

# Alibaba Cloud

## 云存储网关 Overview

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# 1. What is CSG?

Cloud Storage Gateway (CSG) is a gateway service that can be deployed at your data center and in Alibaba Cloud. CSG uses Alibaba Cloud Object Storage Service (OSS) buckets as backend storage devices, and provides on-premises and in-cloud applications with standard file services over the Network File System (NFS) and Server Message Block (SMB) protocols and block storage services over the Internet Small Computer Systems Interface (iSCSI) protocol.

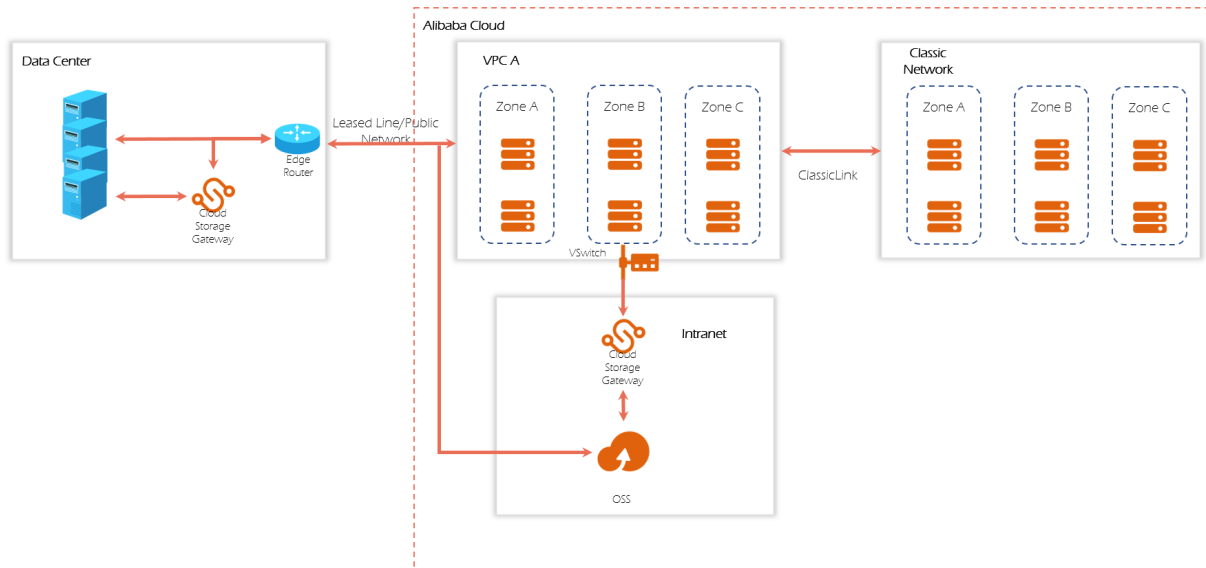
CSG supports two types of gateways:

- **File gateways**  
advancedFile gateways use OSS buckets as backend storage devices, and map the object directory structure of OSS buckets to the file system of Network Attached Storage (NAS). You can read and write all objects in a specified OSS bucket over the standard NFS and SMB protocols. CSG also uses local storage to cache hot data, and provides high-performance data access in addition to large space of OSS buckets. File gateways are compatible with the Portable Operating System Interface (POSIX) and third-party backup software. We recommend that you use standard or basic types of file gateways to back up, share, read from, and write to small files. If you require excellent performance or use multiple clients to access data, we recommend that you use enhanced and types of file gateways.
- **Block gateways**  
Block gateways provide storage volumes in OSS, and support connections over the Internet Small Computer Systems Interface (iSCSI) protocol. Local applications access these volumes as iSCSI targets. Block gateways run in two modes: write-through and cache. In write-through mode, the data in iSCSI volumes is sliced and synchronized to the cloud. This mode is applicable when you use high-speed links such as leased lines. In cache mode, you can create local cache disks to accelerate read and write operations, and transfer data to the cloud in an asynchronous manner. This mode is applicable when you require efficient access to locally cached data but common performance of uploading data to OSS.

## Architecture

You can use in-cloud gateways and local gateway instances to build a storage gateway cluster. In this way, you can share data between clusters deployed in Alibaba Cloud and on the premises. This helps you to migrate business data and services in various scenarios, such as file backup, data distribution, and disaster recovery. You can also use the clusters to efficiently distribute data to multiple server rooms.

As a lightweight storage gateway, you can deploy CSG both at your data center and in Alibaba Cloud.



## Scenarios

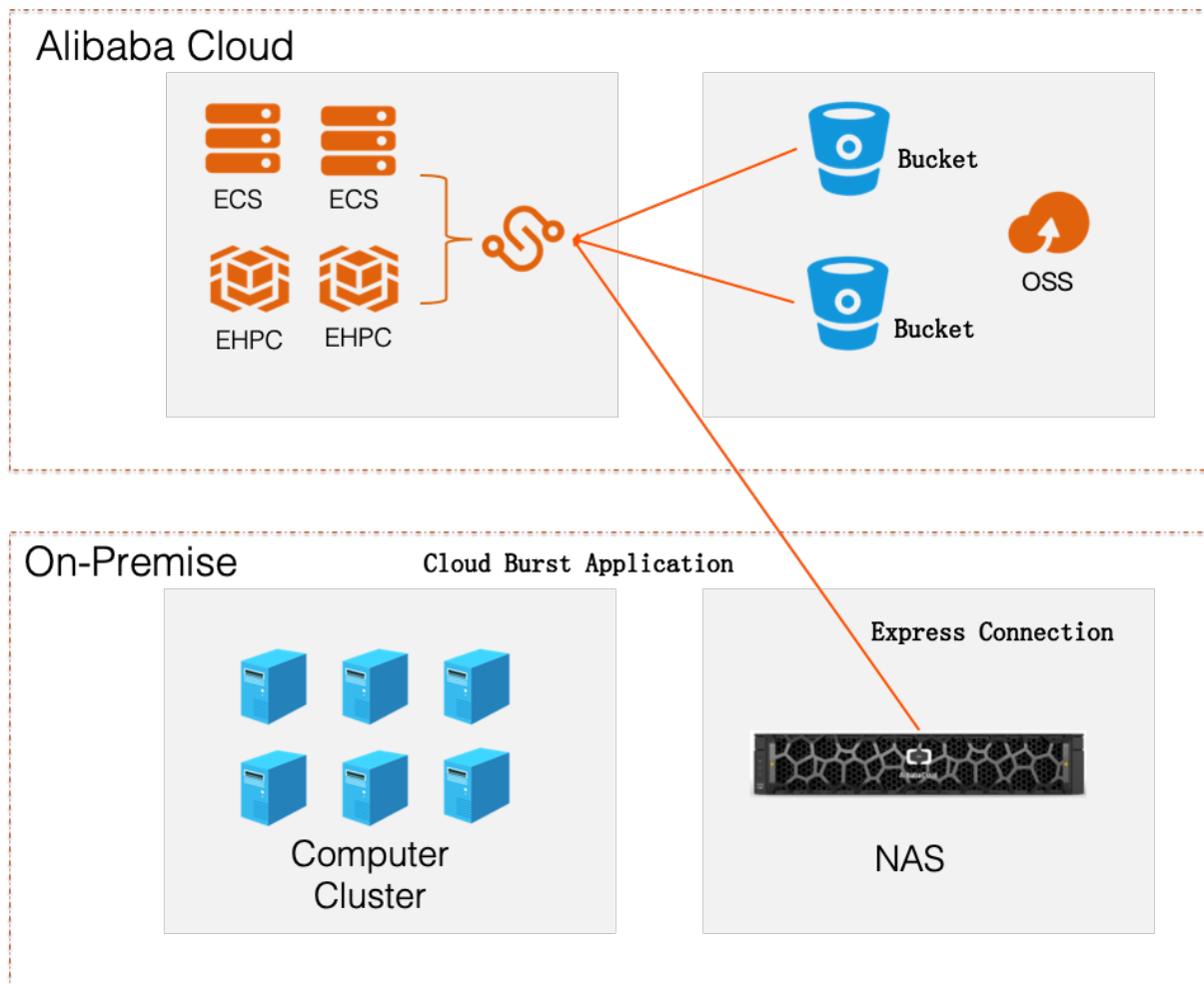
- File gateways
  - large file systemBuild a file storage service for a when local storage is limited.
  - Store data as objects in the cloud, and allow applications to access the data in a file system without modifying code.
  - Access shares in a file storage service among multiple data centers.
- Block gateways
  - Create data backups in the cloud by using backup software that supports efficient transmission over iSCSI.
  - Import video streams to storage volumes through iSCSI-based connections to store data in the cloud.

# 2.Public Preview of CSG 2.0

Cloud Storage Gateway 2.0 (elastic gateway) is a gateway product that can be deployed in Alibaba Cloud. You can mount the gateway by using a Network File System (NFS) client. In addition, you can read data from or write data to an OSS bucket or an Apsara File Storage NAS array or cluster over the Portable Operating System Interface (POSIX). NAS will be supported in CSG from October 2020.

### Architecture

Cloud Storage Gateway (CSG) 2.0 adopts a distributed architecture and redundancy policy, provides high data read/write capabilities, and creates a unified namespace for multiple data sources for easier data management. CSG also supports auto scaling of public bandwidth and cache capacity. You can configure resources based on your business requirements. CSG provides high-performance distributed cache by using Alibaba Cloud enhanced SSDs (ESSDs), and uses Object Storage Service (OSS) buckets to store data. This guarantees 99.9999999999% (12 nines) data reliability. CSG 2.0 integrates different data sources into a virtual file system that provides an access interface.es into the same virtual file system to provide a unified access interface.



# 3.Features

You can manage gateways in the Cloud Storage Gateway (CSG) console or the local gateway console. This topic describes the features in these consoles.

## File gateways

File gateways support two network transmission protocols: Network File System (NFS) and Server Message Block (SMB). You can use both protocols to transfer files over a local area network.

- NFS allows you to access file systems in Unix, such as AIX, HP-UX, and Linux.
- SMB allows you to access file systems in Windows.

Feature	Supported
Web-based configuration	Yes.
Gateway performance displayed on a dashboard	Yes. You can view information about the CPU usage, memory usage, cache input/output operations per second (IOPS), cache bandwidth, and network throughput.
Add OSS resources	Yes. You can add multiple OSS buckets.
Add cache disks	Yes. You can add multiple cache disks.
NFS services	Yes. You can create 16 NFS shares or fewer for each gateway.
SMB services	Yes. You can create 16 SMB shares or fewer for each gateway.
AD and LDAP	Yes.
Log management	Yes.
Gateway upgrade	Yes. You can upgrade gateways in the local gateway console or in the CSG console.

## Block gateways

Feature	Supported
Web-based configuration	Yes.
Gateway performance displayed on a dashboard	Yes. You can view information about the CPU usage, memory usage, cache IOPS, total hard disk reads and writes, and network throughput.
Add OSS resources	Yes. You can add multiple OSS buckets.
Add cache disks	Yes.
iSCSI volumes	Yes.
Challenge Handshake Authentication Protocol (CHAP) settings	Yes. You can specify the one-way CHAP authentication for clients.
Log management	Yes.
Gateway upgrade	Yes. You can upgrade gateways in the local gateway console or in the CSG console.



# 4.Specifications

This topic describes the specifications of in-cloud file gateways, local file gateways, in-cloud block gateways, and local block gateways.

## File gateways

File gateways are classified into in-cloud file gateways and local file gateways. [Table 1](#) and [Table 2](#) show the specifications of these file gateways.

## Specifications of in-cloud file gateways

Item	Description			
	Basic	Standard	Enhanced	Advanced
Type				
Storage protocol	Network File System Version 3 (NFSv3), NFSv4, and Server Message Block (SMB)	NFSv3, NFSv4, and SMB	NFSv3, NFSv4, and SMB	NFSv3, NFSv4, and SMB
Maximum number of files transferred between Object Storage Service (OSS)	10 million	50 million	100 million	500 million
Maximum capacity of file sharing systems (recommended)	64 TB	128 TB	256 TB	256 TB
Maximum number of file shares	NFS: 4, SMB: 4	NFS: 8, SMB: 8	NFS: 16, SMB: 16	NFS: 16, SMB: 16
Maximum number of clients concurrently connected to a gateway	NFS: 1,024, SMB: 1,024	NFS: 1,024, SMB: 1,024	NFS: 1,024, SMB: 1,024	NFS: 1,024, SMB: 1,024
Maximum bandwidth for synchronization with OSS	1 Gbit/s	2 Gbit/s	5 Gbit/s	10 Gbit/s
Encrypted transmission to OSS	Yes	Yes	Yes	Yes
Minimum cache capacity	40 GB	40 GB	40 GB	40 GB
Maximum gateway bandwidth	1 Gbit/s	2 Gbit/s	5 Gbit/s	10 Gbit/s

## Specifications of local file gateways

Item	Description		
Recommended configurations for virtual machines	4-core, 8 GB memory	8-core, 16 GB memory	16-core, 32 GB memory
Storage protocol	NFSv3, NFSv4, and SMB	NFSv3, NFSv4, and SMB	NFSv3, NFSv4, and SMB
Maximum number of files transferred between Object Storage Service (OSS)	50 million	50 million	50 million
Maximum capacity of file sharing systems (recommended)	128 TB	128 TB	128 TB
Maximum number of file shares (recommended)	NFS: 4, SMB: 4	NFS: 8, SMB: 8	NFS: 16, SMB: 16
Maximum number of file shares	NFS: 16, SMB: 16	NFS: 16, SMB: 16	NFS: 16, SMB: 16
Maximum number of clients concurrently connected to a gateway	NFS: 1,024, SMB: 1,024	NFS: 1,024, SMB: 1,024	NFS: 1,024, SMB: 1,024
Maximum bandwidth for synchronization with OSS	10 Gbit/s	10 Gbit/s	10 Gbit/s
Encrypted transmission to OSS	Yes	Yes	Yes
Minimum cache capacity	40 GB	40 GB	40 GB
Image format	OVA, VHD, and QCOW2	OVA, VHD, and QCOW2	OVA, VHD, and QCOW2

## Block gateways

Block gateways are classified into in-cloud block gateways and local block gateways. [Table 3](#) and [Table 4](#) show the specifications of these block gateways.

### Specifications of in-cloud block gateways

Item	Description			
	Basic	Standard	Enhanced	Advanced
Type	Basic	Standard	Enhanced	Advanced
Storage protocol	iSCSI	iSCSI	iSCSI	iSCSI
Maximum number of local data volumes	4	8	16	16
Maximum volume capacity	256 TB	256 TB	256 TB	256 TB
Maximum number of clients concurrently connected to a gateway	Not limited	Not limited	Not limited	Not limited
Maximum bandwidth for synchronization with OSS	1 Gbit/s	2 Gbit/s	5 Gbit/s	10 Gbit/s
Encrypted transmission to OSS	Yes	Yes	Yes	Yes
Cache settings	Write-through and cache	Write-through and cache	Write-through and cache	Write-through and cache
Bandwidth	1 Gbit/s	2 Gbit/s	5 Gbit/s	10 Gbit/s

## Specifications of local block gateways

Item	Description		
Recommended VM specifications	4-core, 8 GB memory	8-core, 16 GB memory	16-core, 32 GB memory
Storage protocol	iSCSI	iSCSI	iSCSI
Maximum volume capacity	256 TB	256 TB	256 TB
Recommended number of data volumes	16	64	128
Maximum number of data volumes	128	128	128
Maximum number of clients concurrently connected to a gateway	Not limited	Not limited	Not limited
Encrypted transmission to OSS	Yes	Yes	Yes
Minimum cache disk capacity	20 GB	20 GB	20 GB
Image format	OVA, VHD, and QCOW2	OVA, VHD, and QCOW2	OVA, VHD, and QCOW2

# 5. Gateway models and specifications

This topic introduces different gateway models and specifications.

## File gateways

- Models and features

The following table lists the features and scenarios supported by different gateway models.

	Basic	Standard	Enhanced	Advanced
Archive and storage	Not supported	Supported	Supported	Supported
Express sync	Not supported	Supported	Supported	Supported
Bandwidth	1 Gbit/s	2-2.5 Gbit/s	4.5-5 Gbit/s	10 Gbit/s
Capacity	64 TB	128 TB	256 TB	256 TB
Recommended cache disks	Ultra disks	Ultra disks	SSD and Enhanced SSD	SSD and Enhanced SSD
Recommended scenarios	Sharing and storage of a small volume of logs and data. Small websites and user-created FTP sites.	Sharing and storage of logs and data. Sharing data across multiple regions. Shared directories, user-created FTP sites, small-sized websites, data archives, and data warehouses.	Unified storage of data and logs. Archiving of large amounts of data. Data sharing among multiple regions. Medium-sized websites, virtual desktop infrastructure (VDI)-based shared directories, code libraries, and data warehouses.	Unified storage of data and logs. Archiving of large amounts of data. Data sharing among multiple regions. Large-sized websites, VDI-based shared directories, code libraries, and data warehouses.
Recommended number of active clients	≤ 5	≤ 20	≤ 50	≤ 150

• Features and prices

The following table lists the specifications of the express sync and remote sync features. Choose the features based on your actual needs.

	Number of files	Metadata synchronization rate	File change synchronization frequency	Monthly cost
Express sync	> 5,000,000	Maximum synchronization rate: 1,000 incremental files per second.	Less than one second. The maximum update interval is the refresh interval of the NFS/SMB client cache.	Fixed. If the number of API calls is less than 20,000,000, the cost of each month (30 days) is calculated as: $(2+0.5 \times \text{number of shares}) \times 30$ .
Remote sync	< 5,000,000	The synchronization rate depends on the scanning and matching time.	More than 15 seconds. The maximum update time is two times of the remote sync interval.	Costs are based on the scanning interval and total number of files.

### Block gateways

The following table lists the features and scenarios supported by different block gateway models.

	Basic	Standard	Enhanced	Advanced
Bandwidth	1 Gbit/s	2-2.5 Gbit/s	4.5-5 Gbit/s	10 Gbit/s
Recommended cache disks	Ultra Disk	Ultra Disk	SSD and Enhanced SSD	SSD and Enhanced SSD
Recommended scenarios	Large data disks (larger than 32 TB) and data backup volumes	Large data disks (larger than 32 TB), SMB volumes, and user-created FTP sites.	Large data disks (larger than 32 TB), medium-sized websites, DFS volumes, code libraries, and user-created FTP sites.	Large data disks (larger than 32 TB), medium-sized websites, DFS volumes, code libraries, and user-created FTP sites.
Recommended number of active volumes	≤ 2	≤ 4	≤ 8	≤ 16

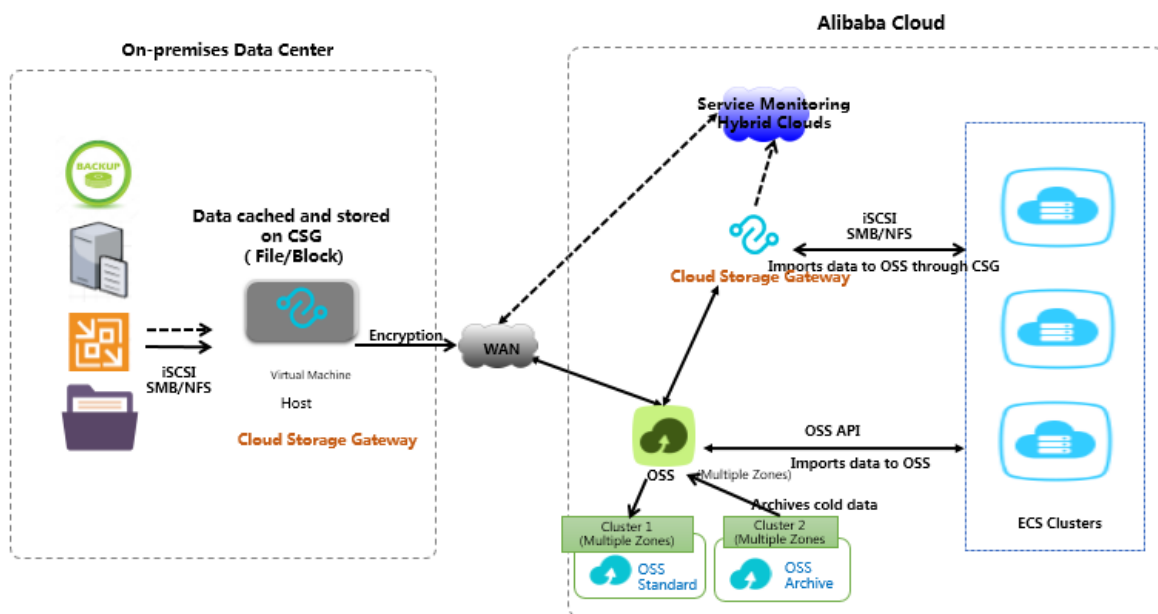
# 6.Scenarios

This topic describes the typical scenarios of Cloud Storage Gateway (CSG).

## Storage expansion and data migration

CSG is integrated with intelligent caching algorithms, which automatically distinguish between hot and cold data. This technology allows CSG to store cold data in the cloud and retain hot data in the local cache to accelerate hot data retrieval. When you connect your on-premises data center to cloud storage services, your users can retrieve the requested resources without noticing this cross-site link. This enables you to expand your storage from your own data center to cloud storage. The cloud also keeps a full copy of the hot data. This guarantees the integrity of your data (hot and cold data). CSG applies to the following scenarios:

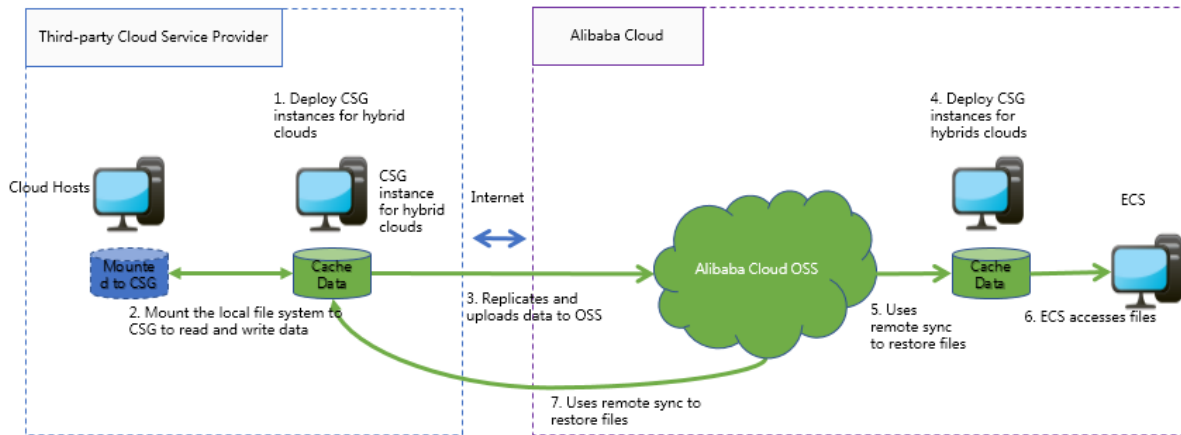
- **Share data and files:** In this scenario, files and data are shared among different computing clusters.
- **Back up data:** In this scenario, data from applications is synchronized to Alibaba Cloud Object Storage Service (OSS) through CSG and backup software, for example, Veeam and NBU.
- **Archive cold data:** In this scenario, CSG synchronizes your cold data from your local file system or ECS instances to OSS IA and Archive buckets. This helps you save local storage space and maximize the utilization of your local and cloud storage resources.





### Cloud disaster recovery

With the development of cloud computing, an increasing number of users are running their workloads in the cloud. The reliability and continuity of workloads running in the cloud have become critical issues. CSG supports virtualization. You can easily connect third-party services to Alibaba Cloud services to achieve disaster recovery.

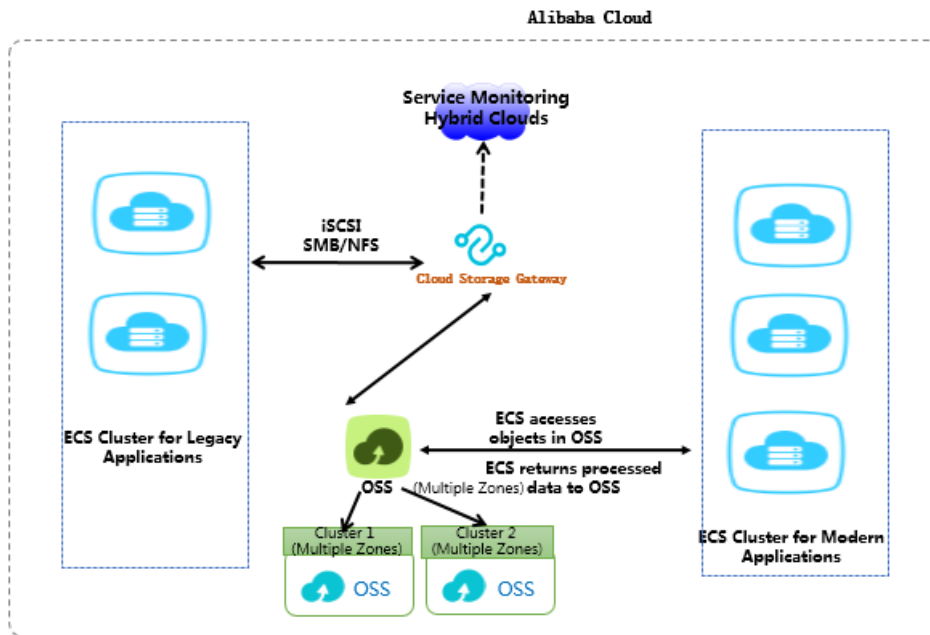


### Data sharing and distribution in multiple regions

You can deploy CSG instances in multiple regions and associate the CSG instances with the same OSS bucket to quickly share and distribute files across multiple regions. This feature is applicable to branch offices where data needs to be synchronized and shared.

### Compatible with legacy applications

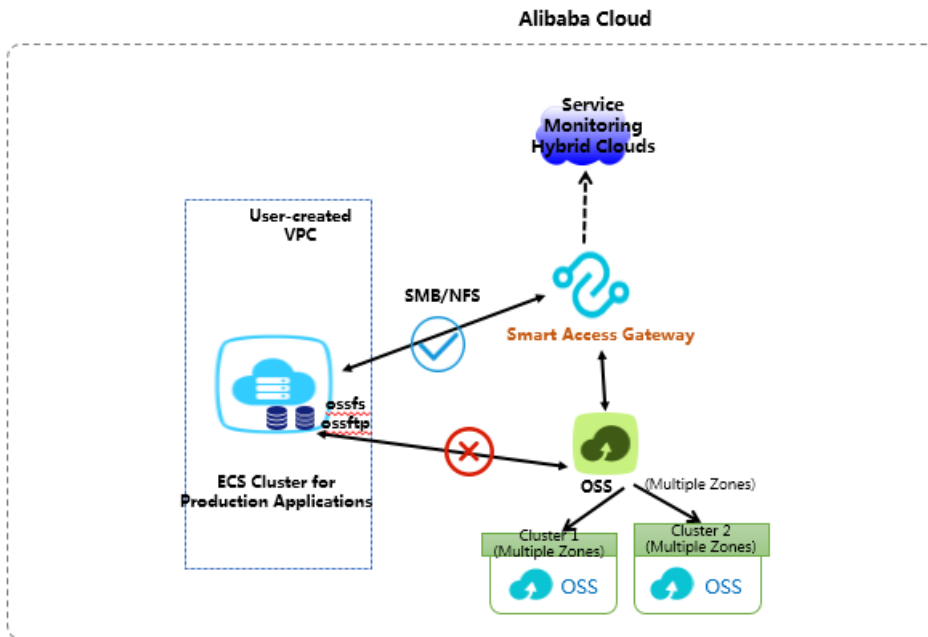
Some users may run both legacy and modern applications in the cloud. In this case, the legacy applications that were migrated from an on-premises deployment have to use standard storage protocols, such as NFS, SMB, and iSCSI. Modern applications are typically based on new technologies and support object access protocols. Data communication among applications using different protocols requires complicated processes. CSG can establish communications among applications using different protocols and enable data to be exchanged between legacy and modern applications.



### An alternative to ossfs and ossftp

ossfs and ossftp are open-source tools based on file protocols. You can use ossfs and ossftp to directly upload files to OSS. However, ossfs and ossftp are not supported in the production environment due to their low compatibility with POSIX. Using ossfs and ossftp to mount file systems to a client also requires additional configurations and caches. In scenarios where you need to use ossfs and ossftp to mount file systems to multiple clients, the configuration process may take a long time.

CSG is an excellent alternative to ossfs and ossftp. To accelerate access to data stored on OSS, create a CSG instance, mount an NFS share to your local client, or map an SMB share to a network drive in the Windows operating system. You can then manage data in the remote OSS bucket in the same way as managing it in the local file system.



# 7. Instructions

Before you run Cloud Storage Gateway (CSG) instances, you must carefully read the following instructions.

## File gateways

- the total file storage usageWe recommend that you do not frequently interrupt uploading large files to Network File System (NFS) or Server Message Block (SMB) shares. The system uploads files by using multipart upload. If you interrupt uploading large files, the corresponding Object Storage Service (OSS) buckets generate file fragments. These fragments are calculated in the consumption of space for OSS buckets. Therefore, the evaluated space of OSS buckets is slightly larger than . You can use the automatic fragment deletion policy that OSS supports to manage file fragments. For more information, see [Manage parts](#).
- The cache capacity for file sharing is calculated in this way: Recommended local cache capacity = [Application bandwidth (MB/s) - Backend bandwidth of a gateway (MB/s)] × Write duration (s) × 1.2.  
If you require an excellent I/O throughput when you use a local cache disk, you can estimate the total amount of hot data. Compare the total amount of hot data with the recommended local cache capacity, and specify the larger value as the capacity of the local cache disk.
- We recommend that you do not write multiple large files at the same time. Otherwise, the cache disk space may be exhausted.If you want to write large files by using a file gateway, the size of each file must be smaller than 30% of the cache disk capacity.
- File gateway version 1.0.30 and earlier support the file space of 122 GB or less. File gateway versions 1.0.31 to 1.0.37 support the file size of 1.2 TB or less. The file larger than 1.2 TB cannot be uploaded to OSS. File gateway version 1.0.38 and later support the file size of 30 TB or less. When you upload a large file that is larger than 2 TB, we recommend that the public bandwidth be 500 Mbit/s or more, or that you connect to Alibaba Cloud through a leased line. Otherwise, upload timeout may occur.
- File gateway version 1.0.31 and later support sparse files. If you fail to upload a sparse file to a file gateway, run the following command to convert the format of the sparse file:

```
dd if=<sparse file name> of=<sparse file name> conv=notrunc bs=1M
```

The size of the sparse file cannot exceed the available capacity of the cache disk.

## In-cloud file gateways

- The CSG console uses the HTTPS protocol. Network storage protocols such as NFS and SMB require some special ports. Therefore, you must configure the firewall or security group rules for the CSG console to support these ports.
  - CSG version 1.0.32 and later support AD and LDAP domains. Therefore, you must configure the following service ports for the domains: LDAP, AD, Domain Name System (DNS), and Kerberos. To specify security group rules, you must configure CIDR blocks and security groups. For more information, see [Add security group rules](#). In the same Virtual Private Cloud (VPC) and under the same Alibaba Cloud account, if a gateway and a domain server fall into different security groups, you can configure the security group rules to authorize connections between these two security groups. Afterward, you must add the following rules to the security group of the domain server: TCP 53/636 and UDP 53/636.
  - To support NFS and SMB, the corresponding service ports listed in the following table are configured in the inbound rule of the security group of CSG. After you create an in-cloud file gateway, the security group has these ports configured by default. The LDAP and AD ports are configured in the inbound rules of the security group of a domain server.

Protocol	Port
HTTPS	443 and 8080
NFS	111 (UDP and TCP), 875 (UDP and TCP), 892 (UDP and TCP), 2049 (UDP and TCP), 32887 (UDP and TCP), 32888 (UDP and TCP), and 32889 (UDP and TCP)
SMB	137 (UDP), 138 (UDP), 139 (TCP), 389 (TCP), 445 (TCP), and 901 (TCP)
SSH	22
LDAP	389 (UDP and TCP) and 636 (UDP)
AD	445 (UDP and TCP)
DNS	53 (UDP and TCP)
Kerberos	88 (UDP and TCP)

- The synchronization bandwidth of a file gateway is determined by the OSS bandwidth. OSS supports the bandwidth of 10 Gbit/s or less. The bandwidth slightly varies for clusters in different regions. For more information, request the OSS customer service in each region.
- After you create an in-cloud file gateway, the gateway has a security group that is prefixed with Cloud\_Storage\_Gateway\_Usage configured by default. Do not use this security group when you create ECS instances.
- When OSS buckets store more than one million files, we recommend that you specify an interval of more than 3,600 seconds for remote synchronization.
- Version 1.0.36 and later automatically specify a Multipurpose Internet Mail Extensions (MIME) type in the OSS metadata based on the file suffix.
- When the Enable Remote Sync parameter is set to Yes, local empty directories that are not uploaded to Alibaba Cloud may be deleted by the remote synchronization process during a scanning cycle. You can create the directories again to solve this issue.

- the Internet upload bandwidthBy default, of gateways deployed in Alibaba Cloud is 1 Mbit/s. These gateways access OSS buckets across regions based on public endpoints. As a result, the data transmission performance may not be stable.

## Local file gateways

- To use local file gateways, you must enable the following ports for the firewall of your client.

Protocol	Port
HTTPS	443
NFS	111 (UDP and TCP), 875 (UDP and TCP), 892 (UDP and TCP), 2049 (UDP and TCP), 32887 (UDP and TCP), 32888 (UDP and TCP), and 32889 (UDP and TCP)
SMB	137 (UDP), 138 (UDP), 139 (TCP), 389 (TCP), 445 (TCP), and 901 (TCP)
SSH	22
LDAP	389 (UDP and TCP) and 636 (UDP)
AD	445 (UDP and TCP)
DNS	53 (UDP and TCP)
Kerberos	88 (UDP and TCP)

## Block gateways

- The cache capacity of Internet Small Computer Systems Interface (iSCSI) volumes is calculated in this way: Recommended local cache capacity = [Application bandwidth (MB/s) - Backend bandwidth of a gateway (MB/s)] × Write duration (s) × 1.2.  
If you require an excellent I/O throughput when you use a local cache disk, you can estimate the total amount of hot data. Compare the total amount of hot data with the recommended local cache capacity, and specify the larger value as the capacity of the local cache disk.
- The synchronization bandwidth of a block gateway is determined by the OSS bandwidth. OSS supports the bandwidth of 10 Gbit/s or less. The bandwidth slightly varies for clusters in different regions. For more information, request the OSS customer service in each region.
- The default input/output operations per second (IOPS) are determined by the backend disk capacity. An ultra disk supports the bandwidth of 110 MB/s or less. An SSD disk supports the bandwidth of 230 MB/s or less.
- To use block gateways, you must enable the following ports for the firewall of your client.
  - In-cloud block gateways

Protocol	Port
iSCSI	860 (TCP) and 3260 (TCP)

- Local block gateways

Protocol	Port
HTTPS	443
iSCSI	860 (TCP) and 3260 (TCP)

# 8. Reliability and consistency

This topic describes the reliability and consistency of Cloud Storage Gateway (CSG).

## Reliability

- In the cache mode, data is written to a disk by using synchronous I/O to prevent data loss due to power failures.
- CSG ensures the durability and reliability of data in the local cache disks by using Alibaba Cloud disks.
- On-premises gateways depend on the reliability of the backend storage in your virtual environment. We recommend that you use Redundant Array of Independent Disks (RAID) storage or a distributed storage system as local cache disks.
- CSG refreshes and uploads data in the local cache disks to an OSS bucket. Alibaba Cloud OSS guarantees 99.999999999% reliability. This ensures data security and reliability when you transfer data from the gateway to Alibaba Cloud.

## Consistency

- A 64-bit cyclic redundancy check (CRC-64) is implemented on the data that is uploaded to an OSS bucket from the gateway. If you send data from your data center to an OSS bucket, a checksum is generated and sent along with the data. Another checksum is generated by OSS and compared with the checksum that is received by OSS. If the two are equal, the uploading process is complete.
- If you upload a small file to an OSS bucket, the file gateway generates a checksum of the file. If you upload a large file in multiple parts to an OSS bucket, the file gateway implements CRC-64 on each part. This ensures consistency between the two checksums that are generated in your data center and the OSS bucket.
- A block gateway splits iSCSI volumes into storage allocation units. If you upload data in multiple units to an OSS bucket, the block gateway implements CRC-64 on the data in each unit. This ensures that the persistent data in the cloud is consistent with the data you write.