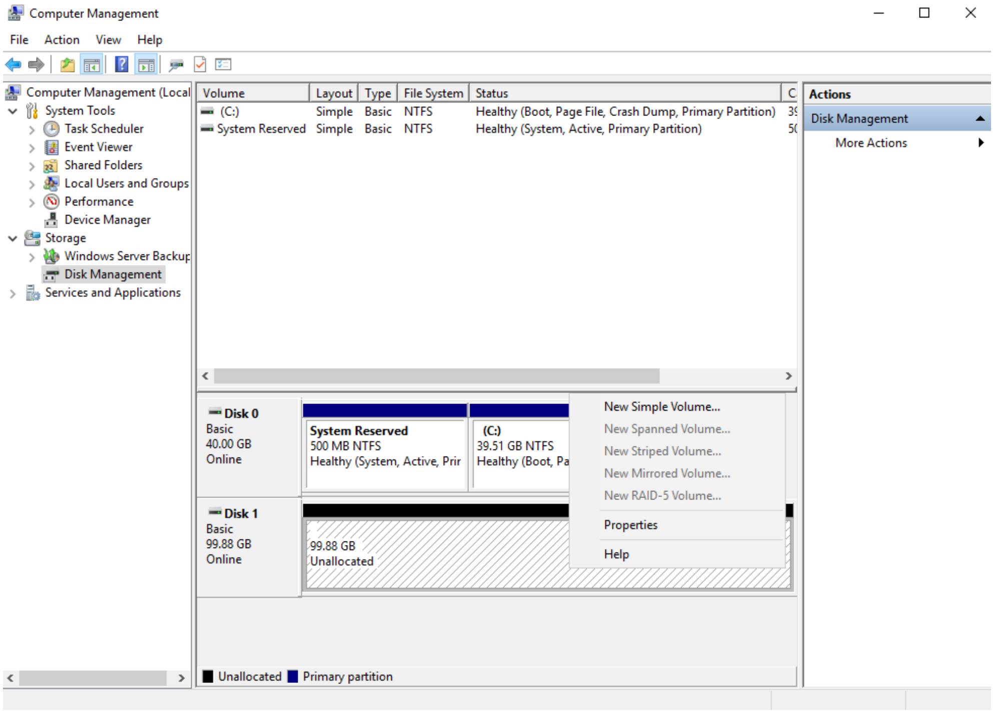
Disk 1
Unknown
100.00 GB
Not Initialized

100.00 GB
Unallocated

Step 5 In the **Initialize Disk** dialog box, the to-be-initialized disk is selected. Select a disk partition style and click **OK**. In this example, **GPT (GUID Partition Table)** is selected.

The **Computer Management** window is displayed.

Figure 2-16 Computer Management



Volume	Layout	Type	File System	Status	C
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	3!
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	5(

Disk 0 Basic 40.00 GB Online	System Reserved 500 MB NTFS Healthy (System, Active, Prir	(C:) 39.51 GB NTFS Healthy (Boot, Pa
Disk 1 Basic 99.88 GB Online	99.88 GB Unallocated	

NOTICE

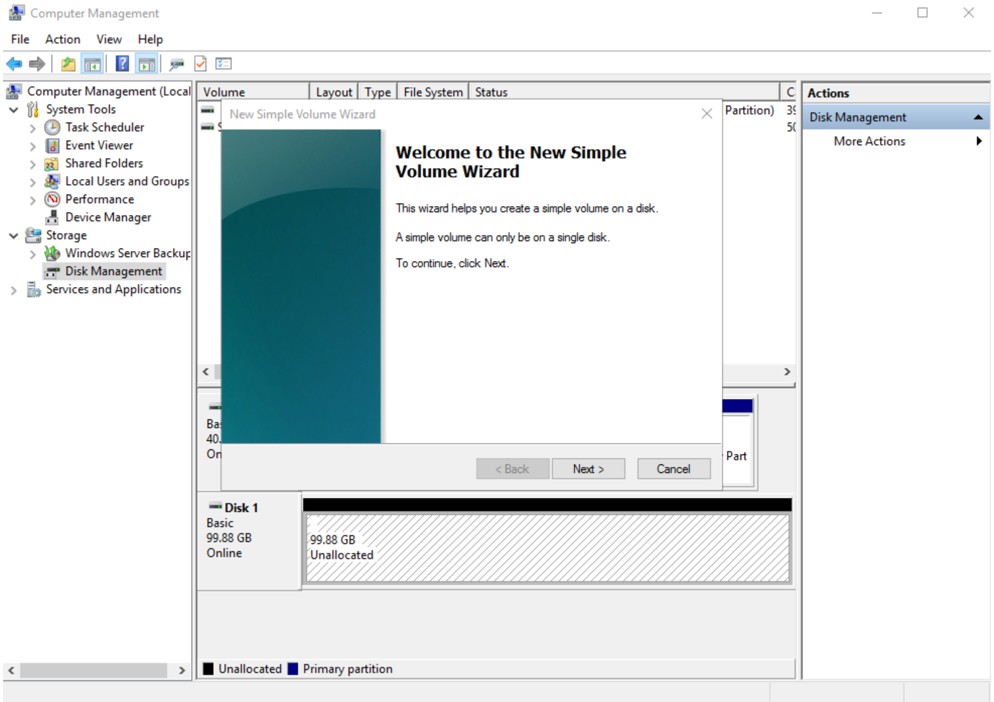
The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

Step 6 Right-click at the unallocated disk space and choose **New Simple Volume** from the shortcut menu.

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

Figure 2-17 New Simple Volume Wizard



New Simple Volume Wizard

Welcome to the New Simple Volume Wizard

This wizard helps you create a simple volume on a disk.

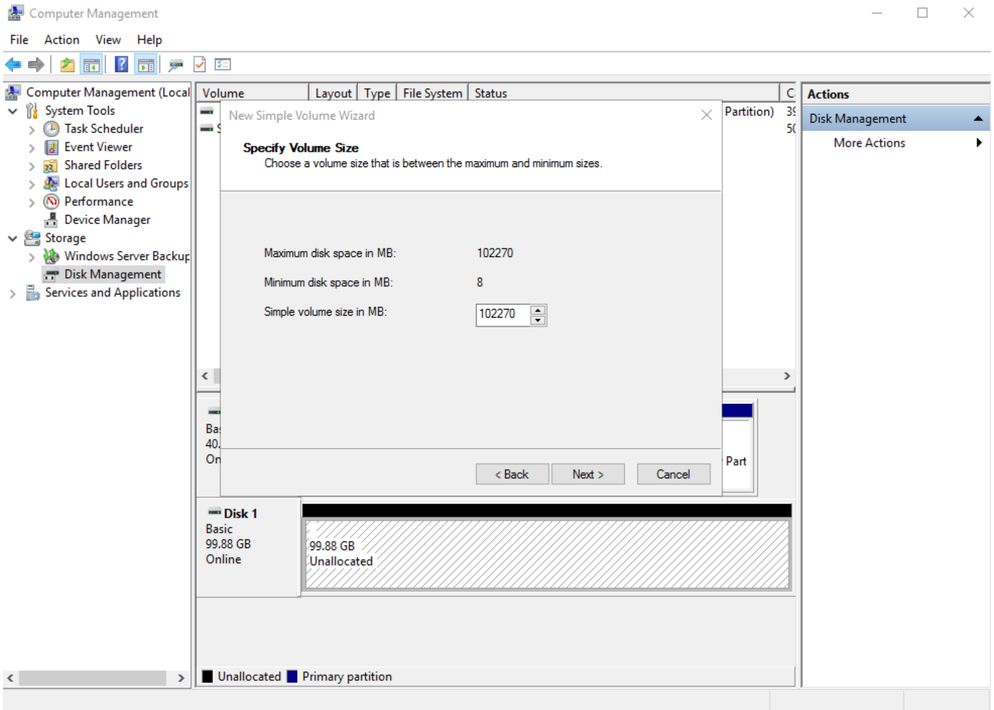
A simple volume can only be on a single disk.

To continue, click Next.

Step 7 Follow the prompts and click **Next**.

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

Figure 2-18 Specify Volume Size



New Simple Volume Wizard

Specify Volume Size

Choose a volume size that is between the maximum and minimum sizes.

Maximum disk space in MB: 102270

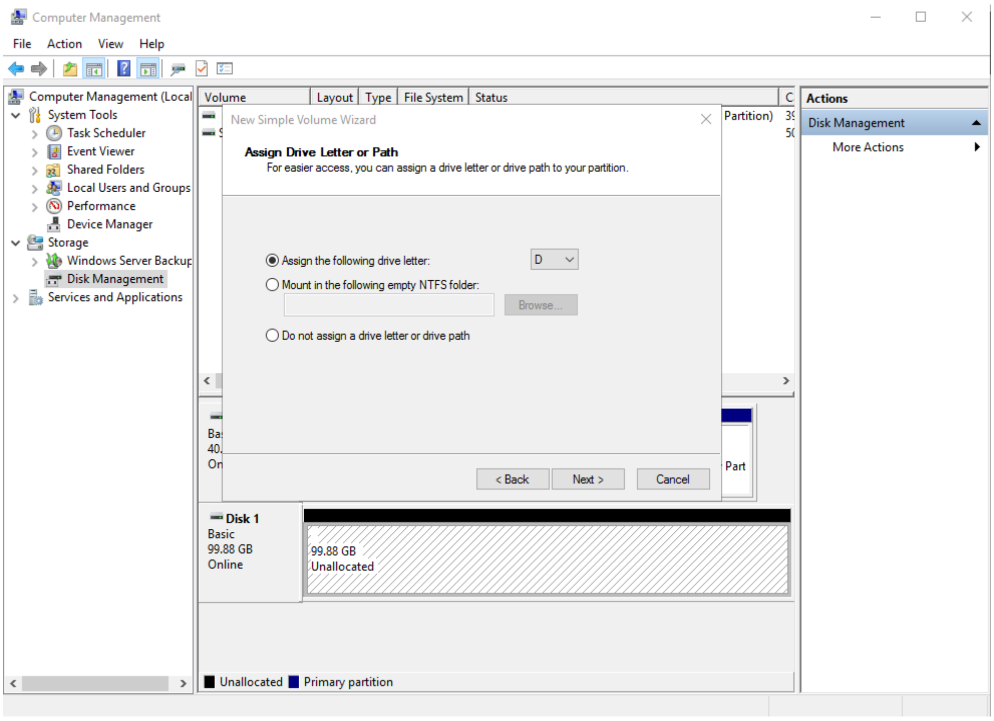
Minimum disk space in MB: 8

Simple volume size in MB: 102270

Step 8 Specify the volume size and click **Next**. The system selects the maximum volume size by default. You can specify the volume size as required. In this example, the default setting is used.

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

Figure 2-19 Assign Driver Letter or Path



New Simple Volume Wizard

Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: D

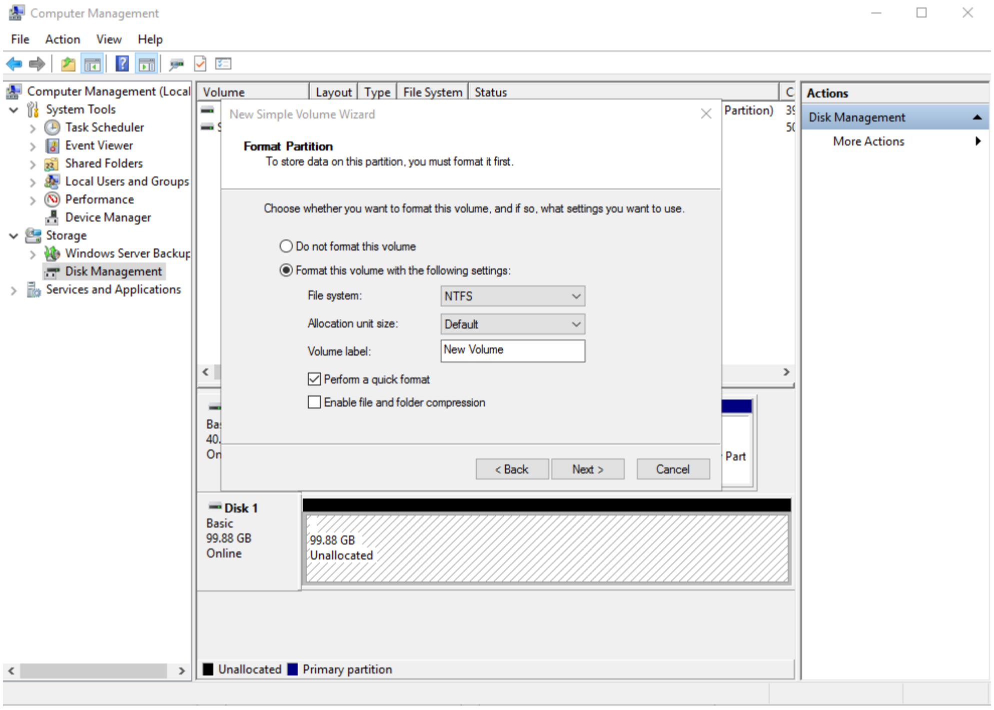
○ Mount in the following empty NTFS folder: Browse...

○ Do not assign a drive letter or drive path

Step 9 Assign a drive letter or path to your partition and click **Next**. The system assigns drive letter D by default. In this example, the default setting is used.

The **Format Partition** page is displayed.

Figure 2-20 Format Partition



New Simple Volume Wizard

Format Partition

To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

Allocation unit size: Default

Volume label: New Volume

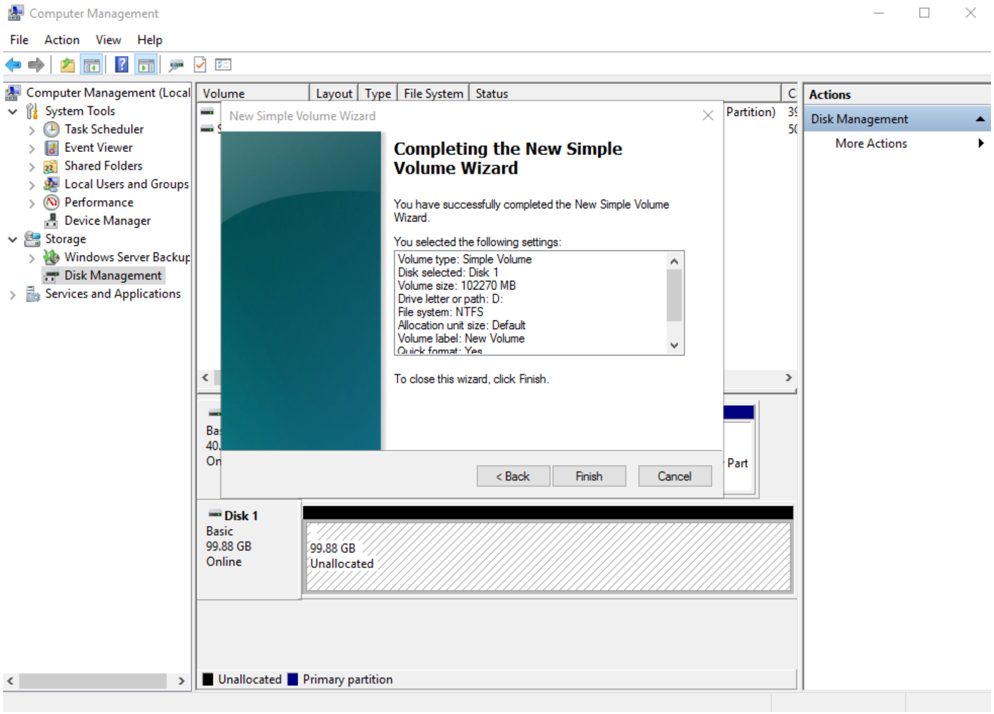
☑ Perform a quick format

☐ Enable file and folder compression

Step 10 Specify format settings and click **Next**. The system selects the NTFS file system by default. You can specify the file system type as required. In this example, the default setting is used.

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

Figure 2-21 Completing the New Simple Volume Wizard



Completing the New Simple Volume Wizard

You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 102270 MB
Drive letter or path: D:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

To close this wizard, click Finish.

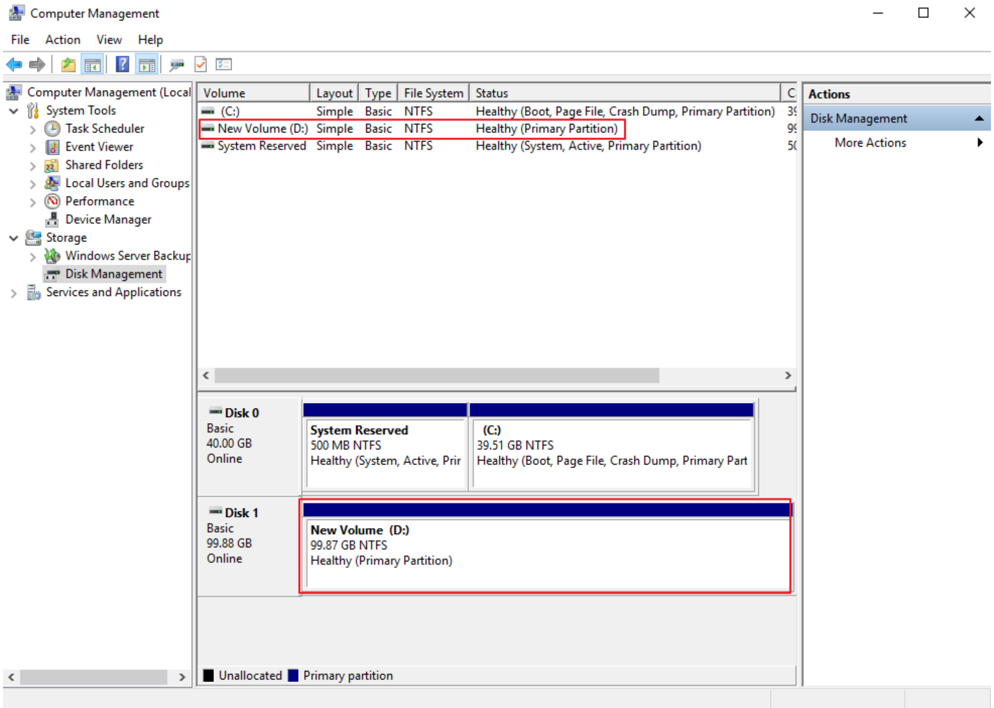
NOTICE

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

Step 11 Click **Finish**.

Wait for the initialization to complete. When the volume status changes to **Healthy**, the initialization has finished successfully, as shown in **Figure 2-22**.

Figure 2-22 Disk initialized



Volume	Layout	Type	File System	Status	C
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	3
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	9
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	5

Disk 0
Basic
40.00 GB
Online

System Reserved
500 MB NTFS
Healthy (System, Active, Prir

(C:)
39.51 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Part

Disk 1
Basic
99.88 GB
Online

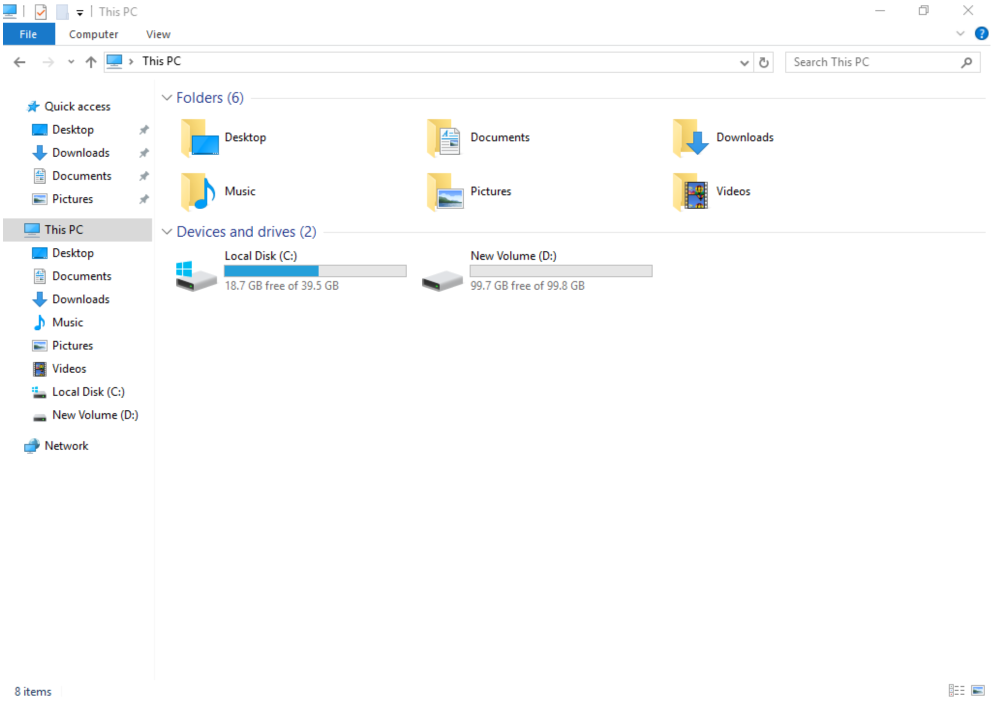
New Volume (D:)
99.87 GB NTFS
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

Step 12 After the volume is created, click 📁 on the task bar and check whether a new volume appears in **This PC**. In this example, New Volume (D:) is the new volume.

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

Figure 2-23 This PC



----End

2.4.4 Initializing a Linux Data Disk (fdisk)

Scenarios

This section uses CentOS 7.4 64bit to describe how to initialize a data disk attached to a server running Linux and use fdisk to partition the data disk.

The maximum partition size that MBR supports is 2 TiB and that GPT supports is 18 EiB. If the disk size you need to partition is greater than 2 TiB, partition the disk using GPT.

The partitioning tool fdisk is suitable only for MBR partitions, and parted is suitable for both MBR and GPT partitions. For more information, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Creating and Mounting a Partition

The following example shows you how a new primary partition can be created on a new data disk that has been attached to a server. The primary partition will be created using fdisk, and MBR will be used. Furthermore, the partition will be formatted using the ext4 file system, mounted on **/mnt/sdc**, and configured with automatic mounting at system start.

Step 1 **fdisk -l**

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/vdb: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

In the command output, the server contains two disks. **/dev/vda** is the system disk, and **/dev/vdb** is the new data disk.

Step 2 Run the following command to enter fdisk to partition the new data disk:

fdisk *New data disk*

In this example, run the following command:

fdisk /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0x38717fc1.

Command (m for help):
```

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

Information similar to the following is displayed:

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

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 4 In this example, a primary partition is created. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

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

Partition number indicates the serial number of the primary partition. The value ranges from **1** to **4**.

Step 5 Enter the serial number of the primary partition and press **Enter**. Primary partition number **1** is used in this example. One usually starts with partition number **1** when partitioning an empty disk.

Information similar to the following is displayed:

```
Partition number (1-4, default 1): 1
First sector (2048-209715199, default 2048):
```

First sector indicates the start sector. The value ranges from **2048** to **209715199**, and the default value is **2048**.

Step 6 Select the default start sector **2048** and press **Enter**.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
First sector (2048-209715199, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-209715199, default 209715199):
```

Last sector indicates the end sector. The value ranges from **2048** to **209715199**, and the default value is **209715199**.

Step 7 Select the default end sector **209715199** and press **Enter**.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (2048-209715199, default 209715199):
Using default value 209715199
Partition 1 of type Linux and of size 100 GiB is set

Command (m for help):
```

A primary partition has been created for the new data disk.

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

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/vdb: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
```

```
Command (m for help):
```

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

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

Information similar to the following is displayed:

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

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

The partition is created.

NOTE

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

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

partprobe

Step 11 Run the following command to set the file system format for the new partition:

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

In this example, run the following command to set the **ext4** file system for the new partition:

mkfs -t ext4 /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# mkfs -t ext4 /dev/vdb1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
6553600 inodes, 26214144 blocks
1310707 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2174746624
800 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872

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

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

NOTICE

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

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

mkdir *Mount point*

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

mkdir /mnt/sdc

NOTE

The **/mnt** directory exists on all Linux systems. If the mount point fails to create, it may be that the **/mnt** directory has been accidentally deleted. Run the **mkdir -p /mnt/sdc** command to create the mount point.

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

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vdb1** on **/mnt/sdc**:

mount /dev/vdb1 /mnt/sdc

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

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
```

New partition **/dev/vdb1** is mounted on **/mnt/sdc**.

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc            ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.
- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

    When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1

2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a

3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

   If information similar to the following is displayed, automatic mounting has been configured:

   ```
   root@ecs-test-0001 ~]# mount | grep /mnt/sdc
   /dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
   ```

----End

2.4.5 Initializing a Linux Data Disk (parted)

Scenarios

This section uses CentOS 7.4 64bit to describe how to initialize a data disk attached to a server running Linux and use parted to partition the data disk.

The maximum partition size that MBR supports is 2 TiB and that GPT supports is 18 EiB. If the disk size you need to partition is greater than 2 TiB, partition the disk using GPT.

The partitioning tool fdisk is suitable only for MBR partitions, and parted is suitable for both MBR and GPT partitions. For more information, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Creating and Mounting a Partition

The following example shows you how a new partition can be created on a new data disk that has been attached to a server. The partition will be created using parted, and GPT will be used. Furthermore, the partition will be formatted using the ext4 file system, mounted on **/mnt/sdc**, and configured with automatic mounting at system start.

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

lsblk

Information similar to the following is displayed:

```
root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  100G  0 disk
```

In the command output, the server contains two disks. **/dev/vda** is the system disk, and **/dev/vdb** is the new data disk.

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

parted *New data disk*

In this example, run the following command:

parted /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# parted /dev/vdb
GNU Parted 3.1
Using /dev/vdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted)
```

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

Information similar to the following is displayed:

```
(parted) p
Error: /dev/vdb: unrecognised disk label
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 107GB
Sector size (logical/physical): 512B/512B
Partition Table: unknown
Disk Flags:
(parted)
```

In the command output, the **Partition Table** value is **unknown**, indicating that no partition style is set for the new disk.

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

mklabel *Disk partition style*

In this example, run the following command to set the partition style to GPT: (Disk partition styles can be MBR or GPT.)

mklabel gpt

NOTICE

The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

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

Information similar to the following is displayed:

```
(parted) mklabel gpt
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 107GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End  Size  File system  Name  Flags

(parted)
```

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

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

Step 7 Run the following command and press **Enter**:

mkpart *Partition name Start sector End sector*

In this example, run the following command:

mkpart test 2048s 100%

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

Information similar to the following is displayed:

```
(parted) mkpart opt 2048s 100%
(parted)
```

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

Information similar to the following is displayed:

```
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 209715200s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End         Size        File system  Name  Flags
 1      2048s  209713151s  209711104s               test

(parted)
```

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

Information similar to the following is displayed:

```
(parted) q
Information: You may need to update /etc/fstab.
```

You can set automatic disk mounting by updating the **/etc/fstab** file. Before updating the file, set the file system format for the partition and mount the partition on the mount point.

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

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  100G  0 disk
└─vdb1 253:17   0  100G  0 part
```

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

Step 11 Run the following command to set the file system format for the new partition:

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

In this example, run the following command to set the **ext4** file system for the new partition:

mkfs -t ext4 /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# mkfs -t ext4 /dev/vdb1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
6553600 inodes, 26213888 blocks
1310694 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2174746624
800 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872

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

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

NOTICE

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

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

mkdir *Mount point*

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

mkdir /mnt/sdc

NOTE

The **/mnt** directory exists on all Linux systems. If the mount point fails to create, it may be that the **/mnt** directory has been accidentally deleted. Run the **mkdir -p /mnt/sdc** command to create the mount point.

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

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vdb1** on **/mnt/sdc**:

mount /dev/vdb1 /mnt/sdc

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

df -TH

Information similar to the following is displayed:

New partition **/dev/vdb1** is mounted on **/mnt/sdc**.

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc              ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.
- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

    When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1

2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a

3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

If information similar to the following is displayed, automatic mounting has been configured:

```
root@ecs-test-0001 ~]# mount | grep /mnt/sdc
/dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
```

----End

2.4.6 Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)

Scenarios

This section uses Windows Server 2008 R2 Standard 64bit to describe how to initialize a data disk whose capacity is larger than 2 TiB. In the following operations, the capacity of the example disk is 3 TiB.

The maximum disk capacity supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Therefore, use the GPT partition style if your disk capacity is larger than 2 TiB. For details, see **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)**. To learn more about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Procedure

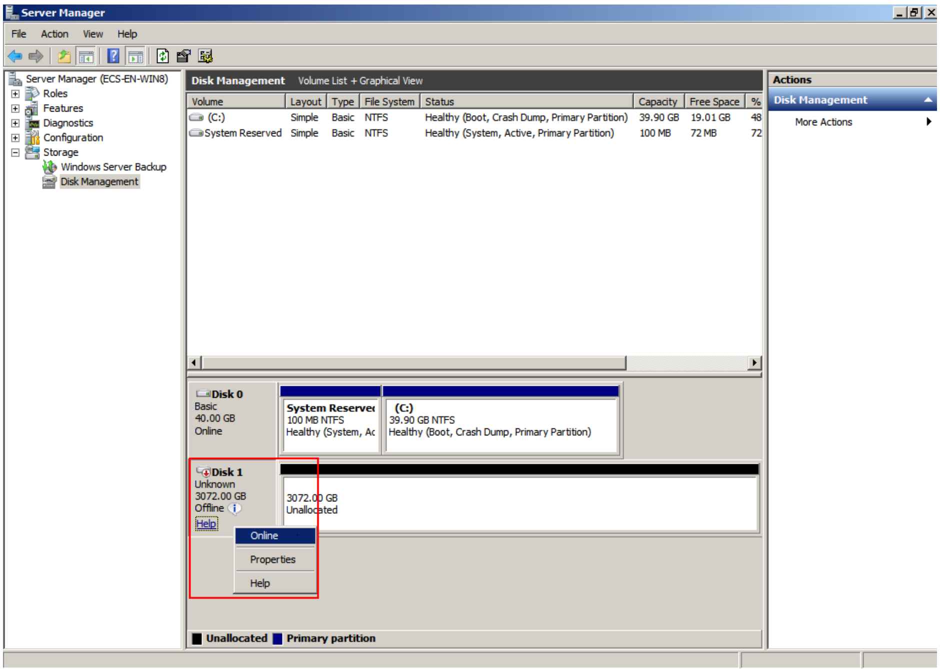
Step 1 On the desktop of the server, click **Start**.

The **Start** window is displayed.

Step 2 Right-click **Computer** and choose **Manage** from the short-cut menu.

The **Server Manager** window is displayed.

Figure 2-24 Server Manager (Windows Server 2008)



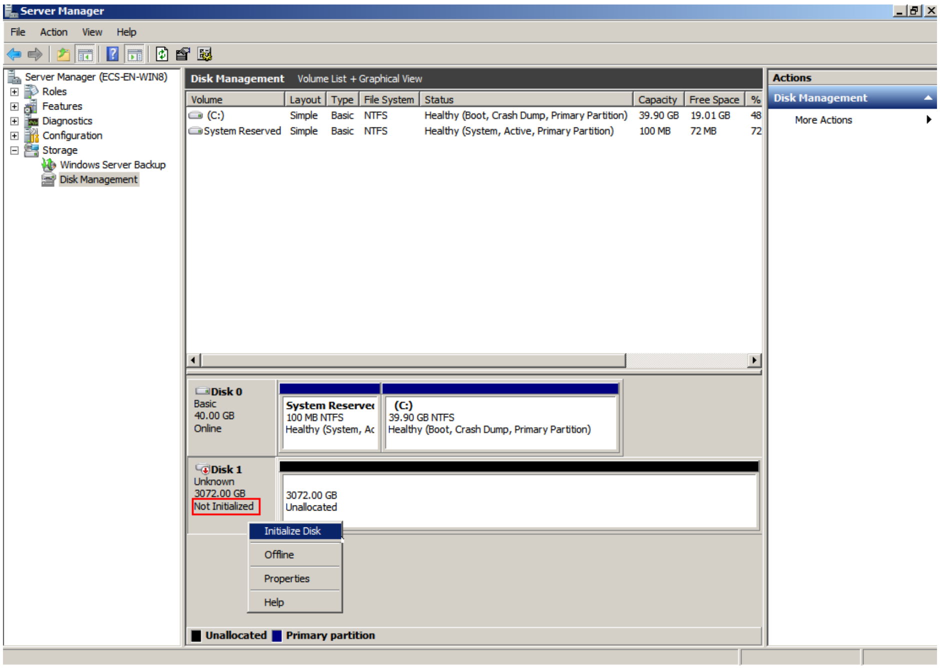
Volume	Layout	Type	File System	Status	Capacity	Free Space	%
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.90 GB	19.01 GB	48
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72

Step 3 Disks are listed in the right pane. If the new disk is in the offline state, bring it online before initializing it.

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

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

Figure 2-25 Bring online succeeded (Windows Server 2008)

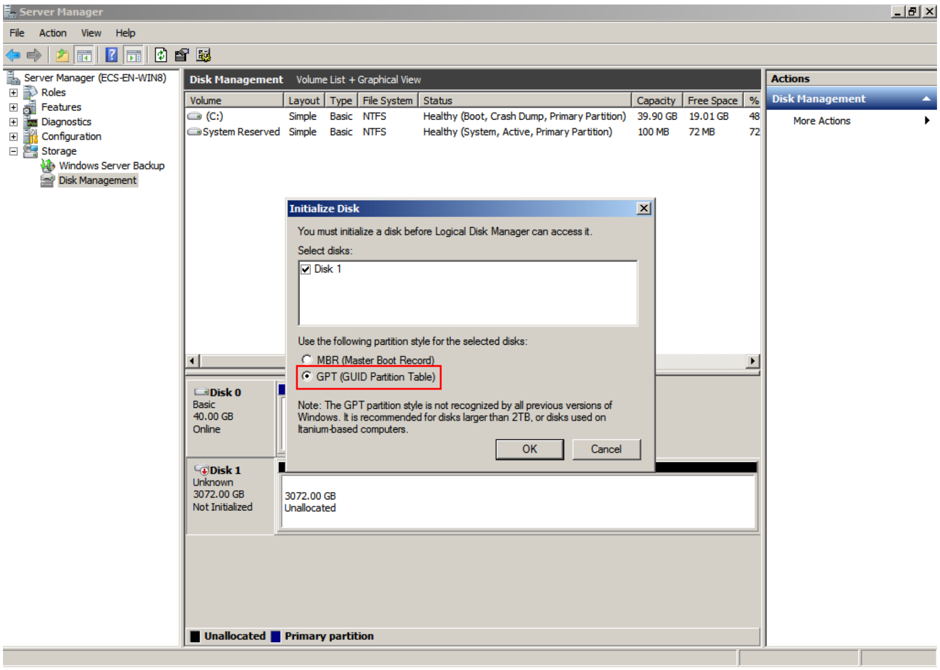


Volume	Layout	Type	File System	Status	Capacity	Free Space	%
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.90 GB	19.01 GB	48
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72

Step 4 In the **Disk 1** area, right-click and choose **Initialize Disk** from the shortcut menu.

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

Figure 2-26 Initialize Disk (Windows Server 2008)



Volume	Layout	Type	File System	Status	Capacity	Free Space	%
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.90 GB	19.01 GB	48
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72

Initialize Disk

You must initialize a disk before Logical Disk Manager can access it.

Select disks:

☑ Disk 1

Use the following partition style for the selected disks:

○ MBR (Master Boot Record)

● GPT (GUID Partition Table)

Note: The GPT partition style is not recognized by all previous versions of Windows. It is recommended for disks larger than 2TB, or disks used on Itanium-based computers.

Disk 0
Basic
40.00 GB
Online

Disk 1
Unknown
3072.00 GB
Not Initialized

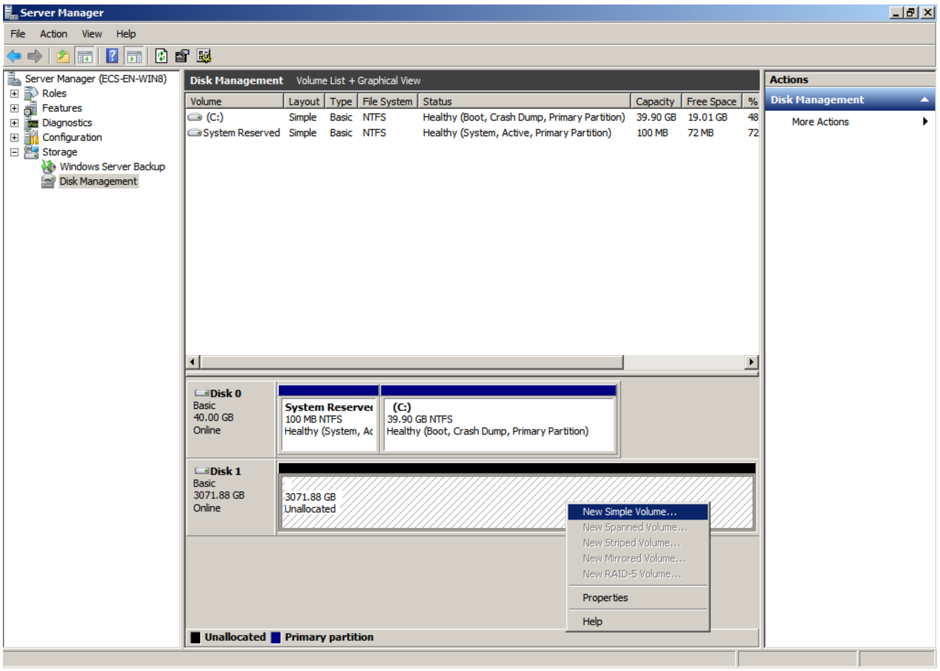
3072.00 GB
Unallocated

■ Unallocated ■ Primary partition

Step 5 In the **Initialize Disk** dialog box, the to-be-initialized disk is selected. In this example, the disk capacity is larger than 2 TiB. Therefore, select **GPT (GUID Partition Table)** and click **OK**.

The **Server Manager** window is displayed.

Figure 2-27 Server Manager (Windows Server 2008)



Volume	Layout	Type	File System	Status	Capacity	Free Space	%
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.90 GB	19.01 GB	48
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72

Disk 0
Basic
40.00 GB
Online

System Reserve
100 MB NTFS
Healthy (System, Ac

(C:)
39.90 GB NTFS
Healthy (Boot, Crash Dump, Primary Partition)

Disk 1
Basic
3071.88 GB
Online

3071.88 GB
Unallocated

■ Unallocated ■ Primary partition

NOTICE

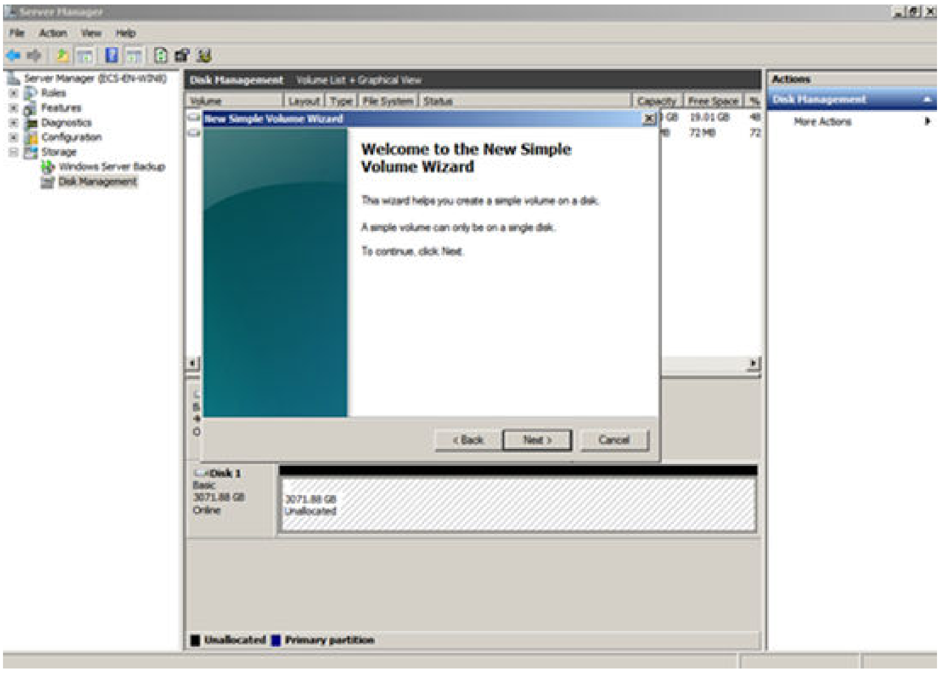
The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

Step 6 Right-click at the unallocated disk space and choose **New Simple Volume** from the shortcut menu.

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

Figure 2-28 New Simple Volume Wizard (Windows Server 2008)



Welcome to the New Simple Volume Wizard

This wizard helps you create a simple volume on a disk.

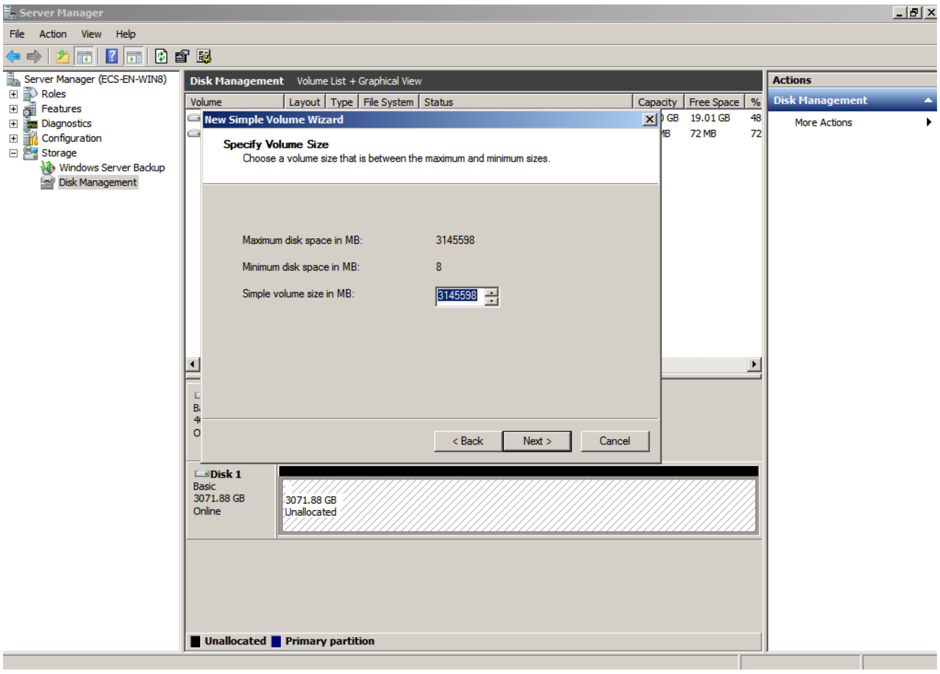
A simple volume can only be on a single disk.

To continue, click Next.

Step 7 Follow the prompts and click **Next**.

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

Figure 2-29 Specify Volume Size (Windows Server 2008)



New Simple Volume Wizard

Specify Volume Size
Choose a volume size that is between the maximum and minimum sizes.

Maximum disk space in MB: 3145598

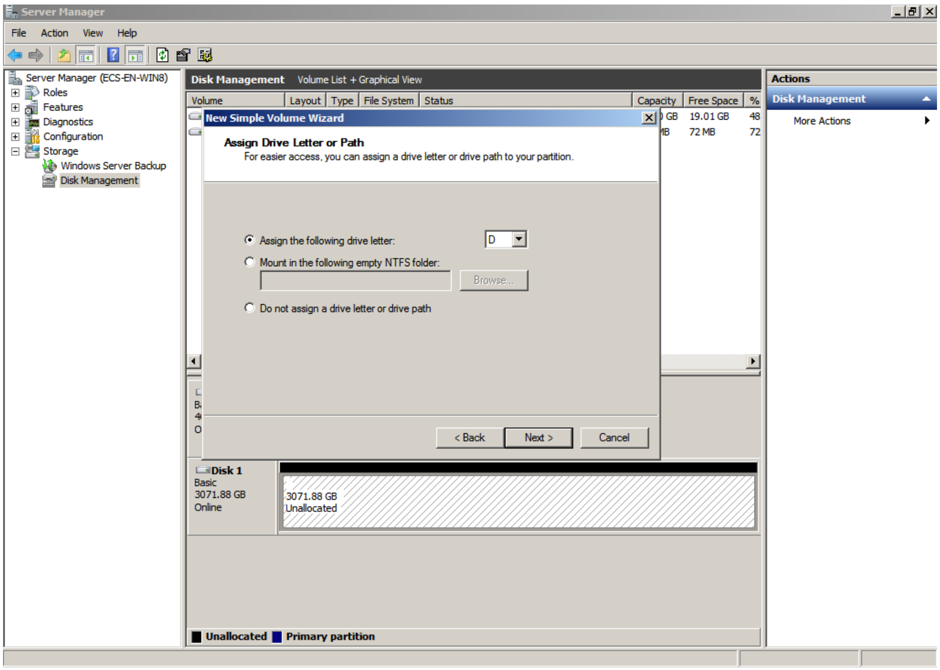
Minimum disk space in MB: 8

Simple volume size in MB: 3145598

Step 8 Specify the volume size and click **Next**. The system selects the maximum volume size by default. You can specify the volume size as required. In this example, the default setting is used.

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

Figure 2-30 Assign Driver Letter or Path (Windows Server 2008)



New Simple Volume Wizard

Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: D

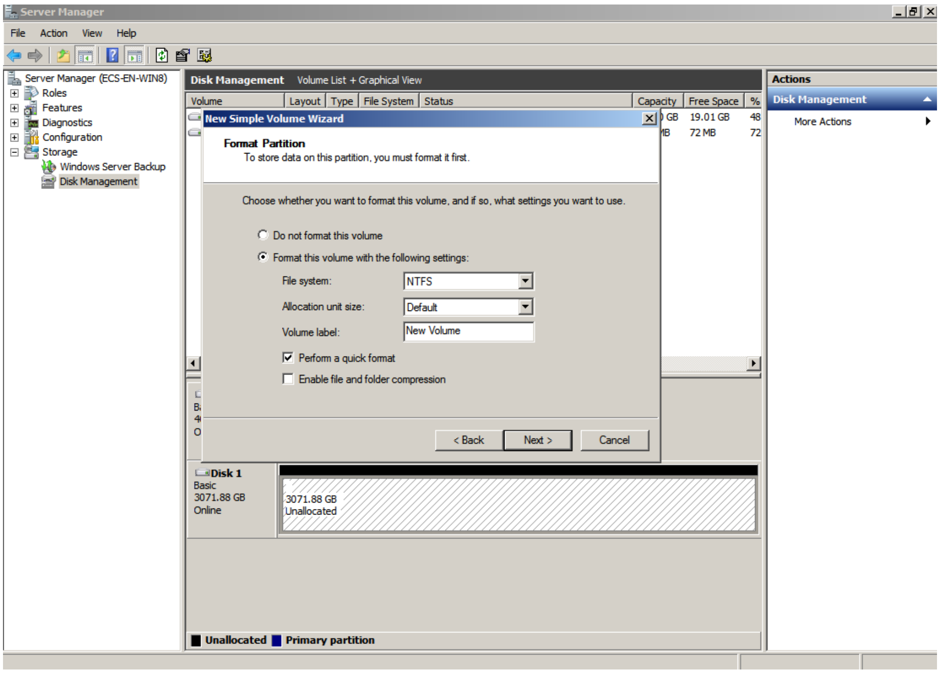
○ Mount in the following empty NTFS folder:

○ Do not assign a drive letter or drive path

Step 9 Assign a drive letter or path to your partition and click **Next**. The system assigns drive letter D by default. In this example, the default setting is used.

The **Format Partition** page is displayed.

Figure 2-31 Format Partition (Windows Server 2008)



Format Partition
To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume
● Format this volume with the following settings:

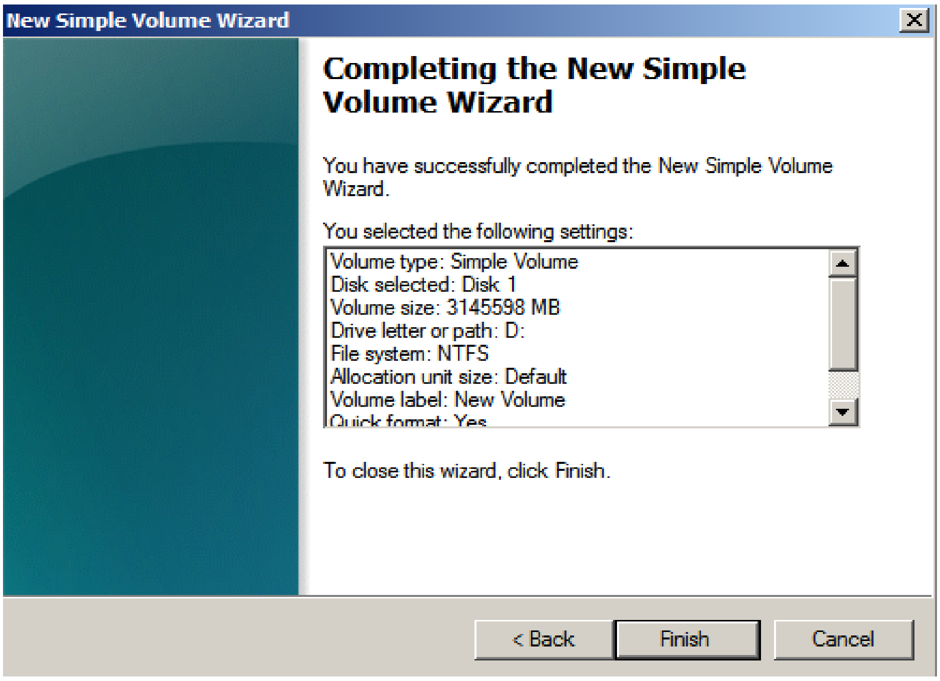
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
☑ Perform a quick format
□ Enable file and folder compression

< Back Next > Cancel

Step 10 Specify format settings and click **Next**. The system selects the NTFS file system by default. You can specify the file system type as required. In this example, the default setting is used.

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

Figure 2-32 Completing the New Simple Volume Wizard



Completing the New Simple Volume Wizard

You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 3145598 MB
Drive letter or path: D:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

To close this wizard, click Finish.

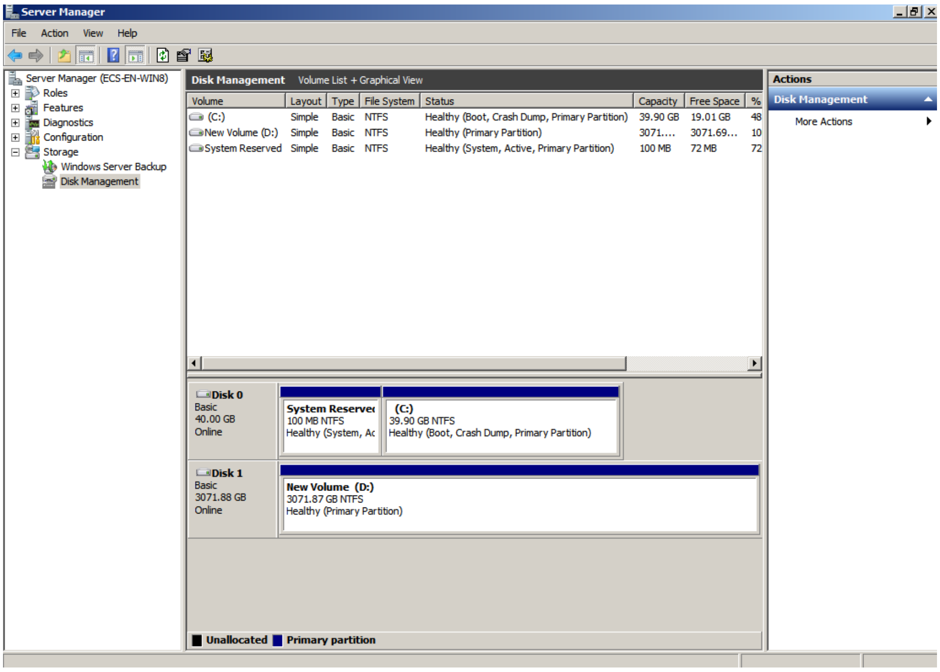
NOTICE

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

Step 11 Click **Finish**.

Wait for the initialization to complete. When the volume status changes to **Healthy**, the initialization has finished successfully, as shown in **Figure 2-33**.

Figure 2-33 Disk initialization succeeded (Windows Server 2008)



Volume	Layout	Type	File System	Status	Capacity	Free Space	%
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.90 GB	19.01 GB	48
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	3071....	3071.69...	10
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Ac

(C:)
39.90 GB NTFS
Healthy (Boot, Crash Dump, Primary Partition)

Disk 1
Basic
3071.88 GB
Online

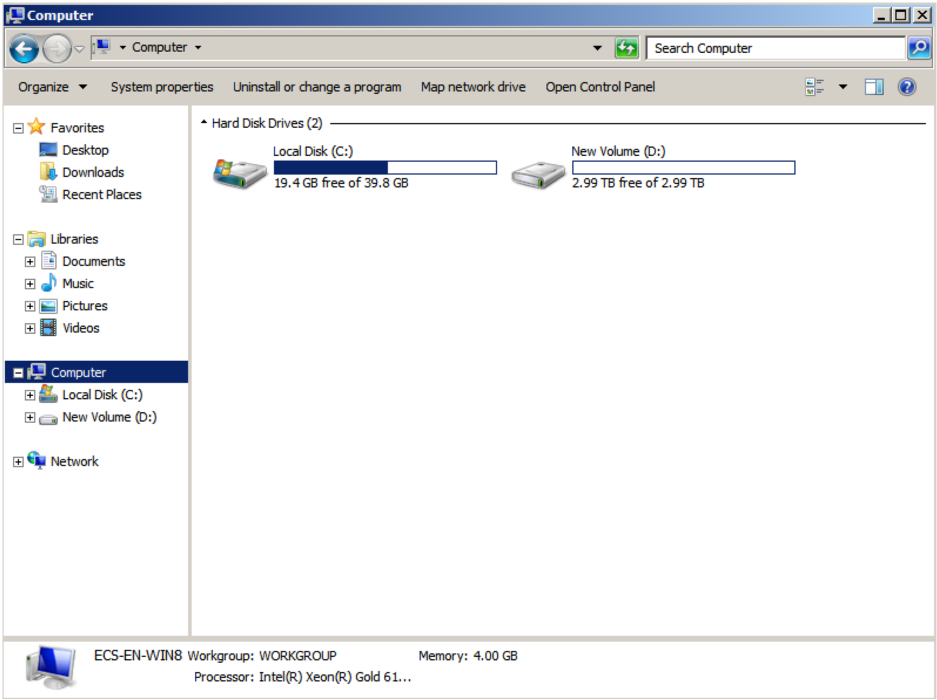
New Volume (D:)
3071.87 GB NTFS
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

Step 12 After the volume is created, click 📁 and check whether a new volume appears in **Computer**. In this example, New Volume (D:) is the new volume.

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

Figure 2-34 Computer (Windows Server 2008)



----End

2.4.7 Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2012)

Scenarios

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

The maximum disk capacity supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Therefore, use the GPT partition style if your disk capacity is larger than 2 TiB. For details, see **Initializing a Windows Data Disk Larger Than 2 TiB (Windows Server 2008)**. To learn more about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

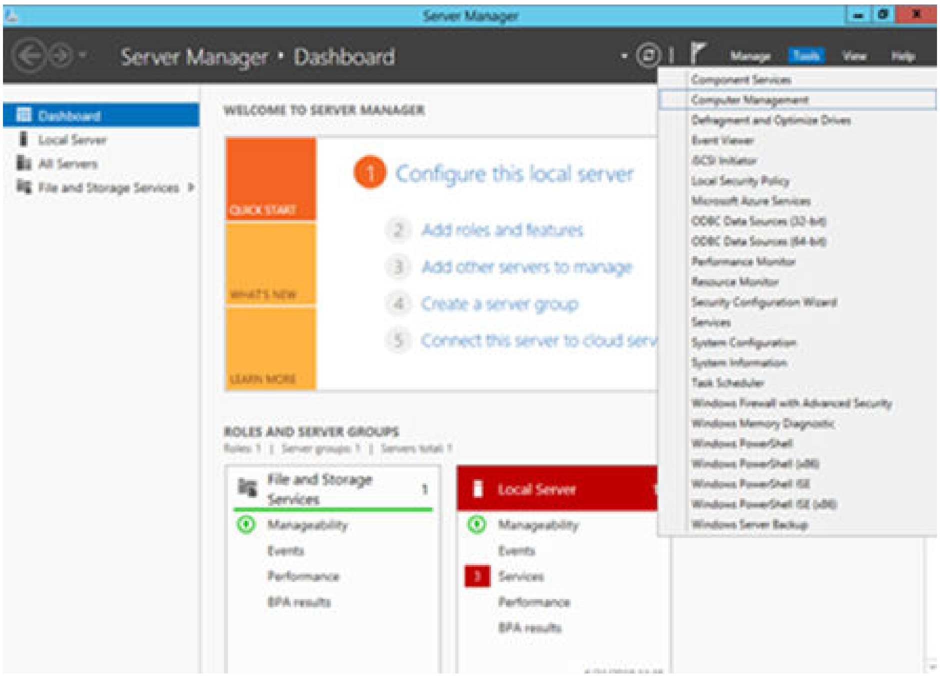
- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Procedure

Step 1 On the desktop of the server, click in the lower area.

The **Server Manager** window is displayed.

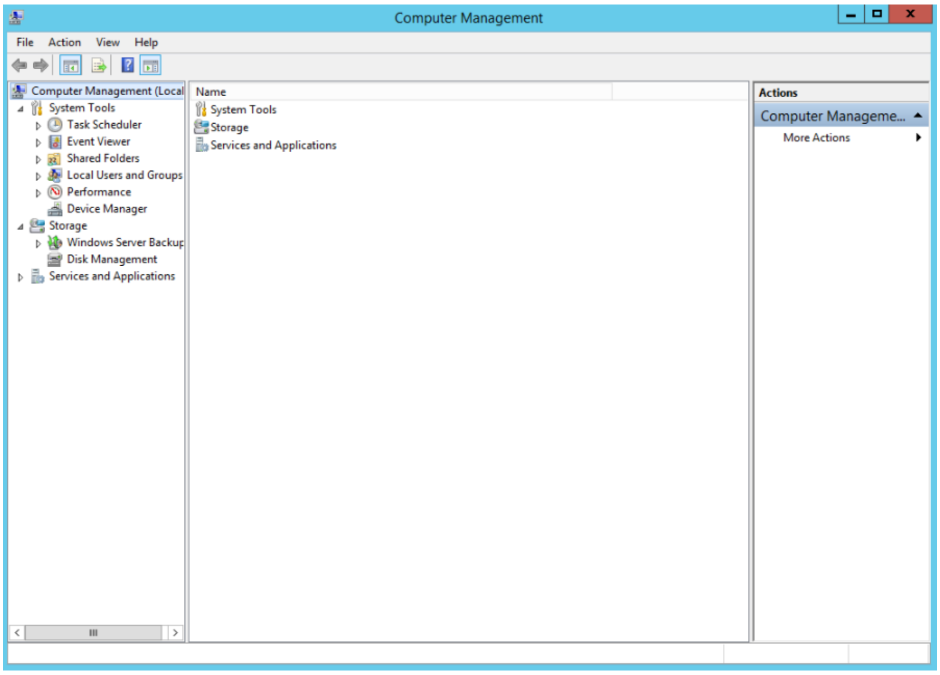
Figure 2-35 Server Manager (Windows Server 2012)



Step 2 In the upper right corner, choose **Tools** > **Computer Management**.

The **Computer Management** window is displayed.

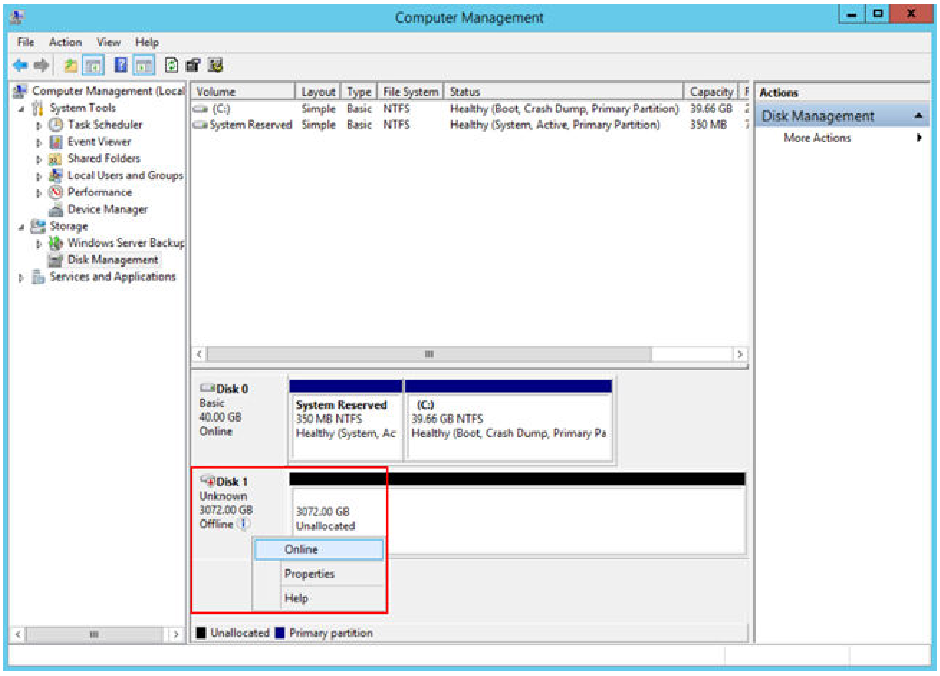
Figure 2-36 Computer Management window (Windows Server 2012)



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

Disks are displayed in the right pane.

Figure 2-37 Disk Management list (Windows Server 2012)



Volume	Layout	Type	File System	Status	Capacity	F
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.66 GB	
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	350 MB	

Disk 0
Basic
40.00 GB
Online

System Reserved
350 MB NTFS
Healthy (System, Ac

(C:)
39.66 GB NTFS
Healthy (Boot, Crash Dump, Primary Pa

Disk 1
Unknown
3072.00 GB
Offline

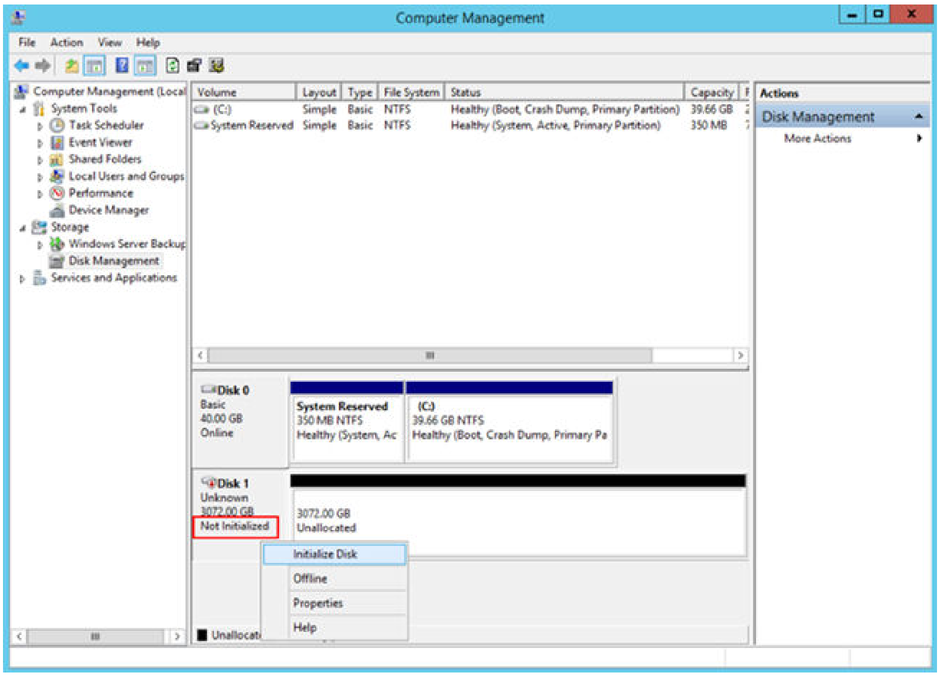
3072.00 GB
Unallocated

Step 4 (Optional) If the new disk is in the offline state, bring it online before initializing it.

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

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

Figure 2-38 Bring online succeeded (Windows Server 2012)



Volume	Layout	Type	File System	Status	Capacity
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.66 GB
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	350 MB

Disk 0
Basic
40.00 GB
Online

System Reserved
350 MB NTFS
Healthy (System, Ac

(C:)
39.66 GB NTFS
Healthy (Boot, Crash Dump, Primary Pa

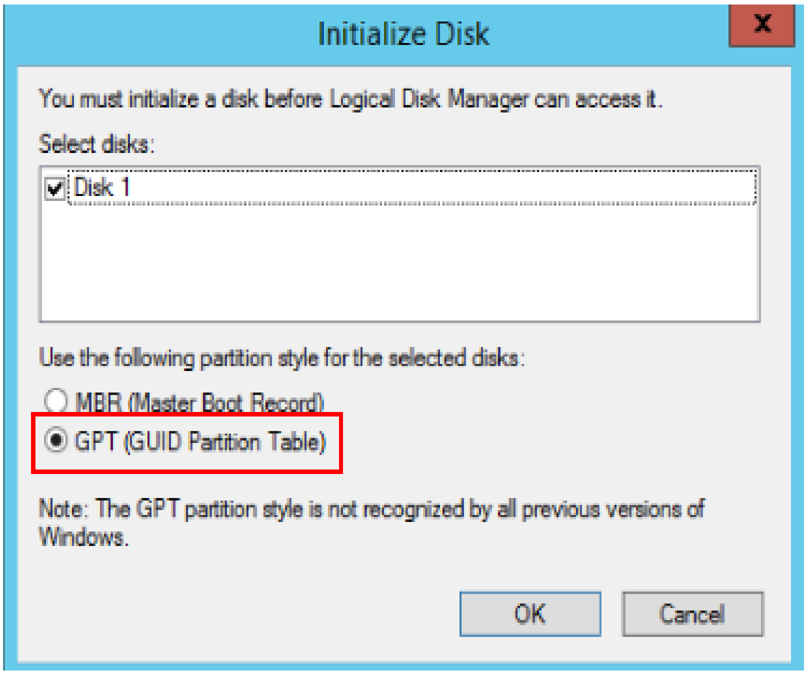
Disk 1
Unknown
3072.00 GB
Not Initialized

3072.00 GB
Unallocated

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

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

Figure 2-39 Initialize Disk (Windows Server 2012)



Initialize Disk

You must initialize a disk before Logical Disk Manager can access it.

Select disks:

☑ Disk 1

Use the following partition style for the selected disks:

○ MBR (Master Boot Record)

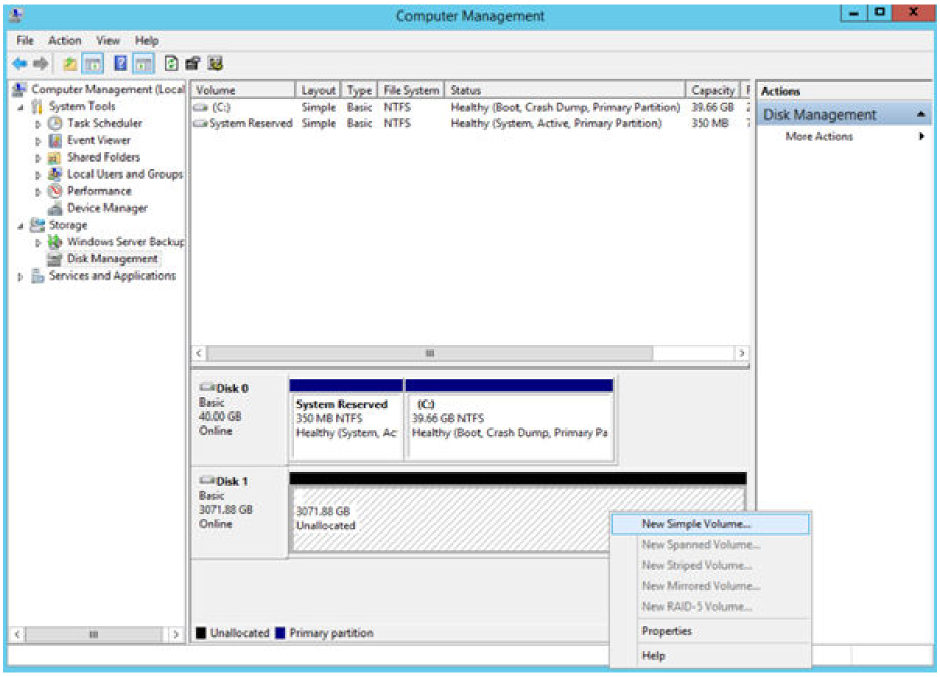
● GPT (GUID Partition Table)

Note: The GPT partition style is not recognized by all previous versions of Windows.

Step 6 In the **Initialize Disk** dialog box, the to-be-initialized disk is selected. In this example, the disk capacity is larger than 2 TiB. Therefore, select **GPT (GUID Partition Table)** and click **OK**.

The **Computer Management** window is displayed.

Figure 2-40 Computer Management (Windows Server 2012)



Volume	Layout	Type	File System	Status	Capacity	F
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.66 GB	2
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	350 MB	1

Disk 0
Basic
40.00 GB
Online

System Reserved
350 MB NTFS
Healthy (System, Ac

(C:)
39.66 GB NTFS
Healthy (Boot, Crash Dump, Primary Pa

Disk 1
Basic
3071.88 GB
Online

3071.88 GB
Unallocated

NOTICE

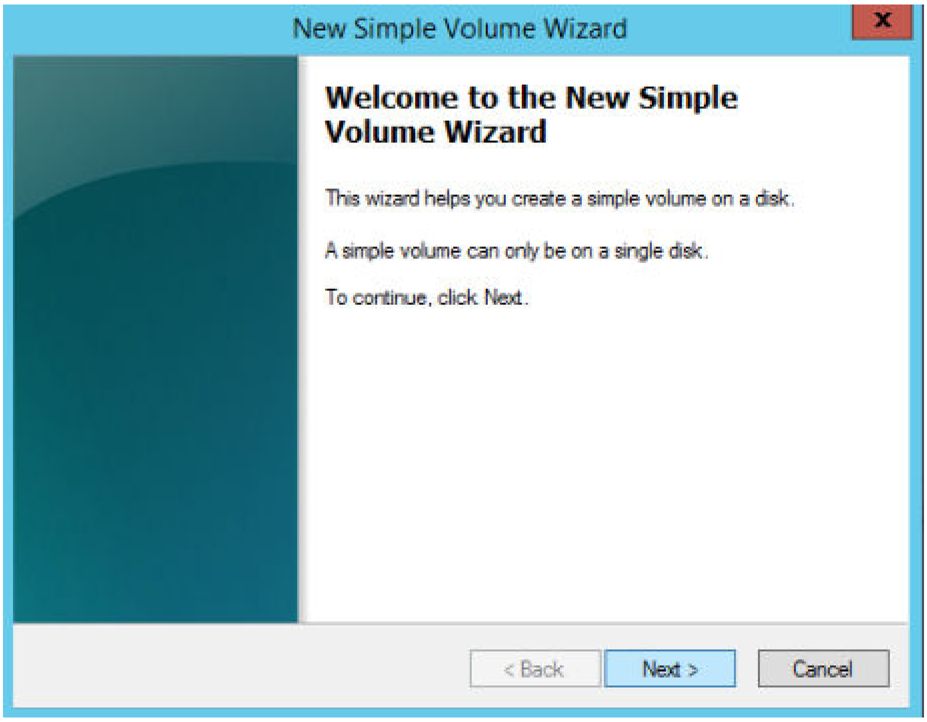
The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

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

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

Figure 2-41 New Simple Volume Wizard (Windows Server 2012)



Welcome to the New Simple Volume Wizard

This wizard helps you create a simple volume on a disk.

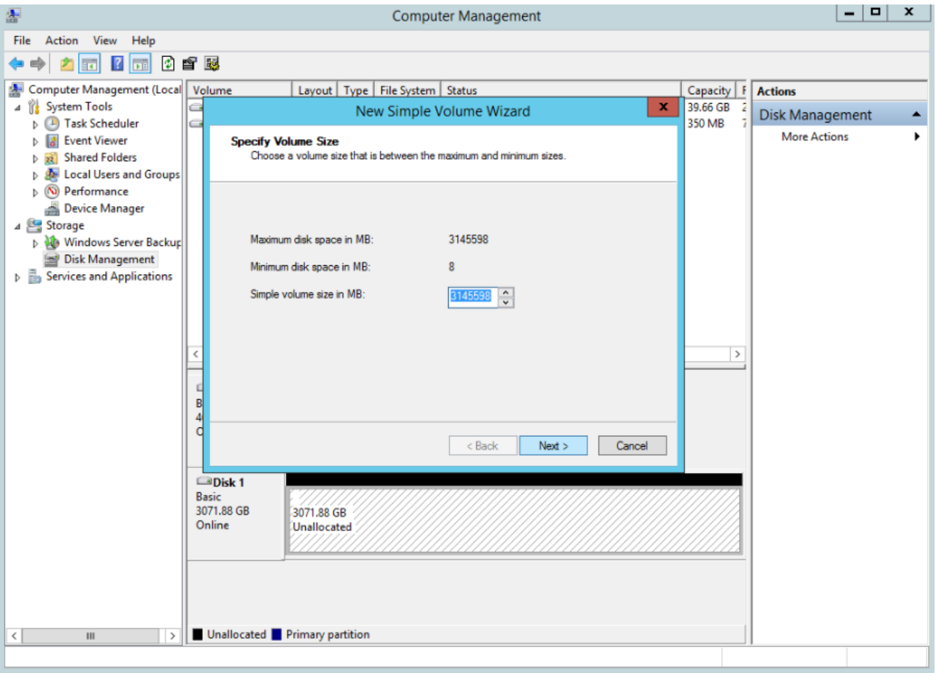
A simple volume can only be on a single disk.

To continue, click Next.

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

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

Figure 2-42 Specify Volume Size (Windows Server 2012)



Specify Volume Size

Choose a volume size that is between the maximum and minimum sizes.

Maximum disk space in MB: 3145598

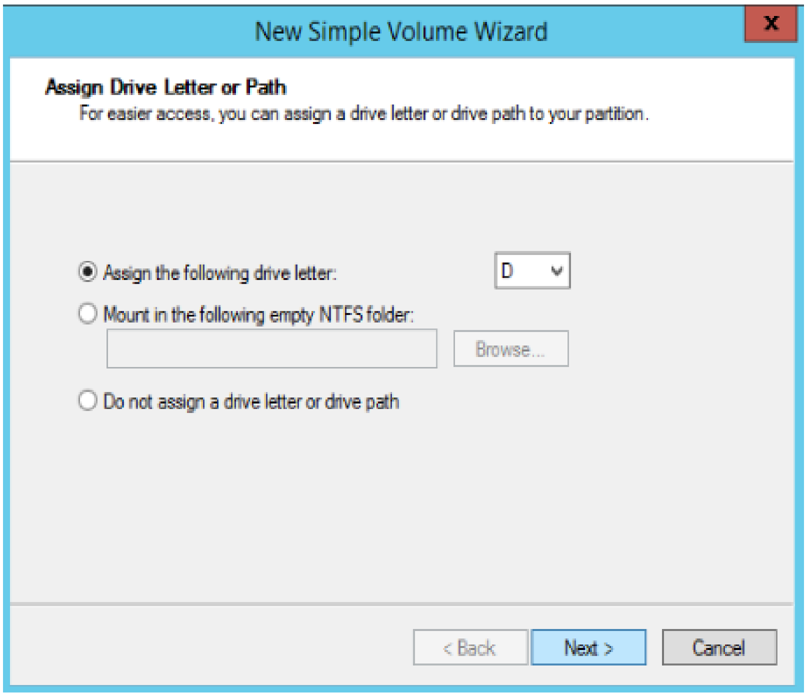
Minimum disk space in MB: 8

Simple volume size in MB: 3145598

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

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

Figure 2-43 Assign Driver Letter or Path (Windows Server 2012)



Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: D

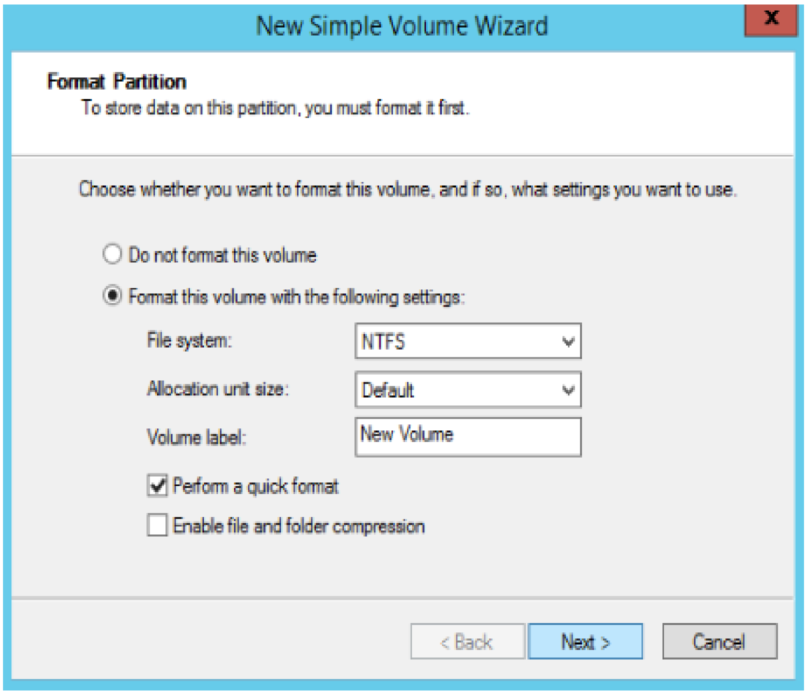
○ Mount in the following empty NTFS folder:

○ Do not assign a drive letter or drive path

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

The **Format Partition** page is displayed.

Figure 2-44 Format Partition (Windows Server 2012)



Format Partition

To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

Allocation unit size: Default

Volume label: New Volume

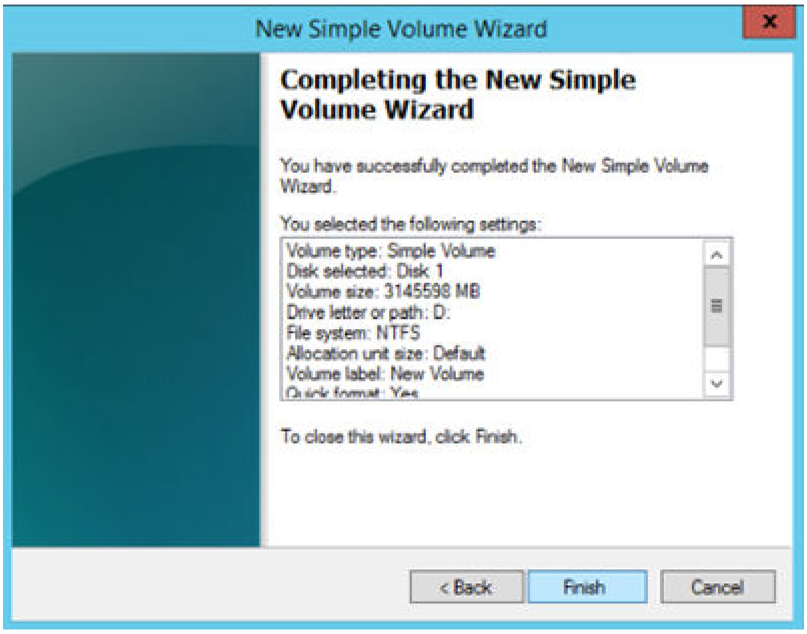
☑ Perform a quick format

□ Enable file and folder compression

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

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

Figure 2-45 Completing the New Simple Volume Wizard (Windows Server 2012)



New Simple Volume Wizard

Completing the New Simple Volume Wizard

You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 3145598 MB
Drive letter or path: D:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

To close this wizard, click Finish.

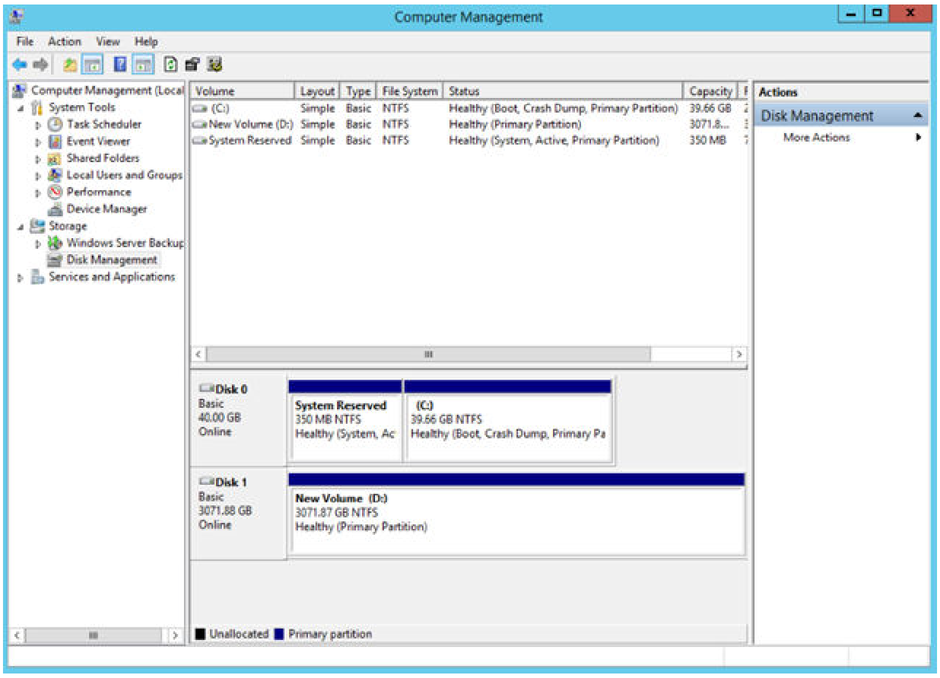
NOTICE

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

Step 12 Click **Finish**.

Wait for the initialization to complete. When the volume status changes to **Healthy**, the initialization has finished successfully, as shown in **Figure 2-46**.

Figure 2-46 Disk initialization succeeded (Windows Server 2012)



Volume	Layout	Type	File System	Status	Capacity
(C:)	Simple	Basic	NTFS	Healthy (Boot, Crash Dump, Primary Partition)	39.66 GB
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	3071.8...
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	350 MB

Disk 0
Basic
40.00 GB
Online

System Reserved
350 MB NTFS
Healthy (System, Ac

(C:)
39.66 GB NTFS
Healthy (Boot, Crash Dump, Primary Pa

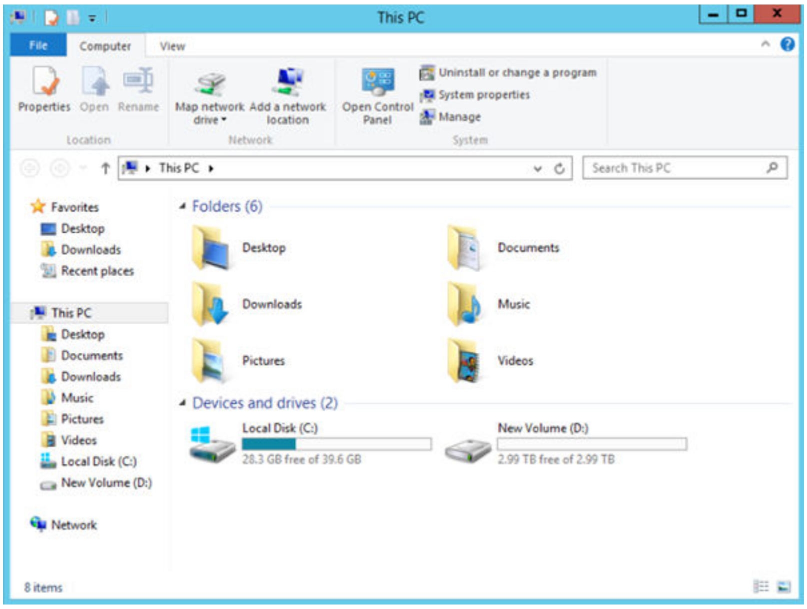
Disk 1
Basic
3071.88 GB
Online

New Volume (D:)
3071.87 GB NTFS
Healthy (Primary Partition)

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

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

Figure 2-47 This PC (Windows Server 2012)



----End

2.4.8 Initializing a Linux Data Disk Larger Than 2 TiB (parted)

Scenarios

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

The maximum partition size that MBR supports is 2 TiB and that GPT supports is 18 EiB. If the disk size you need to partition is greater than 2 TiB, partition the disk using GPT.

The partitioning tool fdisk is suitable only for MBR partitions, and parted is suitable for both MBR and GPT partitions. For more information, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

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

Prerequisites

- A data disk has been attached to a server and has not been initialized.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Creating and Mounting a Partition

The following example shows you how a new partition can be created on a new data disk that has been attached to a server. The partition will be created using parted, and GPT will be used. Furthermore, the partition will be formatted using the ext4 file system, mounted on **/mnt/sdc**, and configured with automatic mounting at system start.

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

lsblk

Information similar to the following is displayed:

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

In the command output, the server contains two disks. **/dev/vda** is the system disk, and **/dev/vdb** is the new data disk.

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

parted *New data disk*

In this example, run the following command:

parted /dev/vdb

Information similar to the following is displayed:

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

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

Information similar to the following is displayed:

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

In the command output, the **Partition Table** value is **unknown**, indicating that no partition style is set for the new disk.

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

mklabel *Disk partition style*

In this example, run the following command to set the partition style to GPT: (Disk partition styles can be MBR or GPT.)

mklabel gpt

NOTICE

The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

If the partition style is changed after the disk has been used, data on the disk will be cleared. Therefore, select an appropriate partition style when initializing the disk. If you must change the partition style to GPT after a disk has been used, it is recommended that you back up the disk data before the change.

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

Information similar to the following is displayed:

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

Number  Start  End  Size  File system  Name  Flags

(parted)
```

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

Step 7 Run the following command and press **Enter**:

mkpart *Partition name Start sector End sector*

In this example, run the following command:

mkpart opt 2048s 100%

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

Information similar to the following is displayed:

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

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

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

Information similar to the following is displayed:

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

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

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

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

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

lsblk

Information similar to the following is displayed:

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

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

Step 11 Run the following command to set the file system format for the new partition:

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

In this example, run the following command to set the **ext4** file system for the new partition:

mkfs -t ext4 /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-centos74 ~]# mkfs -t ext4 /dev/vdb1
mke2fs 1.42.9 (28-Dec-2013)
```

```
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
201326592 inodes, 805305856 blocks
40265292 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2952790016
24576 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872, 71663616, 78675968,
        102400000, 214990848, 512000000, 550731776, 644972544

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

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

NOTICE

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

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

mkdir *Mount point*

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

mkdir /mnt/sdc

NOTE

The **/mnt** directory exists on all Linux systems. If the mount point fails to create, it may be that the **/mnt** directory has been accidentally deleted. Run the **mkdir -p /mnt/sdc** command to create the mount point.

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

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vdb1** on **/mnt/sdc**:

mount /dev/vdb1 /mnt/sdc

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

df -TH

Information similar to the following is displayed:

```
[root@ecs-centos74 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda2      ext4       42G  1.5G   38G   4% /
```

```
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  8.9M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
/dev/vda1      ext4      1.1G  153M  801M  17% /boot
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      3.3T   93M  3.1T   1% /mnt/sdc
```

New partition **/dev/vdb1** is mounted on **/mnt/sdc**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc              ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.
- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.

- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

    When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1

2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a

3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

   If information similar to the following is displayed, automatic mounting has been configured:

```
root@ecs-test-0001 ~]# mount | grep /mnt/sdc
/dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
```

----End

3 Permissions Management

3.1 Creating a User and Granting EVS Permissions

This chapter describes how to use IAM to implement fine-grained permissions control for your EVS resources. With IAM, you can:

- Create IAM users for employees based on your enterprise's organizational structure. Each IAM user will have their own security credentials for accessing EVS resources.
- Grant only the permissions required for users to perform a specific task.
- Entrust an account or cloud service to perform professional and efficient O&M on your EVS resources.

If your account does not require individual IAM users, skip this chapter.

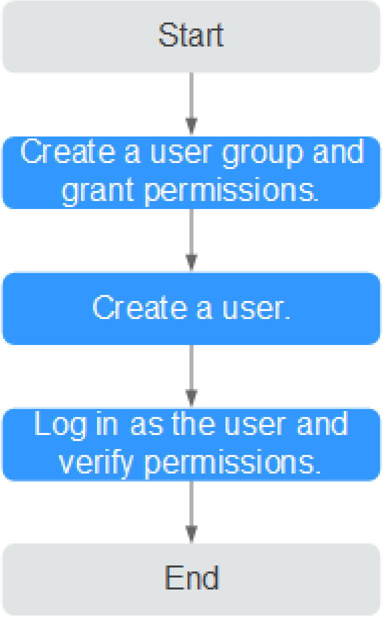
This section describes the procedure for granting permissions (see **Figure 3-1**).

Prerequisites

Learn about the permissions (see section "Permissions Management" in the *Elastic Volume Service User Guide*) supported by EVS and choose policies or roles according to your requirements.

Process Flow

Figure 3-1 Process for granting EVS permissions


Start
Create a user group and grant permissions.
Create a user.
Log in as the user and verify permissions.
End

1. Create a user group and assign permissions to it.

   Create a user group on the IAM console, and attach the **EVS ReadOnlyAccess** policy to the group.

2. Create a user and add it to a user group.

   Create a user on the IAM console and add the user to the group created in **1**.

3. Log in and verify permissions.

   Log in to the EVS console by using the user created in **2**, and verify that the user only has read permissions for EVS.

   – In **Service List**, choose **Elastic Volume Service**. On the EVS console, click **Create Disk** in the upper right corner. If a message appears indicating that you have insufficient permissions to perform the operation, the **EVS ReadOnlyAccess** policy has already taken effect.

   – Choose any other service in **Service List**. If a message appears indicating that you have insufficient permissions to access the service, the **EVS ReadOnlyAccess** policy has already taken effect.

3.2 EVS Custom Policies

Custom policies can be created to supplement the system-defined policies of EVS. For the actions supported for custom policies, see section "Permissions Policies and Supported Actions" in the *Elastic Volume Service API Reference*.

You can create custom policies in either of the following ways:

- Visual editor: Select cloud services, actions, resources, and request conditions. This does not require knowledge of policy syntax.

- JSON: Edit JSON policies from scratch or based on an existing policy.

  For operation details, see section "Creating a Custom Policy" in the *Identity and Access Management User Guide*. The following section contains examples of common EVS custom policies.

Example Custom Policies

- Example 1: Allowing users to create disks.

```
{
        "Version": "1.1",
        "Statement": [
                {
                        "Action": [
                                "evs:volumes:list",
                                "evs:volumes:get",
                                "evs:quotas:get",
                                "evs:volumeTags:list",
                                "evs:types:get",
                                "evs:volumes:create",
                                "ecs:cloudServerFlavors:get",
                                "ecs:cloudServers:list",
                                "bss:balance:view",
                                "bss:order:pay",
                                "bss:order:update"
                        ],
                        "Effect": "Allow"
                }
        ]
}
```

- Example 2: Denying disk deletion

  A policy with only "Deny" permissions must be used in conjunction with other policies to take effect. If the permissions assigned to a user contain both "Allow" and "Deny", the "Deny" permissions take precedence over the "Allow" permissions.

  The following method can be used if you need to assign permissions of the **EVS FullAccess** policy to a user but you want to prevent the user from deleting EVS disks. Create a custom policy for denying disk deletion, and attach both policies to the group to which the user belongs. Then, the user can perform all operations on disks except deleting disks. The following is an example of a deny policy:

```
{
        "Version": "1.1",
        "Statement": [
                {
                        "Effect": "Deny",
                        "Action": [
                                "evs:volumes:delete"
                        ]
                }
        ]
}
```

4 Disk Capacity Expansion

4.1 Expansion Overview

What Is Capacity Expansion?

If the capacity of an existing disk is insufficient, you can expand the disk capacity to increase the storage space.

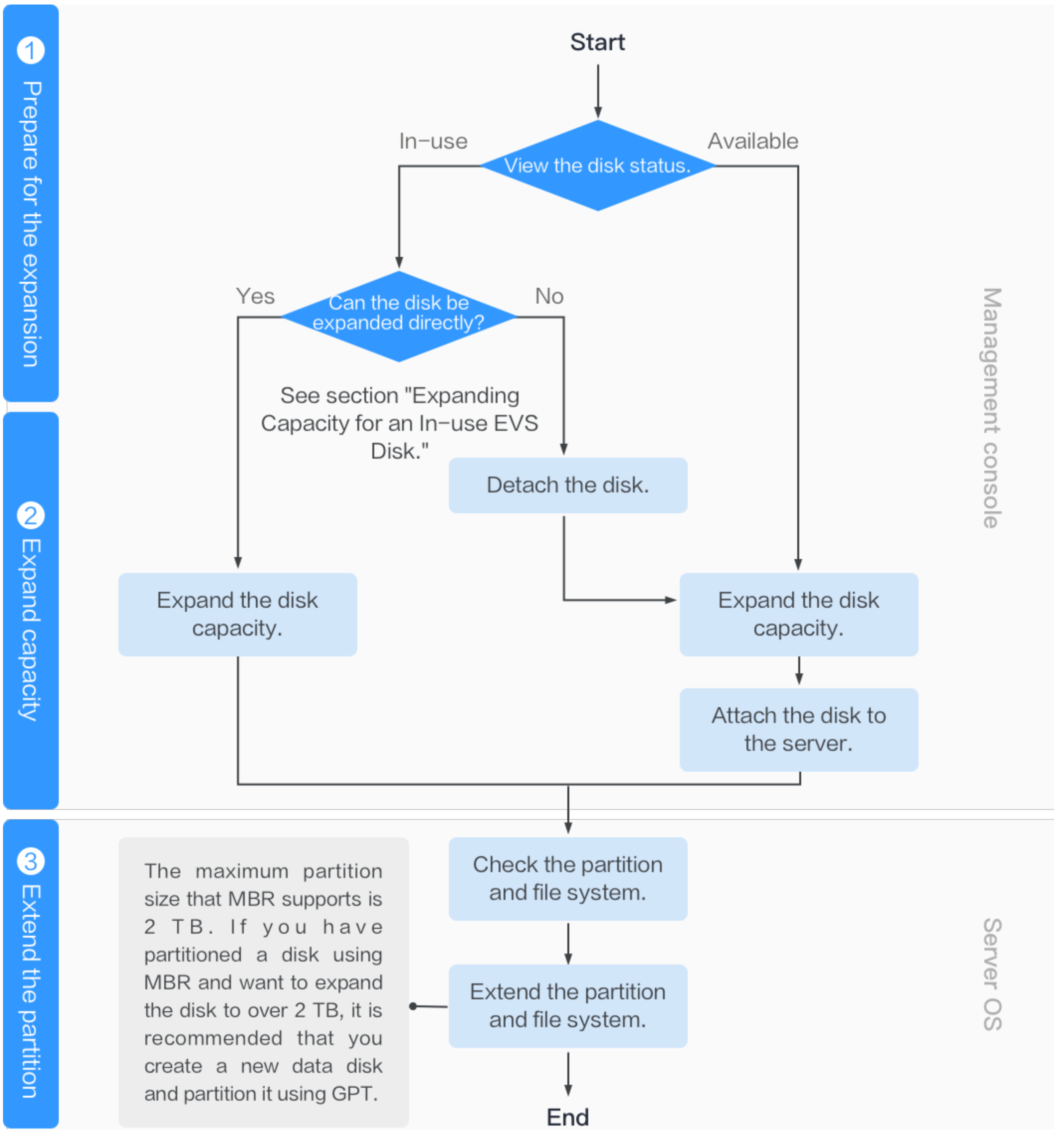
Both system disks and data disks can be expanded. Disk capacity can be expanded only, but cannot be reduced.

How to Expand the Disk Capacity?

A capacity expansion operation includes the following steps:

1. **Expand the disk capacity on the management console.**
2. **Log in to the server and extend the disk partition and file system.**

Figure 4-1 Capacity expansion procedure


1 Prepare for the expansion
2 Expand capacity
3 Extend the partition
Start
In-use
View the disk status.
Available
Yes
Can the disk be expanded directly?
No
See section "Expanding Capacity for an In-use EVS Disk."
Detach the disk.
Expand the disk capacity.
Expand the disk capacity.
Attach the disk to the server.
Management console
Check the partition and file system.
Extend the partition and file system.
End
Server OS
The maximum partition size that MBR supports is 2 TB. If you have partitioned a disk using MBR and want to expand the disk to over 2 TB, it is recommended that you create a new data disk and partition it using GPT.

Expand the Disk Capacity on the Management Console

Choose a proper expansion method based on the disk status.

- For an In-use disk:

  The disk has been attached to a server. Check whether the disk can be expanded in the In-use state by referring to **Constraints**.

  – If yes, expand the disk capacity according to **Expanding Capacity for an In-use EVS Disk**.

  – If no, detach the disk. Then, expand the disk capacity according to **Expanding Capacity for an Available EVS Disk**.

- For an Available disk:

  The disk has not been attached to any server and can be directly expanded by referring to **Expanding Capacity for an Available EVS Disk**.

  A shared disk can be expanded only when its status is **Available**.

Log In to the Server and Extend the Disk Partition and File System

After the disk has been expanded on the management console, only the disk storage capacity is enlarged, but its additional space cannot be used directly. You must log in to the server and extend the disk partition and file system. For details, see **Table 4-1**.

Table 4-1 Extending the disk partition and file system

Capacity After Expansion	Extend Disk Partition and File System
Disk capacity ≤ 2 TiB	• Windows: **Extending Disk Partitions and File Systems (Windows Server 2008)** • Linux: **Partition and File System Extension Preparations (Linux)**
Disk capacity > 2 TiB	• GPT partition style: **Extending Disk Partitions and File Systems (Windows Server 2008)** or **Partition and File System Extension Preparations (Linux)** • MBR partition style: Not supported The maximum disk capacity that MBR supports is 2 TiB, and the disk space exceeding 2 TiB cannot be used. If your disk uses MBR and you need to expand the disk capacity to over 2 TiB, change the partition style from MBR to GPT. Ensure that the disk data has been backed up before changing the partition style because services will be interrupted and data on the disk will be deleted during this change.

Related Operations

For more information, see **FAQs** > **Capacity Expansion**.

4.2 Expanding Capacity for an In-use EVS Disk

Scenarios

This section describes how to expand the capacity of an In-use EVS disk on the management console. The In-use status indicates that the disk has been attached to a server. You do not need to detach the disk when expanding an In-use disk.

Constraints

- Currently, disk capacities can only be expanded, but cannot be reduced.
- When expanding an In-use disk, the server containing this disk must be in the **Running** or **Stopped** state.
- A shared disk cannot be expanded in the **In-use** state. To expand a shared In-use disk, you must detach it from all its servers, wait until its status changes to **Available**, and then expand its capacity. For more information, see **Expanding Capacity for an Available EVS Disk**.
- Only some server OSs support capacity expansion of In-use disks. If the server OS does not support capacity expansion of In-use disks, detach the disk and then expand its capacity. Otherwise, you may need to stop and then start the server after the expansion to make the additional space available.

  Perform the following operations to check whether your server OS supports capacity expansion of In-use disks:

  a. Both public images and private images listed on the console support the capacity expansion of In-use disks.

     How to view: Log in to the management console. In the navigation pane on the left, click ☰ and choose **Compute** > **Image Management Service**. On the **Public Images** tab, view the images of the **ECS image** type.

  b. If your server OS does not appear in the image list, check whether it is included in **Table 4-2**.

     If your server OS appears in **Table 4-2**, the OS supports capacity expansion of In-use disks. Otherwise, you must detach the disk and then expand its capacity. For details, see **Expanding Capacity for an Available EVS Disk**.

Table 4-2 OSs that support the capacity expansion of In-use disks

OS	Version
CentOS 8	8.0 64-bit or later
CentOS 7	7.2 64-bit or later
CentOS 6	6.5 64-bit or later
Debian	8.5.0 64-bit or later
Fedora	24 64-bit or later
SUSE 12	SUSE Linux Enterprise Server 12 64-bit or later
SUSE 11	SUSE Linux Enterprise Server 11 SP4 64-bit
OpenSUSE	42.1 64-bit or later
Oracle Linux Server release 7	7.2 64-bit or later

OS	Version
Oracle Linux Server release 6	6.7 64-bit or later
Ubuntu Server	14.04 64-bit or later
Windows Server 2016	Windows Server 2016 R2 Enterprise 64-bit
Windows Server 2012	Windows Server 2012 R2 Standard 64-bit
Windows Server 2008	Windows Server 2008 R2 Enterprise 64-bit
Red Hat Enterprise Linux 7	7.3 64-bit
Red Hat Enterprise Linux 6	6.8 64-bit
EulerOS	2.2 64-bit or later

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Determine whether to view the server information before expanding the disk.

- If you need to view the server information, perform the following procedure:
  a. In the disk list, click the name of the to-be-expanded disk.
     The disk details page is displayed.
  b. Click the **Servers** tab to view the server where the target disk has been attached.
  c. Click **Expand Capacity** in the upper right corner of the page.
     The expansion page is displayed.
- If you do not need to view the server information, perform the following procedure:
  a. In the disk list, locate the row that contains the target disk and click **Expand Capacity** in the **Operation** column.
     The expansion page is displayed.

Step 4 Set the **Add Capacity (GiB)** parameter and click **Next**.

Step 5 On the **Details** page, check the disk details.

- If you do not need to modify the specifications, click **Submit**.
- If you need to modify the specifications, click **Previous**.

After the specifications are submitted, go back to the disk list page.

Step 6 In the displayed dialog box, click **OK**.

Step 7 In the disk list, view the capacity of the target disk.

When the disk status changes from **Expanding** to **In-use** and the disk capacity increases, the expansion has succeeded.

Step 8 After the disk has been expanded on the management console, only the disk storage capacity is enlarged, but its additional space cannot be used directly. You must log in to the server and extend the disk partition and file system.

The operation method varies depending on the server OS.

- In Windows, see **Extending Disk Partitions and File Systems (Windows Server 2008)**.
- In Linux, see **Partition and File System Extension Preparations (Linux)**.

----End

4.3 Expanding Capacity for an Available EVS Disk

Scenarios

This section describes how to expand the capacity of an Available EVS disk on the management console. The Available status indicates that the disk has not been attached to any server.

Constraints

- Currently, disk capacities can only be expanded, but cannot be reduced.
- A shared disk cannot be expanded in the **In-use** state. To expand a shared In-use disk, you must detach it from all its servers, wait until its status changes to **Available**, and then expand its capacity.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the row that contains the target disk and click **Expand Capacity** in the **Operation** column.

The expansion page is displayed.

Step 4 Set the **Add Capacity (GiB)** parameter and click **Next**.

Step 5 On the **Details** page, check the disk details.

- If you do not need to modify the specifications, click **Submit**.
- If you need to modify the specifications, click **Previous**.

After the specifications are submitted, go back to the disk list page.

Step 6 In the disk list, view the capacity of the target disk.

When the disk status changes from **Expanding** to **Available** and the disk capacity increases, the expansion has succeeded.

Step 7 Attach the disk to the server. For details, see **Attach an EVS Disk**.

Step 8 After the disk has been expanded on the management console, only the disk storage capacity is enlarged, but its additional space cannot be used directly. You must log in to the server and extend the disk partition and file system.

The operation method varies depending on the server OS.

- In Windows, see **Extending Disk Partitions and File Systems (Windows Server 2008)**.
- In Linux, see **Partition and File System Extension Preparations (Linux)**.

----End

4.4 Extending Disk Partitions and File Systems (Windows Server 2008)

Scenarios

After a disk has been expanded on the management console, the disk size is enlarged, but the additional space cannot be used directly.

In Windows, you must allocate the additional space to an existing partition or a new partition.

This section uses Windows Server 2008 R2 Enterprise 64bit as the sample OS to describe the expansion methods:

- For a system disk:
  - If volume (C:) already exists, you can add the additional space to volume (C:) and use it as a system volume. For details, see **System Disk: Add Additional Space to Volume (C:)**.
  - If volume (C:) already exists, you can create a new volume such as volume (F:) with the additional space and use the new volume as a data volume. For details, see **System Disk: Create New Volume (F:) with Additional Space**.
- For a data disk:
  - If volume (D:) already exists, you can add the additional space to volume (D:) and use it as a data volume. For details, see **Data Disk: Add Additional Space to Volume (D:)**.
  - If volume (D:) already exists, you can create a new volume such as volume (E:) with the additional space and use the new volume as a data volume. For details, see **Data Disk: Create New Volume (E:) with Additional Space**.

The method for allocating the additional space varies with the server OS. This section is used for reference only. For detailed operations and differences, see the corresponding OS documents.

NOTICE

Performing the expansion operations with caution. Misoperation may lead to data loss or exceptions. Therefore, you are advised to back up the disk data using CBR or snapshots before expansion. For details about using CBR, see **Managing EVS Backups**. For details about using snapshots, see **Creating a Snapshot**.

Prerequisites

- You have expanded the disk capacity and attached the disk to a server on the management console. For details, see **Expanding Capacity for an In-use EVS Disk** or **Expanding Capacity for an Available EVS Disk**.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

System Disk: Add Additional Space to Volume (C:)

In this example, the system disk has 50 GiB originally, and 22 GiB is added on the management console. The following procedure describes how to add this 22 GiB to volume (C:) on the server. After the operation is complete, volume (C:) will have 72 GiB of capacity and can be used as a system volume.

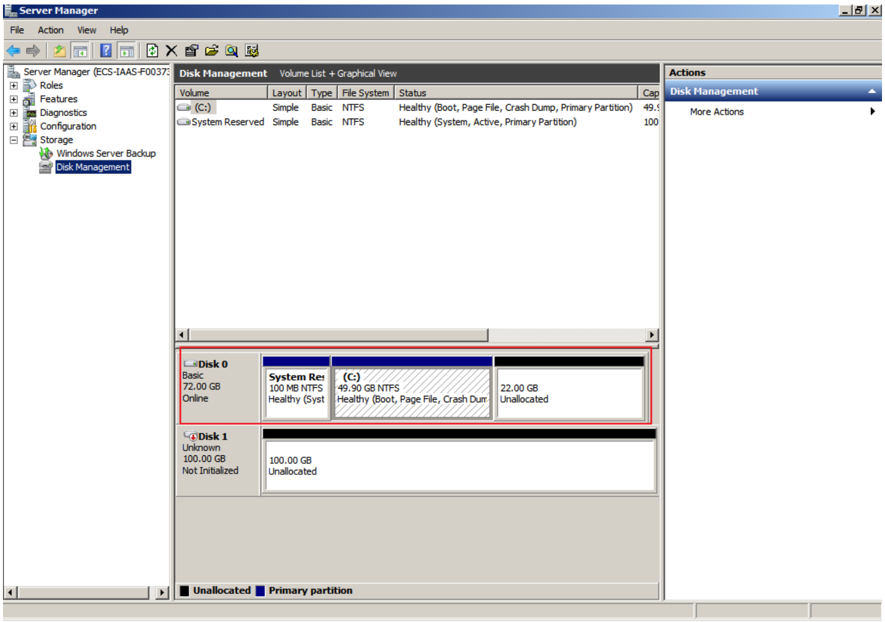
Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

The **Server Manager** window is displayed.

Step 2 In the navigation tree, choose **Storage** > **Disk Management**.

The **Disk Management** window is displayed.

Figure 4-2 Disk Management (system disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	49.9
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
72.00 GB
Online

System Res
100 MB NTFS
Healthy (Syst

(C:)
49.90 GB NTFS
Healthy (Boot, Page File, Crash Dum

22.00 GB
Unallocated

Disk 1
Unknown
100.00 GB
Not Initialized

100.00 GB
Unallocated

■ Unallocated ■ Primary partition

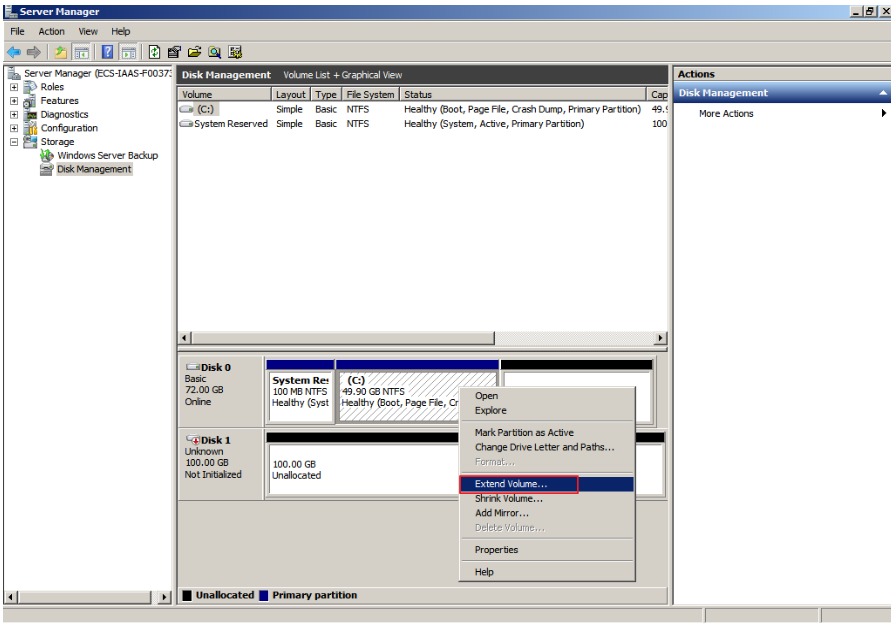
NOTE

If you cannot view the additional space, right-click **Disk Management** and choose **Refresh** from the shortcut menu.

Step 3 On the **Disk Management** page, select the disk and volume that you want to extend. The current volume size and unallocated space are displayed.

Step 4 Right-click the target volume and choose **Extend Volume**.

Figure 4-3 Choosing **Extend Volume**



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	49.!
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
72.00 GB
Online

System Res
100 MB NTFS
Healthy (Syst

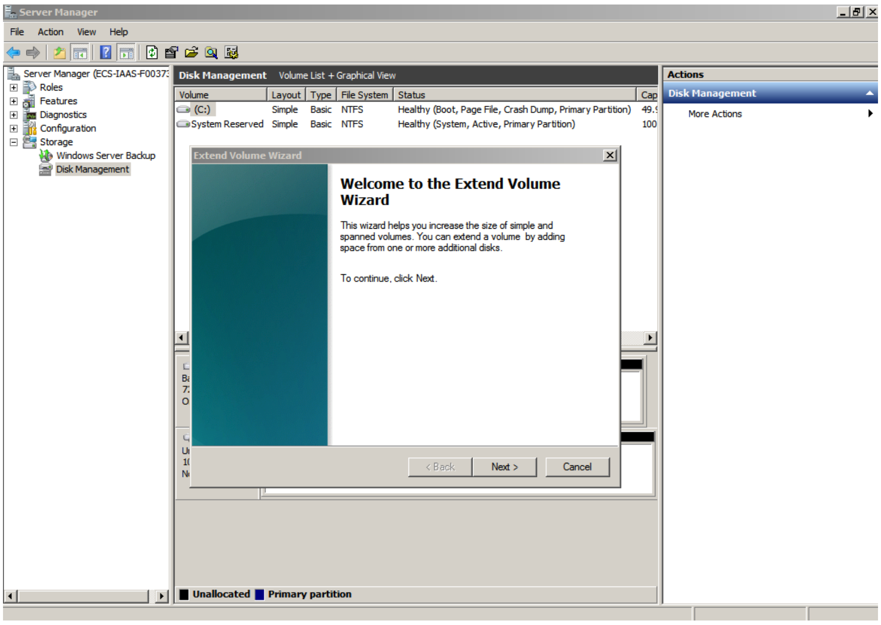
(C:)
49.90 GB NTFS
Healthy (Boot, Page File, Cr

Disk 1
Unknown
100.00 GB
Not Initialized

100.00 GB
Unallocated

Step 5 On the displayed **Extend Volume Wizard** window, click **Next**.

Figure 4-4 Extend Volume Wizard



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	49.!
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Extend Volume Wizard

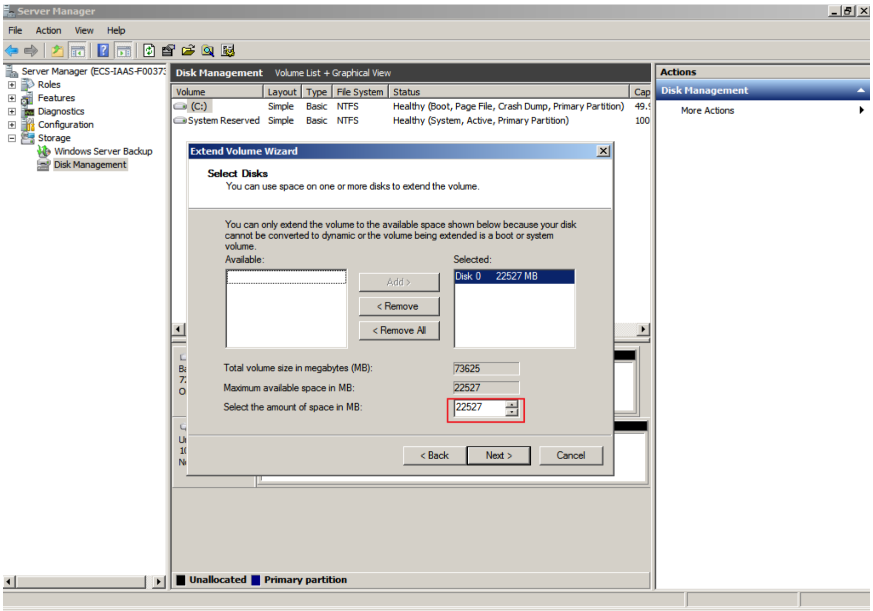
Welcome to the Extend Volume Wizard

This wizard helps you increase the size of simple and spanned volumes. You can extend a volume by adding space from one or more additional disks.

To continue, click Next.

Step 6 In the text box to the right of **Select the amount of space in MB**, enter the amount of the additional space and click **Next**.

Figure 4-5 Selecting space



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	49.!
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Extend Volume Wizard

Select Disks
You can use space on one or more disks to extend the volume.

You can only extend the volume to the available space shown below because your disk cannot be converted to dynamic or the volume being extended is a boot or system volume.

Available:

Selected:
Disk 0 22527 MB

Add > | < Remove | < Remove All

Total volume size in megabytes (MB): 73625

Maximum available space in MB: 22527

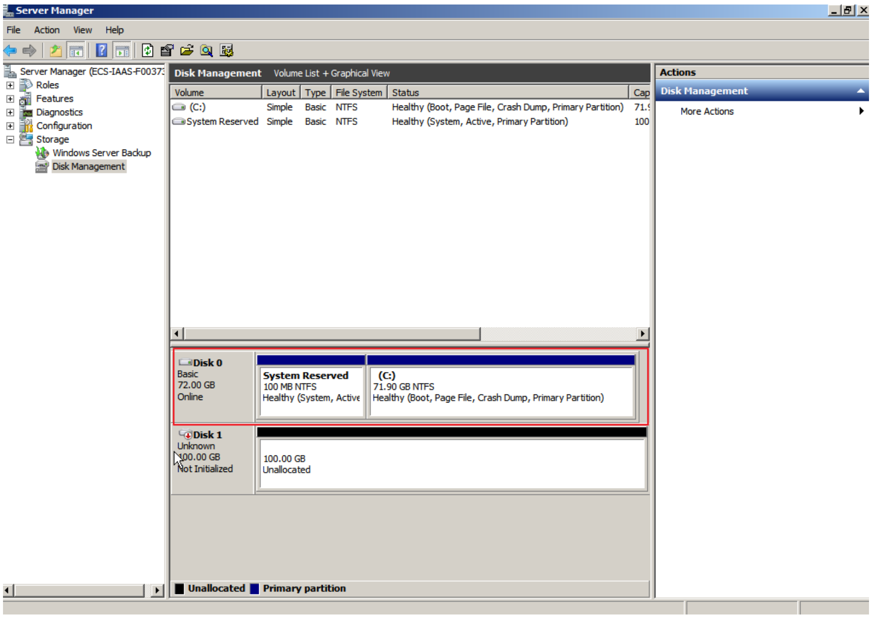
Select the amount of space in MB: 22527

< Back | Next > | Cancel

Step 7 Click **Finish**.

After the expansion succeeded, the partition size is larger than the original size.

Figure 4-6 Capacity expansion succeeded



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	71.!
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
72.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Active

(C:)
71.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Unknown
100.00 GB
Not Initialized

100.00 GB
Unallocated

----End

System Disk: Create New Volume (F:) with Additional Space

In this example, the system disk has 40 GiB originally, and 60 GiB is added on the management console. The following procedure describes how to use this 60 GiB to create a new volume, for example volume (F:), on the server. After the operation is complete, new volume (F:) has 60 GiB of capacity and can be used as a data volume.

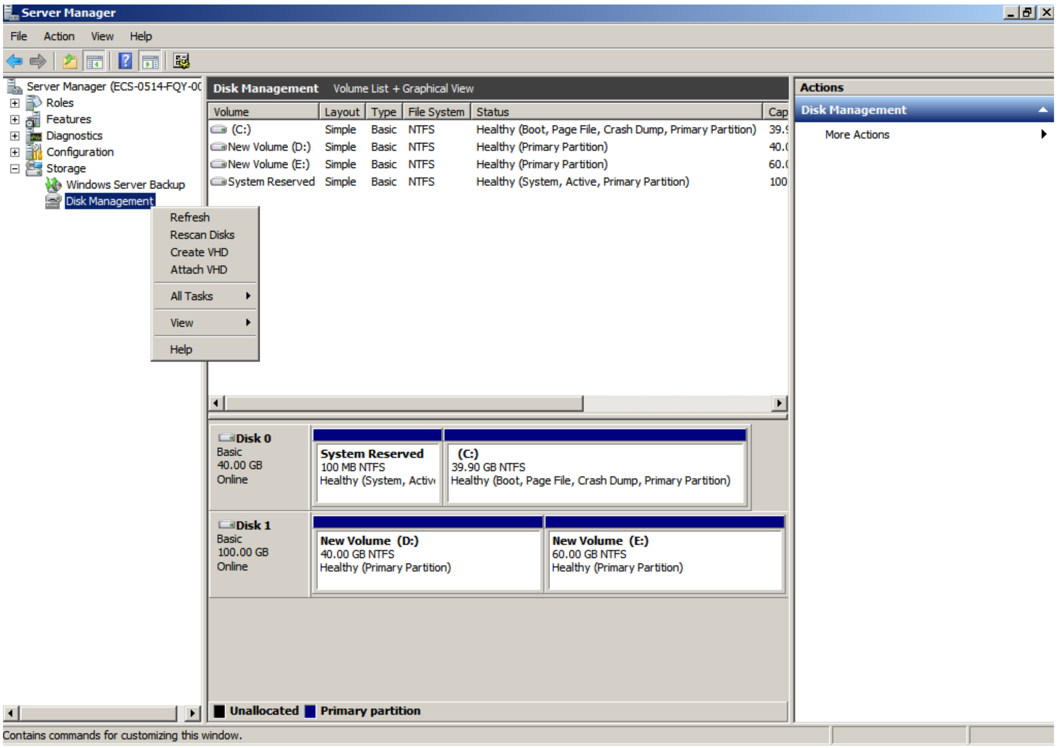
Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

The **Server Manager** window is displayed.

Step 2 In the navigation tree, choose **Storage** > **Disk Management**.

The **Disk Management** window is displayed.

Figure 4-7 Refresh (system disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.9
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
New Volume (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Activ

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

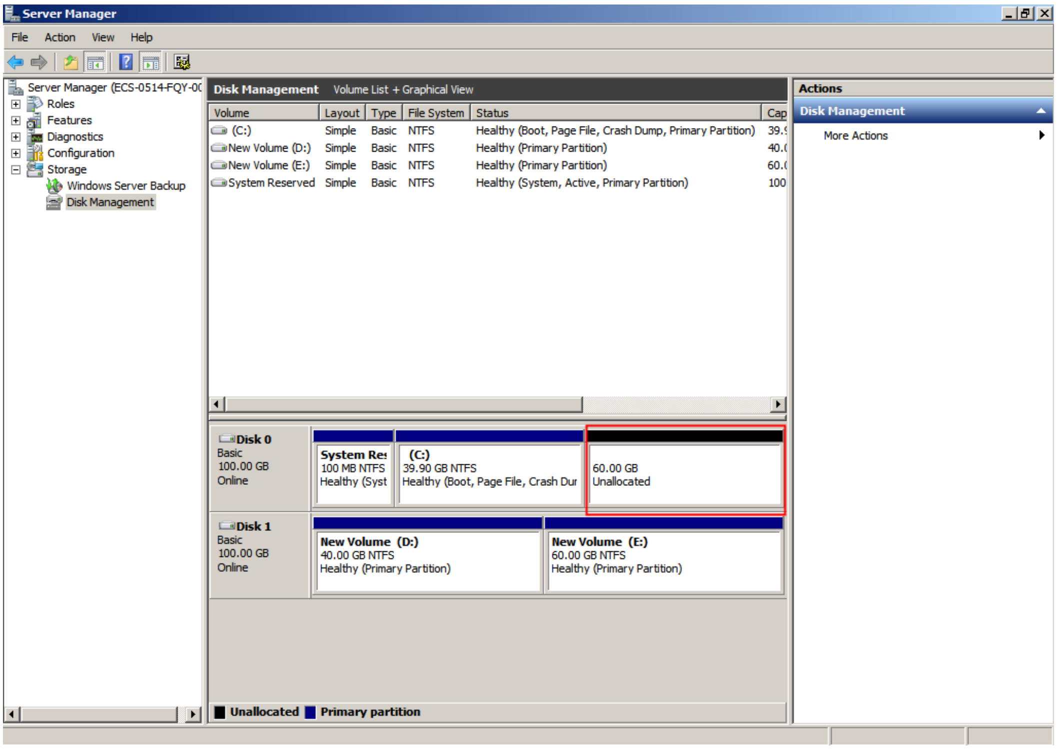
New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Contains commands for customizing this window.

Step 3 If you cannot view the additional space, right-click **Disk Management** and choose **Refresh** from the shortcut menu.

After the refresh, the additional space is displayed in the right area and is unallocated.

Figure 4-8 Unallocated disk space (system disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
New Volume (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
100.00 GB
Online

System Res
100 MB NTFS
Healthy (Syst

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dur

60.00 GB
Unallocated

Disk 1
Basic
100.00 GB
Online

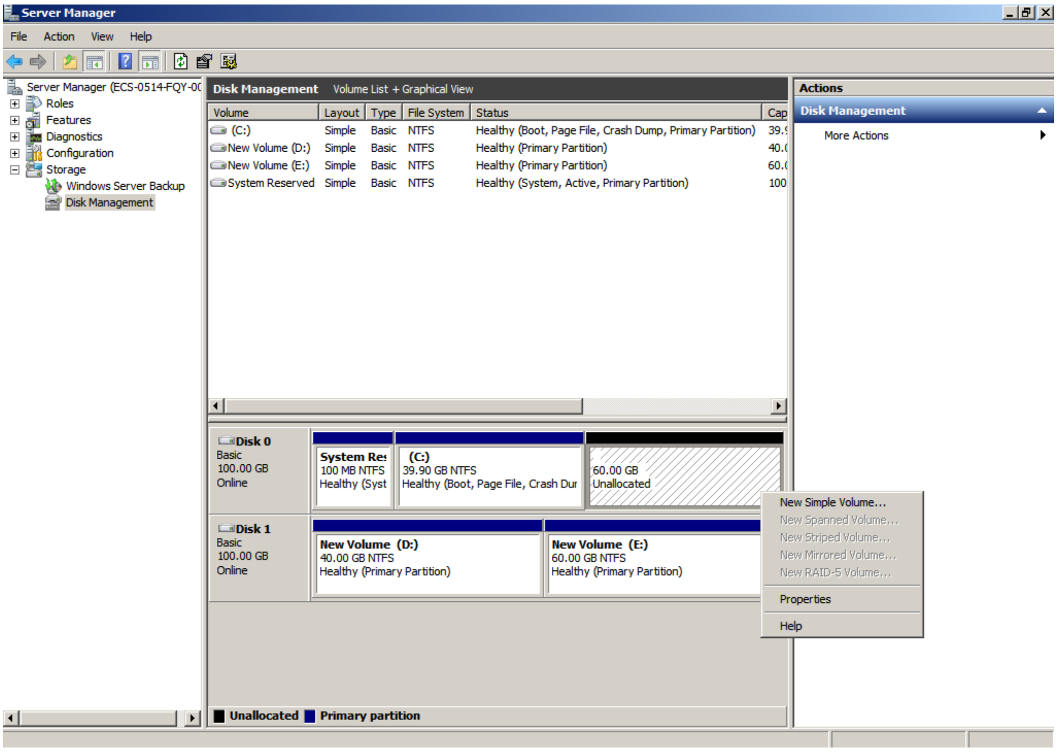
New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

Step 4 In the **Unallocated** area of **Disk 0**, right-click the blank area and choose **New Simple Volume**.

Figure 4-9 New Simple Volume (system disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
New Volume (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
100.00 GB
Online

System Res
100 MB NTFS
Healthy (Syst

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dur

60.00 GB
Unallocated

Disk 1
Basic
100.00 GB
Online

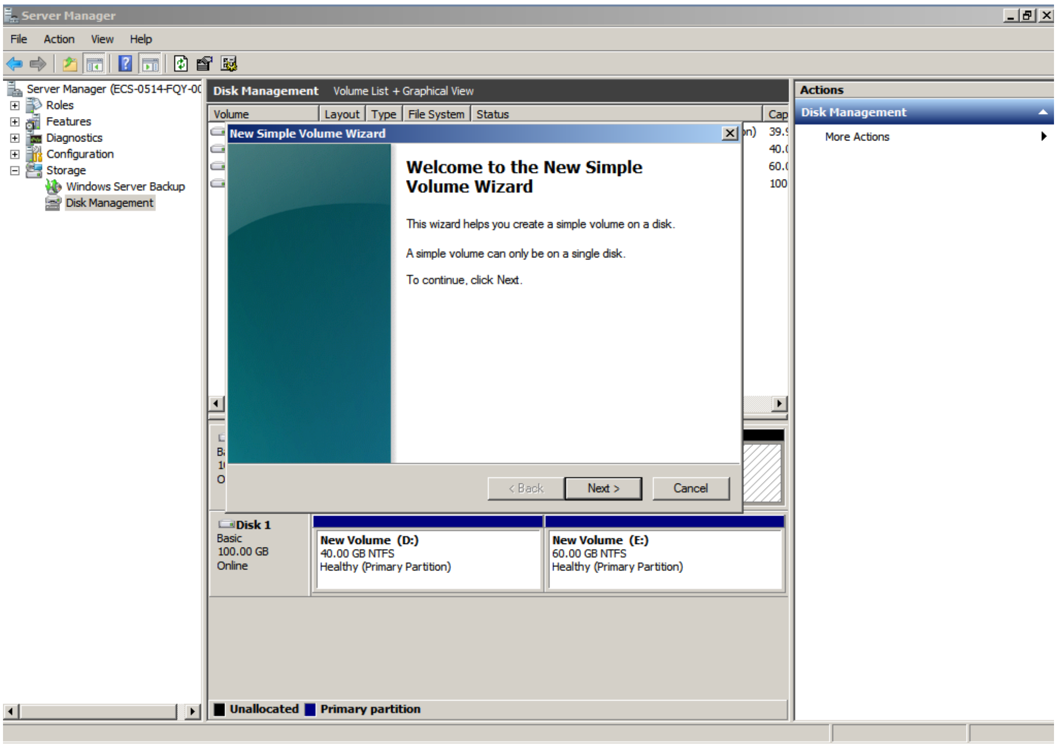
New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

Step 5 On the displayed **New Simple Volume Wizard** window, click **Next**.

Figure 4-10 New Simple Volume Wizard (system disk)



Welcome to the New Simple Volume Wizard

This wizard helps you create a simple volume on a disk.

A simple volume can only be on a single disk.

To continue, click Next.

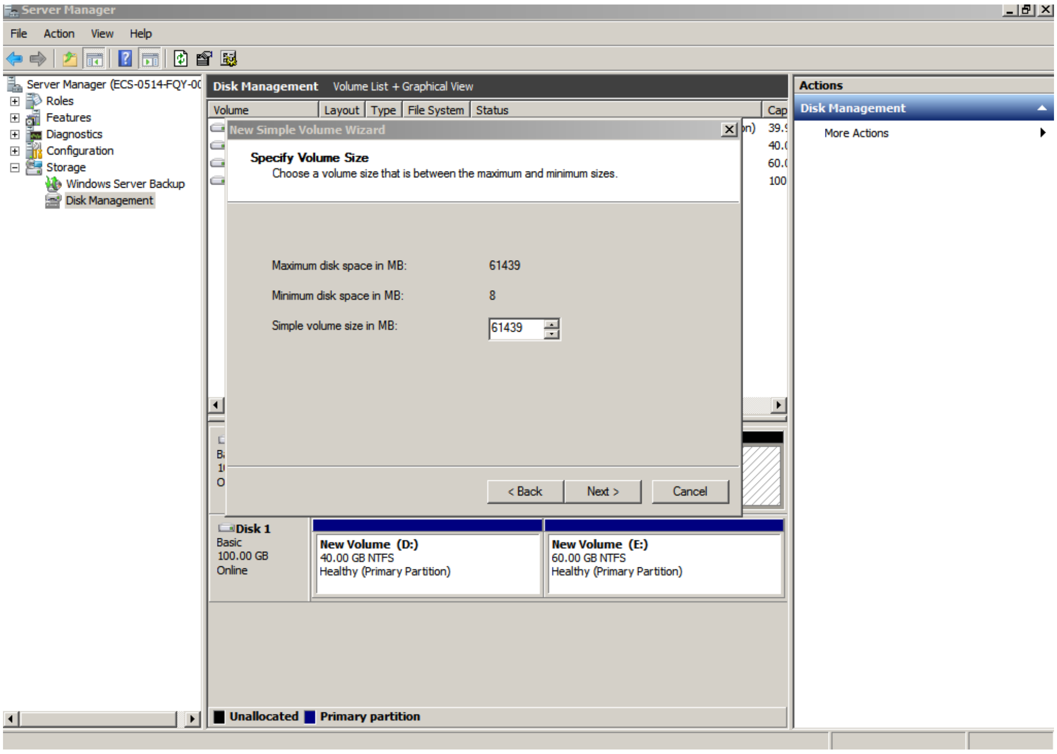
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Step 6 On the displayed **Specify Volume Size** page, set **Simple volume size in MB** and click **Next**. In this example, the default size is used.

Figure 4-11 Specify Volume Size (system disk)



Specify Volume Size
Choose a volume size that is between the maximum and minimum sizes.

Maximum disk space in MB: 61439

Minimum disk space in MB: 8

Simple volume size in MB: 61439

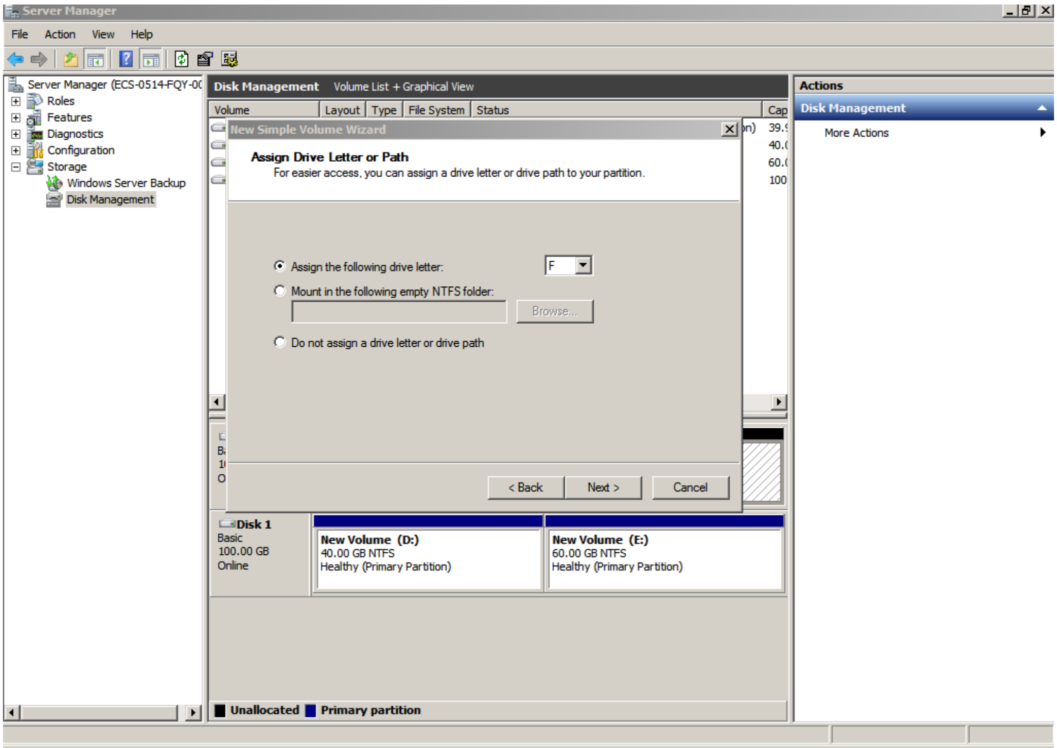
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Step 7 On the displayed **Assign Drive Letter and Path** page, click **Assign the following drive letter**, select a drive letter, and click **Next**. In this example, drive letter **F** is selected.

Figure 4-12 Assign Driver Letter or Path (system disk)



New Simple Volume Wizard

Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: F

○ Mount in the following empty NTFS folder:

○ Do not assign a drive letter or drive path

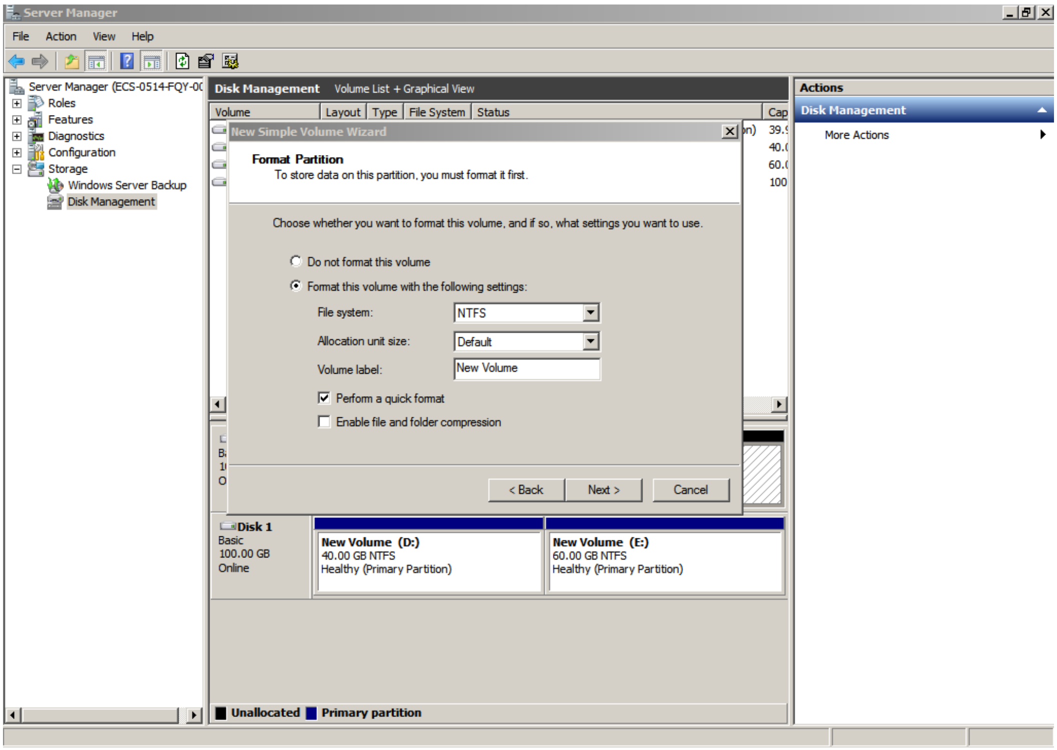
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Step 8 On the displayed **Format Partition** page, click **Format this volume with the following settings**, set parameters based on the requirements, and select **Perform a quick format**. Then, click **Next**.

Figure 4-13 Format Partition (system disk)



New Simple Volume Wizard

Format Partition
To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

Allocation unit size: Default

Volume label: New Volume

☑ Perform a quick format

□ Enable file and folder compression

< Back | Next > | Cancel

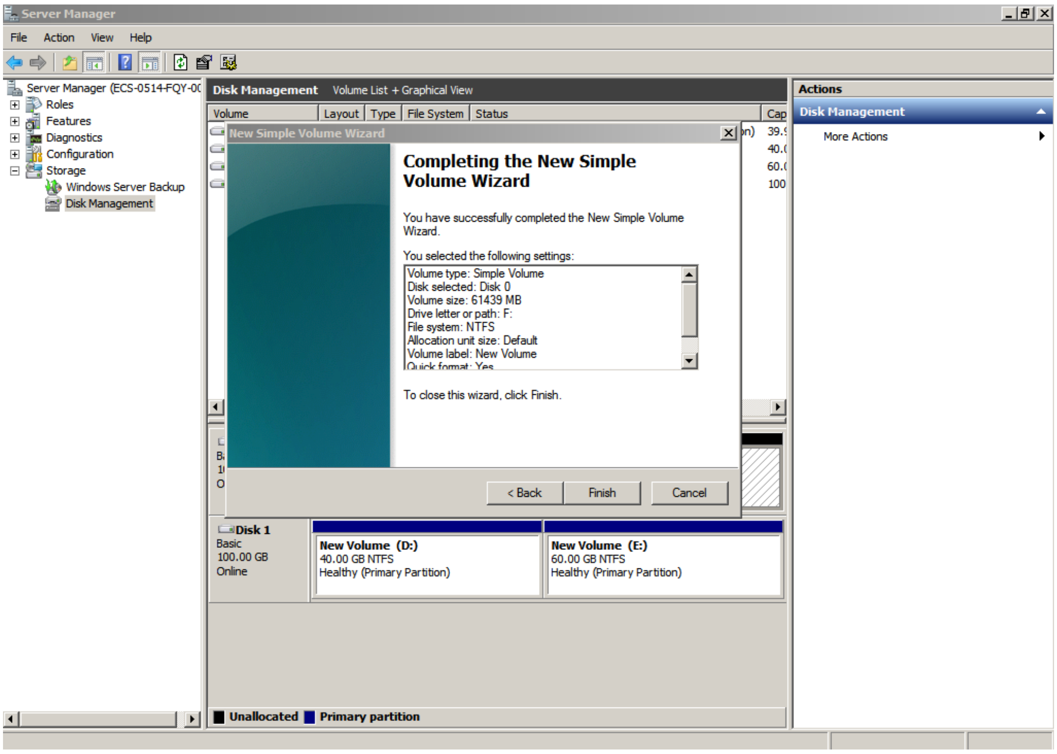
New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Step 9 Click **Finish**.

After the expansion succeeded, new volume (F:) is displayed.

Figure 4-14 Completing the New Simple Volume Wizard (new volume F:)



New Simple Volume Wizard

Completing the New Simple Volume Wizard

You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 0
Volume size: 61439 MB
Drive letter or path: F:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

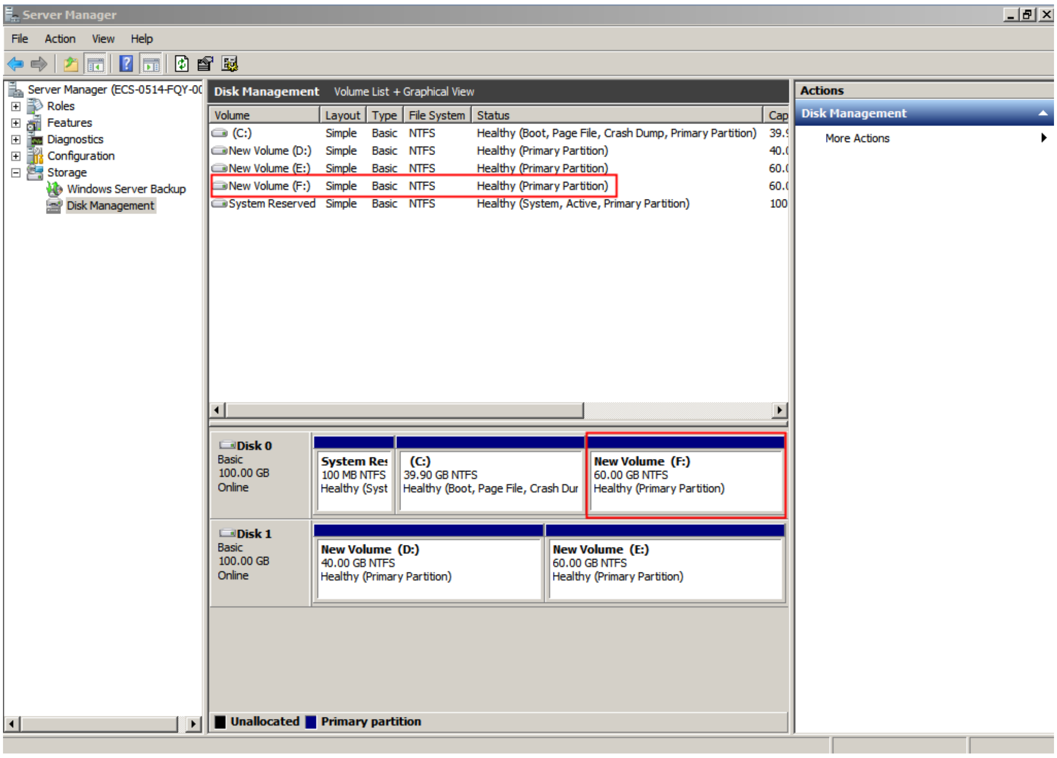
To close this wizard, click Finish.

< Back | Finish | Cancel

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

Figure 4-15 New Volume (F:)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
New Volume (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
New Volume (F:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
100.00 GB
Online

System Res
100 MB NTFS
Healthy (Syst

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dur

New Volume (F:)
60.00 GB NTFS
Healthy (Primary Partition)

Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

----End

Data Disk: Add Additional Space to Volume (D:)

In this example, the data disk has 100 GiB originally, and 50 GiB is added on the management console. The following procedure describes how to add this 50 GiB to volume (D:) on the server. After the operation is complete, volume (D:) has 150 GiB of capacity and can be used as a data volume.

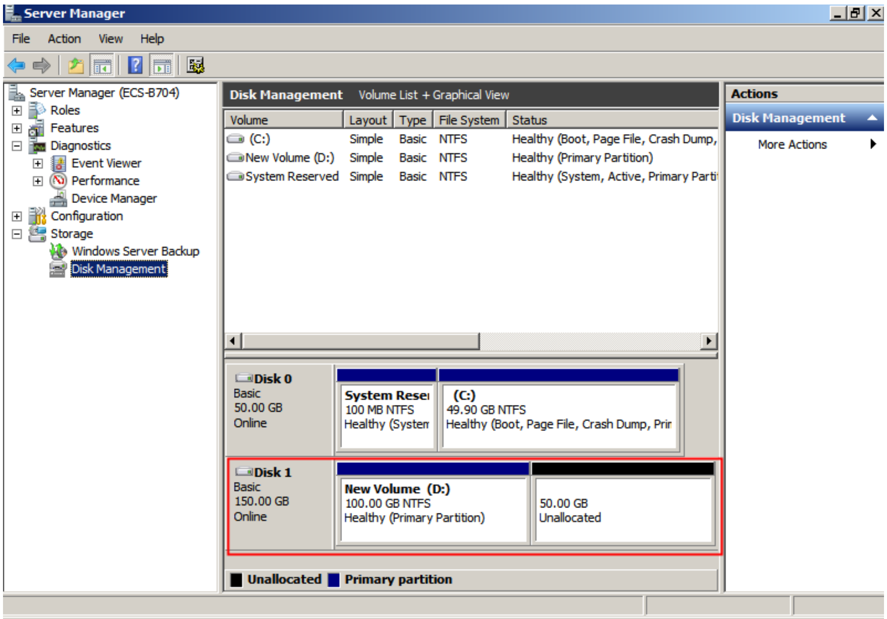
Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

The **Server Manager** window is displayed.

Step 2 In the navigation tree, choose **Storage** > **Disk Management**.

The **Disk Management** window is displayed.

Figure 4-16 Disk Management (data disk)



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Parti

Disk 0
Basic
50.00 GB
Online

System Reser
100 MB NTFS
Healthy (Systen

(C:)
49.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Prir

Disk 1
Basic
150.00 GB
Online

New Volume (D:)
100.00 GB NTFS
Healthy (Primary Partition)

50.00 GB
Unallocated

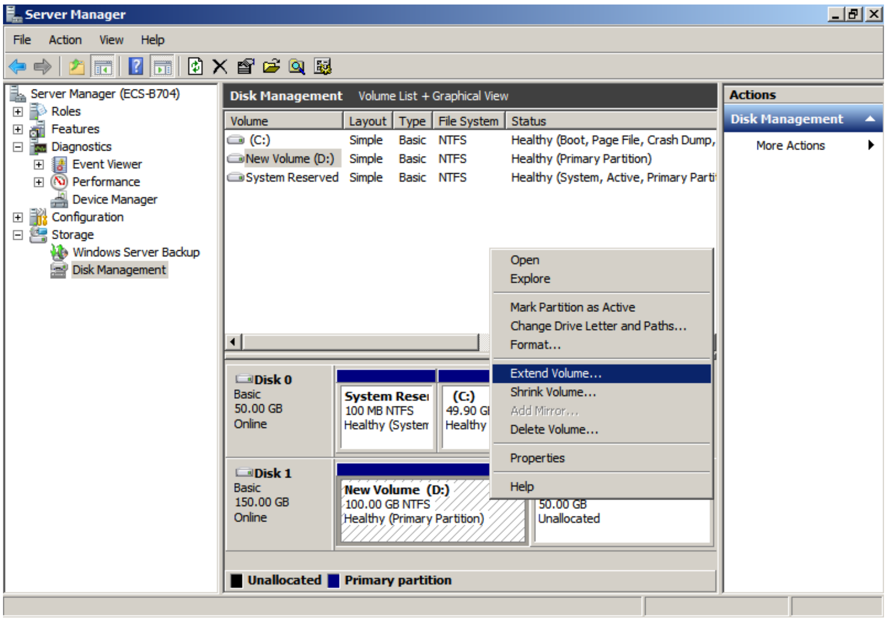
NOTE

If you cannot view the additional space, right-click **Disk Management** and choose **Refresh** from the shortcut menu.

Step 3 On the **Disk Management** page, select the disk and volume that you want to extend. The current volume size and unallocated space are displayed.

Step 4 Right-click the target volume and choose **Extend Volume**.

Figure 4-17 Choosing Extend Volume (Windows Server 2008)



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Parti

Disk 0
Basic
50.00 GB
Online

System Reser
100 MB NTFS
Healthy (Systen

(C:)
49.90 GI
Healthy

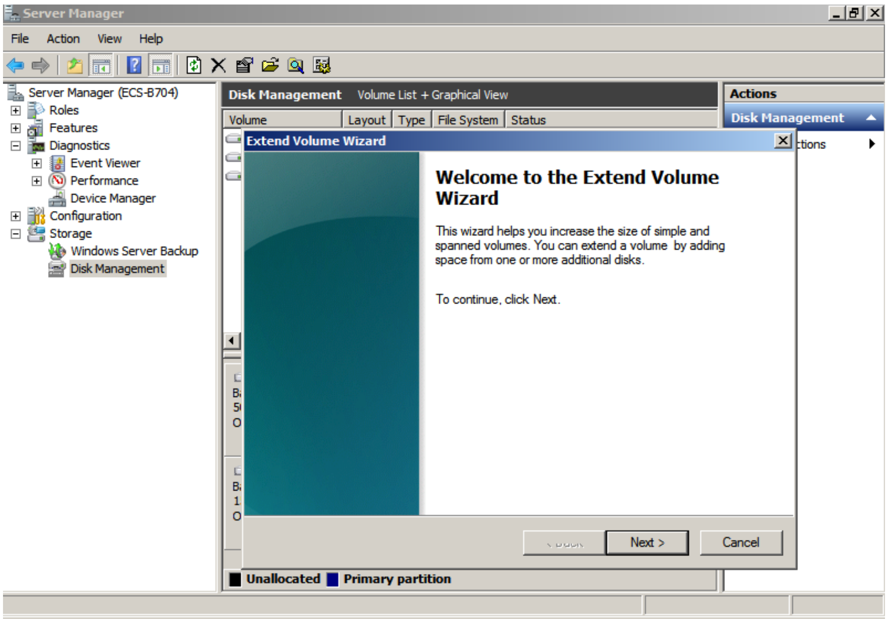
Disk 1
Basic
150.00 GB
Online

New Volume (D:)
100.00 GB NTFS
Healthy (Primary Partition)

50.00 GB
Unallocated

Step 5 On the displayed **Extend Volume Wizard** window, click **Next**.

Figure 4-18 Extend Volume Wizard (Windows Server 2008)



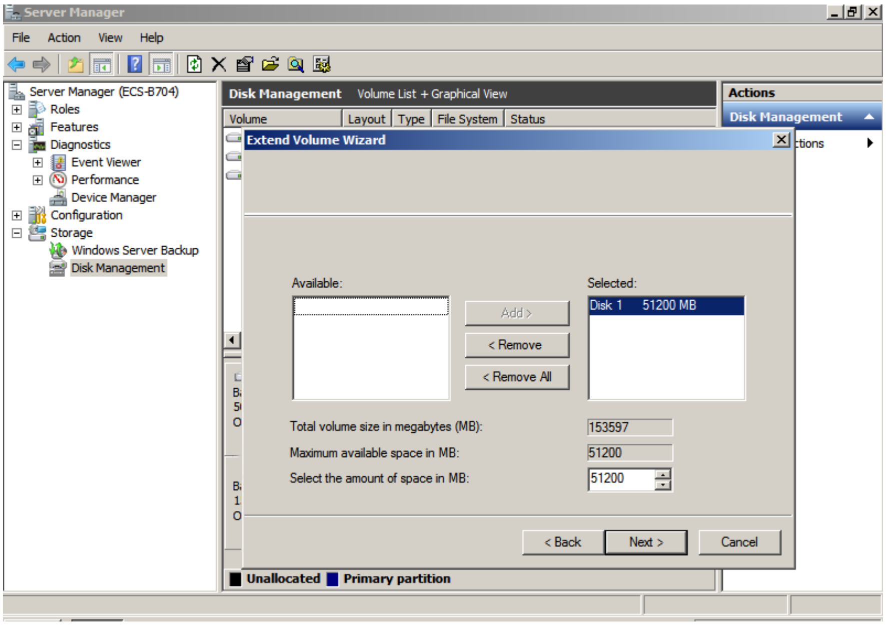
Welcome to the Extend Volume Wizard

This wizard helps you increase the size of simple and spanned volumes. You can extend a volume by adding space from one or more additional disks.

To continue, click Next.

Step 6 In the text box to the right of **Select the amount of space in MB**, enter the amount of the additional space and click **Next**.

Figure 4-19 Selecting space (Windows Server 2008)



Available:

Selected: Disk 1 51200 MB

Total volume size in megabytes (MB): 153597

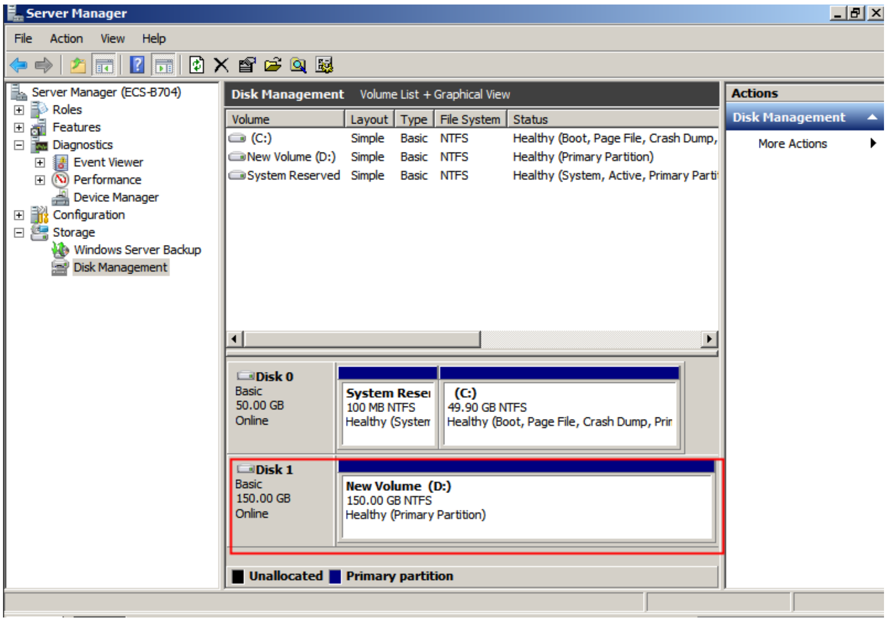
Maximum available space in MB: 51200

Select the amount of space in MB: 51200

Step 7 Click **Finish**.

After the expansion succeeded, the partition size is larger than the original size.

Figure 4-20 Capacity expansion succeeded (Windows Server 2008)



Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Parti

----End

Data Disk: Create New Volume (E:) with Additional Space

In this example, the data disk has 40 GiB originally, and 60 GiB is added on the management console. The following procedure describes how to use this 60 GiB to create a new volume, for example volume (E:), on the server. After the operation is complete, new volume (E:) has 60 GiB of capacity and can be used as a data volume.

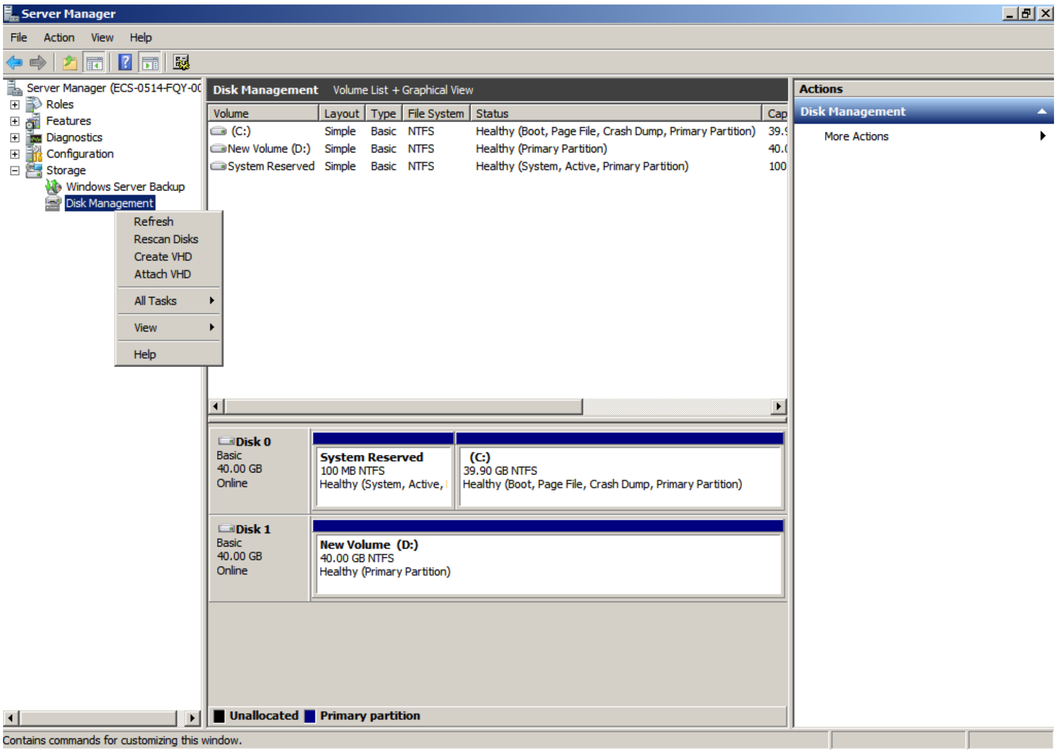
Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

The **Server Manager** window is displayed.

Step 2 In the navigation tree, choose **Storage** > **Disk Management**.

The **Disk Management** window is displayed.

Figure 4-21 Refresh (data disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Active,

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Basic
40.00 GB
Online

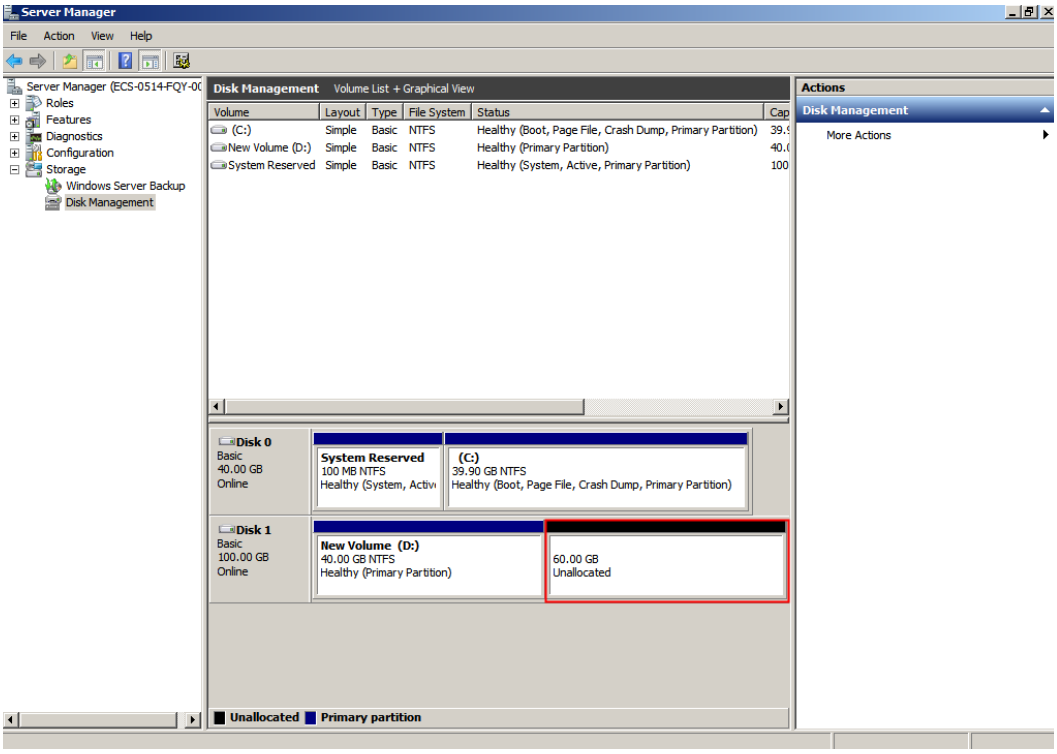
New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

Contains commands for customizing this window.

Step 3 If you cannot view the additional space, right-click **Disk Management** and choose **Refresh** from the shortcut menu.

After the refresh, the additional space is displayed in the right area and is unallocated.

Figure 4-22 Unallocated disk space (data disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Activ

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

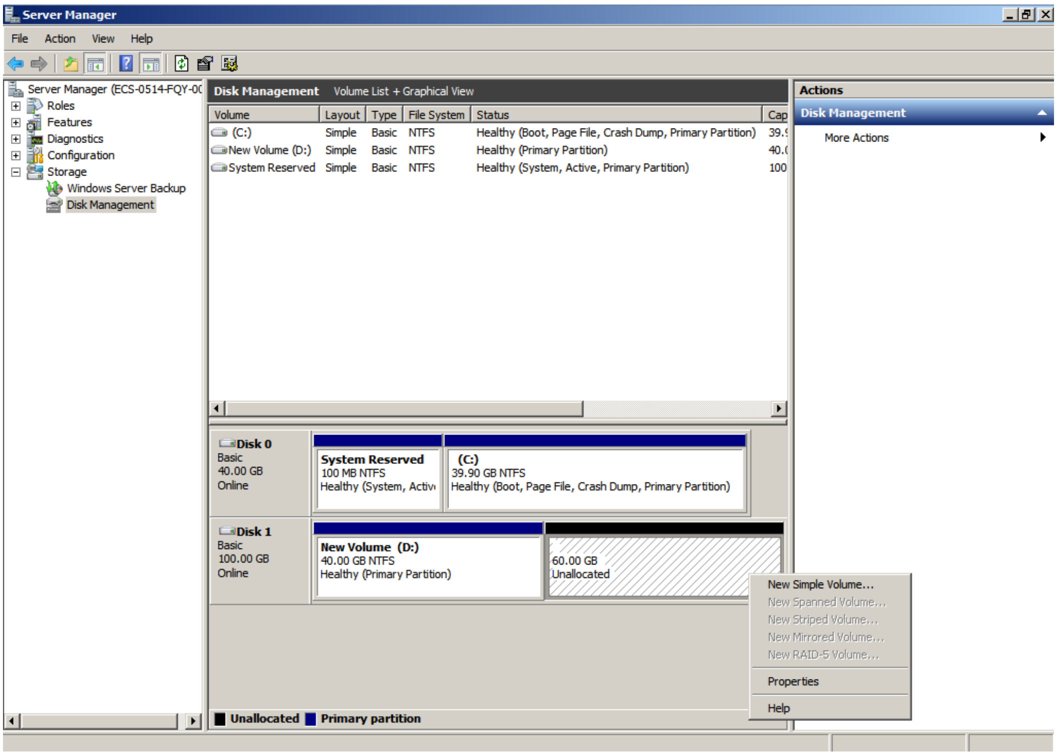
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 4 In the **Unallocated** area of **Disk 1**, right-click the blank area and choose **New Simple Volume**.

Figure 4-23 New Simple Volume (data disk)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.!
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Activ

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

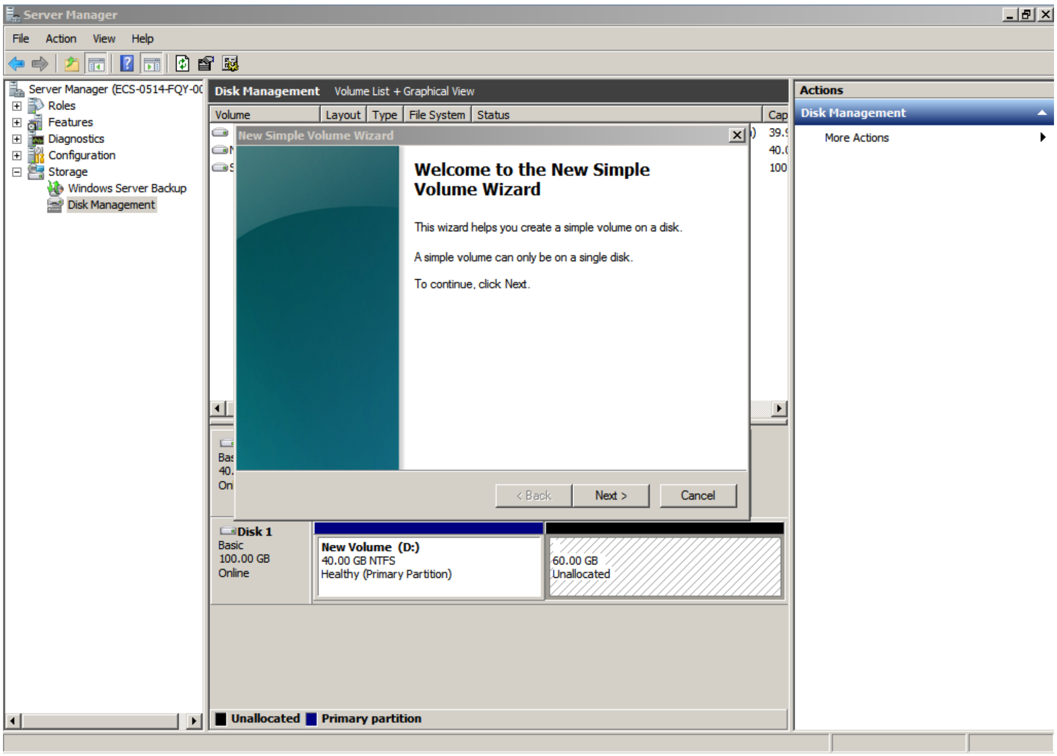
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 5 On the displayed **New Simple Volume Wizard** window, click **Next**.

Figure 4-24 New Simple Volume Wizard (data disk)



New Simple Volume Wizard

Welcome to the New Simple Volume Wizard

This wizard helps you create a simple volume on a disk.

A simple volume can only be on a single disk.

To continue, click Next.

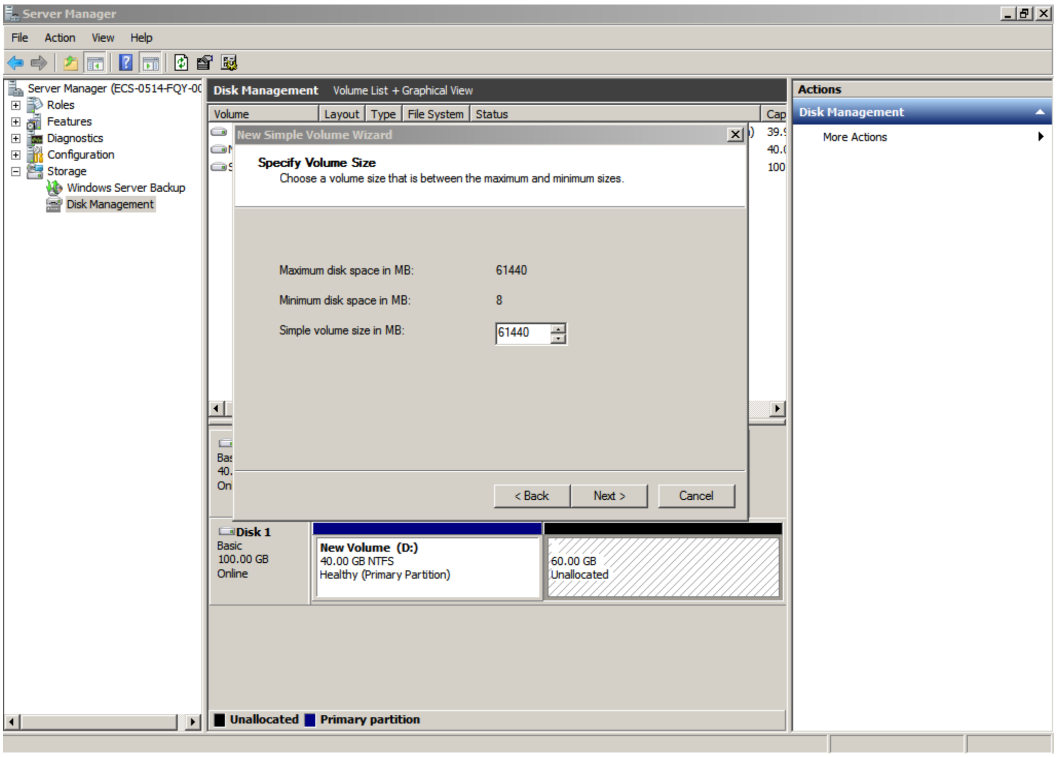
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 6 On the displayed **Specify Volume Size** page, set **Simple volume size in MB** and click **Next**. In this example, the default size is used.

Figure 4-25 Specify Volume Size (data disk)



New Simple Volume Wizard

Specify Volume Size

Choose a volume size that is between the maximum and minimum sizes.

Maximum disk space in MB: 61440

Minimum disk space in MB: 8

Simple volume size in MB: 61440

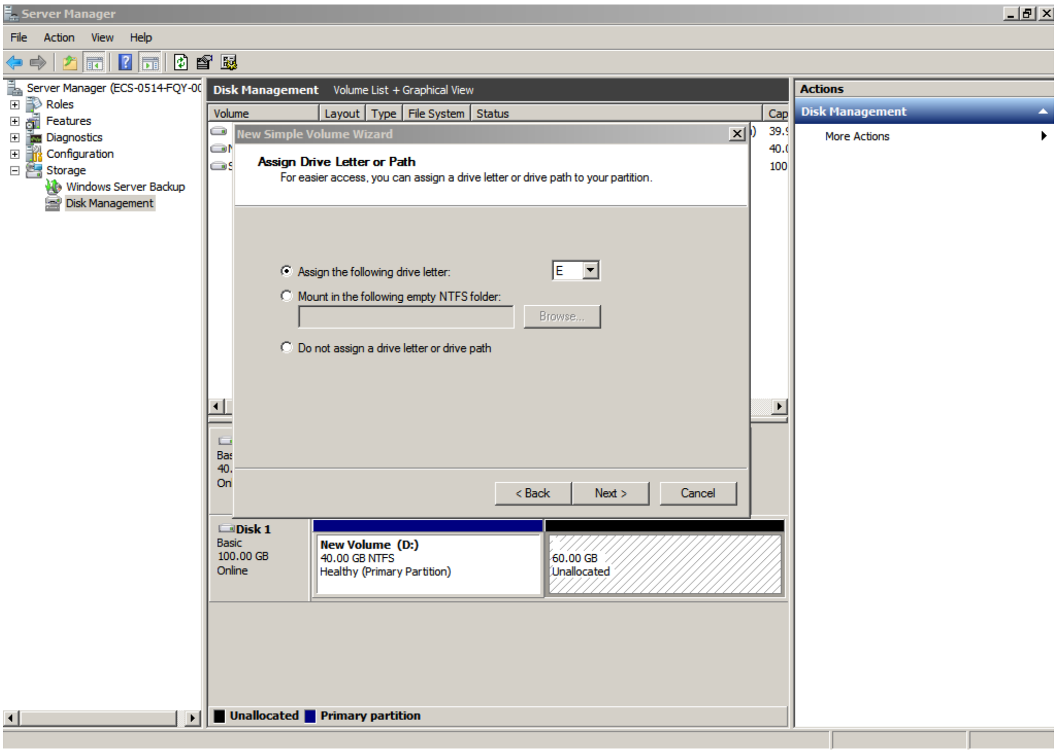
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 7 On the displayed **Assign Drive Letter and Path** page, click **Assign the following drive letter**, select a drive letter, and click **Next**. In this example, drive letter **E** is selected.

Figure 4-26 Assign Driver Letter or Path (data disk)



Assign Drive Letter or Path

For easier access, you can assign a drive letter or drive path to your partition.

● Assign the following drive letter: E

○ Mount in the following empty NTFS folder:

○ Do not assign a drive letter or drive path

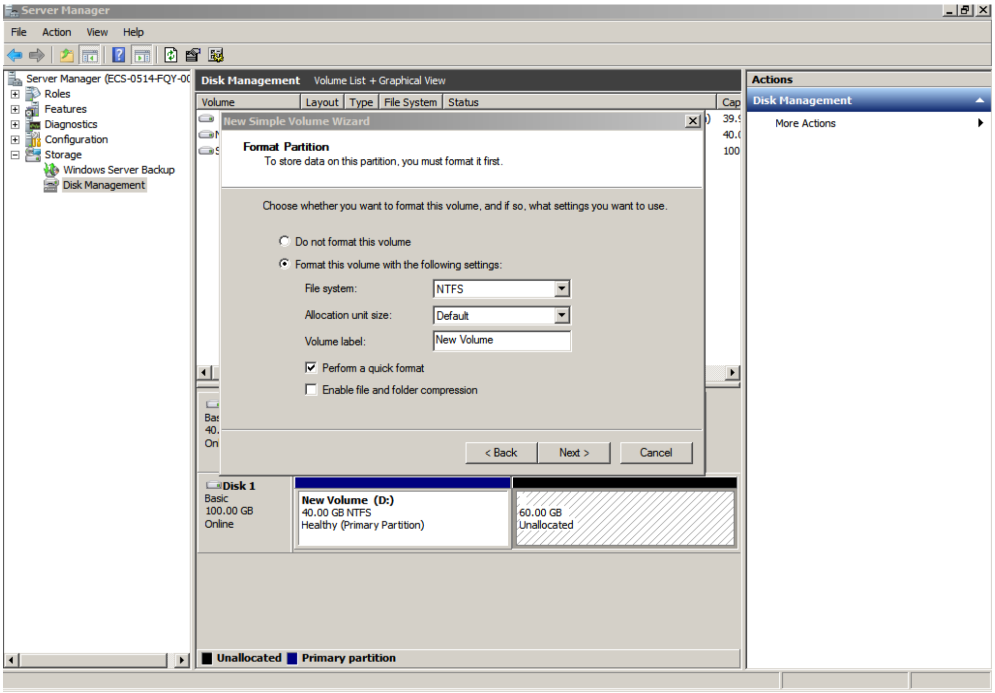
Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 8 On the displayed **Format Partition** page, click **Format this volume with the following settings**, set parameters based on the requirements, and select **Perform a quick format**. Then, click **Next**.

Figure 4-27 Format Partition (data disk)



Format Partition

To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

Allocation unit size: Default

Volume label: New Volume

☑ Perform a quick format

□ Enable file and folder compression

Disk 1
Basic
100.00 GB
Online

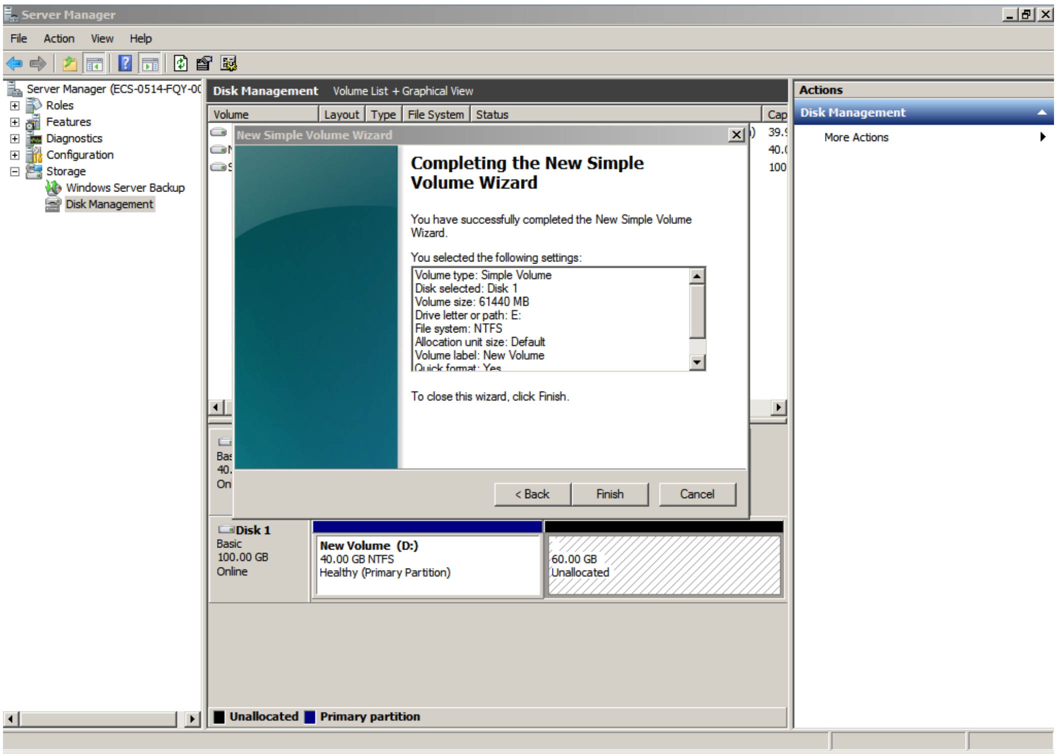
New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

60.00 GB
Unallocated

Step 9 Click **Finish**.

After the expansion succeeded, new volume (E:) is displayed.

Figure 4-28 Completing the New Simple Volume Wizard (new volume E:)



Completing the New Simple Volume Wizard

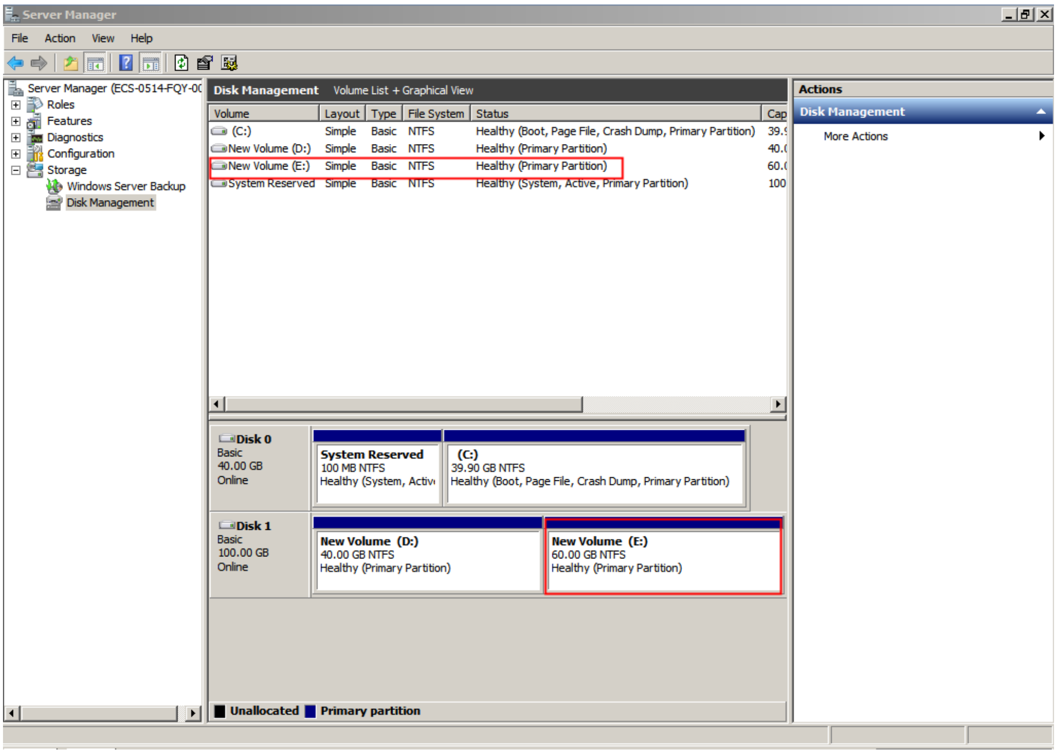
You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 61440 MB
Drive letter or path: E:
File system: NTFS
Allocation unit size: Default
Volume label: New Volume
Quick format: Yes

To close this wizard, click Finish.

Figure 4-29 New Volume (E:)



Volume	Layout	Type	File System	Status	Cap
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	39.9
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.(
New Volume (E:)	Simple	Basic	NTFS	Healthy (Primary Partition)	60.(
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Activ

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Basic
100.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

New Volume (E:)
60.00 GB NTFS
Healthy (Primary Partition)

----End

4.5 Extending Disk Partitions and File Systems (Linux)

4.5.1 Partition and File System Extension Preparations (Linux)

Before extending the disk partition and file system, you must check the disk partition style and file system format, and then select the appropriate operation accordingly.

1. To view the disk partition style, see the following methods:
   - **Method 1: Check Partition Style and File System Format Using fdisk**
   - **Method 2: Check Partition Style and File System Format Using parted**
2. To select the appropriate operation, see **Table 4-3**.

Table 4-3 Disk partition and file system extension scenarios

Disk	Scenario	Method
System disk	Create a new MBR partition with the additional space.	**Creating a New MBR Partition**
	Allocate the additional space to an existing MBR partition.	● **Extending an Existing MBR Partition (Kernel Version Later Than 3.6.0)** ● **Extending an Existing MBR Partition (Kernel Version Earlier Than 3.6.0)**
Data disk	Create a new MBR partition with the additional space.	**Creating a New MBR Partition**
	Allocate the additional space to an existing MBR partition.	**Extending an Existing MBR Partition**
	Create a new GPT partition with the additional space.	**Creating a New GPT Partition**
	Allocate the additional space to an existing GPT partition.	**Extending an Existing GPT Partition**
SCSI data disk	Create a new MBR partition with the additional space.	**Creating a New MBR Partition**
	Allocate the additional space to an existing MBR partition.	**Extending an Existing MBR Partition**

NOTE

The maximum disk capacity that MBR supports is 2 TiB, and the disk space exceeding 2 TiB cannot be used.

If your disk uses MBR and you need to expand the disk capacity to over 2 TiB, change the partition style from MBR to GPT. Ensure that the disk data has been backed up before changing the partition style because services will be interrupted and data on the disk will be cleared during this change.

Method 1: Check Partition Style and File System Format Using fdisk

Step 1 Run the following command to view all the disks attached to the server:

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  150G  0 disk
└─vdb1 253:17   0  100G  0 part /mnt/sdc
```

In this example, data disk **/dev/vdb** already has partition **/dev/vdb1** before capacity expansion, and the additional 50 GiB added has not been allocated yet. Therefore, **/dev/vdb** has 150 GiB, and **/dev/vdb1** has 100 GiB.

Step 2 Run the following command to view the current disk partition style:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/vdb: 161.1 GB, 161061273600 bytes, 314572800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
```

The value in the **System** column indicates the disk partition style. Value **Linux** indicates the MBR partition style. Value **GPT** indicates the GPT partition style.

- If the disk partitions displayed are inconsistent with those obtained in **Step 1**, the partition that is not displayed uses the GPT partition style and has unallocated space. In this case, you cannot query all the partition information using the **fdisk -l** command. Go to **Method 2: Check Partition Style and File System Format Using parted**.

- If the disk partitions displayed are consistent with those obtained in **Step 1**, continue with the following operations.

Step 3 Run the following command to view the partition's file system format:

blkid *Disk partition*

In this example, run the following command:

blkid /dev/vdb1

In the command output, the **TYPE** value is **ext4**, indicating that **/dev/vdb1**'s file system format is **ext4**.

Step 4 Run the following command to view the file system status:

ext*: **e2fsck -n** *Disk partition*

xfs: **xfs_repair -n** *Disk partition*

In this example, the ext4 file system is used. Therefore, run the following command:

e2fsck -n /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# e2fsck -n /dev/vdb1
e2fsck 1.42.9 (28-Dec-2013)
Warning!  /dev/vdb1 is mounted.
Warning: skipping journal recovery because doing a read-only filesystem check.
/dev/vdb1: clean, 11/6553600 files, 459544/26214144 blocks
```

If the file system status is **clean**, the file system status is normal. Otherwise, rectify the faulty and then perform the capacity expansion.

----End

Method 2: Check Partition Style and File System Format Using parted

Step 1 Run the following command to view all the disks attached to the server:

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  150G  0 disk
└─vdb1 253:17   0  100G  0 part /mnt/sdc
```

In this example, data disk **/dev/vdb** already has partition **/dev/vdb1** before capacity expansion, and the additional 50 GiB added has not been allocated yet. Therefore, **/dev/vdb** has 150 GiB, and **/dev/vdb1** has 100 GiB.

Step 2 Run the following command and enter **p** to view the disk partition style:

parted *Disk*

For example, run the following command to view **/dev/vdb**'s partition style:

parted /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# parted /dev/vdb
GNU Parted 3.1
Using /dev/vdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) p
Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that another
operating system believes the
disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
Fix/Ignore/Cancel? Fix
Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all of
the space (an extra 104857600
blocks) or continue with the current setting?
Fix/Ignore? Fix
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 161GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start   End    Size   File system  Name  Flags
 1      1049kB  107GB  107GB  ext4         test

(parted)
```

In the command output, parameter **Partition Table** indicates the disk partition style. Value **msdos** indicates the MBR partition style, and value **gpt** indicates the GPT partition style.

- If the following error information is displayed, enter **Fix**.

  ```
  Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that
  another operating system believes the
  disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
  ```

  The GPT partition table information is stored at the start of the disk. To reduce the risk of damage, a backup of the information is saved at the end of the disk. When you expand the disk capacity, the end of the disk changes accordingly. In this case, enter **Fix** to move the backup file of the information to new disk end.

- If the following warning information is displayed, enter **Fix**.

  ```
  Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all
  of the space (an extra 104857600
  blocks) or continue with the current setting?
  Fix/Ignore? Fix
  ```

  Enter **Fix** as prompted. The system automatically sets the GPT partition style for the additional space.

Step 3 Enter **q** and press **Enter** to exit parted.

----End

4.5.2 Extending Partitions and File Systems for System Disks (Linux)

Scenarios

After a disk has been expanded on the management console, the disk size is enlarged, but the additional space cannot be used directly.

In Linux, you must allocate the additional space to an existing partition or a new partition.

This section uses CentOS 7.4 64bit and CentOS 6.5 64bit as the sample OSs to describe how to extend the disk partition using growpart and fdisk. The method for allocating the additional space varies with the server OS. This section is used for reference only. For detailed operations and differences, see the corresponding OS documents.

For how to query the Linux kernel version, see **Querying the Linux Kernel Version**.

- **Extending an Existing MBR Partition (Kernel Version Later Than 3.6.0)**
- **Extending an Existing MBR Partition (Kernel Version Earlier Than 3.6.0)**
- **Creating a New MBR Partition**

NOTICE

Performing the expansion operations with caution. Misoperation may lead to data loss or exceptions. Therefore, you are advised to back up the disk data using CBR or snapshots before expansion. For details about using CBR, see **Managing EVS Backups**. For details about using snapshots, see **Creating a Snapshot**.

Prerequisites

- You have expanded the disk capacity and attached the disk to a server on the management console. For details, see **Expanding Capacity for an In-use EVS Disk** or **Expanding Capacity for an Available EVS Disk**.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Querying the Linux Kernel Version

Run the following command to query the Linux kernel version:

uname -a

Then, perform corresponding operations depending on whether the Linux kernel version is later than 3.6.0.

- For CentOS 7.4 64bit, information similar to the following is displayed:
  ```
  Linux ecs-test-0001 3.10.0-957.5.1.el7.x86_64 #1 SMP Fri Feb 1 14:54:57 UTC 2019 x86_64 x86_64
  ```
  The kernel version is 3.10.0, which is later than 3.6.0. For subsequent operations, see **Extending an Existing MBR Partition (Kernel Version Later Than 3.6.0)**.
- For CentOS 6.5 64bit, information similar to the following is displayed:
  ```
  Linux ecs-test-0002 2.6.32-754.10.1.el6.x86_64 #1 SMP Tue Jan 15 17:07:28 UTC 2019 x86_64
  ```
  The kernel version is 2.6.32, which is earlier than 3.6.0. In this case, the disk partition and file system extension take effect only after a server reboot. For subsequent operations, see **Extending an Existing MBR Partition (Kernel Version Earlier Than 3.6.0)**.

Extending an Existing MBR Partition (Kernel Version Later Than 3.6.0)

CentOS 7.4 64bit is used as the sample OS. Originally, system disk **/dev/vda** has 40 GiB and one partition (**/dev/vda1**), and then 60 GiB is added to the disk. The following procedure shows you how to allocate the additional 60 GiB to the existing MBR partition **/dev/vda1**.

Step 1 (Optional) Run the following command to install the growpart tool:

yum install cloud-utils-growpart

NOTE

You can run the **growpart** command to check whether the growpart tool has been installed. If the command output displays the tool usage instructions, the tool has been installed and you do not need to install it separately.

Step 2 Run the following command to view the total capacity of the **/dev/vda** system disk:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk -l

Disk /dev/vda: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux
```

Step 3 Run the following command to view the capacity of the **/dev/vda1** partition:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  2.0G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.0M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
```

Step 4 Run the following command to extend the partition using growpart:

growpart *System disk Partition number*

In this example, run the following command:

growpart /dev/vda 1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# growpart /dev/vda 1
CHANGED: partition=1 start=2048 old: size=83884032 end=83886080 new: size=209713119,end=209715167
```

Step 5 Run the following command to extend the file system of the partition:

resize2fs *Disk partition*

In this example, run the following command:

resize2fs /dev/vda1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# resize2fs /dev/vda1
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/vda1 is mounted on /; on-line resizing required
old_desc_blocks = 5, new_desc_blocks = 13
The filesystem on /dev/vda1 is now 26214139 blocks long.
```

Step 6 Run the following command to view the new capacity of the **/dev/vda1** partition:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4      106G  2.0G   99G   2% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.0M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
```

----End

Extending an Existing MBR Partition (Kernel Version Earlier Than 3.6.0)

NOTICE

If the OS kernel version is earlier than 3.6.0, the extension of an existing MBR disk partition and file system takes effect only after a server reboot, and services will be interrupted.

CentOS 6.5 64bit is used as the sample OS. Originally, system disk **/dev/vda** has 40 GiB and one partition (**/dev/vda1**), and then 60 GiB is added to the disk. The following procedure shows you how to allocate the additional 60 GiB to the existing MBR partition **/dev/vda1**.

Step 1 (Optional) Run the following command to install the growpart tool:

yum install cloud-utils-growpart

NOTE

You can run the **growpart** command to check whether the growpart tool has been installed. If the command output displays the tool usage instructions, the tool has been installed and you do not need to install it separately.

Step 2 Run the following command to install the dracut-modules-growroot tool:

yum install cloud-utils-growpart

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# yum install cloud-utils-growpart
Loaded plugins: fastestmirror, security
Setting up Install Process
Determining fastest mirrors
...
Package cloud-utils-growpart-0.27-10.el6.x86_64 already installed and latest version
Nothing to do
```

Step 3 Run the following command to regenerate the initramfs file:

dracut -f

Step 4 Run the following command to view the total capacity of the **/dev/vda** system disk:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# fdisk -l

Disk /dev/vda: 107.4 GB, 107374182400 bytes
255 heads, 63 sectors/track, 13054 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: 0x0004e0be

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *           1        5222    41942016   83  Linux
```

Step 5 Run the following command to view the capacity of the **/dev/vda1** partition:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# df -TH
Filesystem     Type   Size  Used Avail Use% Mounted on
/dev/vda1      ext4    43G  1.7G   39G   5% /
tmpfs          tmpfs  2.1G     0  2.1G   0% /dev/shm
```

Step 6 Run the following command to extend the partition using growpart:

growpart *System disk Partition number*

In this example, run the following command:

growpart /dev/vda 1

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# growpart /dev/vda 1
CHANGED: partition=1 start=2048 old: size=83884032 end=83886080 new: size=209710462,end=209712510
```

Step 7 Run the following command to restart the server:

reboot

After the server is restarted, reconnect to the server and perform the following steps.

Step 8 Run the following command to extend the file system of the partition:

resize2fs *Disk partition*

In this example, run the following command:

resize2fs /dev/vda1

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# resize2fs /dev/vda1
resize2fs 1.41.12 (17-May-2010)
The filesystem is already 26213807 blocks long.  Nothing to do!
```

Step 9 Run the following command to view the new capacity of the **/dev/vda1** partition:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0002 ~]# df -TH
Filesystem     Type   Size  Used Avail Use% Mounted on
/dev/vda1      ext4   106G  1.7G   99G   2% /
tmpfs          tmpfs  2.1G     0  2.1G   0% /dev/shm
```

----End

Creating a New MBR Partition

Originally, system disk **/dev/vda** has 40 GiB and one partition (**/dev/vda1**), and then 40 GiB is added to the disk. The following procedure shows you how to create a new MBR partition **/dev/vda2** with this 40 GiB.

Step 1 Run the following command to view the disk partition information:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-2220 ~]# fdisk -l

Disk /dev/vda: 85.9 GB, 85899345920 bytes, 167772160 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0008d18f

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux
```

In the command output, the capacity of the **dev/vda** system disk is 80 GiB, in which the in-use **dev/vda1** partition takes 40 GiB and the additional 40 GiB has not been allocated.

Step 2 Run the following command to enter fdisk:

fdisk /dev/vda

Information similar to the following is displayed:

```
[root@ecs-2220 ~]# fdisk /dev/vda
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help):
```

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

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
```

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 4 In this example, a primary partition is created. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (2-4, default 2):
```

Step 5 Partition number **2** is used in this example. Therefore, enter **2** and press **Enter.**

Information similar to the following is displayed:

```
Partition number (2-4, default 2): 2
First sector (83886080-167772159, default 83886080):
```

Step 6 Enter the new partition's start sector and press **Enter**. In this example, the default start sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
First sector (83886080-167772159, default 83886080):
Using default value 83886080
Last sector, +sectors or +size{K,M,G} (83886080-167772159,default 167772159):
```

Step 7 Enter the new partition's end sector and press **Enter**. In this example, the default end sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (83886080-167772159,
default 167772159):
Using default value 167772159
Partition 2 of type Linux and of size 40 GiB is set

Command (m for help):
```

Step 8 Enter **p** and press **Enter** to view the new partition.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/vda: 85.9 GB, 85899345920 bytes, 167772160 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x0008d18f

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux
/dev/vda2        83886080   167772159    41943040   83  Linux
Command (m for help):
```

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

Information similar to the following is displayed:

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

The partition is created.

NOTE

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

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

partprobe

Step 11 Run the following command to set the file system format for the new partition:

mkfs -t *File system Disk partition*

- Sample command of the ext* file system:

  (The ext4 file system is used in this example.)

  mkfs -t ext4 /dev/vda2

  Information similar to the following is displayed:

```
[root@ecs-2220 ~]# mkfs -t ext4 /dev/vda2
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
2621440 inodes, 10485760 blocks
524288 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2157969408
320 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624

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

- Sample command of the xfs file system:

  mkfs -t xfs /dev/vda2

  Information similar to the following is displayed:

```
[root@ecs-2220 ~]# mkfs -t xfs /dev/vda2
meta-data=/dev/vda2              isize=512    agcount=4, agsize=2621440 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=10485760, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2              bsize=4096   ascii-ci=0 ftype=1
```

```
log      =internal log           bsize=4096   blocks=5120, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

The formatting takes a while, and you need to observe the system running status. Once **done** is displayed in the command output, the formatting is complete.

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

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/opt** mount point:

mkdir /opt

Step 13 Run the following command to mount the new partition:

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vda2** on **/opt**:

mount /dev/vda2 /opt

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

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

df -TH

Information similar to the following is displayed:

```
[root@ecs-2220 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  2.0G   39G   5% /
devtmpfs       devtmpfs  509M     0  509M   0% /dev
tmpfs          tmpfs     520M     0  520M   0% /dev/shm
tmpfs          tmpfs     520M  7.2M  513M   2% /run
tmpfs          tmpfs     520M     0  520M   0% /sys/fs/cgroup
tmpfs          tmpfs     104M     0  104M   0% /run/user/0
/dev/vda2      ext4       43G   51M   40G   1% /opt
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc                 ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.
- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1

2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a

3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

   If information similar to the following is displayed, automatic mounting has been configured:

```
root@ecs-test-0001 ~]# mount | grep /mnt/sdc
/dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
```

----End

4.5.3 Extending Partitions and File Systems for Data Disks (Linux)

Scenarios

After a disk has been expanded on the management console, the disk size is enlarged, but the additional space cannot be used directly.

In Linux, you must allocate the additional space to an existing partition or a new partition.

This section uses CentOS 7.4 64bit as the sample OS to describe how to extend an MBR or GPT partition. The method for allocating the additional space varies with the server OS. This section is used for reference only. For detailed operations and differences, see the corresponding OS documents.

- **Creating a New MBR Partition**
- **Extending an Existing MBR Partition**
- **Creating a New GPT Partition**
- **Extending an Existing GPT Partition**

NOTICE

Performing the expansion operations with caution. Misoperation may lead to data loss or exceptions. Therefore, you are advised to back up the disk data using CBR or snapshots before expansion. For details about using CBR, see **Managing EVS Backups**. For details about using snapshots, see **Creating a Snapshot**.

Prerequisites

- You have expanded the disk capacity and attached the disk to a server on the management console. For details, see **Expanding Capacity for an In-use EVS Disk** or **Expanding Capacity for an Available EVS Disk**.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Creating a New MBR Partition

Originally, data disk **/dev/vdb** has 100 GiB and one partition (**/dev/vdb1**), and then 50 GiB is added to the disk. The following procedure shows you how to create a new MBR partition **/dev/vdb2** with this 50 GiB.

Step 1 Run the following command to view the disk partition information:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/vdb: 161.1 GB, 161061273600 bytes, 314572800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
```

Step 2 Run the following command to enter fdisk:

fdisk *Disk*

In this example, run the following command:

fdisk /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).
```

```
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help):
```

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

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p):
```

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 4 In this example, a primary partition is created. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (2-4, default 2):
```

Partition number indicates the serial number of the primary partition. Because partition number 1 has been used, the value ranges from **2** to **4**.

Step 5 Enter the serial number of the primary partition and press **Enter**. Partition number **2** is used in this example. Therefore, enter **2** and press **Enter.**

Information similar to the following is displayed:

```
Partition number (2-4, default 2): 2
First sector (209715200-314572799, default 209715200):
```

First sector indicates the start sector. The value ranges from **209715200** to **314572799**, and the default value is **209715200**.

Step 6 Enter the new partition's start sector and press **Enter**. In this example, the default start sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
First sector (209715200-314572799, default 209715200):
Using default value 209715200
Last sector, +sectors or +size{K,M,G} (209715200-314572799, default 314572799):
```

Last sector indicates the end sector. The value ranges from **209715200** to **314572799**, and the default value is **314572799**.

Step 7 Enter the new partition's end sector and press **Enter**. In this example, the default end sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (209715200-314572799, default 314572799):
Using default value 314572799
Partition 2 of type Linux and of size 50 GiB is set

Command (m for help):
```

Step 8 Enter **p** and press **Enter** to view the new partition.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/vdb: 161.1 GB, 161061273600 bytes, 314572800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
/dev/vdb2       209715200   314572799    52428800   83  Linux

Command (m for help):
```

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

Information similar to the following is displayed:

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

NOTE

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

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

partprobe

Step 11 Run the following command to set the file system format for the new partition:

mkfs -t *File system Disk partition*

- Sample command of the ext* file system:

  mkfs -t ext4 /dev/vdb2

  Information similar to the following is displayed:

  ```
  [root@ecs-test-0001 ~]# mkfs -t ext4 /dev/vdb2
  mke2fs 1.42.9 (28-Dec-2013)
  Filesystem label=
  OS type: Linux
  Block size=4096 (log=2)
  ```

```
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
3276800 inodes, 13107200 blocks
655360 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2162163712
400 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424

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

- Sample command of the xfs file system:

  mkfs -t xfs /dev/vdb2

  Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# mkfs -t xfs /dev/vdb2
meta-data=/dev/vdb2              isize=512    agcount=4, agsize=3276800 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=13107200, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=6400, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

The formatting takes a while, and you need to observe the system running status. Once **done** is displayed in the command output, the formatting is complete.

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

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

Step 13 Run the following command to mount the new partition:

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vdb2** on **/mnt/test**:

mount /dev/vdb2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

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

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
/dev/vdb2      ext4       53G   55M   50G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Extending an Existing MBR Partition

NOTICE

If the additional space is allocated to an existing partition, data on the disk will not be cleared but you must use **umount** to unmount the existing partition. In this case, services will be affected.

Originally, data disk **/dev/vdb** has 150 GiB and two partitions (**/dev/vdb1** and **/dev/vdb2**), and then 80 GiB is added to the disk. The following procedure shows you how to add this 80 GiB to the existing MBR partition **/dev/vdb2**.

NOTICE

During an expansion, the additional space is added to the end of the disk. Therefore, if the disk has multiple partitions, the additional space can only be allocated to the partition at the disk end.

Step 1 Run the following command to view the disk partition information:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/vdb: 247.0 GB, 246960619520 bytes, 482344960 sectors
```

```
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
/dev/vdb2       209715200   314572799    52428800   83  Linux
```

In the command output, take note of the partition's start and end sectors. In this example, **/dev/vdb2**'s start sector is **209715200**, and its end sector is **314572799**.

View the **/dev/vdb** capacity and check whether the additional space is included.

- If the additional space is not included, refresh the capacity according to **Extending Partitions and File Systems for SCSI Disks (Linux)**.
- If the additional space is included, take note of the start and end sectors of the target partition and then go to **Step 2**. These values will be used in the subsequent operations.

Step 2 Run the following command to unmount the partition:

umount *Disk partition*

In this example, run the following command:

umount /dev/vdb2

Step 3 Run the following command to enter fdisk:

fdisk *Disk*

In this example, run the following command:

fdisk /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# fdisk /dev/vdb
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help):
```

Step 4 Run the following command to delete the partition to be extended:

1. Enter **d** and press **Enter** to delete the partition.

   Information similar to the following is displayed:

   ```
   Command (m for help): d
   Partition number (1,2, default 2):
   ```

2. Enter the partition number and press **Enter** to delete the partition. In this example, enter **2**.

   Information similar to the following is displayed:

   ```
   Partition number (1,2, default 2): 2
   Partition 2 is deleted

   Command (m for help):
   ```

NOTE

After deleting the partition, recreate the partition according to the following steps, and data on this disk will not be lost.

Step 5 Enter **n** and press **Enter** to create a new partition.

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p):
```

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 6 Ensure that the entered partition type is the same as the partition had before. In this example, a primary partition is used. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (2-4, default 2):
```

Partition number indicates the serial number of the primary partition.

Step 7 Ensure that entered partition number is the same as the partition had before. In this example, partition number **2** is used. Therefore, enter **2** and press **Enter**.

Information similar to the following is displayed:

```
Partition number (2-4, default 2): 2
First sector (209715200-482344959, default 209715200):
```

In the command output, **First sector** specifies the start sector.

NOTE

Data will be lost if the following operations are performed:

- Select a start sector other than the partition had before.
- Select an end sector smaller than the partition had before.

Step 8 Ensure that the entered start sector is the same as the partition had before. In this example, start sector **209715200** is recorded in **Step 1**. Therefore, enter **209715200** and press **Enter**.

Information similar to the following is displayed:

```
First sector (209715200-482344959, default 209715200):
Using default value 209715200
Last sector, +sectors or +size{K,M,G} (209715200-482344959, default 482344959):
```

In the command output, **Last sector** specifies the end sector.

Step 9 Ensure that the entered end sector is larger than or equal to the end sector recorded in **Step 1**. In this example, the recorded end sector is **314572799**, and the default end sector is used. Therefore, enter **482344959** and press **Enter**.

Information similar to the following is displayed:

```
Using default value 209715200
Last sector, +sectors or +size{K,M,G} (209715200-482344959, default 482344959):
Using default value 482344959
Partition 2 of type Linux and of size 130 GiB is set

Command (m for help):
```

The partition is created.

Step 10 Enter **p** and press **Enter** to view the partition details.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/vdb: 247.0 GB, 246960619520 bytes, 482344960 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x38717fc1

   Device Boot      Start         End      Blocks   Id  System
/dev/vdb1            2048   209715199   104856576   83  Linux
/dev/vdb2       209715200   482344959   136314880   83  Linux

Command (m for help):
```

Step 11 Enter **w** and press **Enter** to write the changes to the partition table.

Information similar to the following is displayed:

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

NOTE

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

Step 12 Run the following command to synchronize the new partition table to the OS:

partprobe

Step 13 Perform the following operations based on the file system of the disk:

- For the **ext*** file system
  a. Run the following command to check the correctness of the file system on the partition:

     e2fsck -f *Disk partition*

     In this example, run the following command:

     e2fsck -f /dev/vdb2

     Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# e2fsck -f /dev/vdb2
e2fsck 1.42.9 (28-Dec-2013)
```

```
Pass 1: Checking inodes, blocks, and sizes
Pass 2: Checking directory structure
Pass 3: Checking directory connectivity
Pass 4: Checking reference counts
Pass 5: Checking group summary information
/dev/vdb2: 11/3276800 files (0.0% non-contiguous), 251790/13107200 blocks
```

b. Run the following command to extend the file system of the partition:

resize2fs *Disk partition*

In this example, run the following command:

resize2fs /dev/vdb2

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# resize2fs /dev/vdb2
resize2fs 1.42.9 (28-Dec-2013)
Resizing the filesystem on /dev/vdb2 to 34078720 (4k) blocks.
The filesystem on /dev/vdb2 is now 34078720 blocks long.
```

c. (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

d. Run the following command to mount the partition:

mount *Disk partition Mount point*

In this example, run the following command to mount partition **/dev/vdb2** on **/mnt/test**:

mount /dev/vdb2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

- For the **xfs** file system

a. (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

b. Run the following command to mount the partition:

mount *Disk partition Mount point*

In this example, run the following command to mount partition **/dev/vdb2** on **/mnt/test**:

mount /dev/vdb2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

c. Run the following command to extend the file system of the partition:

sudo xfs_growfs *Disk partition*

In this example, run the following command:

sudo xfs_growfs /dev/vdb2

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# sudo xfs_growfs /dev/vdb2
meta-data=/dev/vdb2              isize=512    agcount=4, agsize=3276800 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, spinodes=0
data     =                       bsize=4096   blocks=13107200, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal               bsize=4096   blocks=6400, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 13107200 to 34078720.
```

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

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
/dev/vdb2      ext4      138G   63M  131G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Creating a New GPT Partition

Originally, data disk **/dev/vdb** has 100 GiB and one partition (**/dev/vdb1**), and then 50 GiB is added to the disk. The following procedure shows you how to create a new GPT partition **/dev/vdb2** with this 50 GiB.

Step 1 Run the following command to view the disk partition information:

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  150G  0 disk
└─vdb1 253:17   0  100G  0 part /mnt/sdc
```

Step 2 Run the following command to enter parted:

parted *Disk*

In this example, run the following command:

parted /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# parted /dev/vdb
GNU Parted 3.1
Using /dev/vdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted)
```

Step 3 Enter **unit s** and press **Enter** to set the measurement unit of the disk to sector.

Step 4 Enter **p** and press **Enter** to view the disk partition information.

Information similar to the following is displayed:

```
(parted) unit s
(parted) p
Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that another operating system believes the
disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
Fix/Ignore/Cancel? Fix
Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all of the space (an extra 104857600
blocks) or continue with the current setting?
Fix/Ignore? Fix
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 314572800s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End         Size        File system  Name  Flags
 1      2048s  209713151s  209711104s  ext4         test

(parted)
```

In the command output, take note of the partition's end sector. In this example, the end sector of the **/dev/vdb1** partition is **209713151s**.

- If the following error information is displayed, enter **Fix**.

  ```
  Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that another operating system believes the
  disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
  ```

  The GPT partition table information is stored at the start of the disk. To reduce the risk of damage, a backup of the information is saved at the end of the disk. When you expand the disk capacity, the end of the disk changes accordingly. In this case, enter **Fix** to move the backup file of the information to new disk end.

- If the following warning information is displayed, enter **Fix**.

  ```
  Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all of the space (an extra 104857600
  blocks) or continue with the current setting?
  Fix/Ignore? Fix
  ```

Enter **Fix** as prompted. The system automatically sets the GPT partition style for the additional space.

Step 5 Run the following command and press **Enter**:

mkpart *Partition name Start sector End sector*

In this example, run the following command:

mkpart data 209713152s 100%

In this example, the additional space is used to create a new partition. In **Step 4**, the end sector of partition **dev/vdb1** is **209713151s**. Therefore, the start sector of the new partition **dev/vdb2** is set to **209713152s** and the end sector **100%**. This start and end sectors are for reference only. You can plan the number of partitions and partition size based on service requirements.

Information similar to the following is displayed:

```
(parted) mkpart data 209713152s 100%
(parted)
```

NOTE

The maximum sector can be obtained in either of the following ways:

- Query the disk's maximum end sector. For details, see **Step 2** to **Step 4**.
- Enter **-1s** or **100%**, and the value displayed is the maximum end sector.

Step 6 Enter **p** and press **Enter** to view the new partition.

Information similar to the following is displayed:

```
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 314572800s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start       End         Size        File system  Name  Flags
 1      2048s       209713151s  209711104s  ext4         test
 2      209713152s  314570751s  104857600s               data

(parted)
```

Step 7 Enter **q** and press **Enter** to exit parted.

Information similar to the following is displayed:

```
(parted) q
Information: You may need to update /etc/fstab.
```

You can set automatic disk mounting by updating the **/etc/fstab** file. Before updating the file, set the file system format for the partition and mount the partition on the mount point.

Step 8 Run the following command to set the file system format for the new partition:

mkfs -t *File system Disk partition*

- Sample command of the ext* file system:

  mkfs -t ext4 /dev/vdb2

  Information similar to the following is displayed:

  ```
  [root@ecs-test-0001 ~]# mkfs -t ext4 /dev/vdb2
  mke2fs 1.42.9 (28-Dec-2013)
  ```

```
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
3276800 inodes, 13107200 blocks
655360 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2162163712
400 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424

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

- Sample command of the xfs file system:

  mkfs -t xfs /dev/vdb2

  Information similar to the following is displayed:

  ```
  [root@ecs-test-0001 ~]# mkfs -t xfs /dev/vdb2
  meta-data=/dev/vdb2              isize=512    agcount=4, agsize=3276800 blks
           =                       sectsz=512   attr=2, projid32bit=1
           =                       crc=1        finobt=0, sparse=0
  data     =                       bsize=4096   blocks=13107200, imaxpct=25
           =                       sunit=0      swidth=0 blks
  naming   =version2               bsize=4096   ascii-ci=0 ftype=1
  log      =internal log           bsize=4096   blocks=6400, version=2
           =                       sectsz=512   sunit=0 blks, lazy-count=1
  realtime =none                   extsz=4096   blocks=0, rtextents=0
  ```

The formatting takes a while, and you need to observe the system running status. Once **done** is displayed in the command output, the formatting is complete.

Step 9 (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

Step 10 Run the following command to mount the new partition:

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/vdb2** on **/mnt/test**:

mount /dev/vdb2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

Step 11 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
/dev/vdb2      ext4       53G   55M   50G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Extending an Existing GPT Partition

NOTICE

If the additional space is allocated to an existing partition, data on the disk will not be cleared but you must use **umount** to unmount the existing partition. In this case, services will be affected.

Originally, data disk **/dev/vdb** has 150 GiB and two partitions (**/dev/vdb1** and **/dev/vdb2**), and then 80 GiB is added to the disk. The following procedure shows you how to add this 80 GiB to the existing GPT partition **/dev/vdb2**.

During an expansion, the additional space is added to the end of the disk. Therefore, if the disk has multiple partitions, the additional space can only be allocated to the partition at the disk end.

Step 1 Run the following command to view the disk partition information:

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  230G  0 disk
├─vdb1 253:17   0  100G  0 part /mnt/sdc
└─vdb2 253:18   0   50G  0 part /mnt/test
```

View the **/dev/vdb** capacity and check whether the additional space is included.

- If the additional space is not included, refresh the capacity according to **Extending Partitions and File Systems for SCSI Disks (Linux)**.
- If the additional space is included, go to **Step 2**.

Step 2 Run the following command to unmount the partition:

umount *Disk partition*

In this example, run the following command:

umount /dev/vdb2

Step 3 Run the following command to view the unmount result:

lsblk

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0  230G  0 disk
├─vdb1 253:17   0  100G  0 part /mnt/sdc
└─vdb2 253:18   0   50G  0 part
```

Step 4 Run the following command to enter parted:

parted *Disk*

In this example, run the following command:

parted /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# parted /dev/vdb
GNU Parted 3.1
Using /dev/vdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted)
```

Step 5 Enter **unit s** and press **Enter** to set the measurement unit of the disk to sector.

Step 6 Enter **p** and press **Enter** to view the disk partition information.

Information similar to the following is displayed:

```
(parted) unit s
(parted) p
Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that another
operating system believes the
disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
Fix/Ignore/Cancel? Fix
Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all of
the space (an extra 167772160
blocks) or continue with the current setting?
Fix/Ignore? Fix
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 482344960s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start       End         Size        File system  Name  Flags
 1      2048s       209713151s  209711104s  ext4         test
 2      209713152s  314570751s  104857600s  ext4         data

(parted)
```

Take note of the start and end sectors of the **/dev/vdb2** partition. These values will be used during the partition recreation. In this example, the partition's start sector is **209713152s**, and its end sector is **314570751s**.

- If the following error information is displayed, enter **Fix**.

  ```
  Error: The backup GPT table is not at the end of the disk, as it should be.  This might mean that
  another operating system believes the
  disk is smaller.  Fix, by moving the backup to the end (and removing the old backup)?
  ```

  The GPT partition table information is stored at the start of the disk. To reduce the risk of damage, a backup of the information is saved at the end of the disk. When you expand the disk capacity, the end of the disk changes accordingly. In this case, enter **Fix** to move the backup file of the information to new disk end.

- If the following warning information is displayed, enter **Fix**.

  ```
  Warning: Not all of the space available to /dev/vdb appears to be used, you can fix the GPT to use all
  of the space (an extra 104857600
  blocks) or continue with the current setting?
  Fix/Ignore? Fix
  ```

  Enter **Fix** as prompted. The system automatically sets the GPT partition style for the additional space.

Step 7 Enter **rm** and the partition number, and then press **Enter**. In this example, partition number **2** is used.

Information similar to the following is displayed:

```
(parted) rm
Partition number? 2
(parted)
```

Step 8 Run the following command to recreate the partition and press **Enter**:

mkpart *Partition name Start sector End sector*

In this example, run the following command:

mkpart data 209713152s 100%

- Ensure that the entered start sector is the same as the partition had before. In this example, start sector **209713152s** is recorded in **Step 6**. Therefore, enter **209713152s**.
- Ensure that the entered end sector is greater than the partition had before. In this example, the end sector recorded in **Step 6** is **314570751s**, and all the additional space needs to be allocated to **dev/vdb2**. Therefore, enter **100%**.

Information similar to the following is displayed:

```
(parted) mkpart data 209713152s 100%
(parted)
```

NOTE

Data will be lost if the following operations are performed:

- Select a start sector other than the partition had before.
- Select an end sector smaller than the partition had before.

Step 9 Enter **p** and press **Enter** to view the partition information.

Information similar to the following is displayed:

```
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 482344960s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:
```

```
Number  Start       End         Size        File system  Name  Flags
 1      2048s       209713151s  209711104s  ext4         test
 2      209713152s  482342911s  272629760s  ext4         data

(parted)
```

Step 10 Enter **q** and press **Enter** to exit parted.

Information similar to the following is displayed:

```
(parted) q
Information: You may need to update /etc/fstab.
```

You can set automatic disk mounting by updating the **/etc/fstab** file. Before updating the file, set the file system format for the partition and mount the partition on the mount point.

Step 11 Perform the following operations based on the file system of the disk:

- For the **ext*** file system
  a. Run the following command to check the correctness of the file system on the partition:

     e2fsck -f *Disk partition*

     In this example, run the following command:

     e2fsck -f /dev/vdb2

     Information similar to the following is displayed:

     ```
     [root@ecs-test-0001 ~]# e2fsck -f /dev/vdb2
     e2fsck 1.42.9 (28-Dec-2013)
     Pass 1: Checking inodes, blocks, and sizes
     Pass 2: Checking directory structure
     Pass 3: Checking directory connectivity
     Pass 4: Checking reference counts
     Pass 5: Checking group summary information
     /dev/vdb2: 11/3276800 files (0.0% non-contiguous), 251790/13107200 blocks
     ```

  b. Run the following command to extend the file system of the partition:

     resize2fs *Disk partition*

     In this example, run the following command:

     resize2fs /dev/vdb2

     Information similar to the following is displayed:

     ```
     [root@ecs-test-0001 ~]# resize2fs /dev/vdb2
     resize2fs 1.42.9 (28-Dec-2013)
     Resizing the filesystem on /dev/vdb2 to 34078720 (4k) blocks.
     The filesystem on /dev/vdb2 is now 34078720 blocks long.
     ```

  c. (Optional) Run the following command to create a mount point:

     Perform this step if you want to mount the partition on a new mount point.

     mkdir *Mount point*

     In this example, run the following command to create the **/mnt/test** mount point:

     mkdir /mnt/test

  d. Run the following command to mount the partition:

     mount *Disk partition Mount point*

     In this example, run the following command to mount partition **/dev/vdb2** on **/mnt/test**:

     mount /dev/vdb2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

- For the **xfs** file system

   a. (Optional) Run the following command to create a mount point:

      Perform this step if you want to mount the partition on a new mount point.

      mkdir *Mount point*

      In this example, run the following command to create the **/mnt/test** mount point:

      mkdir /mnt/test

   b. Run the following command to mount the partition:

      mount *Disk partition Mount point*

      In this example, run the following command to mount partition **/dev/vdb2** on **/mnt/test**:

      mount /dev/vdb2 /mnt/test

      NOTE

      If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

   c. Run the following command to extend the file system of the partition:

      sudo xfs_growfs *Disk partition*

      In this example, run the following command:

      sudo xfs_growfs /dev/vdb2

      Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# sudo xfs_growfs /dev/vdb2
meta-data=/dev/vdb2              isize=512    agcount=4, agsize=3276800 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, spinodes=0
data     =                       bsize=4096   blocks=13107200, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal               bsize=4096   blocks=6400, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 13107200 to 34078720.
```

Step 12 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
```

```
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
/dev/vdb2      ext4      138G   63M  131G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc                ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.

- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

    When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1
2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a
3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

   If information similar to the following is displayed, automatic mounting has been configured:

```
root@ecs-test-0001 ~]# mount | grep /mnt/sdc
/dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
```

----End

4.5.4 Extending Partitions and File Systems for SCSI Disks (Linux)

Scenarios

After a disk has been expanded on the management console, the disk size is enlarged, but the additional space cannot be used directly.

In Linux, you must allocate the additional space to an existing partition or a new partition.

This section uses CentOS 7.4 64bit as the sample OS to describe how to extend an MBR partition of a SCSI data disk. The method for allocating the additional space varies with the server OS. This section is used for reference only. For detailed operations and differences, see the corresponding OS documents.

- **Creating a New MBR Partition**
- **Extending an Existing MBR Partition**

NOTICE

Performing the expansion operations with caution. Misoperation may lead to data loss or exceptions. Therefore, you are advised to back up the disk data using CBR or snapshots before expansion. For details about using CBR, see **Managing EVS Backups**. For details about using snapshots, see **Creating a Snapshot**.

Prerequisites

- You have expanded the disk capacity and attached the disk to a server on the management console. For details, see **Expanding Capacity for an In-use EVS Disk** or **Expanding Capacity for an Available EVS Disk**.
- You have logged in to the server.
  - For how to log in to an ECS, see the *Elastic Cloud Server User Guide*.
  - For how to log in to a BMS, see the *Bare Metal Server User Guide*.

Creating a New MBR Partition

Originally, data disk **/dev/sda** has 50 GiB and one partition (**/dev/sda1**), and then 50 GiB is added to the disk. The following procedure shows you how to create a new MBR partition **/dev/sda2** with this 50 GiB.

Step 1 Run the following command to view the disk partition information:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/sda: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x915ffe6a
```

```
   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            2048   104857599    52427776   83  Linux
```

View the **/dev/sda** capacity and check whether the additional space is included.

- If the additional space is not included, refresh the capacity according to **Step 2**.
- If the additional space is included, go to **Step 3**.

Step 2 (Optional) Run the following command to update the capacity of the SCSI data disk:

1. Run the following command to update the disk capacity on the server:

   echo 1 > /sys/class/scsi_device/*%d:%d:%d:%d***/device/rescan &**

   In the command, **%d:%d:%d:%d** indicates a folder in the **/sys/class/scsi_device/** directory and can be obtained using **ll /sys/class/scsi_device/**.

   Information similar to the following is displayed: (**2:0:0:0** indicates the folder to be obtained.)

   ```
   cs-xen-02:/sys/class/scsi_device # ll /sys/class/scsi_device/
   total 0
   lrwxrwxrwx 1 root root 0 Sep 26 11:37 2:0:0:0 -> ../../devices/xen/vscsi-2064/host2/target2:0:0/2:0:0:0/
   scsi_device/2:0:0:0
   ```

   In this example, run the following command:

   echo 1 > /sys/class/scsi_device/2:0:0:0/device/rescan &

2. After the disk capacity is updated, run the following command to view the disk partition information again:

   fdisk -l

   If the additional space is included, go to **Step 3**.

Step 3 Run the following command to enter fdisk:

fdisk *Disk*

In this example, run the following command:

fdisk /dev/sda

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# fdisk /dev/sda
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help):
```

Step 4 Enter **n** and press **Enter** to create a new partition.

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p):
```

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 5 In this example, a primary partition is created. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (2-4, default 2):
```

Partition number indicates the serial number of the primary partition. Because partition number 1 has been used, the value ranges from **2** to **4**.

Step 6 Enter the serial number of the primary partition and press **Enter**. Partition number **2** is used in this example. Therefore, enter **2** and press **Enter.**

Information similar to the following is displayed:

```
Partition number (2-4, default 2): 2
First sector (104857600-209715199, default 104857600):
```

First sector indicates the start sector. The value ranges from **104857600** to **209715199**, and the default value is **104857600**.

Step 7 Enter the new partition's start sector and press **Enter**. In this example, the default start sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
First sector (104857600-209715199, default 104857600):
Using default value 104857600
Last sector, +sectors or +size{K,M,G} (104857600-209715199, default 209715199):
```

Last sector indicates the end sector. The value ranges from **104857600** to **209715199**, and the default value is **209715199**.

Step 8 Enter the new partition's end sector and press **Enter**. In this example, the default end sector is used.

The system displays the start and end sectors of the partition's available space. You can customize the value within this range or use the default value. The start sector must be smaller than the partition's end sector.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (104857600-209715199, default 209715199):
Using default value 209715199
Partition 2 of type Linux and of size 50 GiB is set

Command (m for help):
```

Step 9 Enter **p** and press **Enter** to view the new partition.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/sda: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
```

```
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x915ffe6a

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            2048   104857599    52427776   83  Linux
/dev/sda2       104857600   209715199    52428800   83  Linux

Command (m for help):
```

Step 10 Enter **w** and press **Enter** to write the changes to the partition table.

Information similar to the following is displayed:

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

NOTE

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

Step 11 Run the following command to synchronize the new partition table to the OS:

partprobe

Step 12 Run the following command to set the file system format for the new partition:

mkfs -t *File system Disk partition*

- Sample command of the ext* file system:

  mkfs -t ext4 /dev/sda2

  Information similar to the following is displayed:

```
[root@ecs-scsi ~]# mkfs -t ext4 /dev/sda2
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
3276800 inodes, 13107200 blocks
655360 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2162163712
400 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424

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

- Sample command of the xfs file system:

  mkfs -t xfs /dev/sda2

  Information similar to the following is displayed:

```
[root@ecs-scsi ~]# mkfs -t xfs /dev/sda2
meta-data=/dev/sda2              isize=512    agcount=4, agsize=3276800 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, sparse=0
data     =                       bsize=4096   blocks=13107200, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal log           bsize=4096   blocks=6400, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```

The formatting takes a while, and you need to observe the system running status. Once **done** is displayed in the command output, the formatting is complete.

Step 13 (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

Step 14 Run the following command to mount the new partition:

mount *Disk partition Mount point*

In this example, run the following command to mount the new partition **/dev/sda2** on **/mnt/test**:

mount /dev/sda2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

Step 15 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  2.0G   39G   5% /
devtmpfs       devtmpfs  509M     0  509M   0% /dev
tmpfs          tmpfs     520M     0  520M   0% /dev/shm
tmpfs          tmpfs     520M  7.2M  513M   2% /run
tmpfs          tmpfs     520M     0  520M   0% /sys/fs/cgroup
tmpfs          tmpfs     104M     0  104M   0% /run/user/0
/dev/sda1      ext4       53G   55M   50G   1% /mnt/sdc
/dev/sda2      ext4       53G   55M   50G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Extending an Existing MBR Partition

NOTICE

If the additional space is allocated to an existing partition, data on the disk will not be cleared but you must use **umount** to unmount the existing partition. In this case, services will be affected.

Originally, SCSI data disk **/dev/sda** has 100 GiB and two partitions (**/dev/sda1** and **/dev/sda2**), and then 50 GiB is added to the disk. The following procedure shows you how to add this 50 GiB to the existing MBR partition **/dev/sda2**.

During an expansion, the additional space is added to the end of the disk. Therefore, if the disk has multiple partitions, the additional space can only be allocated to the partition at the disk end.

Step 1 Run the following command to view the disk partition information:

fdisk -l

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# fdisk -l

Disk /dev/vda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000bcb4e

   Device Boot      Start         End      Blocks   Id  System
/dev/vda1   *        2048    83886079    41942016   83  Linux

Disk /dev/sda: 161.1 GB, 161061273600 bytes, 314572800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x915ffe6a

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            2048   104857599    52427776   83  Linux
/dev/sda2       104857600   209715199    52428800   83  Linux
```

In the command output, take note of the partition's start and end sectors. In this example, **/dev/sda2**'s start sector is **104857600**, and its end sector is **209715199**.

View the **/dev/sda** capacity and check whether the additional space is included.

- If the additional space is not included, refresh the capacity according to **Step 2**.
- If the additional space is included, take note of the start and end sectors of the target partition and then go to **Step 3**. These values will be used in the subsequent operations.

Step 2 (Optional) Run the following command to update the capacity of the SCSI data disk:

1. Run the following command to update the disk capacity on the server:

   echo 1 > /sys/class/scsi_device/_%d:%d:%d:%d_**/device/rescan &**

In the command, **%d:%d:%d:%d** indicates a folder in the **/sys/class/scsi_device/** directory and can be obtained using **ll /sys/class/scsi_device/**.

Information similar to the following is displayed: (**2:0:0:0** indicates the folder to be obtained.)

```
cs-xen-02:/sys/class/scsi_device # ll /sys/class/scsi_device/
total 0
lrwxrwxrwx 1 root root 0 Sep 26 11:37 2:0:0:0 -> ../../devices/xen/vscsi-2064/host2/target2:0:0/2:0:0:0/
scsi_device/2:0:0:0
```

In this example, run the following command:

echo 1 > /sys/class/scsi_device/2:0:0:0/device/rescan &

2. After the disk capacity is updated, run the following command to view the disk partition information again:

   fdisk -l

   If the additional space is included, take note of the start and end sectors of the target partition and then go to **Step 3**. These values will be used in the subsequent operations.

Step 3 Run the following command to unmount the partition:

umount *Disk partition*

In this example, run the following command:

umount /dev/sda2

Step 4 Run the following command to enter fdisk:

fdisk *Disk*

In this example, run the following command:

fdisk /dev/sda

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# fdisk /dev/sda
Welcome to fdisk (util-linux 2.23.2).

Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help):
```

Step 5 Run the following command to delete the partition to be extended:

1. Enter **d** and press **Enter** to delete the partition.

   Information similar to the following is displayed:

   ```
   Command (m for help): d
   Partition number (1,2, default 2):
   ```

2. Enter the partition number and press **Enter** to delete the partition. In this example, enter **2**.

   Information similar to the following is displayed:

   ```
   Partition number (1,2, default 2): 2
   Partition 2 is deleted

   Command (m for help):
   ```

NOTE

After deleting the partition, recreate the partition according to the following steps, and data on this disk will not be lost.

Step 6 Enter **n** and press **Enter** to create a new partition.

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (1 primary, 0 extended, 3 free)
   e   extended
Select (default p):
```

There are two types of disk partitions:

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

NOTE

If the MBR partition style is used, a maximum of 4 primary partitions, or 3 primary partitions and 1 extended partition can be created. The extended partition cannot be used directly and must be divided into logical partitions before use.

Disk partitions created using GPT are not categorized.

Step 7 Ensure that the entered partition type is the same as the partition had before. In this example, a primary partition is used. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (2-4, default 2):
```

Partition number indicates the serial number of the primary partition.

Step 8 Ensure that entered partition number is the same as the partition had before. In this example, partition number **2** is used. Therefore, enter **2** and press **Enter**.

Information similar to the following is displayed:

```
Partition number (2-4, default 2): 2
First sector (104857600-314572799, default 104857600):
```

In the command output, **First sector** specifies the start sector.

NOTE

Data will be lost if the following operations are performed:

- Select a start sector other than the partition had before.
- Select an end sector smaller than the partition had before.

Step 9 Ensure that the entered start sector is the same as the partition had before. In this example, start sector **104857600** is recorded in **Step 1** or **Step 2**. Therefore, enter **104857600** and press **Enter**.

Information similar to the following is displayed:

```
First sector (104857600-314572799, default 104857600):
Using default value 104857600
Last sector, +sectors or +size{K,M,G} (104857600-314572799, default 314572799):
```

In the command output, **Last sector** specifies the end sector.

Step 10 Ensure that the entered end sector is larger than or equal to the end sector recorded in **Step 1** or **Step 2**. In this example, the recorded end sector is **209715199**, and the default end sector is used. Therefore, enter **314572799** and press **Enter**.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (104857600-314572799, default 314572799):
Using default value 314572799
Partition 2 of type Linux and of size 100 GiB is set

Command (m for help):
```

The partition is created.

Step 11 Enter **p** and press **Enter** to view the partition details.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/sda: 161.1 GB, 161061273600 bytes, 314572800 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x915ffe6a

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            2048   104857599    52427776   83  Linux
/dev/sda2       104857600   314572799   104857600   83  Linux

Command (m for help):
```

Step 12 Enter **w** and press **Enter** to write the changes to the partition table.

Information similar to the following is displayed: (The partition is successfully created.)

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

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16: Device or resource busy.
The kernel still uses the old table. The new table will be used at
the next reboot or after you run partprobe(8) or kpartx(8)
Syncing disks.
```

NOTE

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

Step 13 Run the following command to synchronize the new partition table to the OS:

partprobe

Step 14 Perform the following operations based on the file system of the disk:

- For the **ext***file system
  a. Run the following command to check the correctness of the file system on the partition:

     e2fsck -f *Disk partition*

     In this example, run the following command:

     e2fsck -f /dev/sda2

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# e2fsck -f /dev/sda2
e2fsck 1.42.9 (28-Dec-2013)
Pass 1: Checking inodes, blocks, and sizes
Pass 2: Checking directory structure
Pass 3: Checking directory connectivity
Pass 4: Checking reference counts
Pass 5: Checking group summary information
/dev/sda2: 11/3276800 files (0.0% non-contiguous), 251790/13107200 blocks
```

b. Run the following command to extend the file system of the partition:

resize2fs *Disk partition*

In this example, run the following command:

resize2fs /dev/sda2

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# resize2fs /dev/sda2
resize2fs 1.42.9 (28-Dec-2013)
Resizing the filesystem on /dev/sda2 to 26214400 (4k) blocks.
The filesystem on /dev/sda2 is now 26214400 blocks long.
```

c. (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

d. Run the following command to mount the partition:

mount *Disk partition Mount point*

In this example, run the following command to mount partition **/dev/sda2** on **/mnt/test**:

mount /dev/sda2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

- For the **xfs** file system

a. (Optional) Run the following command to create a mount point:

Perform this step if you want to mount the partition on a new mount point.

mkdir *Mount point*

In this example, run the following command to create the **/mnt/test** mount point:

mkdir /mnt/test

b. Run the following command to mount the partition:

mount *Disk partition Mount point*

In this example, run the following command to mount partition **/dev/sda2** on **/mnt/test**:

mount /dev/sda2 /mnt/test

NOTE

If the new partition is mounted on a directory that is not empty, the subdirectories and files in the directory will be hidden. Therefore, you are advised to mount the new partition on an empty directory or a new directory. If the new partition must be mounted on a directory that is not empty, move the subdirectories and files in this directory to another directory temporarily. After the partition is successfully mounted, move the subdirectories and files back.

c. Run the following command to extend the file system of the partition:

sudo xfs_growfs *Disk partition*

In this example, run the following command:

sudo xfs_growfs /dev/sda2

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# sudo xfs_growfs /dev/sda2
meta-data=/dev/sda2              isize=512    agcount=4, agsize=3276800 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, spinodes=0
data     =                       bsize=4096   blocks=13107200, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal               bsize=4096   blocks=6400, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 13107200 to 26214400df .
```

Step 15 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-scsi ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  2.0G   39G   5% /
devtmpfs       devtmpfs  509M     0  509M   0% /dev
tmpfs          tmpfs     520M     0  520M   0% /dev/shm
tmpfs          tmpfs     520M  7.2M  513M   2% /run
tmpfs          tmpfs     520M     0  520M   0% /sys/fs/cgroup
tmpfs          tmpfs     104M     0  104M   0% /run/user/0
/dev/sda1      ext4       53G   55M   50G   1% /mnt/sdc
/dev/sda2      ext4      106G   63M  101G   1% /mnt/test
```

NOTE

If the server is restarted, the mounting will become invalid. You can set automatic mounting for partitions at system start by modifying the **/etc/fstab** file. For details, see **Setting Automatic Mounting at System Start**.

----End

Setting Automatic Mounting at System Start

Modify the **fstab** file to set automatic disk mounting at server start. You can also set automatic mounting for the servers containing data. This operation will not affect the existing data.

The following procedure shows how to set automatic disk mounting at server start by using UUIDs to identify disks in the **fstab** file. You are advised not to use device names to identify disks in the file because a device name may change (for example, from /dev/vdb1 to /dev/vdb2) during the server stop or start, resulting in improper server running after restart.

NOTE

UUID is the unique character string for disk partitions in a Linux system.

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

blkid *Disk partition*

In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
```

The UUID of the **/dev/vdb1** partition is displayed.

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

vi /etc/fstab

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

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

```
UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc            ext4    defaults        0 2
```

The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

- The first column indicates the partition UUID obtained in **Step 1**.
- The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
- The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
- The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
- The fifth column indicates the Linux dump backup option.
  - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
  - **1**: Linux dump backup is used.
- The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.
  - **0**: not use fsck.
  - If the mount point is the root partition (**/**), this parameter must be set to **1**.

    When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

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

The system saves the configurations and exits the vi editor.

Step 6 Perform the following operations to verify the automatic mounting function:

1. Run the following command to unmount the partition:

   umount *Disk partition*

   In this example, run the following command:

   umount /dev/vdb1

2. Run the following command to reload all the content in the **/etc/fstab** file:

   mount -a

3. Run the following command to query the file system mounting information:

   mount | grep *Mount point*

   In this example, run the following command:

   mount | grep /mnt/sdc

   If information similar to the following is displayed, automatic mounting has been configured:

   ```
   root@ecs-test-0001 ~]# mount | grep /mnt/sdc
   /dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
   ```

----End

5 Detaching an EVS Disk

5.1 Detaching a System Disk

Scenarios

A system disk can only be detached offline, that is, its server must be in the **Stopped** state before the system disk is detached. Therefore, you need to first stop the server and then detach the system disk.

For a system disk attached to a server, the disk function is displayed as **System disk**, and the disk status is displayed as **In-use** in the disk list. After a system disk is detached from the server, the disk function changes to **Bootable disk**, and the status changes to **Available**.

NOTE

Bootable disks are the system disks detached from servers. A bootable disk can be re-attached to a server and be used as a system disk or data disk depending on the device name selected.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Compute**, click **Elastic Cloud Server**.

The **Elastic Cloud Server** page is displayed.

Step 3 In the server list, locate the row that contains the server whose system disk is to be detached, click **More** in the **Operation** column, and choose **Stop**.

When the server status changes to **Stopped**, the server has been stopped.

Step 4 Click the name of this server.

The server details page is displayed.

Step 5 Click the **Disks** tab to view the system disk attached to the server.

Step 6 Locate the row that contains the system disk and click **Detach**.

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

Step 7 Click **Yes** to detach the disk.

After the operation had succeeded, the detached system disk is no longer displayed under the **Disks** tab.

----End

Related Operations

For more detachment FAQs, see **Detachment**.

5.2 Detaching a Data Disk

Scenarios

Data disks can be detached online or offline, which means that the server containing the to-be-detached data disk can either be in the **Running** or **Stopped** state.

- ECS

  Detach a disk online. For details, see **Storage** > **Detaching an EVS Disk from a Running ECS** in the *Elastic Cloud Server User Guide*.

- BMS

  SCSI disks can be attached to BMSs and used as data disks. You can detach a data disk either from a running or stopped BMS.

For a data disk attached to a server, the disk function is displayed as **Data disk**, and the disk status is displayed as **In-use** in the disk list. After the data disk has been detached from the server, the disk function remains unchanged, the disk status changes to **Available** for a non-shared data disk, and the disk status changes to **Available** for a shared data disk after it is detached from all its servers.

Prerequisites

- Before detaching an EVS disk from a running Windows ECS, ensure that no program is reading data from or writing data to the disk. Otherwise, data will be lost.
- Before detaching an EVS disk from a running Linux ECS, you must log in to the ECS and run the **umount** command to cancel the association between the disk and the file system. In addition, ensure that no program is reading data from or writing data to the disk. Otherwise, detaching the disk will fail.

Detaching a Non-shared Disk

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Determine whether to view the server information before detaching the disk.

- If you need to view the server information, perform the following procedure:
  a. In the disk list, click the name of the to-be-detached disk.

     The disk details page is displayed.

  b. Click the **Servers** tab to view the server where the target disk has been attached.
  c. Click □ to select the server and click **Detach Disk**.

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

  d. Click **Yes** to detach the disk.
- If you do not need to view the server information, perform the following procedure:
  a. In the disk list, locate the row that contains the target disk and choose **More** > **Detach** in the **Operation** column.

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

  b. Click **Yes** to detach the disk.

The disk list is displayed. The disk status is **Detaching**, indicating that the disk is being detached from the server.

When the status changes to **Available**, the disk is successfully detached.

----End

6 Deleting EVS Disks

Scenarios

If an EVS disk is no longer used, you can release the virtual resources by deleting the disk from the system.

NOTICE

- When you delete a disk, all the disk data including the snapshots created for this disk will be deleted. Exercise caution when performing this operation.
- A deleted disk cannot be recovered.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the row that contains the target disk, click **More** in the **Operation** column, and choose **Delete**.

Step 4 (Optional) If multiple disks are to be deleted, select □ in front of each disk and click **Delete** in the upper area of the list.

Step 5 In the displayed dialog box, confirm the information and click **Yes**.

----End

7 Managing Shared EVS Disks

How to Use Shared VBD and SCSI Disks?

You can create shared VBD disks or shared SCSI disks. It is recommended that you attach the shared disk to the ECSs in the same ECS group to improve service reliability.

- Shared VBD EVS disks: The device type of a newly created shared EVS disk is VBD by default. Such disks can be used as virtual block storage devices, but do not support SCSI reservations. If SCSI reservations are required for your applications, create shared SCSI EVS disks.
- Shared SCSI EVS disks: These EVS disks support SCSI reservations.

NOTICE

- To improve data security, you are advised to use SCSI reservations together with the anti-affinity policy of an ECS group. That said, ensure that shared SCSI EVS disks are only attached to ECSs in the same anti-affinity ECS group.
- If an ECS does not belong to any anti-affinity ECS group, you are advised not to attach shared SCSI EVS disks to this ECS. Otherwise, SCSI reservations may not work properly, which may put your data at risk.

Concepts of the anti-affinity ECS group and SCSI reservations:

- The anti-affinity policy of an ECS group allows ECSs to be created on different physical servers to improve service reliability.

  For details about ECS groups, see **Managing ECS Groups** in the *Elastic Cloud Server User Guide*.
- The SCSI reservation mechanism uses a SCSI reservation command to perform SCSI reservation operations. If an ECS sends such a command to an EVS disk, the disk is displayed as locked to other ECSs, preventing the data damage that may be caused by simultaneous read/write operations to the disk from multiple ECSs.
- ECS groups and SCSI reservations have the following relationship: A SCSI reservation on a single EVS disk cannot differentiate multiple ECSs on the same physical host. For that reason, if multiple ECSs that use the same

shared EVS disk are running on the same physical host, SCSI reservations will not work properly. Therefore, you are advised to use SCSI reservations only on ECSs that are in the same ECS group, thus having a working anti-affinity policy.

Attaching a Shared EVS Disk

A common EVS disk can only be attached to one server, whereas a shared EVS disk can be attached to up to 16 servers.

For details about how to attach a shared EVS disk, see **Attaching a Shared Disk**.

Deleting a Shared EVS Disk

Because a shared EVS disk can be attached to multiple servers, ensure that the shared EVS disk is detached from all the servers before deletion.

For details about how to delete a shared EVS disk, see **Deleting EVS Disks**.

Expanding a Shared EVS Disk

Shared EVS disks must be expanded when they are in the **Available** state. For details, see **Expanding Capacity for an In-use EVS Disk**.

Related Operations

For more disk sharing FAQs, see **Sharing**.

8 Managing EVS Backups

Scenarios

EVS backups are created using the CBR service. For details, see **Creating a Cloud Disk Backup** in the *Cloud Backup and Recovery User Guide*.

This section describes how to configure a backup policy for disks. With backup policies configured, data on EVS disks can be periodically backed up to improve data security.

Creating a Disk Backup Vault and Configuring a Backup Policy

Step 1 Log in to the CBR console.

1. Log in to the management console.
2. Choose **Storage** > **Cloud Backup and Recovery** > **Cloud Disk Backups**.

Step 2 In the upper right corner, click **Create Disk Backup Vault**.

Step 3 (Optional) In the disk list, select the disks you want to back up. After disks are selected, they are added to the list of selected disks.

📖 NOTE

- Only **Available** and **In-use** disks can be selected.
- You can associate desired disks with the vault you created later if you skip this step.

Step 4 Specify the vault capacity. This capacity indicates the total size of the disks that you want to associate with this vault. Therefore, specify a vault capacity that is greater than or equal to the total size of the disks you want to back up. The value ranges from the total size of the disks to 10,485,760 in the unit of GiB.

Step 5 Determine whether to configure auto backup.

- If you select **Configure**, you must then select an existing backup policy or create a new one. After the vault is created, the system applies this backup policy to the vault, and all disks associated with this vault will be automatically backed up based on this policy.
- If you select **Skip**, disks associated with this vault are not automatically backed up.

Step 6 If you have subscribed to Enterprise Project, add the vault to an existing enterprise project.

An enterprise project facilitates project-level management and grouping of cloud resources and users. The default project is **default**.

Step 7 (Optional) Add tags to the vault.

A tag consists of a key-value pair. Tags are used to identify, classify, and search for vaults. Vault tags are used to filter and manage vaults only. You can add up to 10 tags for a vault.

Table 8-1 describes the tag parameters.

Table 8-1 Tag parameters

Parameter	Description	Example Value
Key	A tag key of a vault must be unique. You can customize the key or select the key of an existing tag created in TMS. A tag key: ● Can contain 1 to 36 Unicode characters. ● Cannot be left blank, cannot start or end with spaces, or contain non-printable ASCII (0-31) characters or the following special characters: =*<>\,|/	Key_0001
Value	A tag value can be repetitive or left blank. A tag value: ● Can contain 0 to 43 Unicode characters. ● Can be an empty string, cannot start or end with spaces, or contain non-printable ASCII (0-31) characters or the following special characters: =*<>\,|/	Value_0001

Step 8 Specify a name for the vault.

The name can contain 1 to 64 characters including digits, letters, underscores (_), and hyphens (-), for example, **vault-612c**.

NOTE

You can use the default name, which is in the format of **vault_***xxxx*.

Step 9 Click **Next**.

Step 10 Complete the creation as prompted.

Step 11 Go back to the disk backup page. The vault you created is displayed in the list.

You can associate disks to the new vault or create backups for the disks. For details, see **Vault Management** in the *Cloud Backup and Recovery User Guide*.

----End

9 Managing EVS Snapshots

9.1 Snapshot Overview

What Is EVS Snapshot?

EVS allows you to create snapshots for disks on the management console or by making API calls. An EVS snapshot is a complete copy or image of the disk data at a specific time point. As a major disaster recovery (DR) approach, you can use a snapshot to completely restore the data to the time point when the snapshot was created.

EVS snapshots are sometimes referred to as snapshots in this document.

You can create snapshots to rapidly save the disk data at specified time points. In addition, you can use snapshots to create new disks so that the created disks will contain the snapshot data in the beginning.

Application Scenarios

The snapshot function helps address your following needs:

- Routine data backup

  You can create snapshots for disks on a timely basis and use snapshots to recover your data in case that data loss or data inconsistency occurred due to misoperations, viruses, or attacks.

- Rapid data restoration

  You can create a snapshot or multiple snapshots before an application software upgrade or a service data migration. If an exception occurs during the upgrade or migration, service data can be rapidly restored to the time point when the snapshot was created.

  For example, a fault occurred on system disk A of server A, and therefore server A cannot be started. Because system disk A is already faulty, the data on system disk A cannot be restored by rolling back snapshots. However, you can create disk B using an existing snapshot of system disk A and attach disk B to a properly running server, for example server B. In this case, server B can read the data of system disk A from disk B.

NOTE

Currently, when rolling back data from snapshots, the snapshot data can be rolled back only to its source EVS disk, and a rollback to another EVS disk is not possible.

- Multi-service quick deployment

  You can use a snapshot to create multiple disks containing the same initial data, and these disks can be used as data resources for various services, for example data mining, report query, and development and testing. This method protects the initial data and creates disks rapidly, meeting the diversified service data requirements.

Operation Overview

You can create snapshots according to **Creating a Snapshot** to rapidly save the disk data at specified points in time.

If data lost occurs, you may choose to roll back the disk data to the snapshot creation time based on **Rolling Back Data from a Snapshot**. In addition, you may create a new disk from the snapshot so that the disk will contain the snapshot data in the beginning. For details, see **Creating an EVS Disk from a Snapshot**.

When a snapshot is no longer needed, delete it according to **Deleting a Snapshot** to release the virtual resources.

9.2 Creating a Snapshot

Scenarios

You can create an EVS snapshot on the management console to save the EVS disk data at a specific time point.

Constraints

- A maximum of 7 snapshots can be created for one disk.
- Snapshots can be created for both system disks and data disks.
- Snapshots can be created only for available or in-use disks.
- Snapshots of encrypted disks are stored encrypted, and those of non-encrypted disks are stored non-encrypted.
- The enterprise project of the snapshot is the same as that of the snapshot's source disk.
- If a disk is created from a snapshot, the AZ of the disk is the same as that of the snapshot's source disk and cannot be changed.

Creating a Snapshot on the Disks Page

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the row that contains the target disk, click **Create Snapshot** in the **Operation** column.

Configure the basic settings for the snapshot according to **Table 9-1**.

Table 9-1 Snapshot parameter

Parameter	Description	Example Value
Snapshot Name	Mandatory The name can contain a maximum of 64 characters.	snapshot-01

Step 4 Click **Create Now**.

Step 5 Go back to the **Snapshots** page to view the snapshot creation information.

After the snapshot status changes to **Available**, the snapshot has been created.

----End

Creating a Snapshot on the Snapshots Page

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the navigation pane on the left, choose **Elastic Volume Service** > **Snapshots**.

On the **Snapshots** page, click **Create Snapshot**.

Configure the basic settings for the snapshot according to **Table 9-2**.

Table 9-2 Snapshot parameters

Parameter	Description	Example Value
Region	Mandatory After you select a region, disks in the selected region will be displayed for you to choose.	-
Snapshot Name	Mandatory The name can contain a maximum of 64 characters.	snapshot-01
Select Disk	Mandatory Select a disk based on which the snapshot will be created.	volume-01

Step 4 Click **Create Now**.

Step 5 Go back to the **Snapshots** page to view the snapshot creation information.

After the snapshot status changes to **Available**, the snapshot has been created.

----End

9.3 Deleting a Snapshot

Scenarios

If a snapshot is no longer needed, you can delete the snapshot to release the virtual resources. Snapshot deletion has the following constraints:

Constraints

- The snapshot status must be **Available** or **Error**.
- If a disk is deleted, all the snapshots created for this disk will also be deleted.
- If a snapshot is deleted, disks rolled back and created from this snapshot are not affected.
- If you have reinstalled or changed the server OS, snapshots of the system disk are automatically deleted. Snapshots of the data disks can be used as usual.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

Step 3 In the navigation pane on the left, choose **Elastic Volume Service** > **Snapshots**.

The snapshot list page is displayed.

Step 4 In the snapshot list, locate the row that contains the target snapshot and click **Delete** in the **Operation** column.

Step 5 (Optional) If multiple snapshots are to be deleted, select □ in front of each snapshot and click **Delete** in the upper area of the list.

Step 6 In the displayed dialog box, confirm the information and click **Yes**.

If the snapshot is no longer displayed in the snapshot list, the snapshot is deleted successfully.

----End

9.4 Rolling Back Data from a Snapshot

Scenarios

If the data on an EVS disk is incorrect or damaged, you can roll back the data from a snapshot to the source disk to restore data. Snapshot rollback has the following constraints:

Constraints

- A snapshot can be rolled back only to its source disk. Rollback to another disk is not possible.
- A snapshot can be rolled back only when the snapshot status is **Available** and the source disk status is **Available** (not attached to any server) or **Rollback failed**.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

Step 3 In the navigation pane on the left, choose **Elastic Volume Service** > **Snapshots**.

The snapshot list page is displayed.

Step 4 In the snapshot list, locate the row that contains the target snapshot and click **Roll Back Disk** in the **Operation** column.

Step 5 In the displayed dialog box, click **Yes**.

Step 6 The snapshot list is displayed. After the snapshot status changes from **Rolling back** to **Available**, the data rollback is successful.

----End

9.5 Creating an EVS Disk from a Snapshot

Scenarios

This section describes how to create an EVS disk on the **Snapshots** page. Besides, you can also create an EVS disk from a snapshot by specifying the **Create from snapshot** parameter on the disk creation page. For details, see **Create an EVS Disk**.

Constraints

- The disk type, device type, and snapshot attributes of the new disk are the same as those of the snapshot's source disk.
- A maximum of 128 disks can be created from a snapshot.
- Batch disk creation is not possible, and the quantity parameter must be set to **1**.
- If a disk is created from a snapshot, the AZ of the disk is the same as that of the snapshot's source disk and cannot be changed.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

Step 3 In the navigation pane on the left, choose **Elastic Volume Service** > **Snapshots**.

The snapshot list page is displayed.

Step 4 In the snapshot list, locate the row that contains the target snapshot and click **Create Disk** in the **Operation** column.

Step 5 Set the EVS disk parameters. For details, see parameter descriptions and operations provided in **Create an EVS Disk**.

NOTE

A maximum of 128 disks can be created from a snapshot.

If you create a disk from a snapshot, the disk capacity must be greater than or equal to the snapshot size. In the condition that you do not specify the disk capacity, if the snapshot size is smaller than 10 GiB, the default capacity 10 GiB will be used as the disk capacity; if the snapshot size is greater than 10 GiB, the disk capacity will be consistent with the snapshot size.

Step 6 Click **Next**.

Step 7 Go back to the disk list page and view the disk status.

When the disk status changes to **Available**, the disk is successfully created.

----End

10 Managing EVS Transfers

Scenarios

Through EVS transfer, EVS disks can be transferred from one account to another. After the transfer succeeds, the ownerships of the EVS disks belong to the target account only.

Users can use disk transfer via API only. For more information, see chapter "EVS Transfer" in the *Elastic Volume Service API Reference*.

Constraints

- EVS disks with backups and snapshots available cannot be transferred.
- EVS disks associated with backup policies cannot be transferred.
- EVS disks used as system disks cannot be transferred.

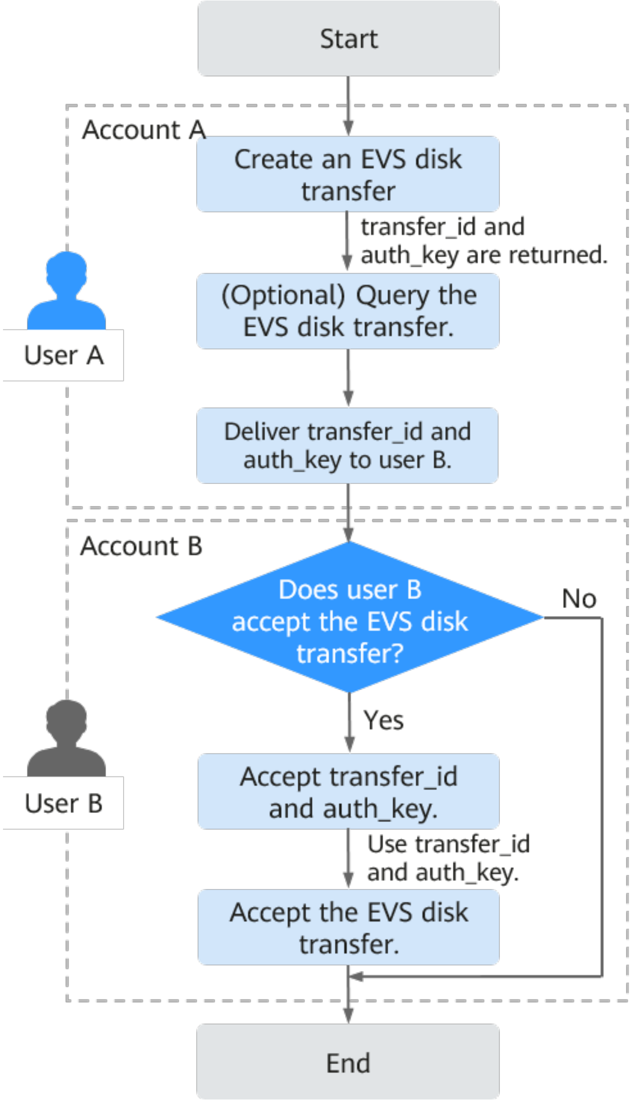
Procedure

The following example shows you how to transfer an EVS disk from account A to account B. User A belongs to account A, and user B belongs to account B. User A creates the transfer. User B accepts the transfer using the transfer ID (**transfer_id**) and authentication key (**auth_key**). After the transfer has been accepted, the transfer is complete. **Figure 10-1** shows the basic transfer process.

NOTE

- **transfer_id** specifies the disk transfer ID. Each EVS disk transfer has a transfer ID, and user B uses this ID to accept the disk transfer. The transfer ID expires after user B accepts the transfer.
- **auth_key** specifies the identity authentication key of the disk transfer. Each EVS disk transfer has an authentication key, and user B uses this key for authentication when accepting the disk transfer.

Figure 10-1 EVS disk transfer process


Start
Account A
Create an EVS disk transfer
transfer_id and auth_key are returned.
User A
(Optional) Query the EVS disk transfer.
Deliver transfer_id and auth_key to user B.
Account B
Does user B accept the EVS disk transfer?
No
Yes
User B
Accept transfer_id and auth_key.
Use transfer_id and auth_key.
Accept the EVS disk transfer.
End

Step 1 User A creates the transfer. For details, see "Creating a Disk Transfer" in the *Elastic Volume Service API Reference*.

After the transfer is successfully created, **transfer_id** and **auth_key** are returned.

Step 2 (Optional) User A views the disk transfer. For details, see "Querying Details of a Disk Transfer" in the *Elastic Volume Service API Reference*. If multiple disk transfers have been created, user A can query all disk transfers. For details, see "Querying All Disk Transfers" or "Querying Details of All Disk Transfers" in the *Elastic Volume Service API Reference*.

Step 3 User A delivers the returned **transfer_id** and **auth_key** to user B.

Step 4 Check whether user B is going to accept the disk transfer.

- If yes, go to **Step 5**.
- If no, no further action is required.

  User A can delete the unaccepted disk transfer. For details, see "Deleting a Disk Transfer" in the *Elastic Volume Service API Reference*.

Step 5 User B accepts **transfer_id** and **auth_key**.

Step 6 User B accepts the transfer through **transfer_id** and **auth_key**. For details, see "Accepting a Disk Transfer" in the *Elastic Volume Service API Reference*.

----End

11 Managing a Tag

11.1 Tag Overview

Tags identify EVS resources for purposes of easy categorization and quick search.

Table 11-1 Tag overview

Operation	Scenario
Adding a Tag	Add tags for existing disks or during disk creations.
Modifying a Tag	Change tag values for existing disks. Tag keys of existing disks cannot be changed.
Deleting a Tag	Delete tags that are no longer needed for existing disks.
Searching Disks by Tags	After tags are added, search for disks by tags.

11.2 Adding a Tag

Scenarios

This section is used to guide users to add a tag for an existing EVS disk. You can also add tags during the disk creation. For details, see **Create an EVS Disk**.

Tags are used to identify the cloud resources for purposes of easy categorization and quick search.

- A tag is composed of a key-value pair.
  - A tag key can contain a maximum of 36 characters, including letters, digits, and underscores (_).
  - A tag value can contain a maximum of 43 characters, including letters, digits, underscores (_), periods (.), and hyphens (-).

- A maximum of 10 tags can be added for an EVS disk.
- Tag keys of the same EVS disk must be unique.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the desired disk and click the disk name.

The disk details page is displayed.

Step 4 Click the **Tags** tab.

Step 5 Click **Add Tag**.

The **Add Tag** page is displayed.

Step 6 Enter a key and a value for a tag and click **OK**.

- **Key**: This parameter is mandatory.
- **Value**: This parameter is optional.

The **Tags** tab is displayed, and you can view the newly added tag.

----End

11.3 Modifying a Tag

Scenarios

You can change the value of a tag for an existing disk, but cannot change the key of a tag.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the desired disk and click the disk name.

The disk details page is displayed.

Step 4 Click the **Tags** tab.

Step 5 Locate the target tag and click **Edit** in the **Operation** column.

The **Edit Tag** page is displayed.

Step 6 Change the value of the tag and click **OK**.

Return to the tag list. If the tag value is changed, the modification is complete.

----End

11.4 Deleting a Tag

Scenarios

If an existing tag is no longer needed, you can delete it.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the disk list, locate the desired disk and click the disk name.

The disk details page is displayed.

Step 4 Click the **Tags** tab.

Step 5 Locate the target tag and click **Delete** in the **Operation** column.

The **Delete Tag** page is displayed.

Step 6 Confirm the information and click **OK**.

The **Tags** tab is displayed, and the deletion is complete.

----End

11.5 Searching Disks by Tags

Scenarios

Tags can be used to categorize EVS disks, and users can quickly search for their desired EVS disks by tags. This section is used to guide users to search for EVS disk by existing tags.

Procedure

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the upper area of the disk list, click **Search by Tag**.

The **Search by Tag** page is displayed.

Step 4 Enter or select an existing tag in the text box under **Search by Tag**.

Step 5 (Optional) If disks containing multiple tags need to be queried, click + to add tags.

A maximum of 10 tags can be added at a time.

For the added tags, you can delete them individually or click **Reset** to clear all of them.

Step 6 After the tags are added, click **Search**.

Disks owning the added tags are displayed in the list, and the search is complete.

----End

12 Viewing EVS Monitoring Data

Description

This section describes monitored metrics reported by EVS to Cloud Eye as well as their namespaces and dimensions. You can use the console or APIs provided by Cloud Eye to query the metrics of the monitored objects and alarms generated for EVS.

Namespace

SYS.EVS

Metrics

Table 12-1 EVS metrics

Metric ID	Metric Name	Description	Value Range	Monitored Object	Monitoring Period
disk_device_read_bytes_rate	Disk Read Bandwidth	Number of bytes read from the monitored disk per second Unit: Bytes/s	≥ 0 bytes/s	EVS disk	5 minutes in average
disk_device_write_bytes_rate	Disk Write Bandwidth	Number of bytes written to the monitored disk per second Unit: Bytes/s	≥ 0 bytes/s	EVS disk	5 minutes in average
disk_device_read_requests_rate	Disk Read IOPS	Number of read requests sent to the monitored disk per second Unit: Requests/s	≥ 0 Requests/s	EVS disk	5 minutes in average

Metric ID	Metric Name	Description	Value Range	Monitored Object	Monitoring Period
disk_device_write_requests_rate	Disk Write IOPS	Number of write requests sent to the monitored disk per second Unit: Requests/s	≥ 0 Requests/s	EVS disk	5 minutes in average

Dimension

Key	Value
disk_name	Server ID-drive letter, for example, 6f3c6f91-4b24-4e1b-b7d1-a94ac1cb011d-vda (vda is the drive letter)

Viewing Monitoring Data

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 In the EVS disk list, click the name of the disk you want to view the monitoring data.

The disk details page is displayed.

Step 4 On the **Servers** tab, locate the row that contains the server and click **View Metric** in the **Operation** column.

The **Monitoring metric** page is displayed.

Step 5 You can view the disk monitoring data by metric or monitored duration.

For more information about Cloud Eye, see the *Cloud Eye User Guide*.

----End

13 Auditing

Scenarios

EVS supports the recording of EVS operations through CTS. You can query EVS traces and use them for historical operation audits and backtracks.

Prerequisites

CTS has been enabled.

Key EVS Operations Recorded by CTS

Table 13-1 EVS operations that can be recorded by CTS

Operation	Resource	Trace
Create disk	evs	createVolume
Update disk	evs	updateVolume
Expand disk capacity	evs	extendVolume
Delete disk	evs	deleteVolume

Viewing Traces

To view audit logs, see **Querying Real-Time Traces** in the *Cloud Trace Service User Guide.*

14 FAQ

14.1 General

14.1.1 How Do I Start Using a Newly Purchased Disk?

A newly purchased disk must be attached to a server and then initialized in the server operating system before you can use it.

14.1.2 Can EVS Disks Be Used Directly for Storage?

No.

EVS disks must be attached to cloud servers before use. You cannot use EVS disks alone to store data.

14.1.3 Can EVS Disks Be Used Alone?

No.

EVS disks must be attached to servers before you can use them.

14.1.4 How Can I View My Disk Details?

To do so, perform the following operations:

Step 1 Log in to the management console.

Step 2 Under **Storage**, click **Elastic Volume Service**.

The disk list page is displayed.

Step 3 Locate the row that contains the target disk and view the disk specifications, attributes, and billing mode.

Step 4 (Optional) Click the disk name to view more information, such as the disk backup and snapshot information.

View more information on the **Summary** tab.

----End

14.1.5 Can I Change the AZ of My Disk?

No.

The AZ of a disk cannot be changed after you have created the disk. If you want to change the AZ, delete the disk and create a new one.

14.1.6 What Are the Differences Between System Disks and Data Disks?

- A system disk runs the server operating system. It is like drive C in a PC.

  When a server is created, a system disk is automatically created and attached. You cannot create a system disk separately. The maximum size of a system disk is 1,024 GiB.
- Data disks store the server data. They are like drive D, drive E, and drive F in a PC.

  Data disks can be created during or after the server creation. If you create data disks during the server creation, the system will automatically attach the data disks to the server. If you create data disks after the server creation, you need to manually attach the data disks. The maximum size of a data disk is 32,768 GiB.

If one system disk already meets your business needs, you do not need to create data disks. As your business grows, you can create data disks when needed.

If the disk paths in your service systems cannot be changed or are difficult to change, you are advised to create data disks according to your system planning.

14.1.7 How Can I Download My EVS Disk Data to a Local PC?

EVS disk data cannot be directly saved to a local PC. It is recommended that you use a third-party tool, such as FTP, to download the data.

14.1.8 How Can I Export the Original Data After I Changed My Server OS from Windows to CentOS?

Solution:

1. Install the ntfsprogs software to enable Linux to access the NTFS file system.

   yum install ntfsprogs
2. View the data disks previously attached to Windows.

   parted –l
3. Mount the data disks.

   mount -t ntfs-3g *Data disk path Mount point*

14.1.9 What Are the Differences Between MBR and GPT Partition Styles?

Table 14-1 lists the common disk partition styles. In Linux, different partition styles require different partitioning tools.

Table 14-1 Disk partition styles

Disk Partition Style	Maximum Disk Capacity Supported	Maximum Number of Partitions Supported	Linux Partitioning Tool
Master Boot Record (MBR)	2 TiB	● 4 primary partitions ● 3 primary partitions and 1 extended partition With MBR, you can create several primary partitions and one extended partition. The extended partition must be divided into logical partitions before use. For example, if 6 partitions need to be created, you can create them in the following two ways: ● 3 primary partitions and 1 extended partition, with the extended partition divided into 3 logical partitions ● 1 primary partition and 1 extended partition, with the extended partition divided into 5 logical partitions	You can use either of the following tools: ● fdisk ● parted
Guid Partition Table (GPT)	18 EiB 1 EiB = 1048576 TiB	Unlimited Disk partitions created using GPT are not categorized.	parted

NOTICE

The maximum disk size supported by MBR is 2 TiB, and that supported by GPT is 18 EiB. Because an EVS data disk currently supports up to 32 TiB, use GPT if your disk size is larger than 2 TiB.

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

14.2 Capacity Expansion

14.2.1 Can I Reduce or Temporarily Expand the Disk Capacity?

No. The disk capacity can only be expanded, and temporary capacity expansion is not supported.

14.2.2 What Are the Differences Between Expanding Capacity by Expanding an EVS Disk and Creating a New EVS Disk?

The differences are as follows:

- Expanding an EVS disk is when you expand the capacity of an existing EVS disk. Some systems let you expand the capacity of EVS disks in use. In this case, services are not interrupted.
- If you create a new EVS disk and attach it to a server that already has an existing EVS disk, the new EVS disk and the original EVS disk are attached to the same server but independent from each other.

14.2.3 Will My Disk Data Be Lost After I Expand the Disk Capacity?

Data will not be deleted during a system disk or data disk capacity expansion. However, misoperations during an expansion may result in data loss or exceptions. Exercise caution when performing capacity expansions. You are advised to back up the disk data before expanding capacity.

14.2.4 Do I Need to Restart the Server After Expanding the Disk Capacity?

An EVS disk can be expanded either in the Available or In-use state. Expanding the disk capacity on the management console enlarges the disk capacity, but you still need to log in to the server and extend the disk partitions and file systems to make that additional space usable. You may need to restart the server during the partition and file system extension. The details are as follows:

- After expanding an In-use disk on the management console, log in to the server and view the disk capacity.
  - If the additional space can be viewed, you can extend the partition and file system and a restart is not required.
  - If the additional space cannot be viewed, the server OS may not be included in the compatibility list. In this case, you should stop and then start the server (do not restart the server). When the additional space can be viewed, extend the partition and file system.
- After expanding an Available disk on the management console, attach the disk to the server and extend the partition and file system on the server. In this case, a server restart is not required.

14.2.5 Do I Need to Detach an EVS Disk Before Expanding Its Capacity?

An expansion consists of two phases:

1. Expand the disk capacity on the management console.
   - A shared, in-use disk cannot be expanded. You must detach the shared disk from all its servers and then expand its capacity.
   - A non-shared, in-use disk can be expanded, and you can leave the disk attached during expansion as long as the following conditions are met:
     - The disk's server is in the **Running** or **Stopped** state.
     - The disk's server OS supports the expansion of In-use disks.
2. Log in to the server and create a new partition or allocate the additional space to one that is already there.
   - In Windows, there are no partition extensions that require the partition to be unmounted first.
   - In Linux:
     - When allocating the additional space to an existing partition, that is, extending an existing partition, you must use the **umount** command to unmount the partition first.
     - When allocating the additional space to a new partition, that is, creating a new partition, you do not need to unmount the existing partition.

14.2.6 What Should I Do If My Disk Capacity Exceeds 2 TiB After Expansion?

An EVS system disk can be as large as 1 TiB (1,024 GiB). You can expand the capacity of a system disk to up to 1 TiB.

An EVS data disk can be as large as 32 TiB (32,768 GiB).

- With MBR, any disk space in excess of 2 TiB cannot be allocated and used, because the maximum disk capacity supported by MBR is 2 TiB (2,048 GiB).

  In this case, if you want to expand the disk capacity to over 2 TiB, change the partition style from MBR to GPT. Ensure that the disk data has been backed up before changing the partition style because services will be interrupted and data on the disk will be deleted during this change.
- With GPT, you can expand the capacity of a data disk to up to 32 TiB because the maximum disk capacity supported by GPT is 18 EiB (19,327,352,832 GiB).

  If the in-use partition style is GPT, see the following methods:
  - Windows:

    Extending Disk Partitions and File Systems (Windows Server 2008)
  - Linux:

    Extending Partitions and File Systems for Data Disks (Linux)

14.2.7 Why Did My Disk Capacity Remain Unchanged on the Server After Capacity Expansion?

After expanding disk capacity on the management console, you must log in to the server and extend the disk partition and file system for the extra capacity to become available. Otherwise, you cannot view the additional space on the server.

To extend disk partitions and file systems, see the following sections:

- **Extending Disk Partitions and File Systems (Windows Server 2008)**
- **Partition and File System Extension Preparations (Linux)**

14.2.8 How Do I Extend the File System of an Unpartitioned Data Disk in Linux?

Scenarios

If no partition but only a file system is created on a data disk, extend the file system according to the following operations:

Run the **lsblk** command. Information similar to the following is displayed:

```
[root@ecs-test ~]# lsblk
NAME     MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda      253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb      253:16   0   60G  0 disk /mnt/sdc
```

In the command output, no partition but only a file system is created on data disk **/dev/vdb**.

In the following example, CentOS 7.4 64bit is used as the sample OS, data disk **/dev/vdb** has 10 GB, no partition but only a file system is created on the disk, and additional 50 GB has been added to this data disk on the management console. The following steps show how to extend this 50 GB to the file system.

- **Extending the EXT* File System**
- **Extending the XFS File System**

The way you allocate additional space depends on the OS. This example is used for reference only. For the detailed operations and differences, see the corresponding OS documentations.

Extending the EXT* File System

Step 1 Run the following command to extend the file system:

resize2fs *Disk name*

In this example, run the following command:

resize2fs /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test ~]# resize2fs /dev/vdb
resize2fs 1.42.9 (28-Dec-2013)
Filesystem at /dev/vdb is mounted on /root/test; on-line resizing required
```

```
old_desc_blocs = 2, old_desc_blocs = 8
[17744.521535] EXT4-fs (vdb): resizing filesystem from 26214400 to 15728640 blocks
[17744.904470] EXT4-fs (vdb): resized filesystem to 15728640
The filesystem on /dev/vdb is now 15728640 blocks long.
```

Step 2 Run the following command to view the result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb       ext4       64G   55M   61G   1% /mnt/sdc
```

----End

Extending the XFS File System

Step 1 Run the following command to extend the file system:

xfs_growfs *Disk name*

In this example, run the following command:

xfs_growfs /dev/vdb

Information similar to the following is displayed:

```
[root@ecs-test ~]# xfs_growfs /dev/vdb
meta-data=/dev/vdb               isize=512    agcount=4, agsize=655360 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=0, spinodes=0
data     =                       bsize=4096   blocks=2621440, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version2               bsize=4096   ascii-ci=0 ftype=1
log      =internal               bsize=4096   blocks=2560, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
data blocks changed from 2621440 to 15728640.
```

Step 2 Run the following command to view the result:

df -TH

Information similar to the following is displayed:

```
[root@ecs-test ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       40G  2.3G   35G   7% /
devtmpfs       devtmpfs  1.9G     0  1.9G   0% /dev
tmpfs          tmpfs     1.9G     0  1.9G   0% /dev/shm
tmpfs          tmpfs     1.9G  8.6M  1.9G   1% /run
tmpfs          tmpfs     1.9G     0  1.9G   0% /sys/fs/cgroup
tmpfs          tmpfs     379M     0  379M   0% /run/user/0
/dev/vdb       xfs        60G   34M   60G   1% /mnt/sdc
```

----End

14.3 Attachment

14.3.1 Why Can't I View the Attached Data Disk on the Server?

Troubleshooting

Table 14-2 Possible causes

OS	Possible Cause	Solution
Linux	● New data disks are not formatted and partitioned by default, and an unformatted disk will not be listed in the command output. You must manually initialize the disk. ● If a data disk cannot be found after the server is restarted, automatic partition mounting at system start may not be configured.	**Linux Data Disk**
Wind ows	New data disks are not formatted and partitioned by default. Only formatted and partitioned drives show up in the resource manager. You must manually initialize the disk.	**Windows Data Disk**

Linux Data Disk

Symptom: A data disk has been attached to a Linux server on the management console, but the disk cannot be viewed on the server.

Run **df -TH** to view the disk information. CentOS 7.4 is used in this example. The normal command output is as follows:

```
[root@ecs-test-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  1.9G   39G   5% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  9.1M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      106G   63M  101G   1% /mnt/sdc
```

Unlike the normal command output, only system disk **/dev/vda1** is visible, but data disk **/dev/vdb1** is missing from the command output.

Cause Analysis:

- **Cause 1**: New data disks are not formatted and partitioned by default, and an unformatted disk will not be listed in the command output. You must manually initialize the disk.

For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

- **Cause 2**: If a data disk cannot be found after the server is restarted, automatic partition mounting at system start may not be configured. Perform the following steps:

  a. Run the following command to mount the partition again:

     mount *Disk partition Mount point*

     In this example, run the following command:

     mount /dev/vdb1 /mnt/sdc

     Perform the following steps to enable automatic partition mounting at system start:

  b. Run the following command to query the partition UUID:

     blkid *Disk partition*

     In this example, run the following command to query the UUID of the **/dev/vdb1** partition:

     blkid /dev/vdb1

     Information similar to the following is displayed:

     ```
     [root@ecs-test-0001 ~]# blkid /dev/vdb1
     /dev/vdb1: UUID="0b3040e2-1367-4abb-841d-ddb0b92693df" TYPE="ext4"
     ```

     The UUID of the **/dev/vdb1** partition is displayed.

  c. Run the following command to open the **fstab** file using the vi editor:

     vi /etc/fstab

     Press **i** to enter editing mode.

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

     ```
     UUID=0b3040e2-1367-4abb-841d-ddb0b92693df /mnt/sdc           ext4    defaults        0 2
     ```

     The preceding content is used for reference only. Add the information that is used in the environment. The parameters are described as follows:

     - The first column indicates the partition UUID obtained in **b**.
     - The second column indicates the directory on which the partition is mounted. You can query the mount point using the **df -TH** command.
     - The third column indicates the file system format of the partition. You can query the file system format using the **df -TH** command.
     - The fourth column indicates the partition mount option. Normally, this parameter is set to **defaults**.
     - The fifth column indicates the Linux dump backup option.
       - **0**: Linux dump backup is not used. Normally, dump backup is not used, and you can set this parameter to **0**.
       - **1**: Linux dump backup is used.
     - The sixth column indicates the fsck option, that is, whether to use fsck to check the attached disk during startup.

- **0**: not use fsck.
- If the mount point is the root partition (/), this parameter must be set to **1**.

  When this parameter is set to **1** for the root partition, this parameter for other partitions must start with **2** because the system checks the partitions in the ascending order of the values.

e. Press **Esc**, enter **:wq**, and press **Enter**.

The system saves the configurations and exits the vi editor.

Perform the following operations to verify the automatic mounting function:

i. Run the following command to unmount the partition:

umount *Disk partition*

In this example, run the following command:

umount /dev/vdb1

ii. Run the following command to reload all the content in the **/etc/fstab** file:

mount -a

iii. Run the following command to query the file system mounting information:

mount | grep *Mount point*

In this example, run the following command:

mount | grep /mnt/sdc

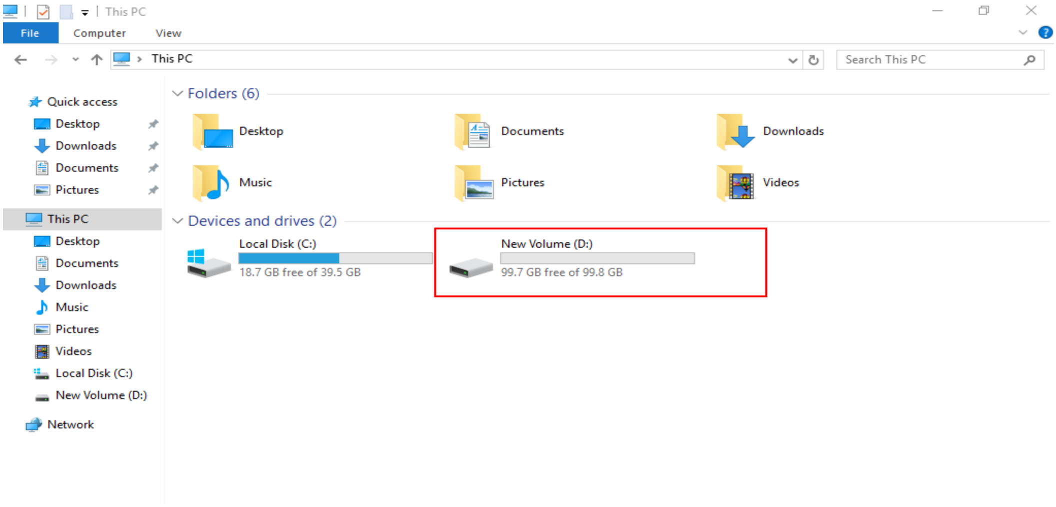
If information similar to the following is displayed, automatic mounting has been configured:

```
root@ecs-test-0001 ~]# mount | grep /mnt/sdc
/dev/vdb1 on /mnt/sdc type ext4 (rw,relatime,data=ordered)
```

Windows Data Disk

Symptom: A data disk has been attached to a Windows server on the management console, but the disk cannot be viewed on the server. For example, Volume (D:) was not shown in **This PC** of a Windows server running Windows Server 2012. Normally, Volume (D:) appears, as shown in **Figure 14-1**.

Figure 14-1 Volume (D:) appears



Solution: New data disks are not formatted and partitioned by default. Only formatted and partitioned drives show up in **This PC**. You must manually initialize the disk before it can be viewed here.

For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

14.3.2 Can I Attach a Disk to Multiple Servers?

- A non-shared disk can only be attached to one server.
- A shared disk can be attached to up to 16 servers.

NOTE

- Shared disks are a type of EVS disks that can be attached to multiple servers.
- To use shared disks, you must set up a shared file system or cluster management system. If you directly attach a disk to multiple servers, the disk sharing attribute does not work and data may be overwritten.

14.3.3 Can I Attach a Disk to a Server in Another AZ?

No.

Disks and the servers you attach the disks to must be in the same AZ. The same is true for shared disks. Shared disks can only be attached to the servers in the same AZ.

14.3.4 How Can I Add a Data Disk to an Existing Server?

Data disks can be created during or after the server creation. If you create data disks during the server creation, the system will automatically attach the data disks to the server. If you create data disks after the server creation, you need to manually attach the data disks.

- On a Windows server:
  - If a data disk is created along with the server, you need to log in to the server and initialize the disk. The data disk will be visible after the initialization succeeds.

  - If no data disk is not created along with the server, you need to create a data disk and attach it to the server. Then, you need to log in to the server and initialize the disk. The data disk will be visible after the initialization succeeds.

- On a Linux server:
  - If a data disk is created along with the server, you need to log in to the server and initialize the disk. The data disk will be visible after the initialization succeeds and the disk has been mounted via the **mount** command.
  - If no data disk is not created along with the server, you need to create a data disk and attach it to the server. Then, you need to log in to the server and initialize the disk. The data disk will be visible after the initialization succeeds and the disk has been mounted via the **mount** command.

For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

14.3.5 Can I Attach Different Types of Disks to the Same Server?

Yes. Different types of EVS disks can be attached to the same server. You only need to make sure that these disks and the server are in the same AZ.

14.3.6 What Should I Do If a Linux EVS Disk Is Attached to a Windows Server?

You are not advised to attach a Linux EVS disk to a Windows server or attach a Windows EVS disk to a Linux server.

The disk information may fail to be displayed due to the inconsistent file systems. To solve this issue, you need to initialize and partition the disk again. Formatting the disk will destroy any data the disk has contained, so you should back up the data first.

14.4 Detachment

14.4.1 If I Detach a Disk, Will I Lose the Data on My Disk?

Data on a disk will not be lost after the disk is detached, and the disk can be re-attached later if needed.

To ensure your data safety, you are advised to follow the instructions described in **Disk Detachment Process**.

Disk Detachment Process

- For disks not supporting online detachment:
  a. Stop the server where the disk was attached.

b. After the server has stopped, detach the disk.

- For disks supporting online detachment:

  Detach the disk from a running ECS. For details, see **Management** > **Detaching an EVS Disk from a Running ECS** in the *Elastic Cloud Server User Guide*.

14.4.2 Why Can't I Detach My Disk?

EVS disks can be used as system disks or data disks, but the way you detach each one is different.

- System disks: A system disk can only be detached offline. You must first stop the server that uses this system disk and then detach the disk.

  NOTE

  In Linux, a system disk is typically mounted on **/dev/vda**. In Windows, a system disk is normally **Volume (C:)**.

- Data disks: A data disk can be detached regardless of whether it is offline or online.

  NOTE

  In Linux, a data disk is typically mounted on a mount point other than **/dev/vda**. In Windows, a data disk is normally a volume other than **Volume (C:)**.

  – Offline detachment: The server must be in the **Stopped** state. If it is not, stop the server and then detach the data disk.

  – Online detachment: Some OSs support online detachment. In this case, you do not need to stop the server before detaching the data disk. For more information, see **Storage** > **Detaching an EVS Disk from a Running ECS** in the *Elastic Cloud Server User Guide*.

14.5 Capacity

14.5.1 What Is the Maximum Capacity Supported for the System and Data Disks?

The maximum capacity supported for a system disk is 1024 GiB.

The maximum capacity supported for a data disk is 32768 GiB.

14.5.2 What Should I Do If My Disk Starts to Run Out of Space?

If your disk space starts to fill up, you can:

- Create a new disk and attach it to the server.
- Expand the capacity of the existing disk. Both system disks and data disks can be expanded.

14.5.3 What Should I Do If I Use fdisk to Initialize a Disk Larger Than 2 TB and Then the Space in Excess of 2 TB Cannot Be Displayed?

If your disk capacity is greater than 2 TB, do not use fdisk to partition the disk. Or any space in excess of 2 TB will be unable to be displayed after the disk is partitioned.

In this case, use parted to repartition the disk and choose the GPT partition style because MBR does not support disks over 2 TB.

For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

14.5.4 How Can I View My Disk Usage?

You can view your disk usages in either of the following ways:

- View disk usages manually.

  The details depend on the OS. This FAQ uses Windows Server 2008, Windows Server 2016, and Linux as samples to describe how to view the disk usage.

  – **Viewing Disk Usage in Linux**

  – **Viewing Disk Usage in Windows Server 2008**

  – **Viewing Disk Usage in Windows Server 2016**

- **Installing Agent to View Disk Usage**

Viewing Disk Usage in Linux

In this section, CentOS 7.4 64bit is used as an example. The details depend on if you need to view the available space or not.

- To query the total capacity only, run **lsblk**.

  Information similar to the following is displayed:

```
[root@ecs-test-0001 ~]# lsblk
NAME   MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
vda    253:0    0   40G  0 disk
└─vda1 253:1    0   40G  0 part /
vdb    253:16   0   40G  0 disk
└─vdb1 253:17   0   40G  0 part
```

  In the command output, the server has two disks, **/dev/vda** and **/dev/vdb**. System disk **/dev/vda** has 40 GB of capacity, as does data disk **/dev/vdb**.

- To query the total capacity and display the space available as well, run **df -TH**. Ensure that the disk has been attached and initialized before running this command.

  Information similar to the following is displayed:

```
[root@ecs-0001 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda1      ext4       43G  2.0G   39G   5% /
devtmpfs       devtmpfs  509M     0  509M   0% /dev
tmpfs          tmpfs     520M     0  520M   0% /dev/shm
tmpfs          tmpfs     520M  7.2M  513M   2% /run
tmpfs          tmpfs     520M     0  520M   0% /sys/fs/cgroup
tmpfs          tmpfs     104M     0  104M   0% /run/user/0
/dev/vdb1      ext4       43G   51M   40G   1% /mnt/sdc
```

In the command output, the server has two partitions, **/dev/vda1** and **/dev/vdb1**. Partition **/dev/vda1** is used to deploy the OS, and its total capacity, used capacity, and available capacity are 43 GB, 2 GB, and 39 GB, respectively. Partition **/dev/vdb1**'s total capacity, used capacity, and available capacity are 43 GB, 51 MB, and 40 GB, respectively.

Viewing Disk Usage in Windows Server 2008

In this section, Windows Server 2008 R2 Enterprise 64bit is used as an example.

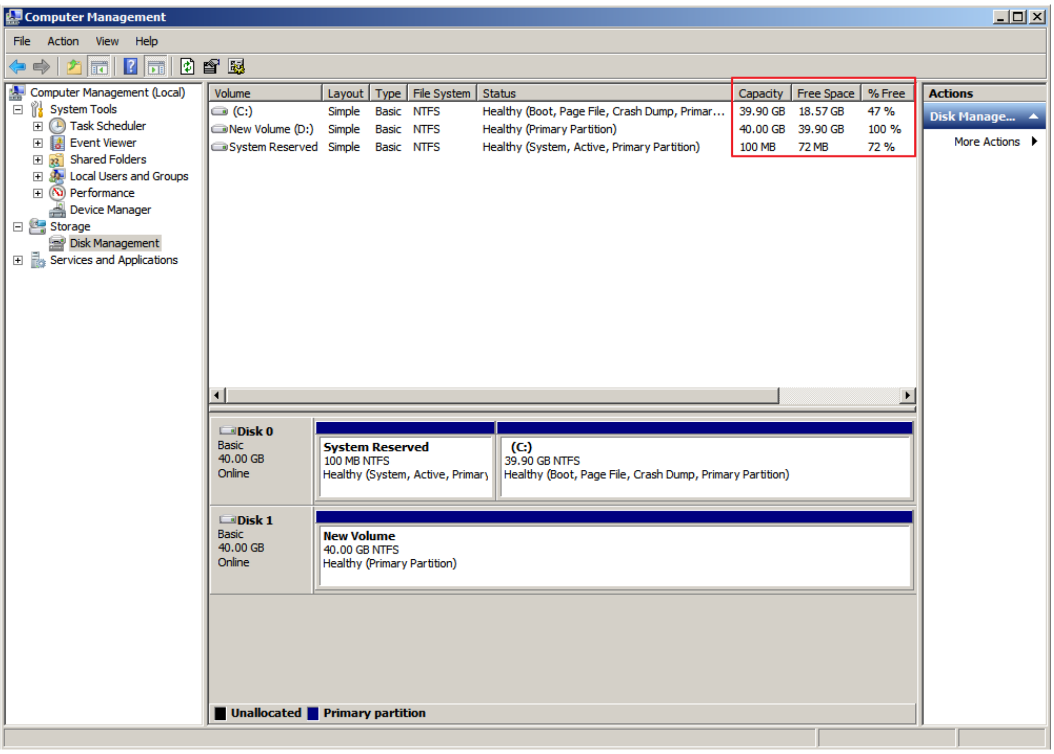
Step 1 On the desktop of the server, right-click **Computer** and choose **Manage** from the shortcut menu.

The **Server Manager** window is displayed.

Step 2 In the navigation tree on the left, choose **Storage** > **Disk Management**.

The sizes and available spaces of the volumes on the current disk are displayed in the middle pane.

Figure 14-2 Disk Management page



Volume	Layout	Type	File System	Status	Capacity	Free Space	% Free
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primar...	39.90 GB	18.57 GB	47 %
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.00 GB	39.90 GB	100 %
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	100 MB	72 MB	72 %

Disk 0
Basic
40.00 GB
Online

System Reserved
100 MB NTFS
Healthy (System, Active, Primar

(C:)
39.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Basic
40.00 GB
Online

New Volume
40.00 GB NTFS
Healthy (Primary Partition)

----End

Viewing Disk Usage in Windows Server 2016

In this section, Windows Server 2016 Standard 64bit is used as an example.

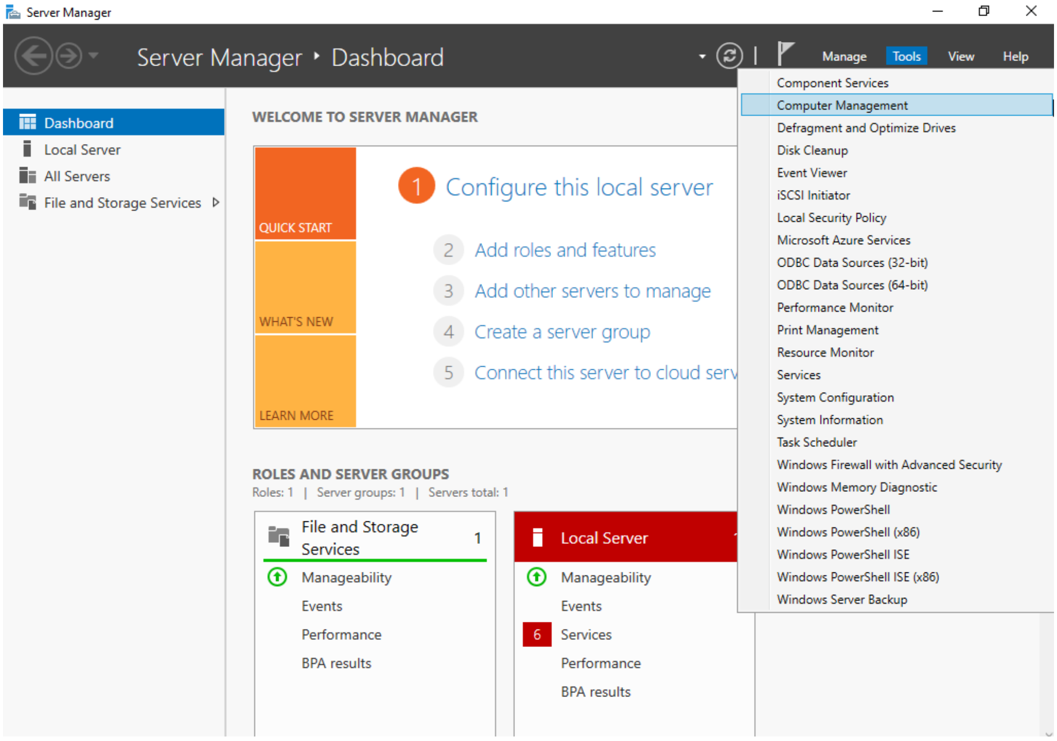
Step 1 On the desktop of the server, click the start icon in the lower left corner.

The **Windows Server** window is displayed.

Step 2 Click **Server Manager**.

The **Server Manager** window is displayed.

Figure 14-3 Server Manager page

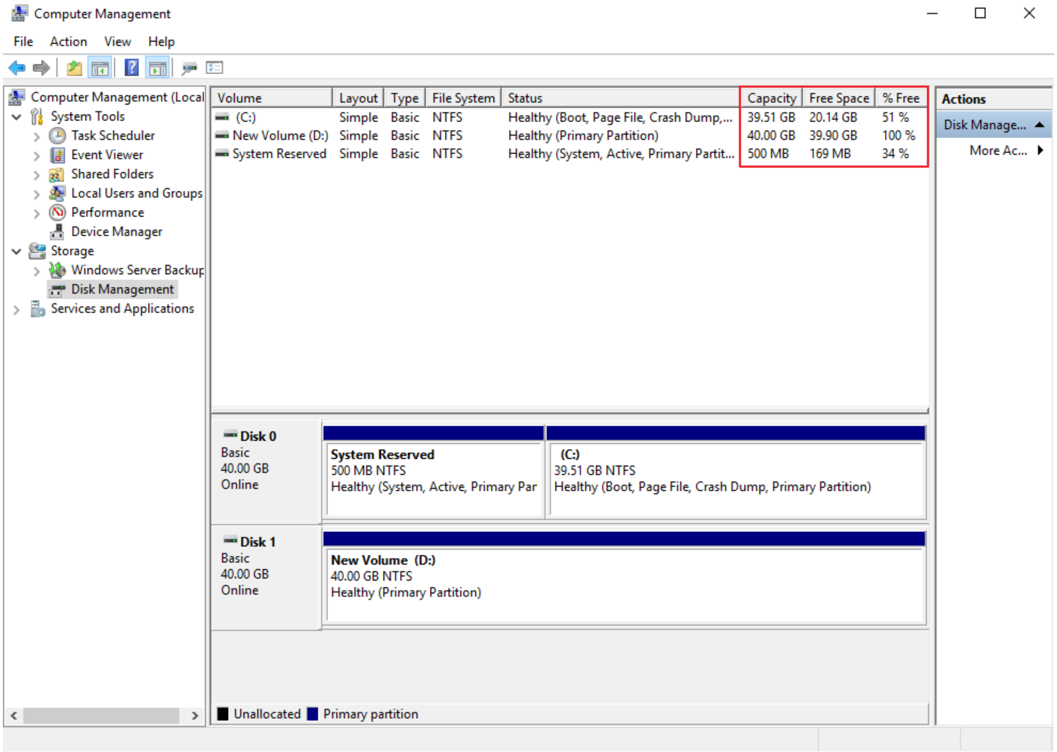


Step 3 In the upper right corner, choose **Tools** > **Computer Management**.

Step 4 Choose **Storage** > **Disk Management**.

In the middle pane, you can view the sizes and available spaces of the volumes on the disk.

Figure 14-4 Disk list page



Volume	Layout	Type	File System	Status	Capacity	Free Space	% Free
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump,...	39.51 GB	20.14 GB	51 %
New Volume (D:)	Simple	Basic	NTFS	Healthy (Primary Partition)	40.00 GB	39.90 GB	100 %
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partit...	500 MB	169 MB	34 %

Disk 0
Basic
40.00 GB
Online

System Reserved
500 MB NTFS
Healthy (System, Active, Primary Par

(C:)
39.51 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

Disk 1
Basic
40.00 GB
Online

New Volume (D:)
40.00 GB NTFS
Healthy (Primary Partition)

----End

Installing Agent to View Disk Usage

Some disk monitoring metrics require that the agent to be installed.

- For instructions about how to install the agent on a Windows ECS, see "Installing and Configuring the Agent (Windows)" in the *Cloud Eye User Guide*.
- For instructions about how to install the agent on a Linux ECS, see "Installing and Configuring the Agent (Linux)" in the *Cloud Eye User Guide*.

Table 14-3 Disk metrics

Metric	Parameter	Description	Value Range	Monitored Object	Monitoring Period (Raw Data)
mountPointPrefix_disk_free	(Agent) Available Disk Space	Free space on the disks Unit: GB ● Linux: Run the **df -h** command to check the value in the **Avail** column. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~).	≥ 0	ECS	1 minute
mountPointPrefix_disk_total	(Agent) Disk Storage Capacity	Total space on the disks, including used and free Unit: GB ● Linux: Run the **df -h** command to check the value in the **Size** column. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~).	≥ 0	ECS	1 minute
mountPointPrefix_disk_used	(Agent) Used Disk Space	Used space on the disks Unit: GB ● Linux: Run the **df -h** command to check the value in the **Used** column. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~).	≥ 0	ECS	1 minute

Metric	Parameter	Description	Value Range	Monitored Object	Monitoring Period (Raw Data)
mountPointPrefix_disk_usedPercent	(Agent) Disk Usage	Percentage of total disk space that is used, which is calculated as follows: **Disk Usage** = **Used Disk Space**/**Disk Storage Capacity** Unit: percent ● Linux: It is calculated as follows: Used/Size. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~).	0-100	ECS	1 minute

14.6 Sharing

14.6.1 Do I Have to Deploy a Cluster to Use Shared Disks?

Yes.

If you simply attach a shared disk to multiple servers, files cannot be shared among them. Because there are no mutually agreed data read/write rules among servers, read and write operations from them may interfere with each other, or unpredictable errors may occur.

Shared EVS disks do not have cluster management capabilities. You need to build a clustered system for data sharing, such as Windows MSCS, Veritas VCS, and Veritas CFS clusters.

14.6.2 How Many Servers Can I Attach a Shared Disk to?

A shared disk can be attached to up to 16 servers.

14.6.3 How Can I Attach a Shared Disk to Multiple Servers?

A shared disk can be attached to multiple servers on the management console. You can choose to attach it to servers one by one or in a batch.

14.6.4 Can a Shared Disk Be Attached to Servers That Belong to Different Accounts?

No. A Shared disk can only be attached to servers that belong to the same account and are in the same AZ.

14.6.5 Can I Attach a Shared Disk to Servers Running Different OSs?

- It is recommended that you do not simultaneously attach a shared disk to servers running Linux and Windows.
- If a shared disk is attached to servers running different versions of the same OS type, it can be used normally. For example, a shared disk attached to one server running CentOS 6 and another server running CentOS 7 can work fine.

A Appendix

A.1 EVS Disk Status

An EVS disk has several statuses. **Table A-1** lists the EVS disk statuses, the meaning of each status, and the operations a disk in each status allows.

Table A-1 Disk status details

EVS Disk Status	Description	Allowed Operation
In-use	The EVS disk is attached to a server and is in use.	● Detaching ● Expanding
Available	The EVS disk has not been attached to any server and can be attached.	● Attaching ● Expanding ● Deleting ● Rolling back snapshots to EVS disks
Creating	The EVS disk is being created.	None
Attaching	The EVS disk is being attached to a server.	None
Detaching	The EVS disk is being detached from a server.	None
Deleting	The EVS disk is being deleted.	None
Expanding	The capacity of the EVS disk is being expanded.	None
Uploading	Data on the EVS disk is being uploaded to an image. This state occurs when you create an image from a server.	None

EVS Disk Status	Description	Allowed Operation
Downloading	Data is being downloaded from an image to the EVS disk. This state occurs when you create a server.	None
Error	An error occurs when you try to create an EVS disk.	Deleting
Deletion failed	An error occurs when you try to delete the EVS disk.	None
Expansion failed	An error occurs when you try to expand the capacity of the EVS disk.	Deleting
Rolling back	Data on the EVS disk is being restored from a snapshot. **NOTE** ● When you roll back a snapshot to an EVS disk, you can only roll back the snapshot to the source EVS disk. Rollback to a specified disk is not supported. ● You can roll back an EVS disk from a snapshot only when the disk is in the **Available** or **Rollback failed** state.	None
Rollback failed	An error occurs when the EVS disk is rolled back from a snapshot.	● Deleting ● Rolling back snapshots to EVS disks

A.2 EVS Snapshot Status

An EVS snapshot has several statuses. **Table A-2** lists the EVS snapshot statuses, the meaning of each status, and the operations a snapshot in each status allows.

Table A-2 Snapshot status details

Snapshot Status	Description	Allowed Operation
Creating	The snapshot is being created.	No operations are allowed.
Available	The snapshot is successfully created.	● Creating EVS disks using snapshots ● Deleting snapshots ● Rolling back snapshots to source EVS disks

Snapshot Status	Description	Allowed Operation
Deleting	The snapshot is being deleted.	No operations are allowed.
Error	An error occurs when you try to create a snapshot.	Deleting
Deletion failed	An error occurs when you try to delete a snapshot.	No operations are allowed.
Rolling back	The snapshot is rolling back data. **NOTE** ● When you roll back a snapshot to an EVS disk, you can only roll back the snapshot to the source EVS disk. Rollback to a specified disk is not supported. ● You can roll back an EVS disk from a snapshot only when the disk is in the **Available** or **Rollback failed** state.	No operations are allowed.

B Change History

Released On	Description
2020-09-20	This issue is the first official release.