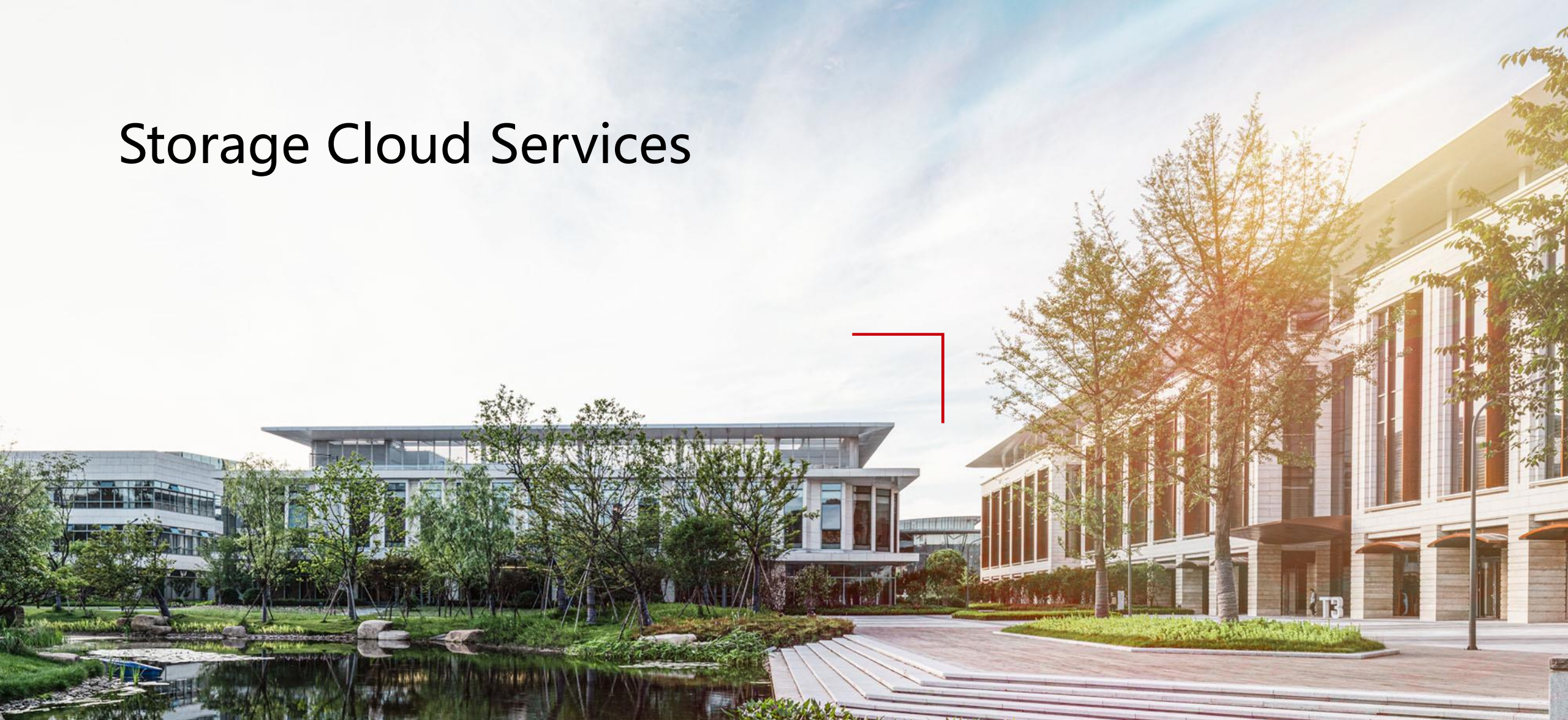


# Storage Cloud Services



# Foreword

- Data is everywhere. We use USB flash drives and cloud disks to store data, and these devices are called storage devices. That is enough for most of us, but what do you use if you are an enterprise? In today's age of cloud computing, what are the most common storage cloud services?
- In this section, we will cover some common storage services on HUAWEI CLOUD.

# Objectives

- Upon completion of this course, you will:
  - Acquire a basic understanding of cloud storage.
  - Understand the principles behind and uses of common storage services on HUAWEI CLOUD.

# Storage Services Overview



Elastic Volume Service  
EVS



Volume Backup Service  
VBS



Storage Disaster  
Recovery Service  
SDRS



Cloud Server  
Backup Service  
CSBS



Scalable File Service  
SFS



Dedicated Distributed  
Storage Service  
DSS



Data Express Service  
DES



Object Storage Service  
OBS



Cloud Backup and  
Recovery  
CBR

# Contents

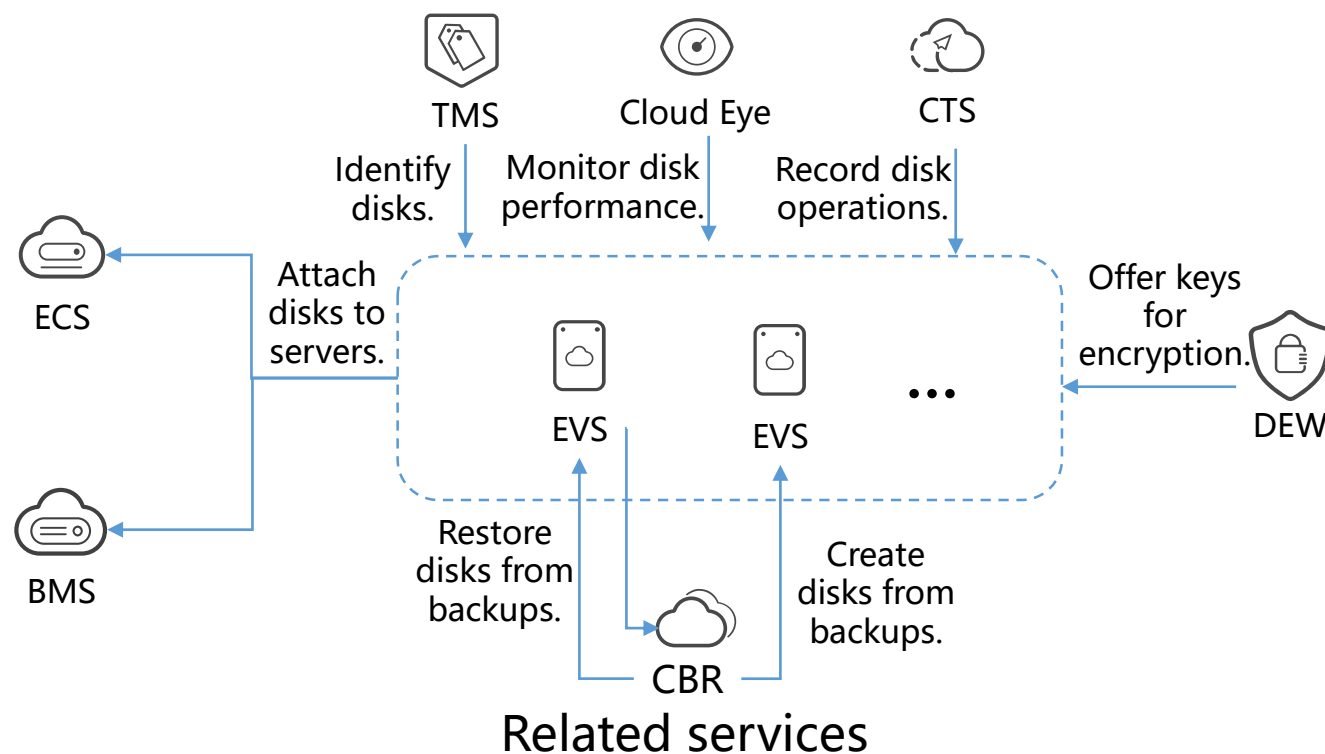
## **1. Elastic Volume Service**

## 2. Object Storage Service

## 3. Scalable File Service

# What Is EVS?

- Elastic Volume Service (EVS) offers scalable block storage for cloud servers. EVS disks offer high reliability and excellent performance. They can be used for distributed file systems, development and testing environments, data warehouse applications, and high-performance computing (HPC).





# EVS Advantages

## Various disk types

- Choose from a range of disk types with different I/O performance specifications.

## Real-time monitoring

- With Cloud Eye, you can monitor EVS disk health in real time.

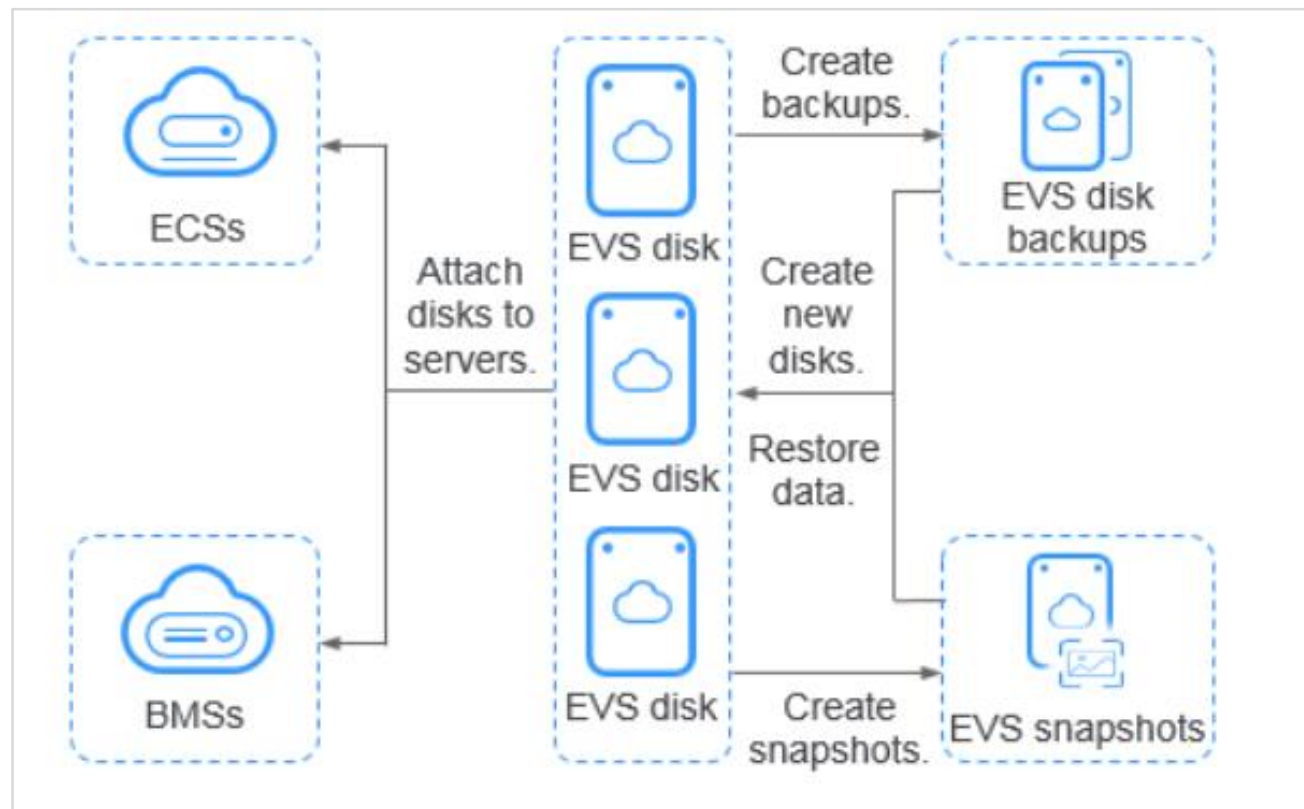
## Elastic scalability

- You can expand capacity on-demand and without interrupting services.

## High security and reliability

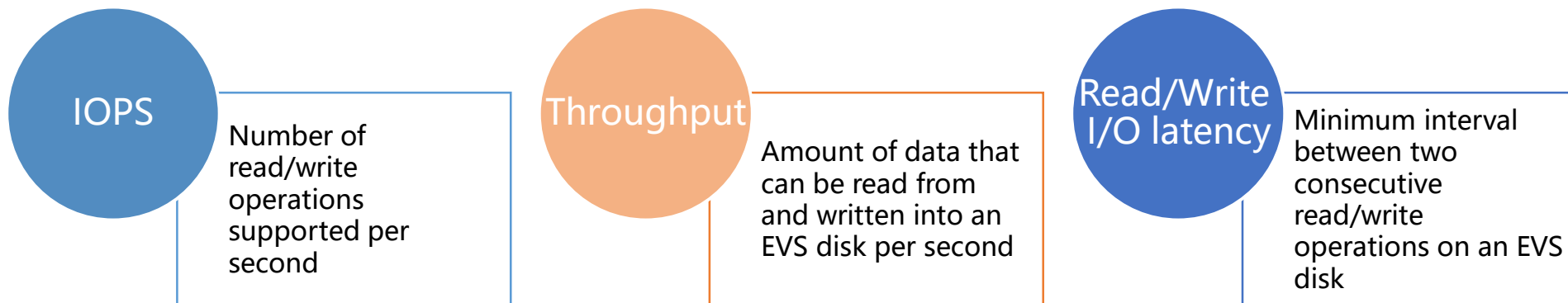
- EVS provides high durability and supports data protection mechanisms including encryption, backup, and snapshot.

# EVS Architecture





# EVS Performance Metrics



Parameter	Extreme SSD	Ultra-high I/O	General Purpose SSD	High I/O
Short description	For workloads that demand super-high bandwidth and super-low latency	High-performance disks, excellent for enterprise mission-critical services as well as workloads demanding high throughput and low latency	Cost-effective disks suitable for enterprise office applications	Disks suitable for commonly accessed workloads
Maximum IOPS (for reference)	128,000	50,000	20,000	5,000
Maximum throughput (for reference)	1,000 MB/s	350 MB/s	250 MB/s	150 MB/s
Single-queue access latency (for reference)	200 $\mu$ s	1 ms	1 ms	1 ms to 3 ms
Typical application scenarios	Databases AI scenarios	Read/write-intensive applications that require ultra-large bandwidth, transcoding services, I/O-intensive scenarios, and latency-sensitive applications	Enterprise office applications, large-scale development and testing, transcoding services, and container system disks	Common office applications, light-load development and testing, and non-system disks

# EVS Device Types

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

## VBD

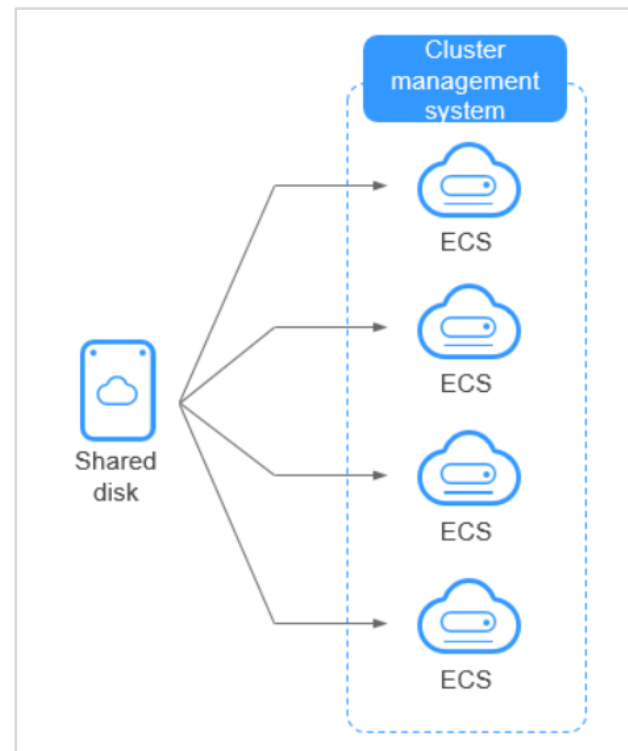
- VBD is the default EVS device type.
- VBD EVS disks support only basic read/write SCSI commands.

## SCSI

- SCSI EVS disks support transparent SCSI command transmission and the cloud server OS can directly access the underlying storage media.
- Besides basic read/write SCSI commands, SCSI EVS disks also support more advanced SCSI commands.

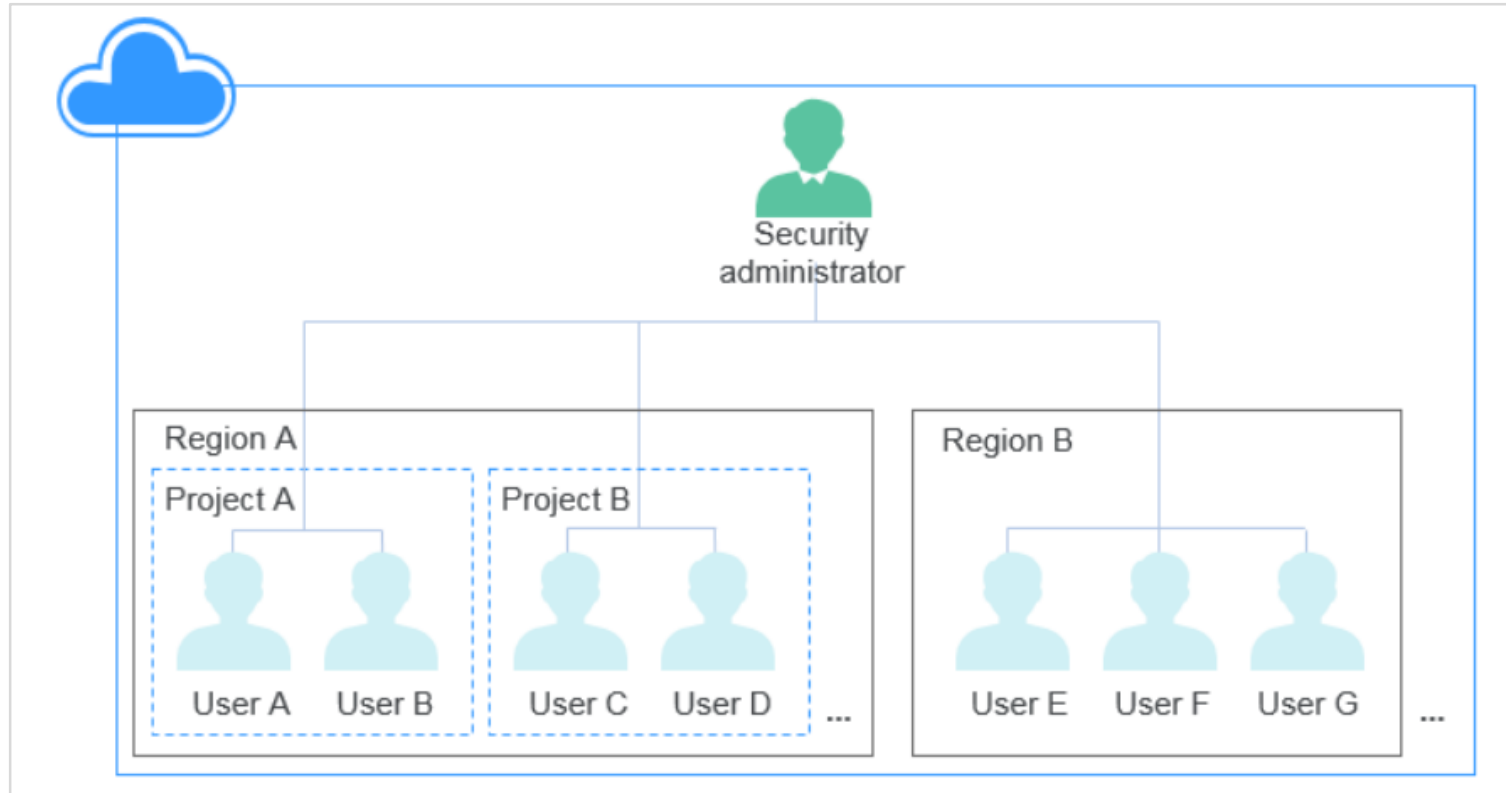
# Shared EVS Disks

- A shared EVS disk can be attached to multiple ECSs or BMSs, and supports concurrent access. Shared EVS disks feature multiple attachments, high-concurrency, high-performance, and high-reliability. They are often used for mission-critical applications that require cluster deployment for high availability (HA).



# EVS Disk Encryption

- EVS disks can be encrypted in case your services require extra security.



# EVS Disk Backup

- CBR cloud disk backup allows you to create backups for EVS disks to safeguard the important data on your disks. You can back up EVS disks on the console without stopping the cloud servers. If anything happens to an EVS disk, you can restore the disk data to any point in the past when the backup was created. Disk backups help ensure the integrity and security of your data.

Associated Disk

Configure

Skip

Disk List

All statuses

ID

68b8c851-...

x

Q

C

<input checked="" type="checkbox"/>	Name	Status	ECS/BMS	Capacity (GB)	Ass...
<input checked="" type="checkbox"/>	ecs-123 68b8c851-5244-...	✓ Avail...	--	10	No

Selected Disks (1)

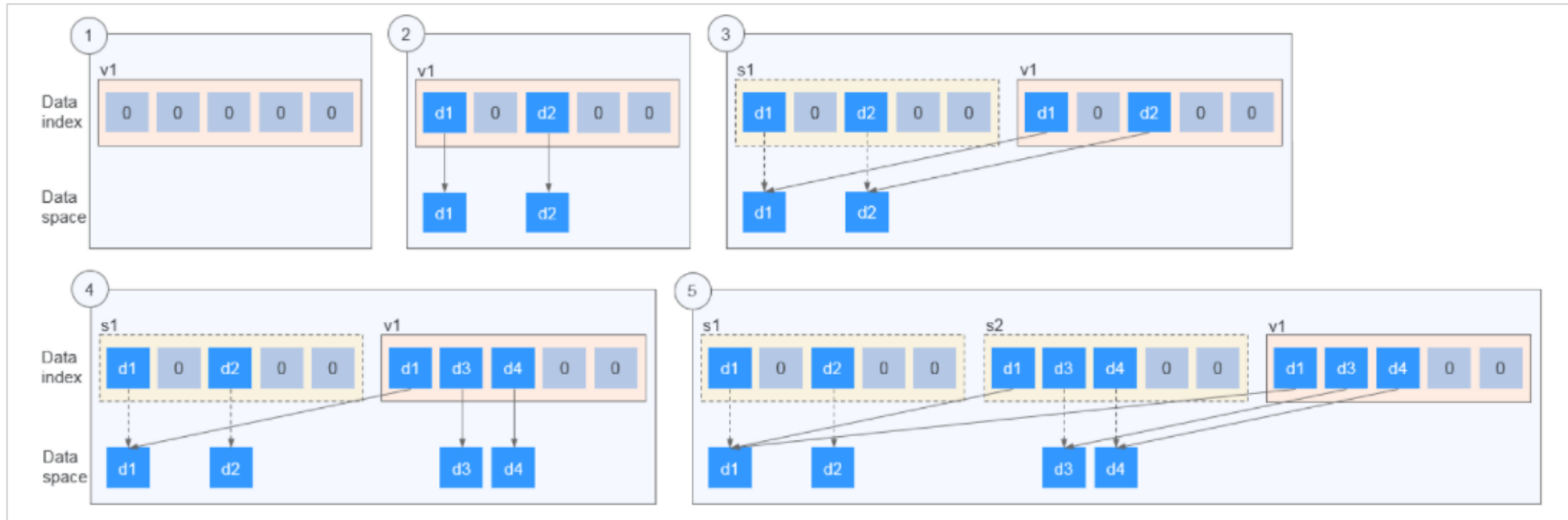
Name

Q

Name	Status	ECS/BMS	Capacity (GB)	Operation
ecs-123 68b8c851-5244-...	✓ Avail...	--	10	

# EVS Snapshot

- An EVS snapshot is a complete copy or image of the disk data taken at a specific point in time. They are used for disaster recovery. If anything happens, you can completely restore the disk data to the state from when the snapshot was taken.





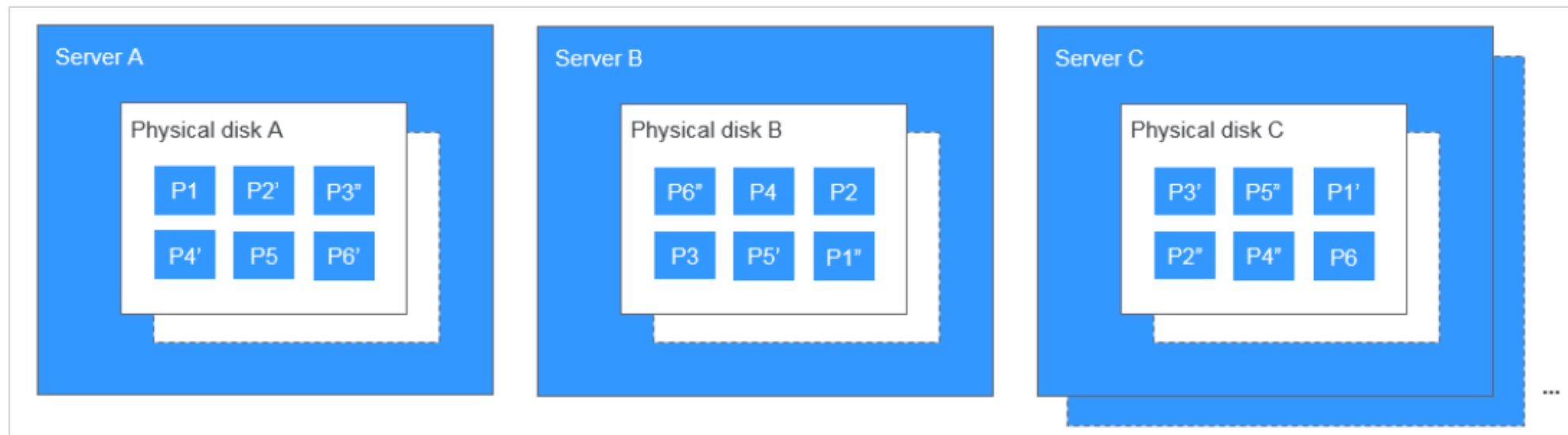
# Differences Between EVS Disk Backup and EVS Snapshot

- Both EVS disk backups and snapshots provide redundancy for the EVS disk data. They improve reliability. The following table lists the differences between them.

Item	Data Storage	Data Synchronization	Disaster Recovery Scope	Service Recovery
Backup	Backup data is stored in OBS, instead of EVS disks. Data can be restored even when the EVS disk is damaged.	A backup is a complete copy of a disk at a given point in time. You can also schedule auto backups by configuring backup policies. The backup will not be deleted even if the EVS disk is deleted.	A backup and its source EVS disk have to be in the same AZ. Cloud server backups, in contrast, can be replicated across regions.	You can restore a backup to the original disk or choose to restore it to a new disk. Backups ensure excellent data reliability.
Snapshot	The snapshots are stored with the disk data.	A snapshot is the state of an EVS disk at a specific point in time. When an EVS disk is deleted, its snapshots are also deleted.	The snapshots are in the same AZ as their source EVS disks.	You can use a snapshot to roll back an EVS disk to a previous state, or you can restore the data to a new EVS disk.

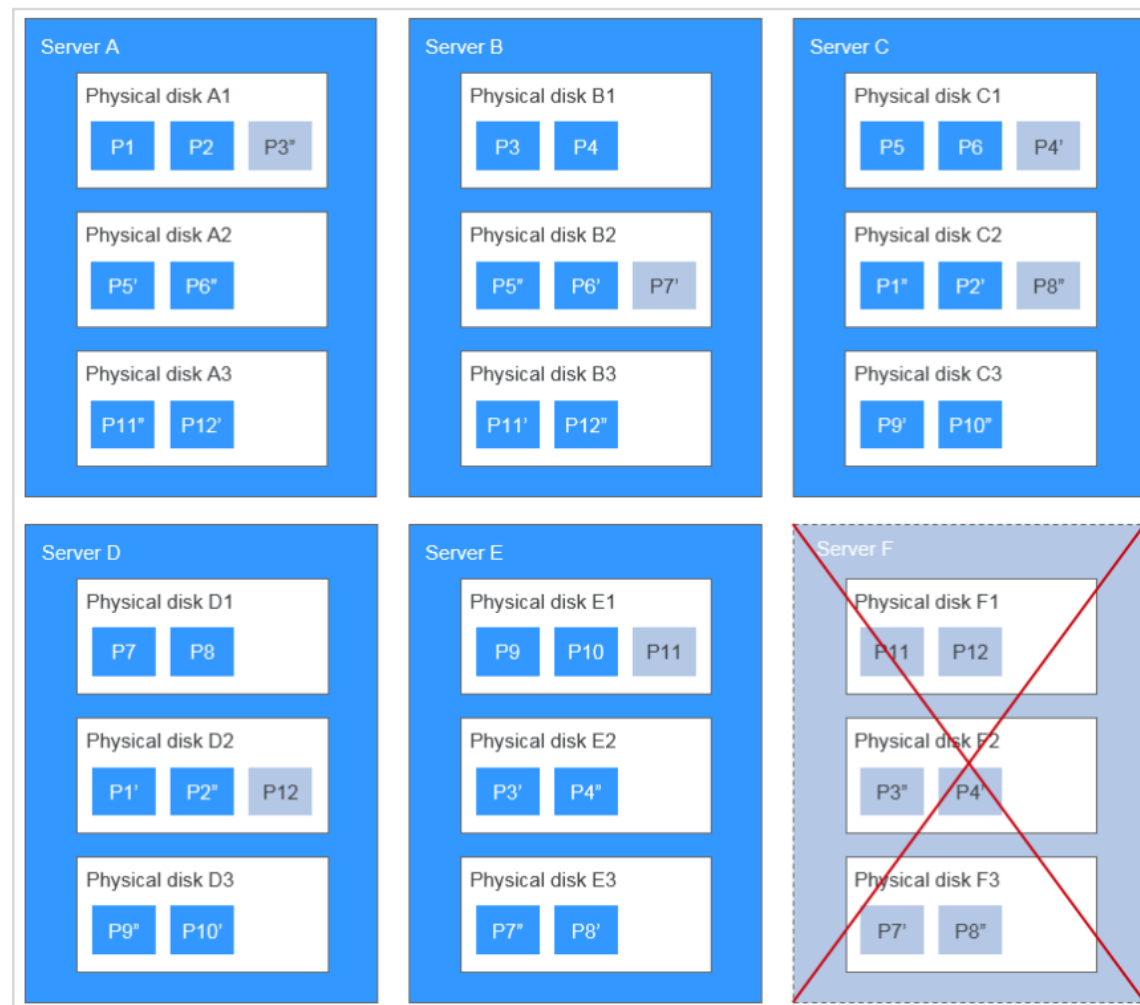
# EVS Three-Copy Redundancy

- The backend storage system of EVS uses three-copy redundancy to guarantee data reliability. Every piece of data is, by default, divided into 1 MB blocks. Three copies of each block are then saved and stored on different nodes in the system based on distribution algorithms. Three-Copy Redundancy has the following features:
  - The storage system automatically distributes three copies of data to different physical disks on different servers. The failure of a single piece of hardware does not affect services.
  - The storage system guarantees strong consistency among data copies.

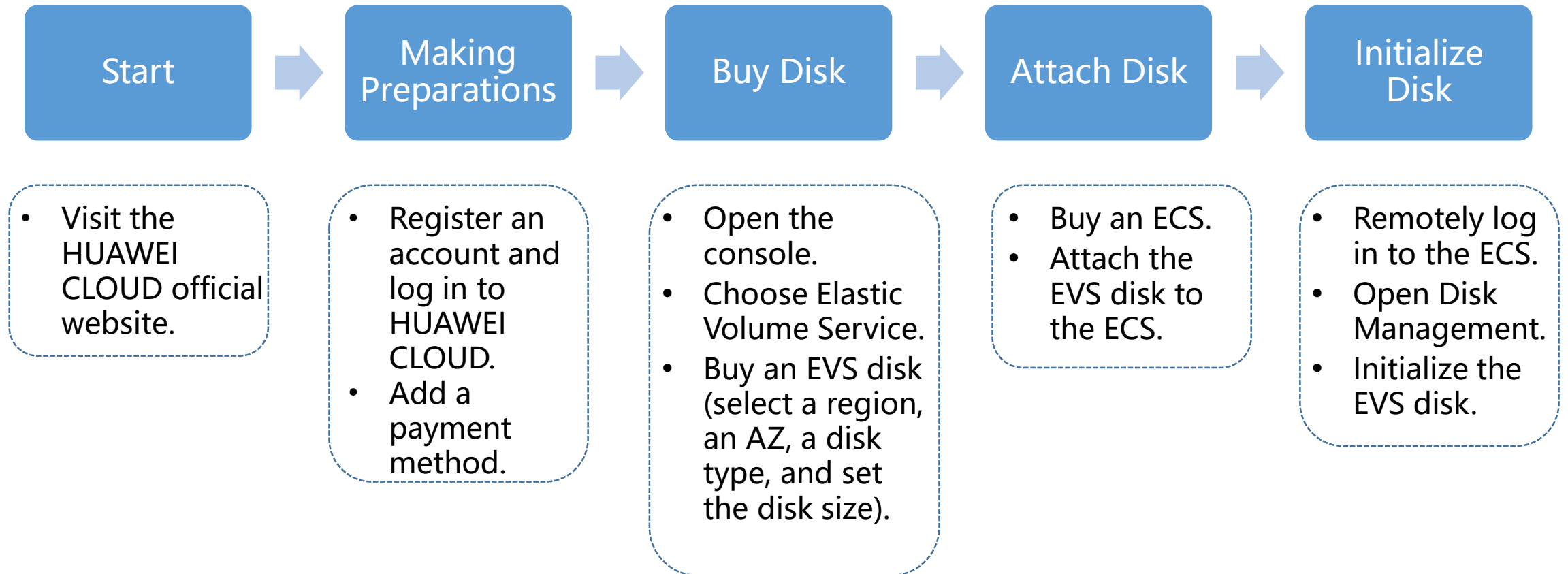


# Data Rebuild

- If a physical server or disk fault is detected, the storage system automatically rebuilds the data. Since data copies are distributed on different storage nodes, data can be rebuilt on different nodes at the same time and each node has only a small amount of data to be rebuilt. This mechanism prevents performance deterioration caused by restoration of a large amount of data on a single node, and therefore minimizes impacts on upper-layer services.

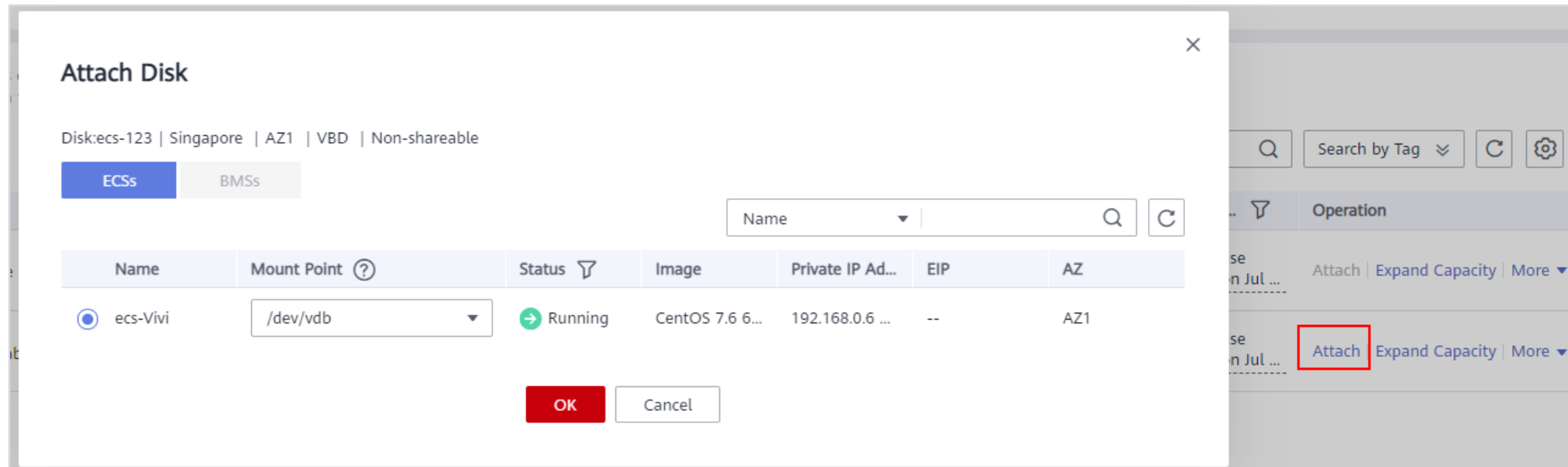


# EVS Configuration Process



# Attaching an EVS Disk

- An EVS disk cannot be used alone. It can be accessed and used only after being attached to an ECS or BMS and initialized.
  - A non-shared EVS disk can be attached to only one server.
  - A shared EVS disk can be attached to up to 16 servers in the same AZ.



# Discussion

- What are the differences between EVS disks and other forms of online storage?
- What are the differences between three-copy redundancy, EVS disk backups, and EVS snapshots?



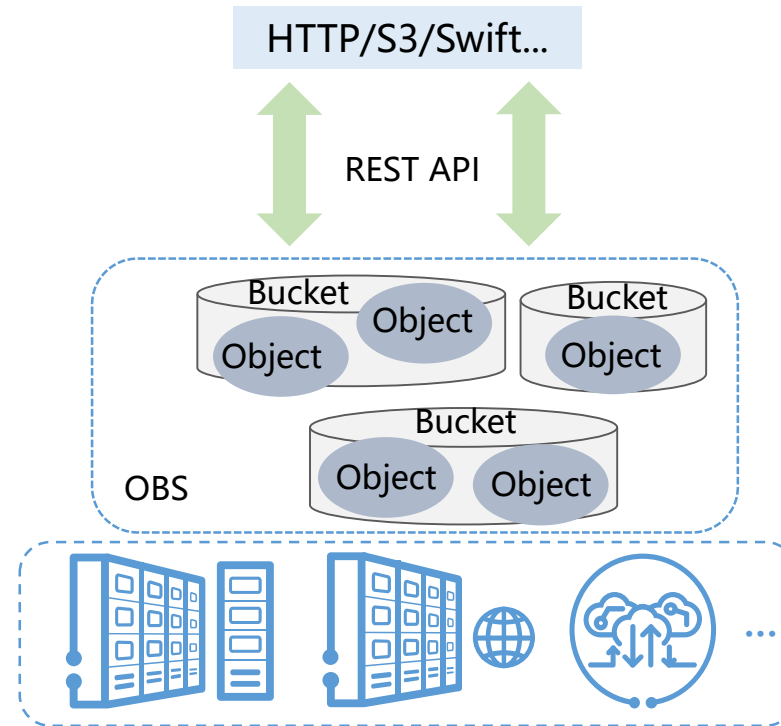


# Contents

1. Elastic Volume Service
- 2. Object Storage Service**
3. Scalable File Service

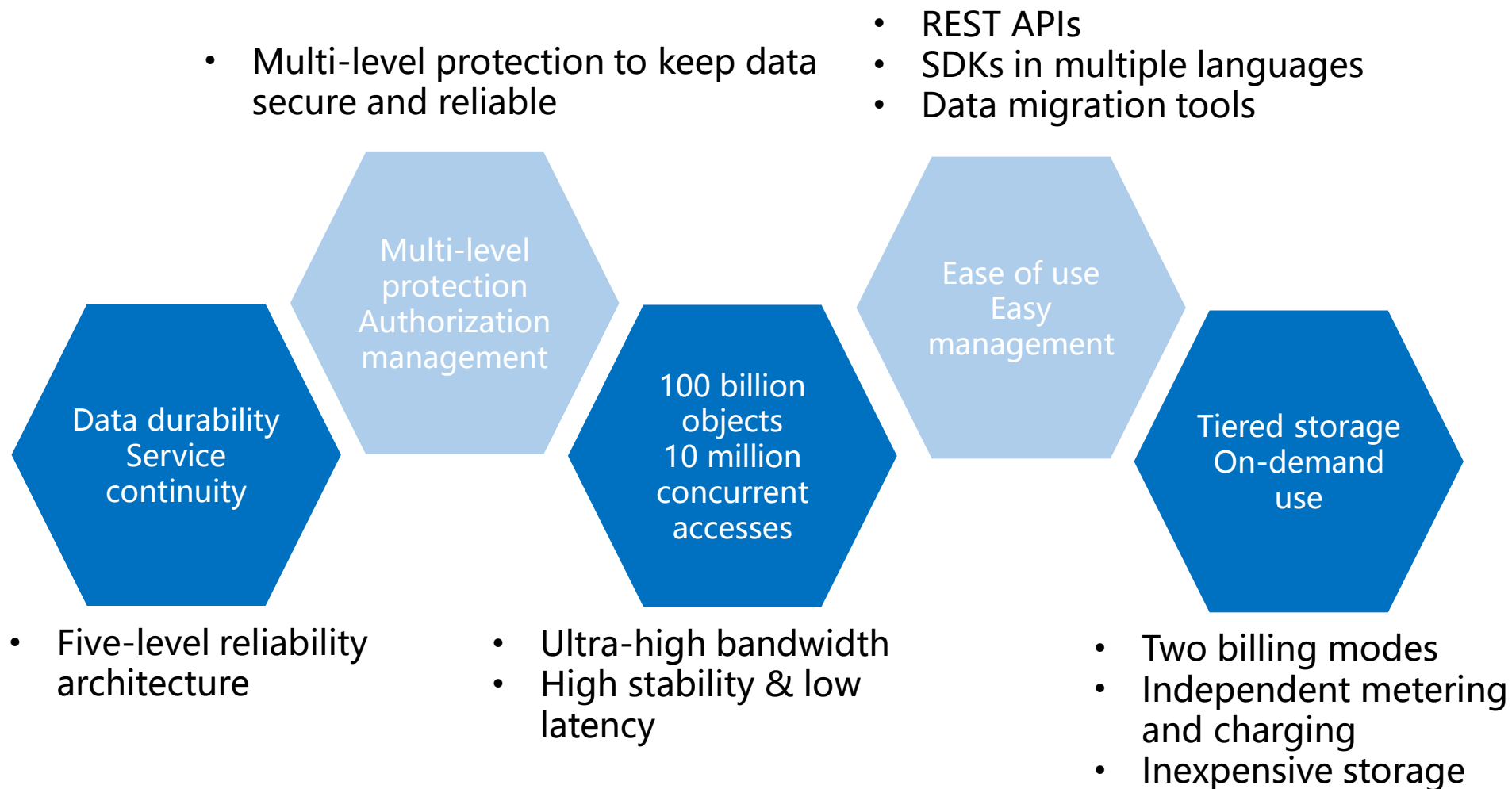
# What Is OBS?

- Object Storage Service (OBS) is a cloud storage service optimized for storing massive amounts of data. It provides unlimited, secure, and highly reliable storage capabilities at a relatively low cost.



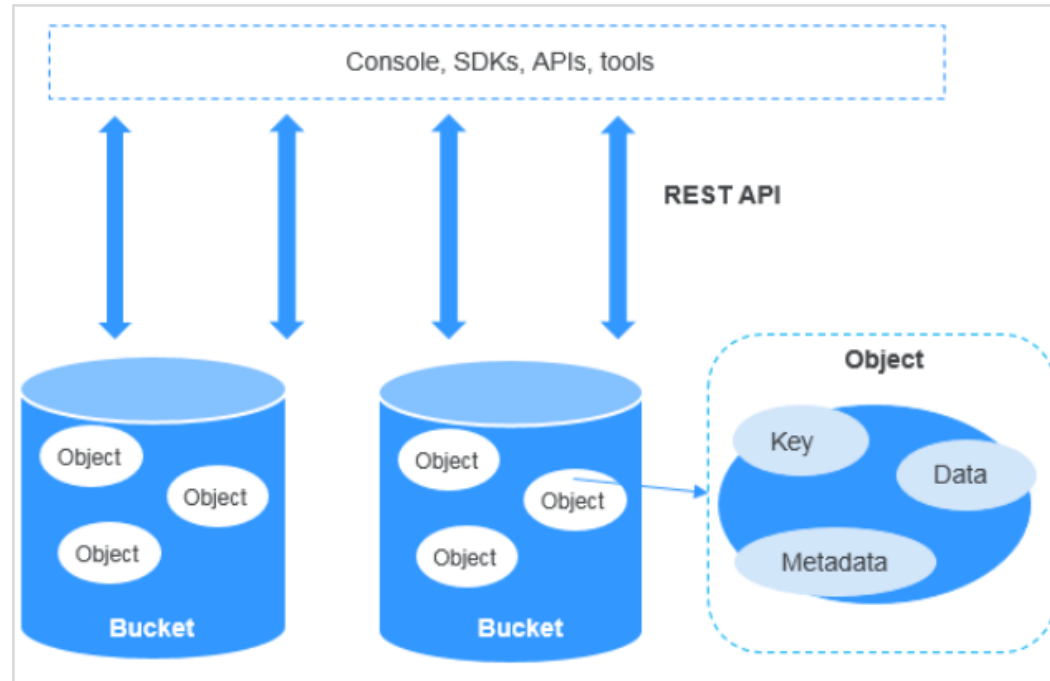
- Flat structure, isolated tenant data
- Users can create buckets (like folders) where they can upload objects to or download objects from, and share objects using links.

# OBS Advantages



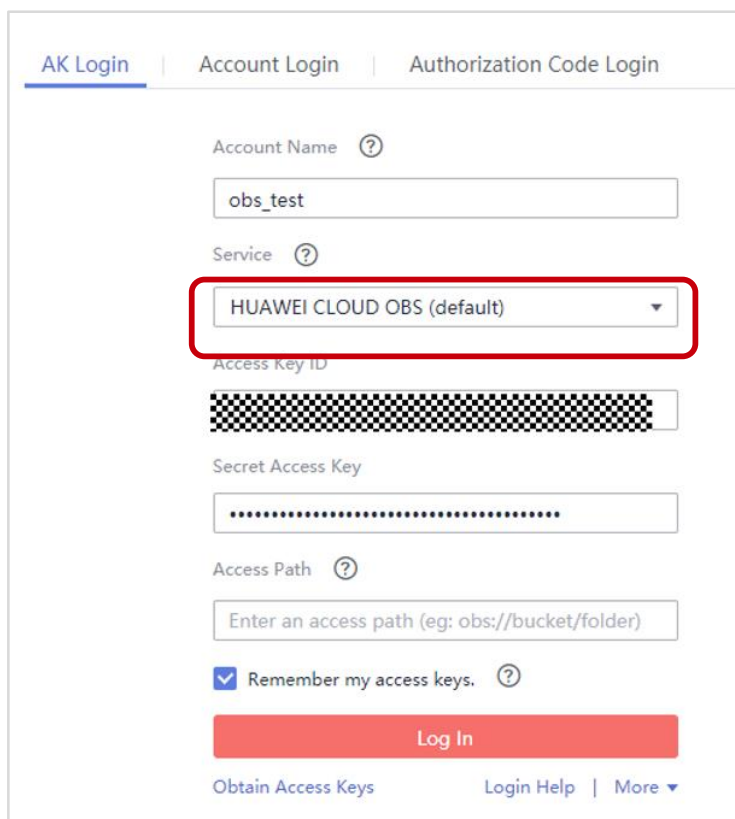
# OBS Architecture

- A bucket is a container for storing objects in OBS. OBS stores all objects in the same logical layer, realizing a flat storage structure instead of a hierarchical one.
- An object is the basic data storage unit in OBS, which is a file and any metadata that describes the file. Data is stored as objects in OBS buckets. An object consists of three parts: key, metadata, and data.



# Permanent AK/SK Pair

- OBS supports authentication using an AK/SK pair. It leverages the AK/SK-based encryption to authenticate a request sender. Users can create a permanent AK/SK pair on the My Credentials page.



The screenshot shows the 'AK Login' tab of a login interface. It contains the following fields and elements:

- Account Name**: A text input field containing 'obs\_test'.
- Service**: A dropdown menu with 'HUAWEI CLOUD OBS (default)' selected. This field is highlighted with a red rectangle.
- Access Key ID**: A text input field containing a masked value (black and white checkered pattern).
- Secret Access Key**: A text input field containing a masked value (black dots).
- Access Path**: A text input field with the placeholder text 'Enter an access path (eg: obs://bucket/folder)'.
- Remember my access keys**: A checked checkbox.
- Log In**: A red button.
- Obtain Access Keys**: A link.
- Login Help**: A link.
- More**: A dropdown arrow.

# Temporary AK/SK Pair

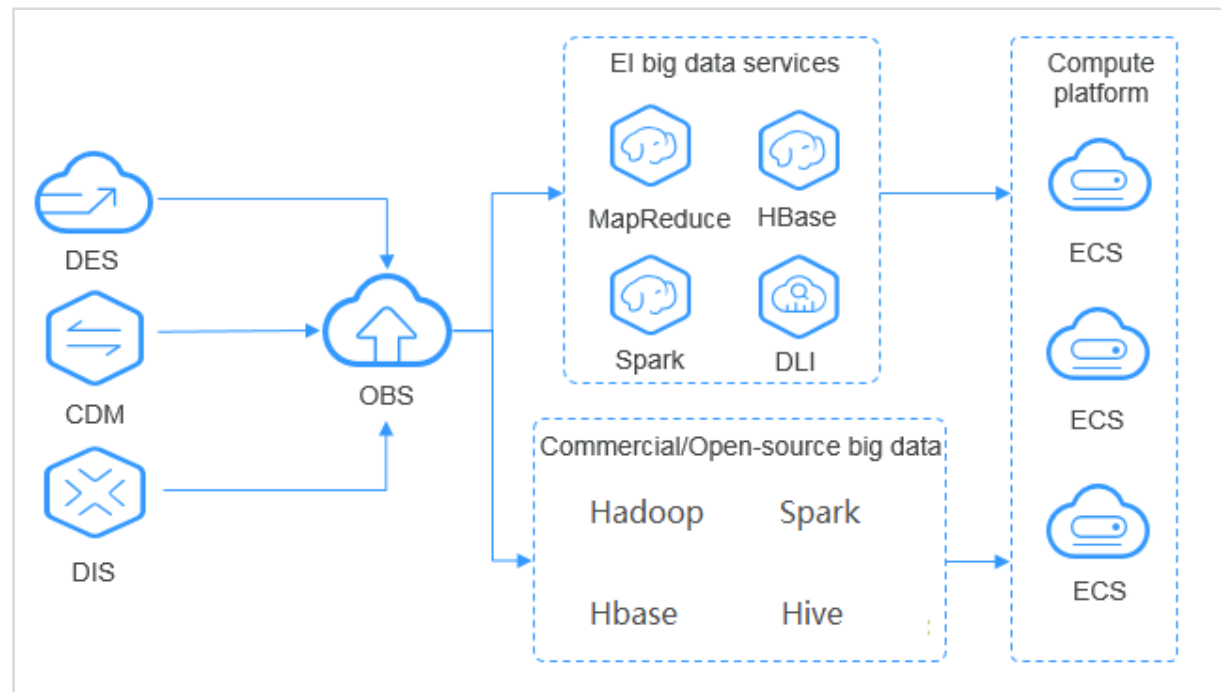
- Temporary AK/SK and security token issued by the system to users are valid for 15 minutes to 24 hours. The temporary AK/SK and security token comply with the least privilege principle and can be used to temporarily access OBS. Error code 403 will be returned if a request does not have a security token.

Status Code	Description
201	The request is successful.
400	Invalid parameters.
401	Authentication failed.
403	Access denied.
500	Internal server error.



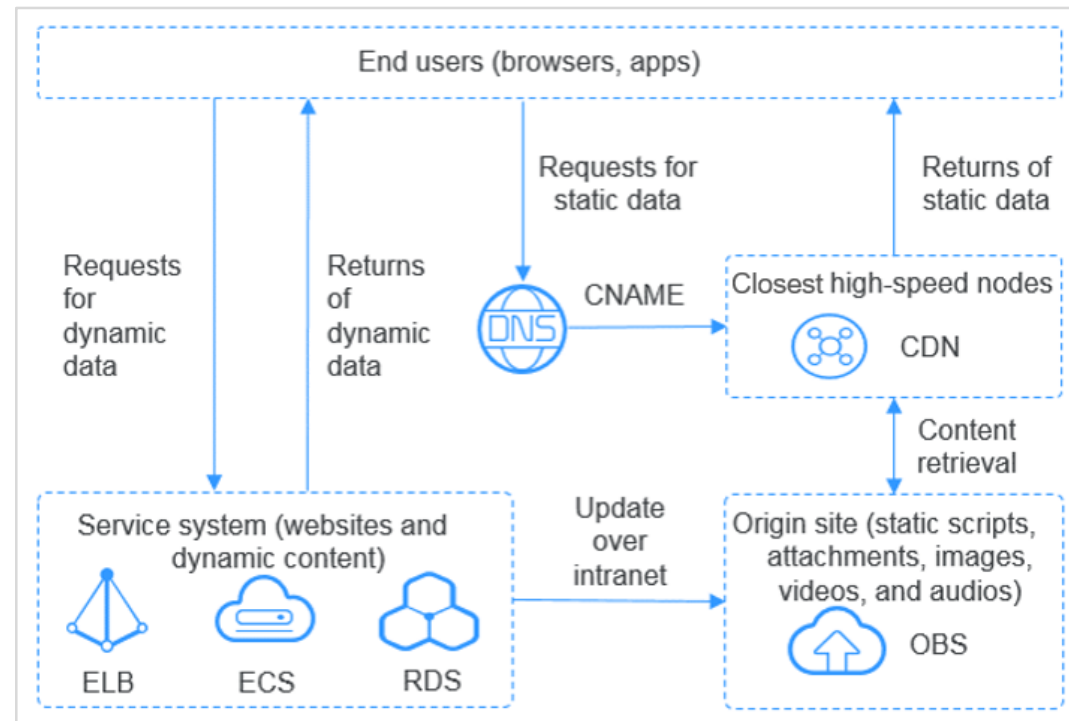
# OBS Application Scenario - Big Data Analytics

- OBS provides inexpensive big data solutions that feature high performance with zero service interruption and eliminate the need for capacity expansion. Such solutions are designed for scenarios involving storage and analysis of massive amounts of data, query of historical data details, analysis of a large number of behavior logs, analysis of public transactions, and statistics collection.



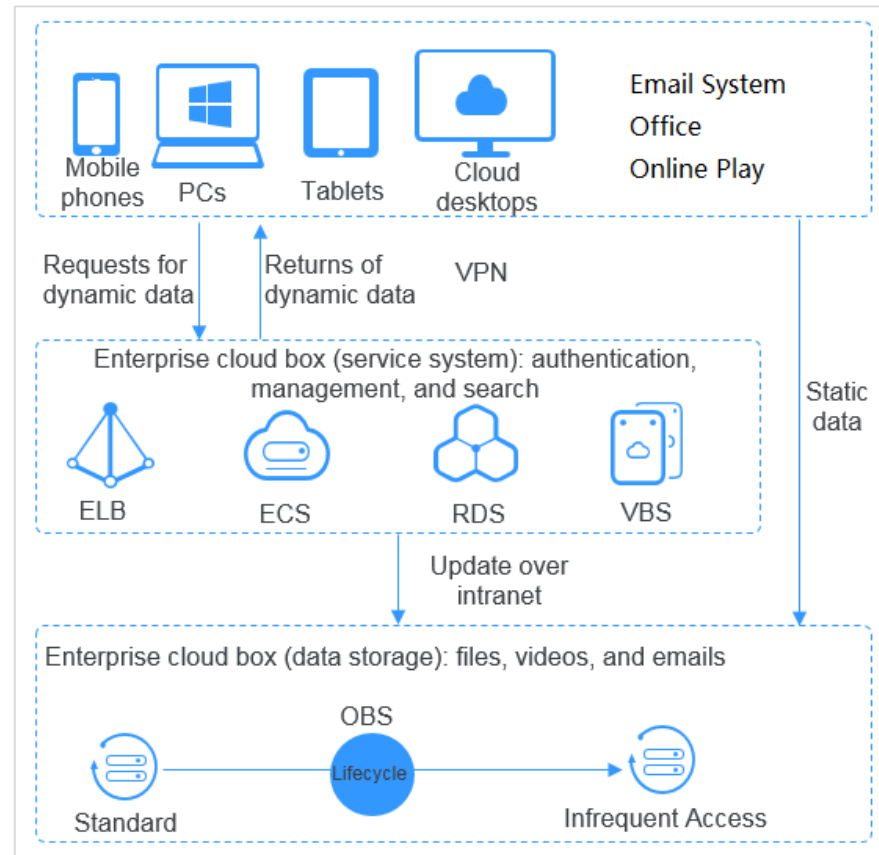
# OBS Application Scenario - Static Website Hosting

- Dynamic data on end users' browsers and apps directly interacts with the service system on HUAWEI CLOUD. Requests for dynamic data are sent to the service system for processing and then returned to end users. The static data is stored in OBS. The service system processes static data over the intranet, and end users can directly request and read the static data from OBS through the closest high-speed nodes.



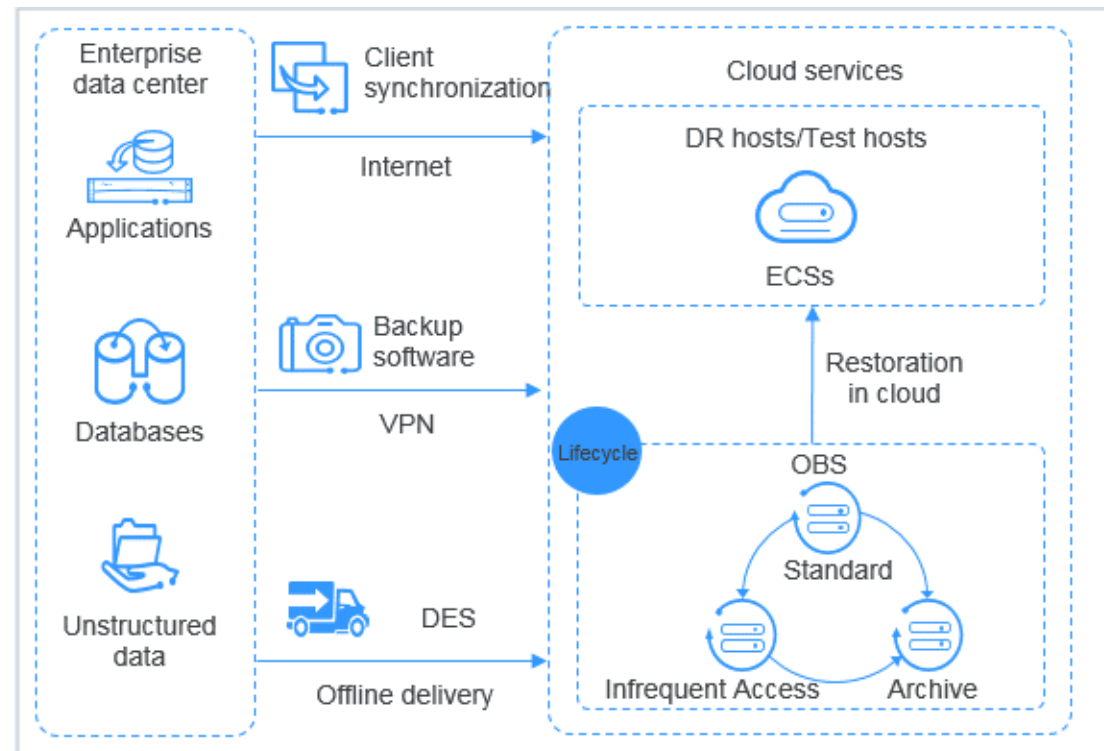
# OBS Application Scenario - Enterprise Cloud Box

- OBS offers a highly reliable, inexpensive storage system featuring high concurrency and low latency. Users can scale the storage capacity as their data volume grows.

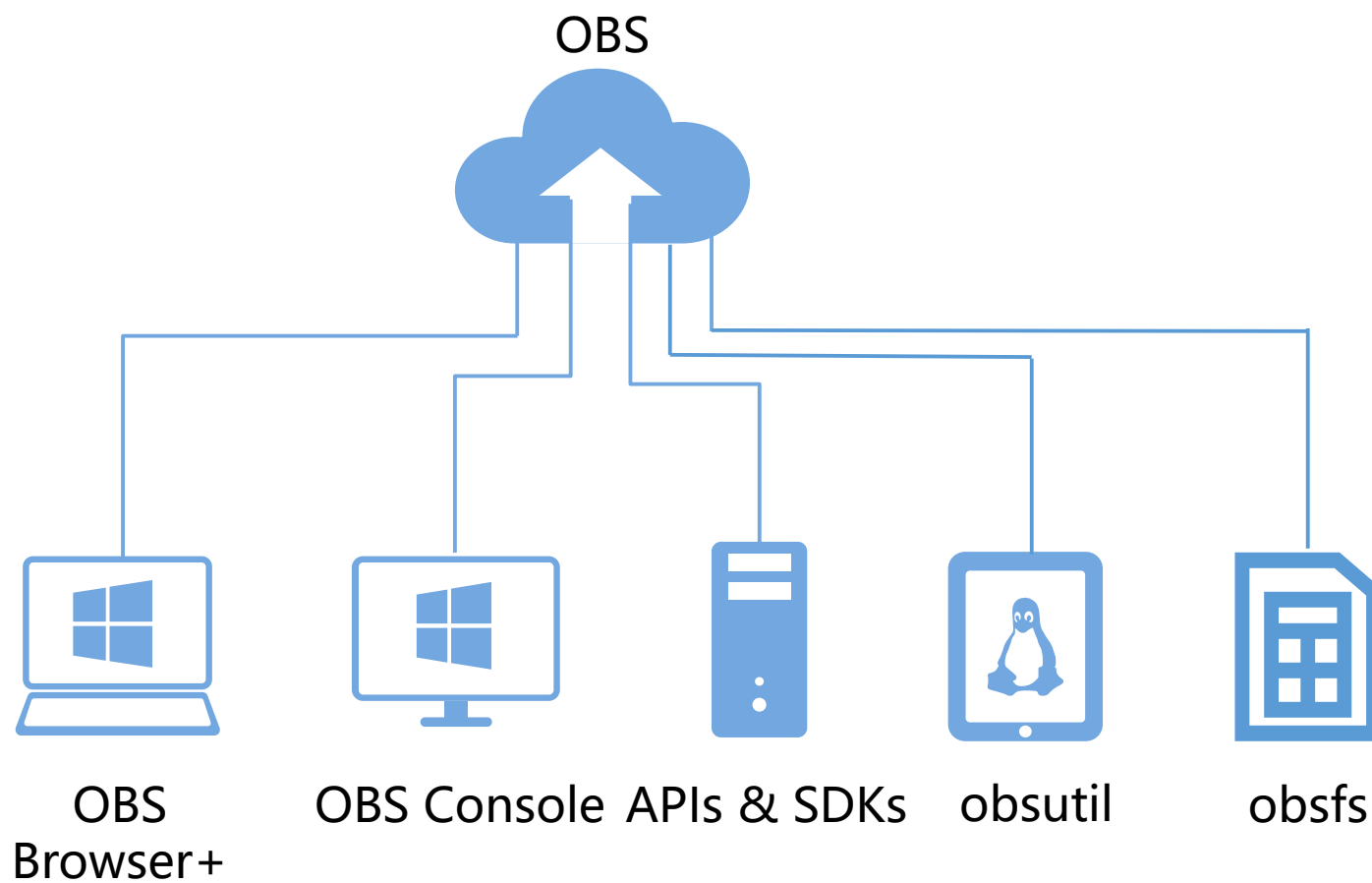


# OBS Application Scenario - Backup and Archive

- Users can use the synchronization client, mainstream backup software, or DES to back up your on-premises data and store the data in OBS. Data can be restored from OBS to the DR host or test host on the cloud if necessary.

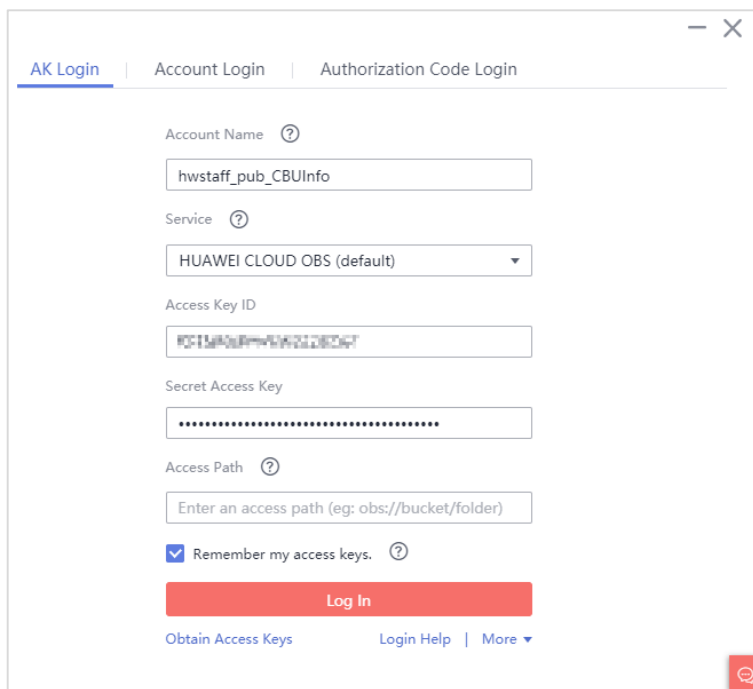


# Accessing OBS



# Accessing OBS Using OBS Browser+

- Install OBS Browser+.
  - Download OBS Browser+ from the corresponding download link.
- Log in to OBS Browser+.
  - Access keys (AK/SK), an account, and an authorization code can be used to log in to OBS Browser+.



AK Login | Account Login | Authorization Code Login

Account Name ⓘ  
hwstaff\_pub\_CBUInfo

Service ⓘ  
HUAWEI CLOUD OBS (default)

Access Key ID  
AKIAI44QH8DHBEXAMPLE

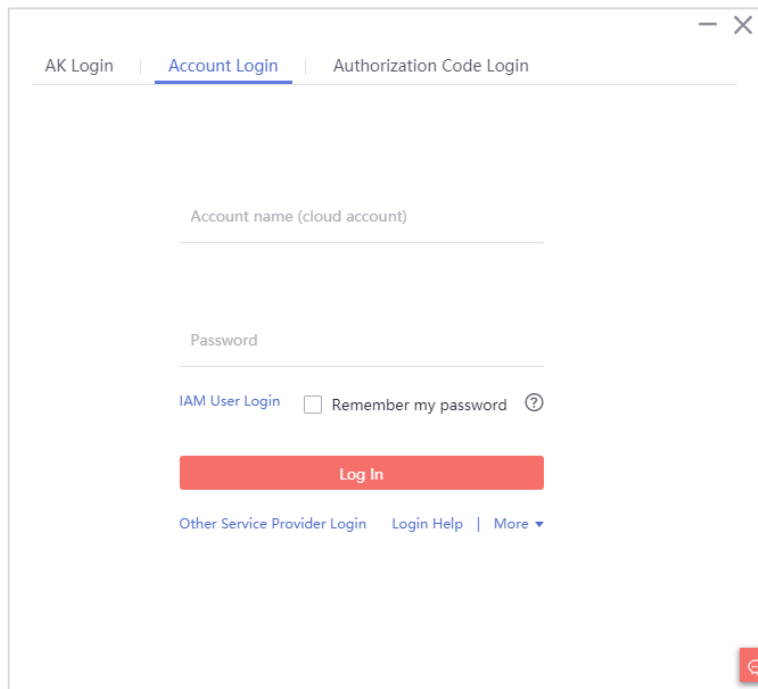
Secret Access Key  
.....

Access Path ⓘ  
Enter an access path (eg: obs://bucket/folder)

☒ Remember my access keys. ⓘ

Log In

[Obtain Access Keys](#) [Login Help](#) | [More](#) ▼



AK Login | Account Login | Authorization Code Login

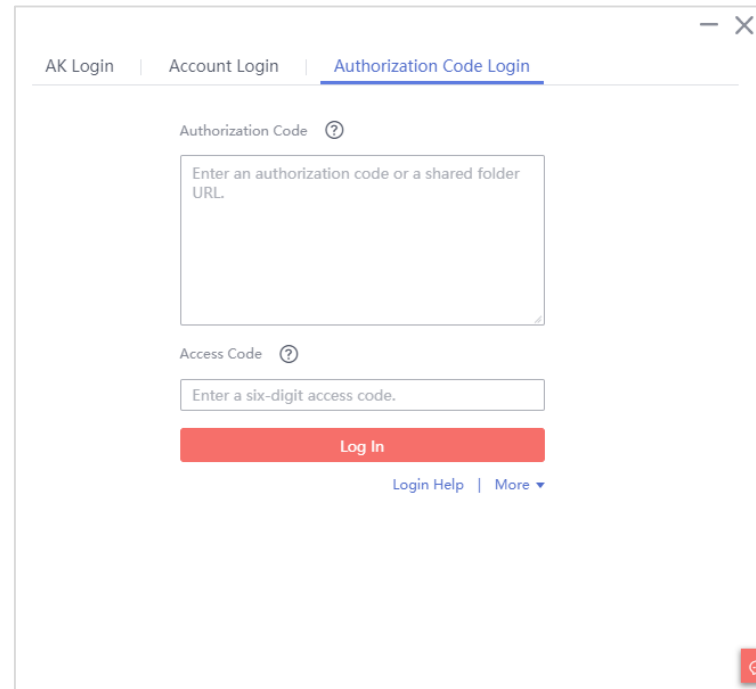
Account name (cloud account)

Password

IAM User Login ☐ Remember my password ⓘ

Log In

[Other Service Provider Login](#) [Login Help](#) | [More](#) ▼



AK Login | Account Login | Authorization Code Login

Authorization Code ⓘ  
Enter an authorization code or a shared folder URL.

Access Code ⓘ  
Enter a six-digit access code.

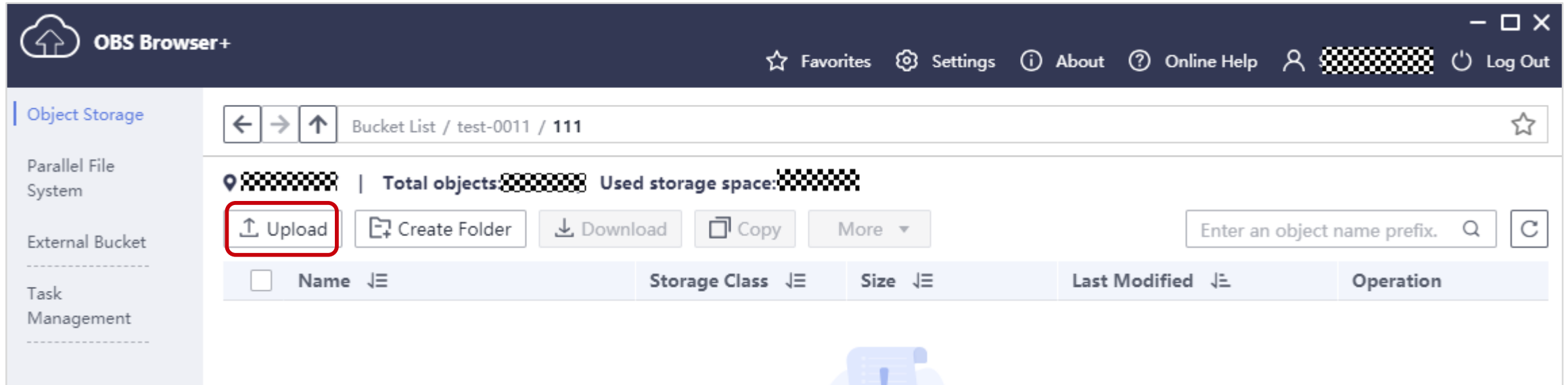
Log In

[Login Help](#) | [More](#) ▼



# Accessing OBS Using OBS Browser+

- Upload objects by drag and drop.
- OBS Browser+ provides a powerful drag-and-drop function. Users can drag one or more local files or folders to the object list of a bucket or parallel file system.




# Server-Side Encryption

- With server-side encryption enabled:
  - OBS encrypts your object before saving it on the server.
  - OBS decrypts the object on the server before it is downloaded.

Upload Object Note: If the bucket is not versioning-enabled, uploading a file/folder with the name that already exists in the bucket will replace the existing file/folder.

[Remove All](#) [Add File](#) 1/100 Files Size 472 byte

Name	Size	Operation
 object_001.txt	472 byte	<a href="#">Remove</a>

**Encryption** Encrypts the file for secure storage. The encryption status of the encrypted file cannot be changed.

☒ KMS encryption

CN North-Beijing1 ▼

obs/default ▼ [Create KMS Key](#)

[Upload](#) [Cancel](#)

# URL Validation

- Some bad sites may steal links from other sites to enrich their content without any costs. This not only damages the interests of original websites but also increases workloads for the website servers. To avoid link stealing, URL validation is created. OBS also supports whitelist and blacklist settings.
- If Whitelisted Referers is left blank but Blacklisted Referers is not, all websites except those specified in the blacklist are allowed to access the target bucket.
- If Whitelisted Referers is not left blank, only the websites specified in the whitelist are allowed to access the target bucket no matter whether Blacklisted Referers is left blank or not.

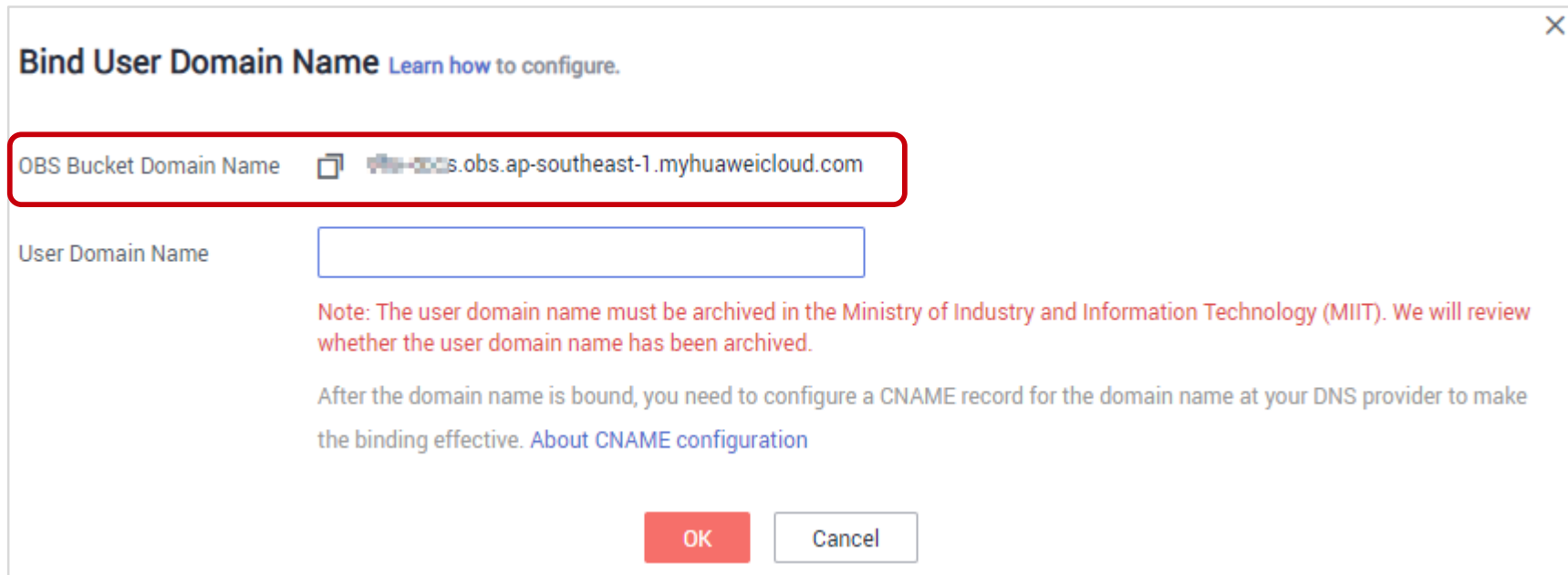
# OBS Versioning

- With versioning enabled, OBS stores multiple versions of an object so that users can quickly search for and restore different object versions or restore data in the event of failures.




# User-Defined Domain Names

- If users want to migrate files from a website to OBS and still want to use their own website link for accessing files stored in OBS, they can bind a user-defined domain name to an OBS bucket.



The screenshot shows a dialog box titled "Bind User Domain Name" with a close button (X) in the top right corner. Below the title is a link "Learn how to configure.". The dialog contains two input fields: "OBS Bucket Domain Name" and "User Domain Name". The "OBS Bucket Domain Name" field is highlighted with a red border and contains the text "my-obs.obs.ap-southeast-1.myhuaweicloud.com". The "User Domain Name" field is empty. Below the input fields, there is a red note: "Note: The user domain name must be archived in the Ministry of Industry and Information Technology (MIIT). We will review whether the user domain name has been archived." followed by a grey instruction: "After the domain name is bound, you need to configure a CNAME record for the domain name at your DNS provider to make the binding effective. About CNAME configuration". At the bottom right, there are two buttons: "OK" (red) and "Cancel" (white).

Bind User Domain Name [Learn how to configure.](#)

OBS Bucket Domain Name  my-obs.obs.ap-southeast-1.myhuaweicloud.com

User Domain Name

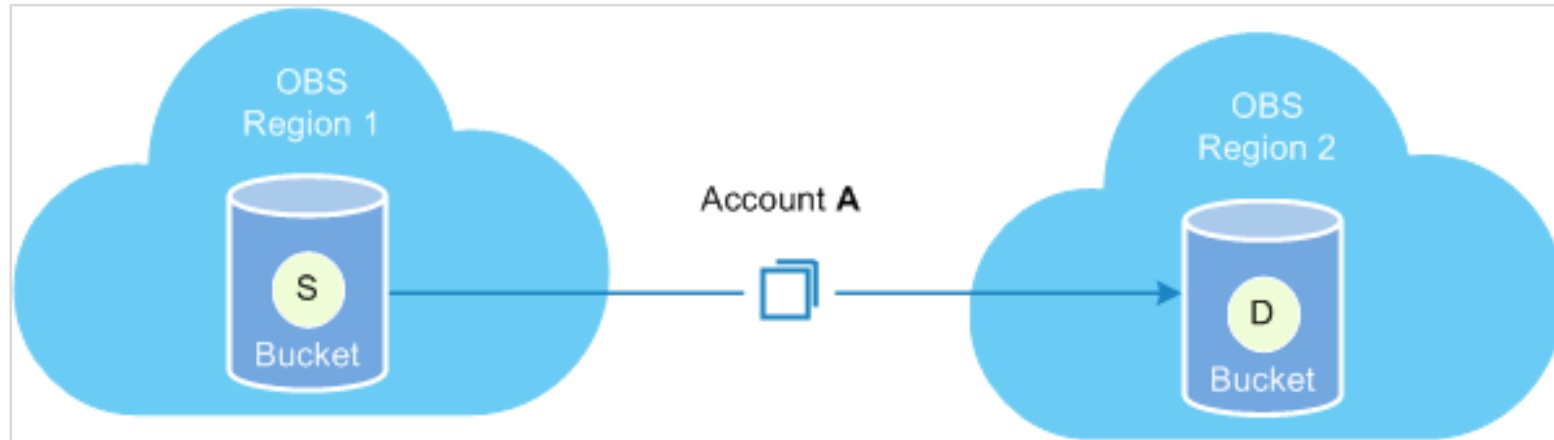
Note: The user domain name must be archived in the Ministry of Industry and Information Technology (MIIT). We will review whether the user domain name has been archived.

After the domain name is bound, you need to configure a CNAME record for the domain name at your DNS provider to make the binding effective. [About CNAME configuration](#)

OK Cancel

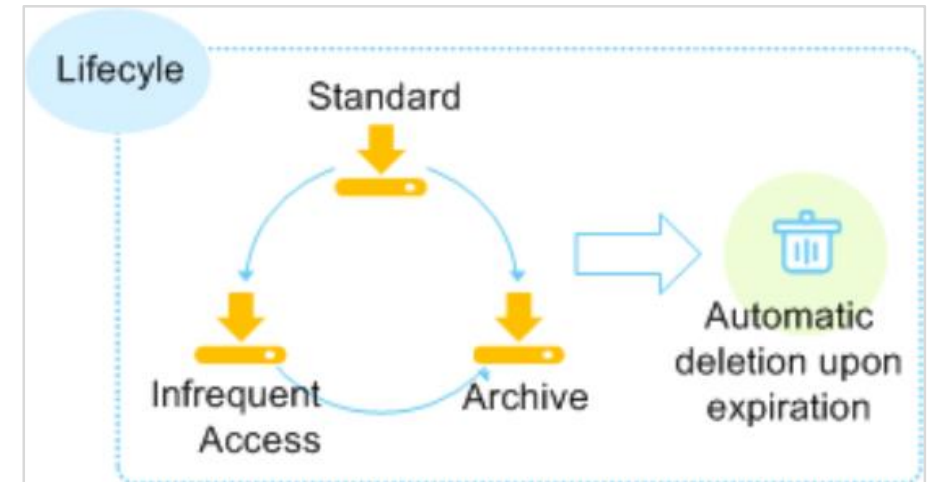
# Cross-Region Replication

- Cross-region replication provides data disaster recovery across regions, catering to your needs for off-site data backup.
- With replication rules configured, OBS automatically and asynchronously replicates data from a source bucket to a destination bucket in another region.



# Lifecycle Management

- Users can configure lifecycle rules to periodically delete objects or transition object storage classes.
- Lifecycle rules apply to the following scenarios:
  - Periodically deleting files that are only meant to be retained for specified periods of time
  - Transitioning documents that are seldom accessed to the Infrequent Access or Archive storage class or deleting them



# Permission Management

- OBS leverages the following two methods for access control:



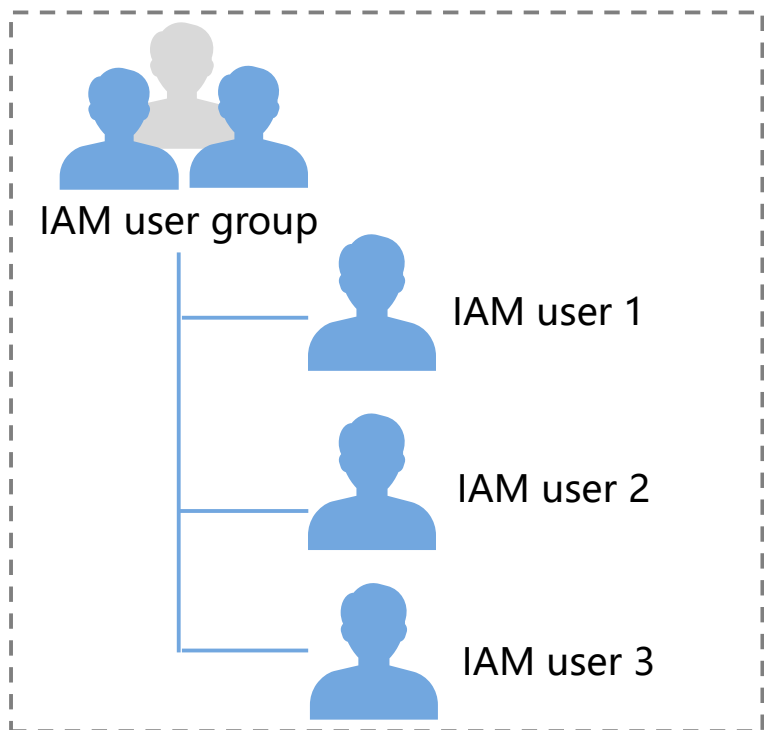
- Apply to cloud resources.
- Define the actions that are allowed or denied.

- Apply to a bucket and objects in it.
- Apply to the objects in a bucket.



# Access Control - IAM Permissions

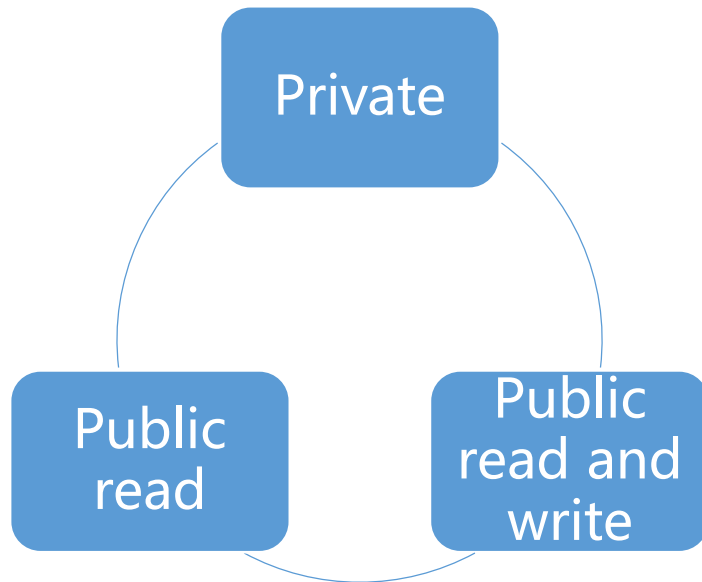
- Users can create IAM users under a registered cloud service account, and then use IAM permissions to control their access to cloud resources.



Permission	Description
Tenant Administrator	Allows users to perform any operations on OBS resources.
Tenant Guest	Allows users to query the usage of OBS resources.
OBS Buckets Viewer	Allows users to obtain the bucket list, metadata, and location information.

# Access Control - Bucket Policies

- Bucket policies apply to buckets and objects in them. A bucket owner can use bucket policies to grant IAM users or other accounts the permissions required to operate the bucket and objects in the bucket. There are three options for standard bucket policies.



## Standard bucket policies:

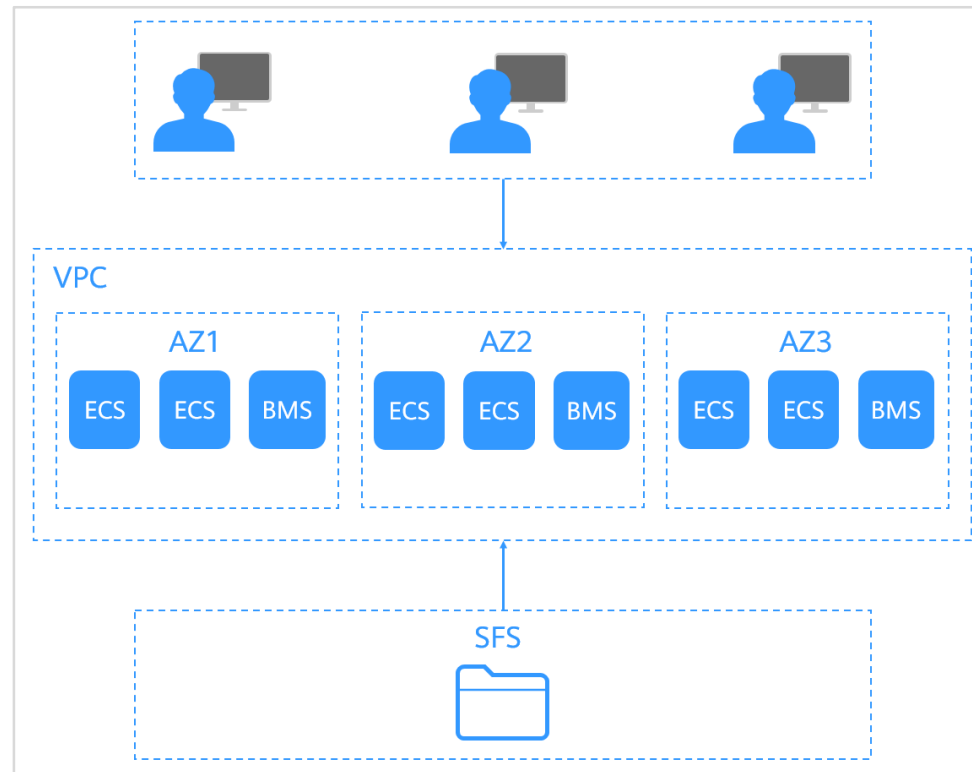
- **Private:** Only users granted permissions by the ACL can access a bucket.
- **Public read:** Anyone can read objects in a bucket.
- **Public read and write:** Anyone can read, write, or delete objects in a bucket.

# Contents

1. Elastic Volume Service
2. Object Storage Service
- 3. Scalable File Service**

# What Is SFS?

- Scalable File Service (SFS) provides reliable, high-performance shared file storage hosted on HUAWEI CLOUD. With SFS, you can enjoy shared file access spanning multiple ECSs, BMSs, and containers.



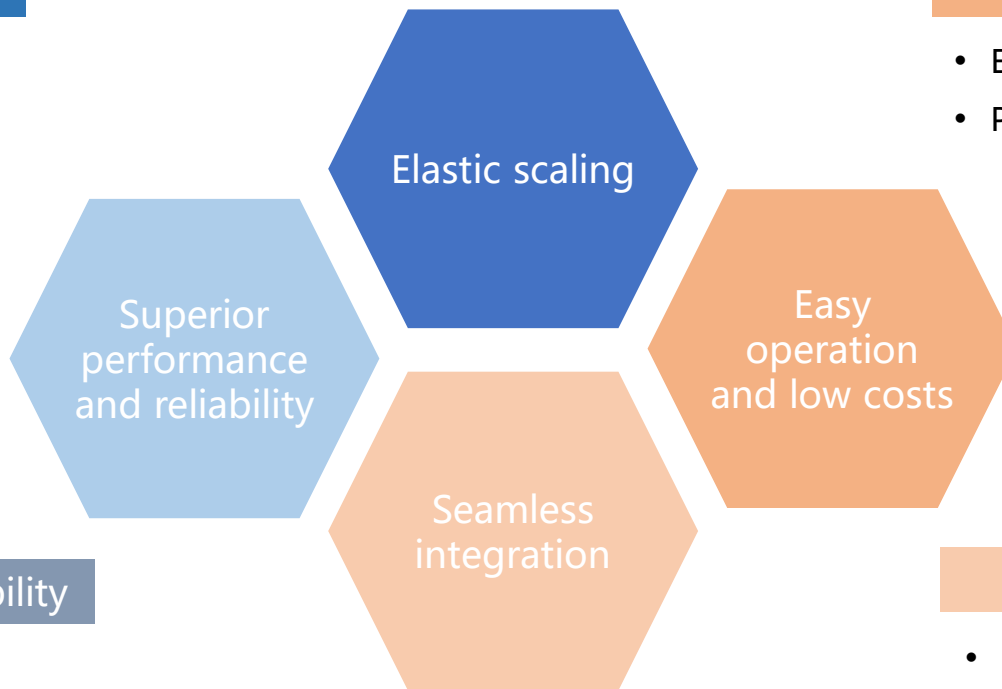
# SFS Advantages

## Elastic scaling

- Uninterrupted applications during resizing
- On-demand scaling of file system capacity
- Custom file system capacity

## Superior performance and reliability

- Performance scaling with capacity
- High data durability



## Easy operations and low costs

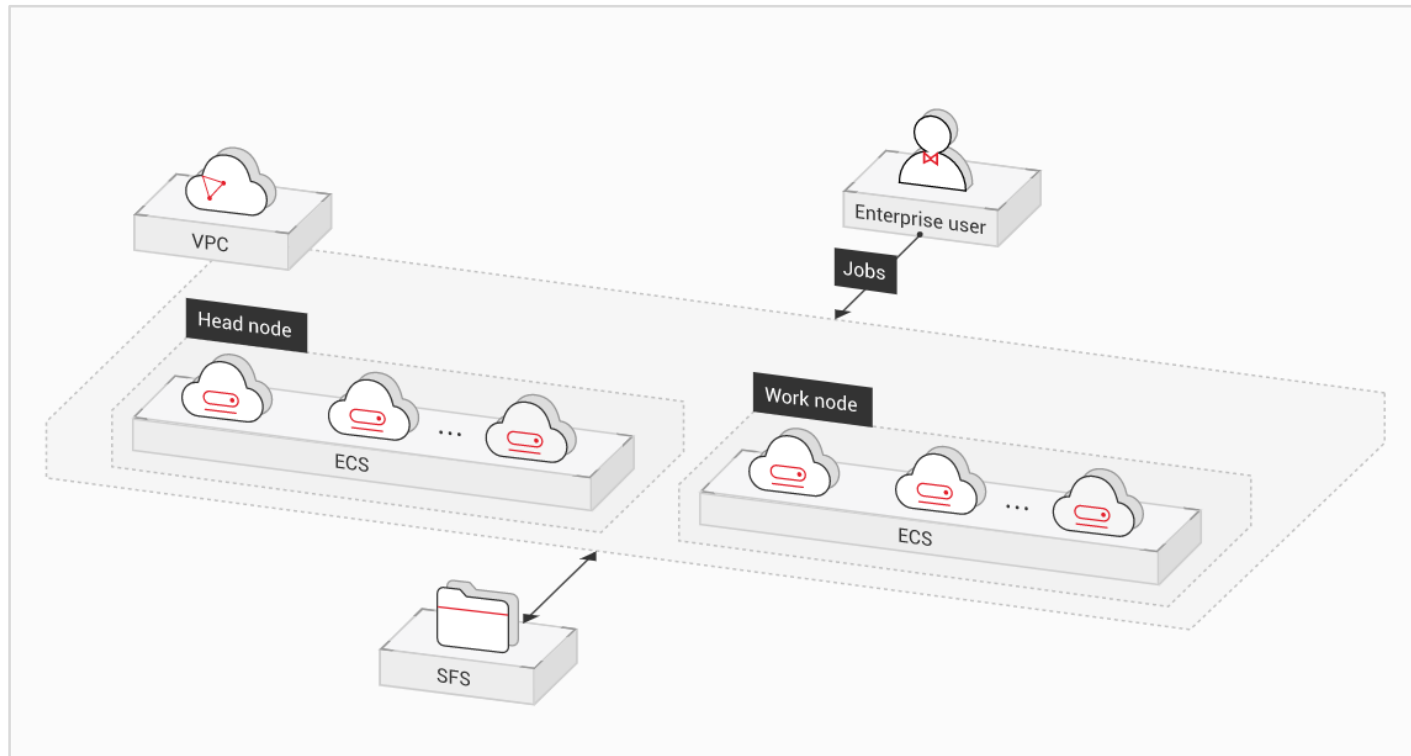
- Easy operations on the UI
- Pay-per-use storage

## Seamless integration

- Support for NFS
- Adaptation to mainstream applications

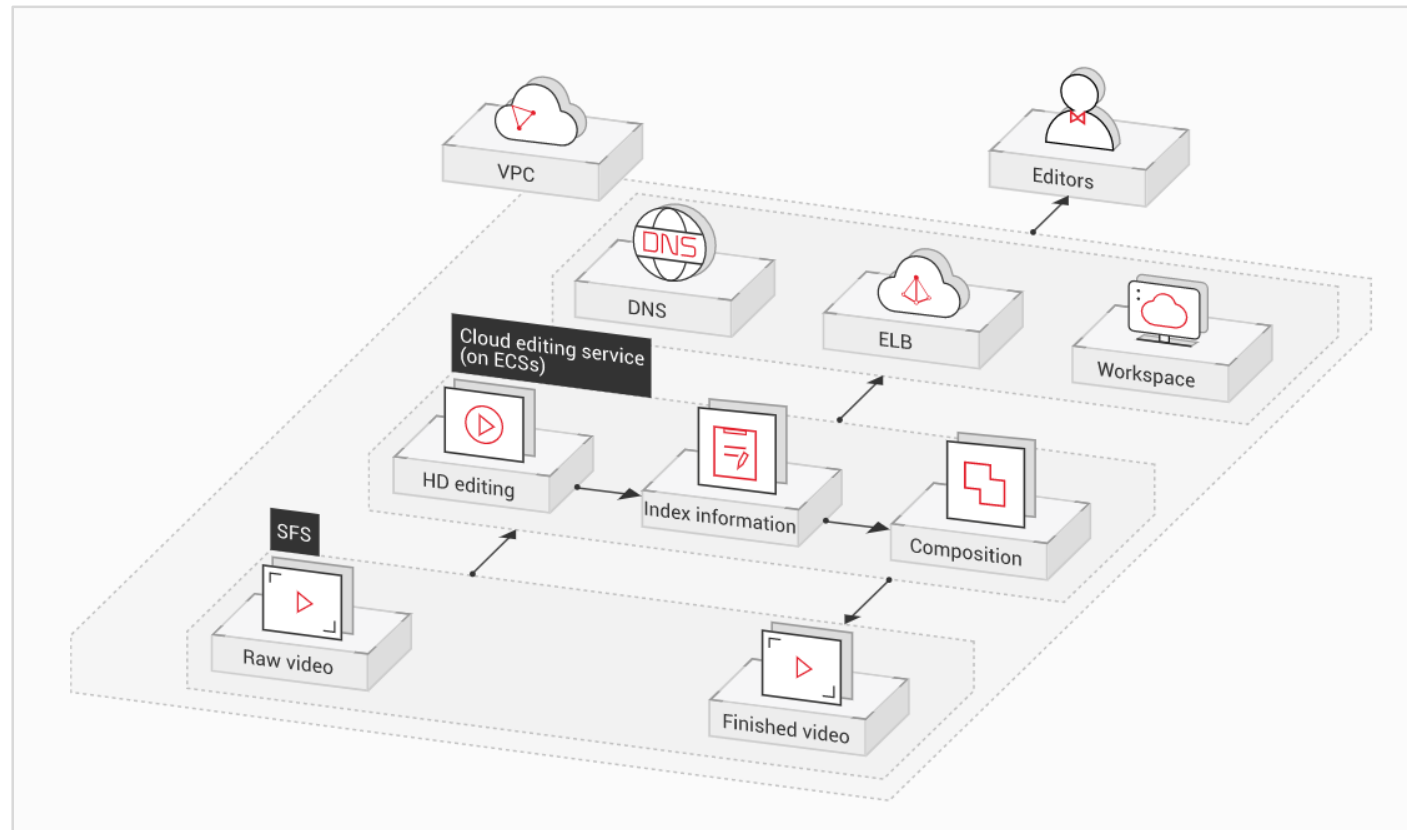
# Application Scenario - High Performance Computing

- Shared file storage facilitates industry design, biomedicine, energy exploration, graphic rendering, and heterogeneous computing.



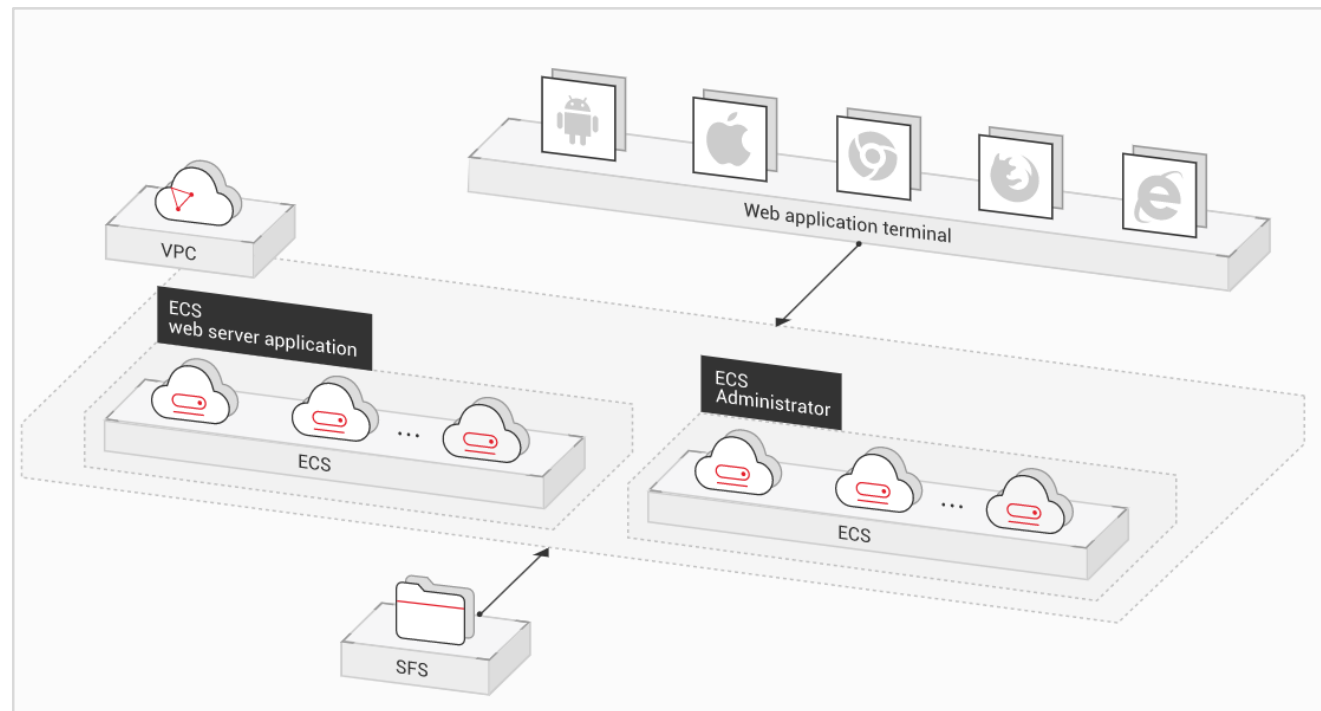
# Application Scenario - Media Processing

- Shared file storage facilitates multi-layer HD and 4K video editing, transcoding, composition, and video on demand (VoD).



# Application Scenario - Content Manage and Web Services

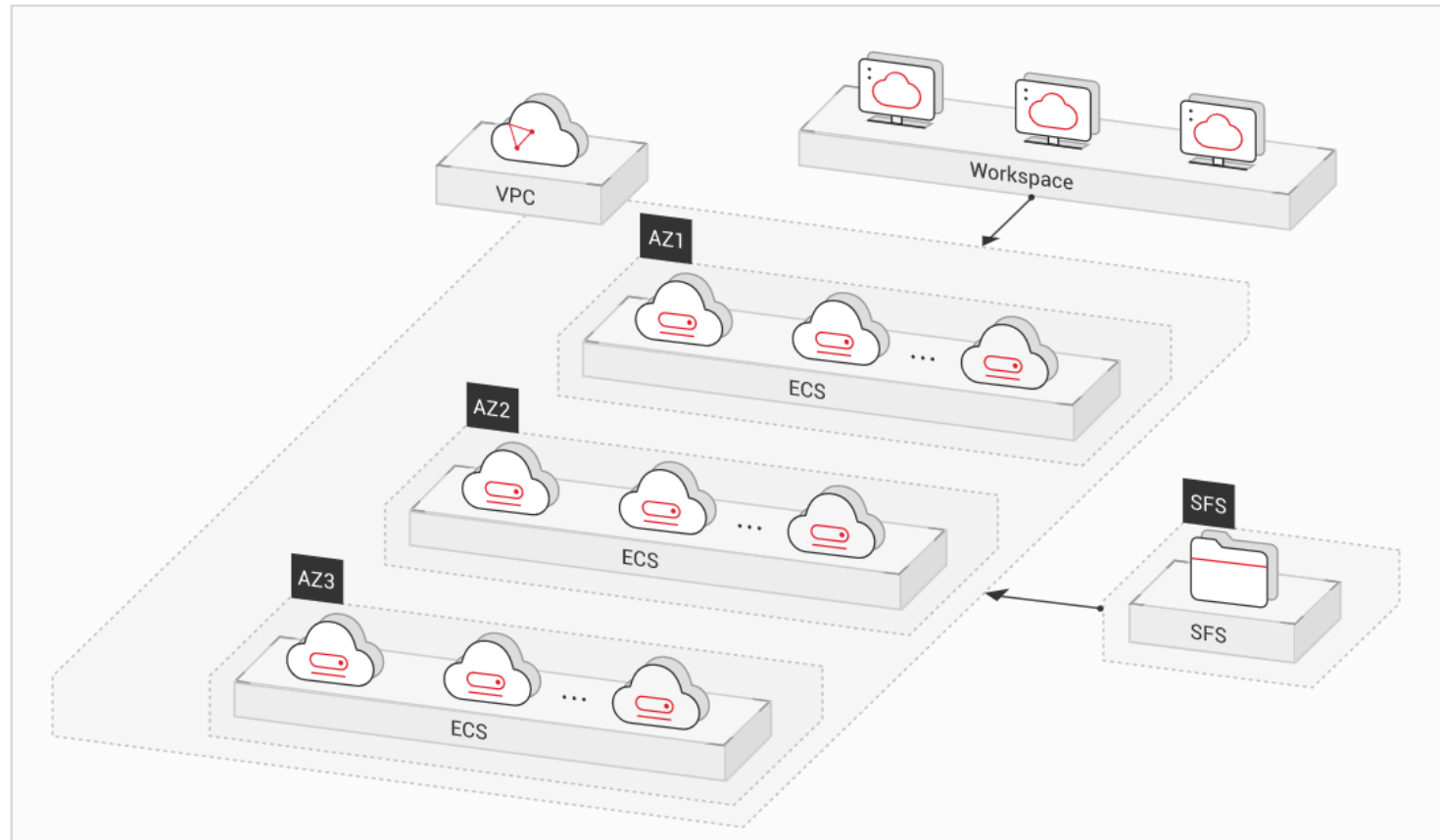
- SFS provides secure storage for content management systems and web applications, facilitating quick online publishing and archiving. Burst traffic at peak hours can also be properly handled, which frees you up from worrying about capacity expansion.



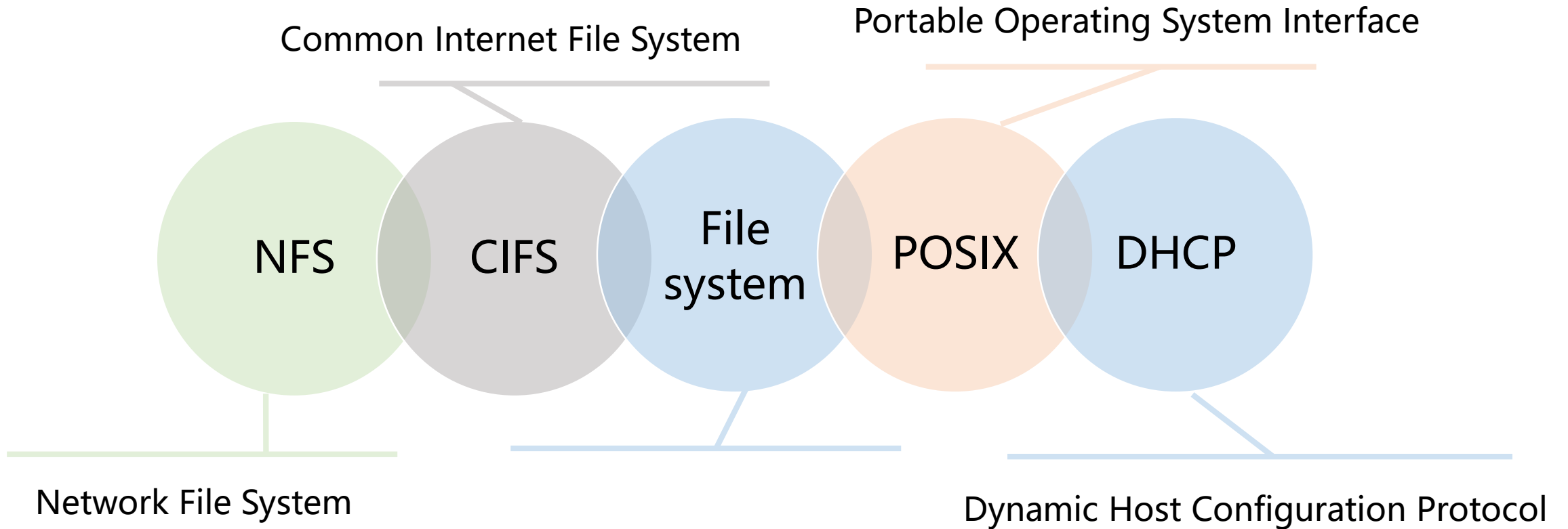


# Application Scenario - File Sharing

- For companies with a large number of departments and employees, documents and data can be shared and accessed company-wide.



# Concepts Related to SFS

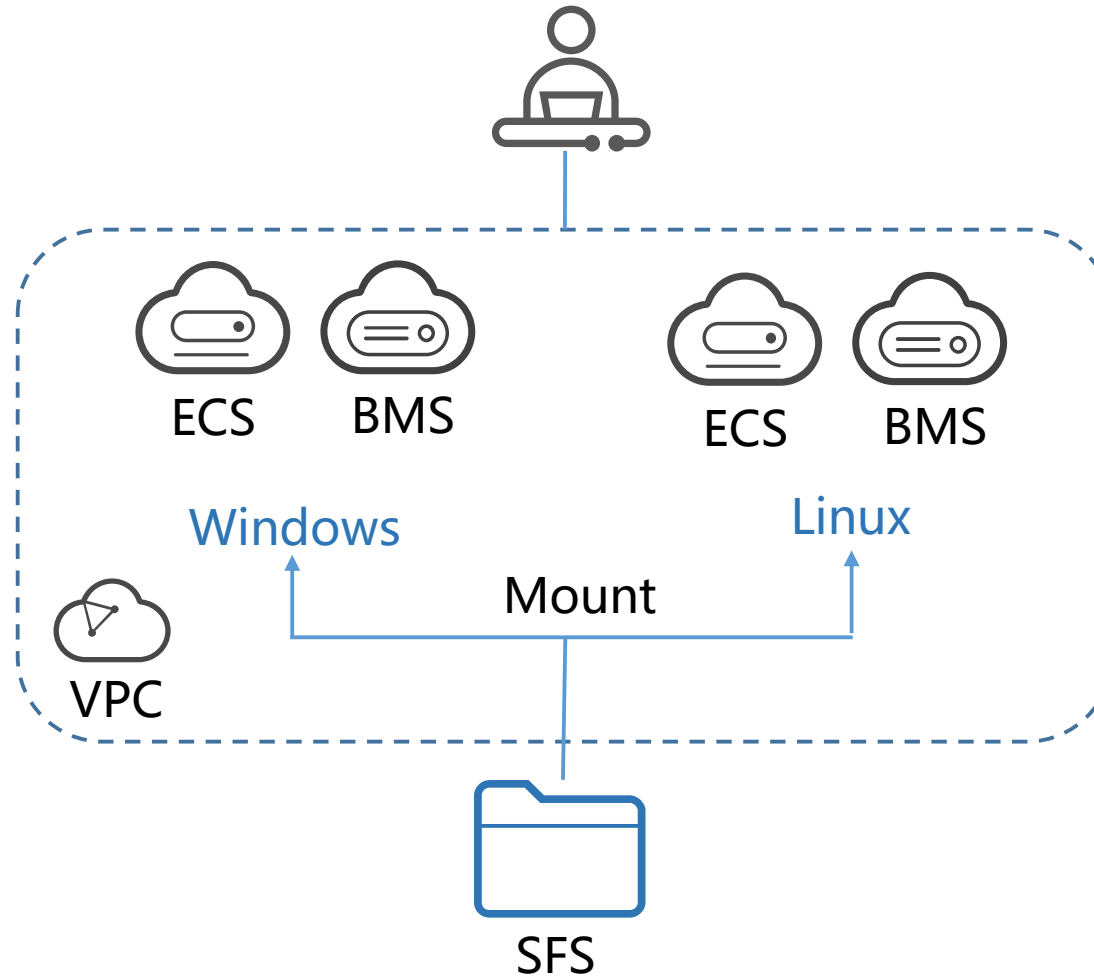


# SFS Configuration Process

3. Mount the file system to Linux or Windows servers.

2. Ensure that the file system and servers are in the same VPC.

1. Create a file system.

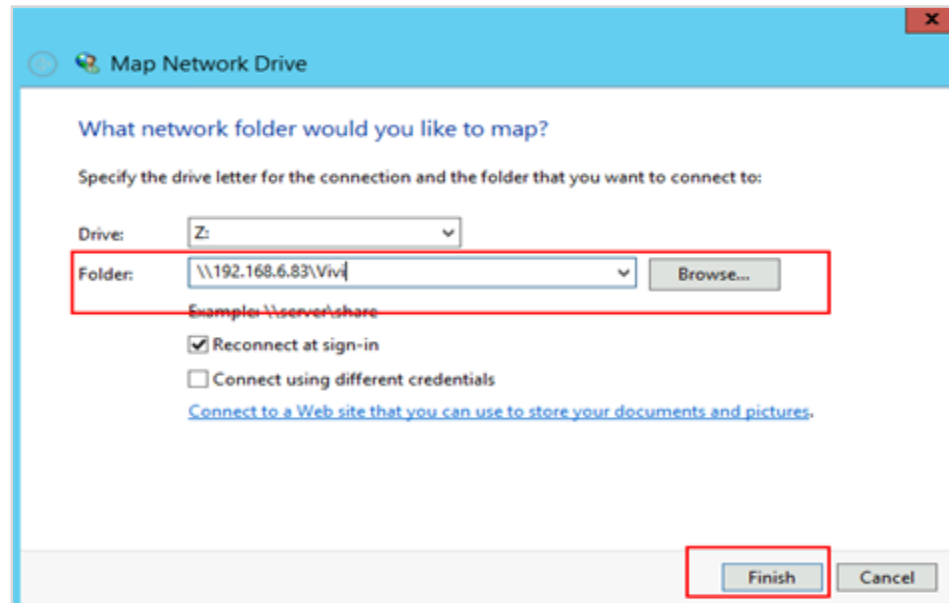


# Using SFS - Mounting an NFS FS to a Linux Server

- After a file system has been created, mount the file system to servers so that the servers can share the file system. In the following example, user root is used to log in to the servers.
- Install support for NFS.
- Run the following command to check whether the file system domain name can be resolved: (SFS Turbo file systems do not require domain name resolution. You can skip this step and directly mount the file system.)
  - `nslookup file-system-domain-name`
- Run the following command to create a local path for mounting the file system:
  - `mkdir /mount-point`
- Run the following command to mount the file system to the server. Currently, the file system can be mounted to Linux servers using NFS v3 only.
  - `mount -t nfs -o vers=3 timeo=600 file-system-domain-name mount-point`
  - After the file system is mounted, check that you can access the file system on the server.

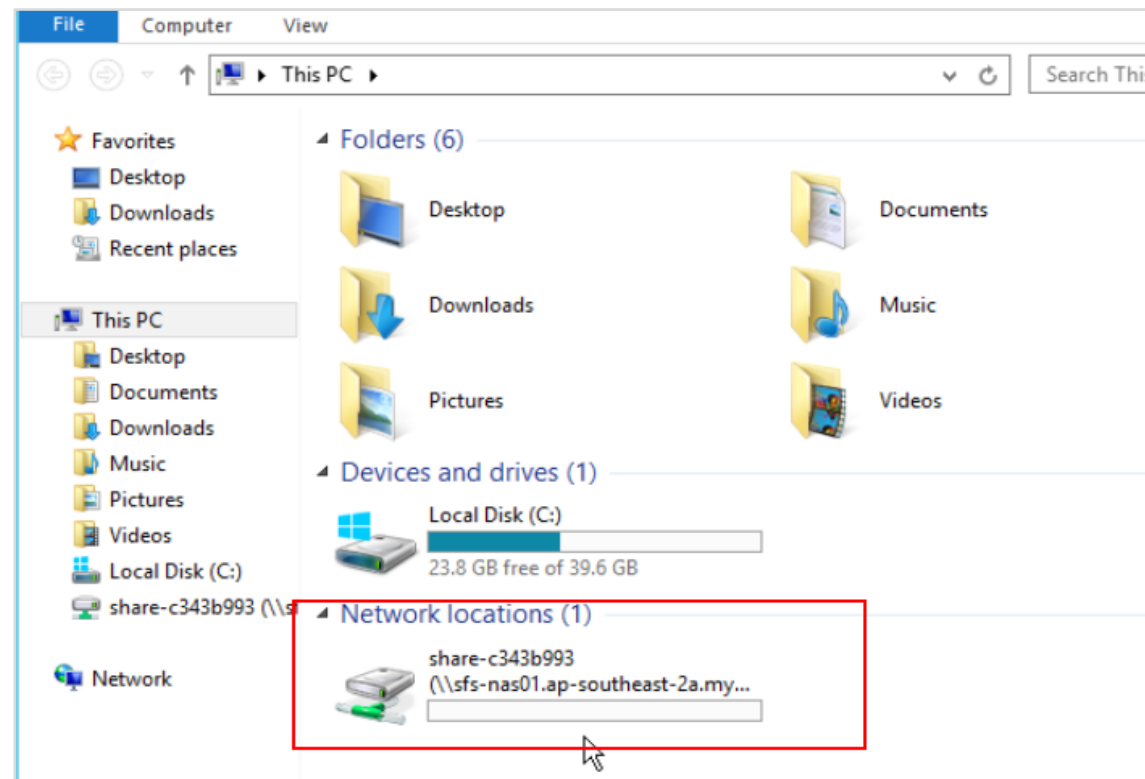
# Using SFS - Mounting a CIFS FS to a Windows Server

- In the following example, a CIFS file system is mounted to a Windows ECS:
- Log in to an ECS running Windows Server 2012.
  - Click Start, right-click Computer, and choose Map network drive.
  - In the dialog box that is displayed, enter the file system mount address, specifically, \\file-system-domain-name\path.



# Using SFS - Unmounting a File System

- If a file system is no longer used and needs to be deleted, unmount the file system and then delete it.
- Linux:
  - Log in to the ECS.
  - Run `umount /mount-point`
- Windows:
  - Log in to the ECS.
  - Right-click the file system to be unmounted and choose Disconnect.
  - The file system has been unmounted when it disappears from the network location.
  - File system unmounted



# Using SFS - Configuring VPCs

- Multiple VPCs can be configured for an SFS file system so that servers belonging to different VPCs can share the same file system.

Basic Info

Mount Point Info

Name	sfs-Vivi	ID	8dc27f33-d917-4630-8dc7-7dd0110e7484
Protocol Type	NFS	Status	Available
Available Capacity (GB)	1.00	Maximum Capacity (GB)	1.00
Region	AP-Bangkok	AZ	AZ1
Created	Jul 28, 2021 15:42:10 GMT+08:00		

Authorizations

Tags

Only ECSs on VPCs can access file systems. If there are no available VPCs, [apply for VPCs](#) first.

Add Authorized VPC

You can add 19 more authorized VPCs and 399 more authorized addresses/segments.

Name	Authorized Addresses/Segments	Operation
▼ vpc-mp	1	<a href="#">Add</a> <a href="#">Delete</a>

# Differences Among SFS, OBS and EVS

Dimension	SFS	OBS	EVS
Definition	SFS provides on-demand high-performance file storage, which can be shared by multiple servers. Using SFS is like mounting a remote directory from a Windows or Linux server.	OBS provides massive, secure, reliable, and cost-effective data storage for users to store data of any type and size.	EVS provides scalable block storage that features high reliability and high performance to meet various service requirements. An EVS disk is similar to a hard disk on a PC.
Data storage logic	Stores files. Data is sorted and displayed in files and folders.	Stores objects. Files stored directly automatically generate system metadata, which can also be customized by users.	Stores binary data. Files cannot be stored directly. To store files, you need to format the disk first.
Access method	SFS systems can be accessed only after being mounted to servers through NFS or CIFS. A network address must be specified or mapped to a local directory for access.	OBS buckets can be accessed through the Internet or Direct Connect. The bucket address must be specified for access, and transmission protocols HTTP and HTTPS are used.	EVS disks can be used and accessed from applications only after being attached to ECSs or BMSs and initialized.
Application scenario	HPC, media processing, file sharing, content management, and web services	Big data analysis, static website hosting, online video on demand (VoD), and gene sequencing	HPC, enterprise clustered applications, enterprise application systems, and development and testing



# Quiz

1. (True or false) Before attaching an EVS disk to an ECS, you must stop the ECS.

True

False

2. (Multiple-choice) Which of the following is not an OBS function?

A. Cross-region replication

B. Versioning

C. URL validation

D. Attached to cloud servers for use

# Summary

- Where there is data, there is a need for data storage. After studying the content presented here, we should have a new understanding of storage types and we should understand HUAWEI CLOUD storage services a little better. As more and more enterprises migrate to the cloud, we are more able to better meet their storage requirements if we understand the positioning, principles, and usages of various storage services, for example, which storage services are suitable for video cloud and which are the best for databases.

# Recommendations

- Huawei iLearning
  - <https://e.huawei.com/en/talent/>
- HUAWEI CLOUD Help Center
  - <https://support.huaweicloud.com/intl/en-us/help-novice.html>
- HUAWEI CLOUD Academy
  - <https://edu.huaweicloud.com/intl/en-us/>

# Acronyms and Abbreviations

- AK/SK: Access Key ID/Secret Access Key
- API: Application Programming Interface
- AZ: Availability Zone
- BMS: Bare Metal Server
- CAD/CAE: Computer Aided Design/Computer Aided Engineering
- CIFS: Common Internet File System
- DES: Data Express Service
- DHCP: Dynamic Host Configuration Protocol
- ECS: Elastic Cloud Server
- EVS: Elastic Volume Service
- HA: High Available

# Acronyms and Abbreviations

- HPC: High Performance Computing
- HTTP: Hypertext Transfer Protocol
- HTTPS: Hypertext Transfer Protocol over Secure Sockets Layer
- IAM: Identity and Access Management
- IOPS: Input/Output Operations per Second
- NAS: Network Attached Storage
- NFS: Network File System
- OBS: Object Storage Service
- POSIX: Portable Operating System Interface
- SCSI: Small Computer System Interface
- SDK: Software Development Kit

# Acronyms and Abbreviations

- SFS: Scalable File Service
- SSD: Solid-State Drive
- VBD: Virtual Block Device
- VPC: Virtual Private Cloud

# Thank you.

把数字世界带入每个人、每个家庭、  
每个组织,构建万物互联的智能世界.

Bring digital to every person, home, and  
organization for a fully connected,  
intelligent world.

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