

# Alibaba Cloud Apsara File Storage NAS

## Product Introduction

Issue: 20190902

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## Generic conventions

Table -1: Style conventions

Style	Description	Example
	This warning information indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	 <b>Danger:</b> Resetting will result in the loss of user configuration data.
	This warning information indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	 <b>Warning:</b> Restarting will cause business interruption. About 10 minutes are required to restore business.
	This indicates warning information, supplementary instructions, and other content that the user must understand.	 <b>Notice:</b> Take the necessary precautions to save exported data containing sensitive information.
	This indicates supplemental instructions, best practices, tips, and other content that is good to know for the user.	 <b>Note:</b> You can use Ctrl + A to select all files.
>	Multi-level menu cascade.	Settings > Network > Set network type
<b>Bold</b>	It is used for buttons, menus, page names, and other UI elements.	Click OK.
<code>Courier font</code>	It is used for commands.	Run the <code>cd / d C :/ windows</code> command to enter the Windows system folder.
<i>Italics</i>	It is used for parameters and variables.	<code>bae log list --instanceid Instance_ID</code>
[ ] or [a b]	It indicates that it is an optional value, and only one item can be selected.	<code>ipconfig [-all -t]</code>

Style	Description	Example
<b>{}</b> or <b>{a b}</b>	It indicates that it is a required value, and only one item can be selected.	<code>swich {stand   slave}</code>



# Contents

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Legal disclaimer.....	I
Generic conventions.....	I
1 Introduction.....	1
2 Features.....	4
3 Scenarios.....	6
4 Storage types.....	8
5 Limits.....	10
6 NFS protocol limits.....	13
7 SMB protocol limits.....	15

# 1 Introduction

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Alibaba Cloud Network Attached Storage (NAS) provides file storage services for compute nodes, such as ECS instances, Elastic High Performance Computing (E-HPC) clusters, and Container Service clusters.

## Overview

NAS is a distributed file system that provides shared access, scalability, high availability, and high performance. Dependent on POSIX-based file APIs, NAS provides several benefits, such as compatibility with operating systems, shared access, data consistency, and exclusive locks.

NAS provides easy-to-use and scalable file storage that can work with ECS. A NAS file system can provide simultaneous access to multiple ECS instances. The storage capacity of a file system scales up or down with the number of files. NAS provides a common data source for multiple instances or running applications.

NAS provides multiple storage types, such as NAS Capacity, NAS Performance, and NAS Extreme. For more information, see [#unique\\_4](#).

NAS provides a wide variety of scenarios. For more information, see [#unique\\_5](#).

## Benefits

NAS provides a number of benefits, such as being high-performance, cost-effective, secure, reliable, and easy-to-use.

- Costs
  - A NAS file system can be mounted on multiple compute nodes at the same time while still allowing access to these nodes. This reduces a large number of data copies and synchronization costs.
  - The performance of a NAS file system increases with expanding storage capacity. Without the need for further investment in high-end file storage devices, you can reduce a large number of hardware costs.
  - With NAS, you only pay for the size of storage space that you use. In addition, no minimum consumption or extra configuration costs exist. For more information, see [#unique\\_6](#).
  - With high reliability, NAS reduces data security risks and maintenance costs.

- Easy-to-use

You can easily create file systems without the extra need to deploy and maintain these file systems.

- Security

RAM-based access control VPC networks are used to isolate user access, and encrypt data both in transit and at rest to prevent the interception and tampering of critical data.

- High reliability

With data reliability of 99.999999999%, NAS reduces a large number of data security risks.

- High performance

NAS is a distributed file system that provides linear performance with increasing capacity and ultra-high performance over traditional data stores.

- Compatibility

- NAS is compatible with multiple standard protocols, such as NFS and SMB. Compatible with POSIX-based file APIs, NAS provides data consistency and exclusive locks.
- You can view the result in real time after the content of a file stored in a NAS file system is changed.

## Features

NAS provides the following features:

Scenarios	Features	Reference
Create file systems	Before using NAS, you must create a file system.	<a href="#">#unique_7/unique_7_Connect_42_section_5jo_0kj</a>
Manage file systems	You can view the details of a file system or delete a file system.	<a href="#">#unique_7</a>
Add mount points	You must add a mount point to a file system before mounting the file system.	<a href="#">#unique_8/unique_8_Connect_42_section_6xi_a3u</a>

Scenarios	Features	Reference
Manage mount points	You can disable, enable, or delete a mount point, or modify the permission group of a mount point.	<a href="#">#unique_8</a>
Mount file systems	You must mount a file system on a computational node before using the file system.	<a href="#">Mount a file system</a>
Manage user access	You can authorize a RAM user to operate NAS or control user access by using permission groups.	<ul style="list-style-type: none"><li>• <a href="#">#unique_10</a></li><li>• <a href="#">#unique_11</a></li><li>• <a href="#">#unique_12</a></li></ul>
Use NAS APIs	NAS provides various API interfaces that allow you to perform various operations on a file system.	<a href="#">#unique_13</a>

### Billing methods

For more information about NAS billing methods, see [NAS pricing](#).

## 2 Features

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NAS provides a wide variety of features, such as scalable capacity, shared access, support for several standard protocols, security and compliance, encryption, flexible access modes, data transmission, and data backup.

### Scalable capacity

The capacity of a file system is scalable. With an increasing or decreasing number of files, the capacity of the file system can be scaled up or down.

### Shared access

Multiple computational instances share access to the same data source in a file system and use file locks to ensure data consistency.

### Support for several standard protocols

Provides standard Network File System (NFS) and Server Message Block (SMB) protocols and supports mainstream Linux and Windows operating systems.

### Security and compliance

Access control mechanisms, such as RAM authentication, VPC isolation, and security groups, ensure data security.

- For more information about access control by using permission groups, see [Manage the access permissions of a file system](#).
- For more information about authorization for RAM users, see [Manage the access permissions of file system resources](#).

### Encryption

Encrypted data transmission prevents user data from being intercepted or sniffed during transmission.

### Flexible access modes

Supports multiple access modes. You can access NAS from various networks, such as VPCs, on-premises IDCs, and dedicated networks.

### Data transmission

Supports synchronous or asynchronous data transmission between NAS file systems or between NAS and OSS by using Data Transmission Service (DTS).

**Data backup**

Multiple copies of data can be generated by using flexible backup policies. These data backups are used to restore corrupted data.

## 3 Scenarios

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To identify the target scenarios of Alibaba Cloud Network Attached Storage (NAS) more precisely, the application scenarios of NAS can be classified into the following five types:

### Enterprise applications

With high scalability, elasticity, availability, and persistence, NAS can be used to store the files of enterprise applications and the applications delivered as services. NAS provides standard file system interfaces and semantics. Therefore, you can easily construct new applications or migrate your enterprise applications to Alibaba Cloud.

### Media and entertainment workflows

Shared storage is used to process large files in media workflows, such as video editing, audio and video production, broadcast processing, and sound design and rendering. With the powerful data consistency model, high throughput, and shared file access, NAS can reduce the time required to complete the work flows and merge multiple local file repositories into a single repository that can be accessed by all users.

### Big data analysis

NAS can provide the scale, performance, and features required by big data applications, for example, high throughput of computing nodes, post-write read consistency, and file operations with low latency. Many analysis workloads use file interfaces for data interactions and depend on file system semantics such as the file lock. In addition, the workloads also require to write a part of a file. NAS supports the required file system semantics and can provide scalable capacity and performance.

### Content management and Web services

As a file system with high throughput and persistence, NAS can be used in content management systems and Web service applications to store and provide information for websites and online publishing and archiving applications. NAS follows the expected file system semantics, file naming conventions, and the privileges that Web developers are used to applying. Therefore, you can easily integrate NAS with Web applications and use it in websites and online publishing and archiving applications.

## Container storage

Containers are ideal for microservices construction thanks to such features as fast presetting, portability, and process isolation. For the containers that access raw data at every start, a shared file system is required to allow these containers to access the file system no matter which instance they run on. NAS is ideal for container storage because it provides persistent shared access to file data.

## 4 Storage types

NAS provides the following storage types to meet your needs: NAS Capacity, NAS Performance, and NAS Extreme.

The features, benefits, and scenarios of each storage type are described in the following table.

Storage type	Feature	Benefit	Scenario
NAS Capacity	<ul style="list-style-type: none"><li>• Scalable capacity and linear throughput (up to 10 Gbit/s).</li><li>• Maximum throughput of 150 Mbit/s for a single TB and a maximum latency of 10 milliseconds.</li><li>• Improved performance, applicable to large-capacity and high-throughput businesses.</li></ul>	High capacity and low cost.	Scalable capacity and cost-sensitive applications, such as big data analysis, file sharing, and data backup.
NAS Performance	<ul style="list-style-type: none"><li>• Scalable capacity and linear throughput with increasing capacity with a maximum throughput of 20 Gbit/s.</li><li>• Maximum throughput of 150 Mbit/s for a single TB and a maximum latency that is in milliseconds.</li><li>• Improved performance, applicable to businesses that require large-capacity and high-throughput.</li></ul>	Low latency and high IOPS	Random I/O access, data-intensive, and latency-sensitive businesses, such as enterprise applications, websites, and containers.

Storage type	Feature	Benefit	Scenario
NAS Extreme	<ul style="list-style-type: none"><li>• Maximum capacity of 32 TB. The initial bandwidth is 150 Mbit/s and can be scaled up to 300 Mbit/s.</li><li>• A consistent latency of 100 microseconds.</li><li>• Applicable to latency-sensitive businesses that handle large amounts of small files.</li></ul>	Ultra-low latency and high IOPS	High-Performance websites, DevOps , code repository, and CI integration environments.

## 5 Limits

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This topic describes the limits when you use Alibaba Cloud Network Attached Storage (NAS) and its resources. It also includes the limits when you use a client to access NAS resources.

### Limits on resources

The following table lists limits on NAS resources.

Resource	Description
Maximum number of file systems for each account in a region	20
Maximum number of mount points in each file system	2

### Limits on NFS clients

Limits on the usage of NFS clients are listed as follows:

- You can open a maximum of 32,768 files at a time on an NFS client. Files in the list folder and its subfolders are not included in the total number of open files.
- Each unique mount on an NFS client can acquire a maximum total of 8,192 locks across up to 256 unique file or process pairs. For example, a single process can acquire one or more locks on 256 separate files, or 8 processes can each acquire one or more locks on 32 files.
- We do not recommend that you use an NFS client in a Windows environment to access an NFS file system.

### Limits on SMB clients

Any one particular file or folder can at any one time be opened a maximum of 8,192 times. This applies across all compute nodes on which file systems are mounted and users that share access to these file systems. This represents a maximum of 8,192 active file handlers for each file or folder. A maximum of 65,536 active file handlers can exist on a file system.

### Limits on file systems

The following lists the limits specific to Alibaba Cloud NAS file systems:

- Maximum number of files in a single file system: 1 billion.

- Maximum length of a file system name: 255 bytes.
- Maximum size of a single file: 32 TB.
- Maximum directory depth: 1,000 levels.
- Maximum capacity of a single file system: 10 PB for NAS Capacity and 1 PB for NAS Extreme.
- Maximum number of mount points for a single file system: 1,000.
- On Linux systems, mappings between user IDs (UIDs) and usernames and mappings between group IDs (GIDs) and group names are defined in configuration files. For NFSv3-compliant file systems, if the mapping between an ID and a name is defined in a configuration file, the name is displayed. If no mapping can be found for an ID, the ID is displayed.
- For NFSv4-compliant file systems, the usernames and group names are displayed as nobody for all files if the version of a Linux kernel is earlier than 3.0. If the kernel version is later than 3.0, the rule used by NFSv3-compliant file systems applies.
- We recommend that you do not run the `chown` or `chgrp` command if the following conditions are met: the file or directory is stored on an NFSv4-compliant file system and the Linux kernel version is earlier than 3.0. If you run either command in this case, the UID and GID of the file or directory are changed to nobody.
- NAS supports protocols including SMB 2.1 and later and operating systems including Windows 7, and Windows Server 2008 R2 or later. However, NAS does not support Windows Vista, or Windows Server 2008 or earlier. Compared with SMB 2.1 or later, SMB 1.0 has performance and functionality defects due to design issues. Furthermore, the Windows products that support SMB 1.0 or earlier are no longer available.

### Unsupported NFS features

Alibaba Cloud NAS does not support the following NFS features.

- NFSv4.0 does not support the following attributes: `FATTR4_MIMETYPE`, `FATTR4_QUOTA_AVAIL_HARD`, `FATTR4_QUOTA_AVAIL_SOFT`, `FATTR4_QUOTA_USED`, `FATTR4_TIME_BACKUP`, and `FATTR4_TIME_CREATE`. If one or more of these attributes are specified, an `NFS4ERR_ATTRNOTSUPP` error occurs in the `/var/log/messages` file.
- NFSv4.1 does not support the following attributes: `FATTR4_DIR_NOTIF_DELAY`, `FATTR4_DIRENT_NOTIF_DELAY`, `FATTR4_DACL`, `FATTR4_SACL`, `FATTR4_CHA`

NGE\_POLICY, FATTR4\_FS\_STATUS, FATTR4\_LAYOUT\_HINT, FATTR4\_LAYOUT\_TYPES, FATTR4\_LAYOUT\_ALIGNMENT, FATTR4\_FS\_LOCATIONS\_INFO, FATTR4\_MDSTHRESHOLD, FATTR4\_RETENTION\_GET, FATTR4\_RETENTION\_SET, FATTR4\_RETENT EVT\_GET, FATTR4\_RETENT EVT\_SET, FATTR4\_RETENTION\_HOLD, FATTR4\_MODE\_SET\_MASKED, and FATTR4\_FS\_CHARSET\_CAP. If one or more of these attributes are specified, an NFS4ERR\_ATTRNOTSUPP error is displayed in the /var/log/messages file.

- NFSv4 does not support the following operations: OP\_DELEGPURGE, OP\_DELEGRETURN, and NFS4\_OP\_OPENATTR. If one or more of these operations are applied, an NFS4ERR\_ATTRNOTSUPP error is displayed in the /var/log/messages file.
- NFSv4 does not support delegations.

### Unsupported SMB features

Alibaba Cloud NAS does not support the following SMB features:

- Extended file attributes and client-side caching based on leases.
- Input/output control (IOCTL) or file system control (FSCTL) operations, such as creating sparse files, compressing files, retrieving NIC status, and creating reparse points.
- Alternate data streams.
- Identity authentication provided by Active Directory (AD) or Lightweight Directory Access Protocol (LDAP).
- Several features provided by SMB 3.0 or later, such as SMB Direct, SMB Multichannel, SMB Directory Leasing, and Persistent File Handle.
- Access control lists (ACLs) on files or directories

## 6 NFS protocol limits

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Network Attached Storage (NAS) supports the NFSv3 and NFSv4 protocols. However, you must pay attention to the following limits:

- Attributes not supported by NFSv4.0 include: `FATTR4_MIMETYPE`, `FATTR4_QUOTA_AVAIL_HARD`, `FATTR4_QUOTA_AVAIL_SOFT`, `FATTR4_QUOTA_USED`, `FATTR4_TIME_BACKUP`, and `FATTR4_TIME_CREATE`. If these attributes are attempted, an `NFS4ERR_ATTRNOTSUPP` error is returned to the client.
- Attributes not supported by NFSv4.1 include: `FATTR4_DIR_NOTIF_DELAY`, `FATTR4_DIRENT_NOTIF_DELAY`, `FATTR4_DACL`, `FATTR4_SACL`, `FATTR4_CHANGE_POLICY`, `FATTR4_FS_STATUS`, `FATTR4_LAYOUT_HINT`, `FATTR4_LAYOUT_TYPES`, `FATTR4_LAYOUT_ALIGNMENT`, `FATTR4_FS_LOCATIONS_INFO`, `FATTR4_MDSTHRESHOLD`, `FATTR4_RETENTION_GET`, `FATTR4_RETENTION_SET`, `FATTR4_RETENT EVT_GET`, `FATTR4_RETENT EVT_SET`, `FATTR4_RETENTION_HOLD`, `FATTR4_MODE_SET_MASKED`, and `FATTR4_FS_CHARSET_CAP`. If these attributes are attempted, an `NFS4ERR_ATTRNOTSUPP` error is returned to the client.
- OPs not supported by NFSv4.1 include: `OP_DELEGPURGE`, `OP_DELEGRETURN`, and `NFS4_OP_OPENATTR`. If these OPs are attempted, an `NFS4ERR_NOTSUPP` error is returned to the client.
- NFSv4 currently does not support Delegation.
- Issues concerning UID and GID
  - For the NFSv3 protocol, if the file's UID or GID exists in a Linux local account, then the corresponding user name or group name is displayed based on the mapping relations of the local UID and GID; if the file's UID or GID does not exist in the local account, then the UID or GID is displayed directly.
  - For the NFSv4 protocol, if the version of the local Linux kernel is earlier than 3.0, the UID and GID of all files is displayed as nobody; if the version is later than 3.0, then the display rule is the same as that of NFSv3 protocol.



### Note:

If you use NFSv4 protocol to mount a file system, and the version of your Linux kernel is earlier than 3.0, we recommend that you do not change owner or

group of the file or directory. Otherwise, the UID and GID of the file or directory is changed to nobody.

- A single file system can be simultaneously mounted and accessed by up to 10,000 computing nodes.

## 7 SMB protocol limits

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NAS supports the SMB protocol. However, you must pay attention to some limits.

### Introduction

Server Message Block (SMB), also known as Common Internet File System (CIFS), usually refers to SMB protocols earlier than SMB2. SMB is an application-layer communication protocol used to access files, printers, and other shared resources on networks. The SMB mentioned in NAS documentations refers to SMB 2.0 and later versions, which are supported by Alibaba Cloud NAS.

Compared to NFS, the SMB protocol is more suitable for Windows clients. Many versions of Windows provide excellent support for the SMB protocol, and most Windows applications can access Alibaba Cloud NAS through the SMB protocol without modification. We recommend that you use SMB as the file system on your Windows clients.

### Features

SMB provides the following functions:

- It supports SMB 2.0 and later versions, with corresponding support for Windows Vista, Windows Server 2008, and all later versions of Windows, but does not support Windows XP, Windows Server 2003, and earlier versions. The main reason is that SMB 1.0, in comparison to SMB 2.0 and later versions, has major design differences and serious defects in performance and functions, and Microsoft no longer provides support for earlier versions of Windows and Windows that only supports SMB 1.0.
- The file system capacity and performance can be linearly scaled in a single namespace. The maximum capacity for a single file system is petabyte-sized data with up to one billion of files.
- SMB supports secure access control in VPCs and classic networks to protect the privacy of user data. SMB provides mount point permission groups and supports RAM for console access (RAM APIs).
- Access method: Each mount point provides only one share, all named `myshare`. You can use `\\mount_point \ myshare` to access this SMB share.

Your multiple virtual hosts in an Alibaba Cloud classic or VPC network can simultaneously access the same SMB file system.

- The same as the NFS, SMB is based on the same distributed and highly-available underlying file system, so it provides the same SLA. The restrictions on file quantities and lengths are also the same as those in NFS.

## Limits

Public cloud environments and traditional enterprise environments are different, especially in diversity and complexity of clients. A few SMB functions are not supported. These unsupported functions have no effect on the operation of most applications. The following functions are unsupported:

- Access by Linux clients
- Access to the same file system from both NFS and SMB, or direct access to an SMB file system over a WAN
- File and directory ACLs (file system ACLs are supported)
- File extended attributes and Oplocks and Lease-based client caching
- Sparse files, file compression, NIC status queries, reparse points, and other IOCTL/FSCTL operations
- Alternate data streams
- SMB Direct, SMB Multichannel, SMB Directory Leasing, Persistent File Handle, and other protocol functions provided by SMB 3.0 and later versions