

Instance stores and Amazon Elastic Block Store (Amazon EBS)

EC2 instances have hard drives as well. And there are a few different types.

When you launch an EC2 instance, depending on the type of the EC2 instance you launched, it might provide you with local storage called instance store volumes. These volumes are physically attached to the host, your EC2 instances running on top of. And you can write to it just like a normal hard drive. The catch here is that since this volume is attached to the underlying physical host, if you stop or terminate your EC2 instance, all data written to the instance store volume will be deleted. The reason for this, is that if you start your instance from a stop state, it's likely that EC2 instance will start up on another host. A host where that volume does not exist. Remember EC2 instances are virtual machines, and therefore the underlying host can change between stopping and starting an instance.

All right, I'm telling you not to write important data to the drives that come with EC2 instances. I'm sure that sounds a bit scary because obviously you'll need a place to write data that persists outside of the life cycle of an EC2 instance. You don't want your entire database getting deleted every time you stop an EC2 instance. Don't worry, this is where a service called Amazon Elastic Block Store, or EBS, comes into play.

With EBS, you can create virtual hard drives, that we call EBS volumes, that you can attach to your EC2 instances. These are separate drives from the local instance store volumes, and they aren't tied directly to the host that you're easy to is running on. This means, that the data that you write to an EBS volume can persists between stops and starts of an EC2 instance.

EBS volumes come in all different sizes and types. How this works, is you define the size, type and configurations of the volume you need. Provision the volume, and then attach it to your EC2 instance. From there, you can configure your application to write to the volume and you're good to go. If you stop and then start the EC2 instance, the data in the volume remains.

Since the use case for EBS volumes is to have a hard drive that is persistent, that your applications can write to, it's probably important that you back that data up. EBS allows you to take incremental backups of your data called snapshots. It's very important that you take regular snapshots of your EBS volumes This way, if a drive ever becomes corrupted, you haven't lost your data. And you can restore that data from a snapshot.

Step 1

An Amazon EC2 instance with an attached instance store is running.



1 2 3 ✓

Step 2

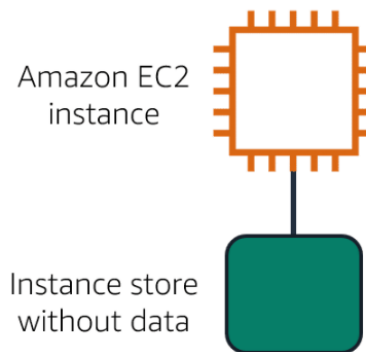
The instance is stopped or terminated.



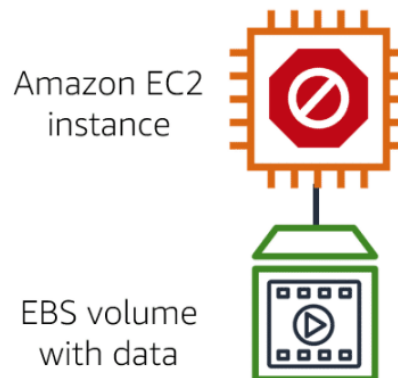
1 2 3 ✓

Step 3

All data on the attached instance store is deleted.



1 2 3 ✓

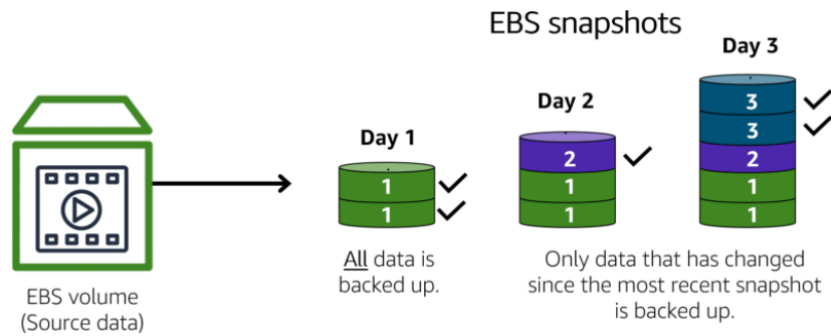


[Amazon Elastic Block Store \(Amazon EBS\)](#) is a service that provides block-level storage volumes that you can use with Amazon EC2 instances. If you stop or terminate an Amazon EC2 instance, all the data on the attached EBS volume remains available.

To create an EBS volume, you define the configuration (such as volume size and type) and provision it. After you create an EBS volume, it can attach to an Amazon EC2 instance.

Because EBS volumes are for data that needs to persist, it's important to back up the data. You can take incremental backups of EBS volumes by creating Amazon EBS snapshots.

Amazon EBS snapshots

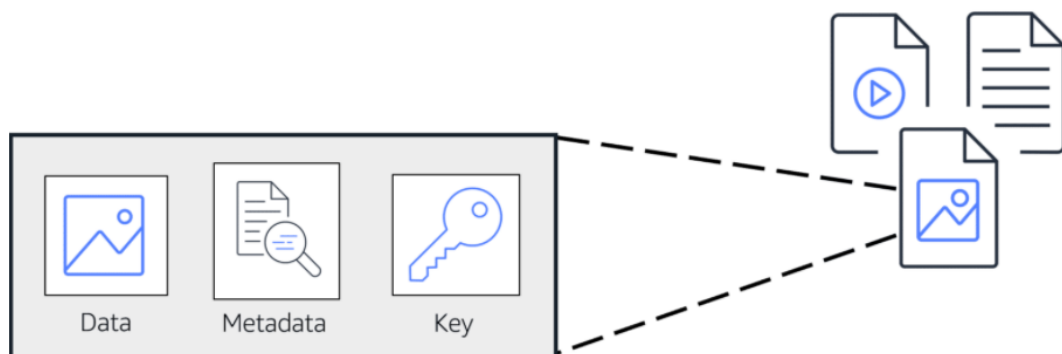


An [EBS snapshot](#) is an incremental backup. This means that the first backup taken of a volume copies all the data. For subsequent backups, only the blocks of data that have changed since the most recent snapshot are saved.

Incremental backups are different from full backups, in which all the data in a storage volume copies each time a backup occurs. The full backup includes data that has not changed since the most recent backup.

Amazon Simple Storage (Amazon S3)

Object storage



In **object storage**, each object consists of data, metadata, and a key.

The data might be an image, video, text document, or any other type of file. Metadata contains information about what the data is, how it is used, the object size, and so on. An object's key is its unique identifier.

Amazon Simple Storage Service (Amazon S3)

[Amazon Simple Storage Service \(Amazon S3\)](#) is a service that provides object-level storage.

Amazon S3 stores data as objects in buckets.

You can upload any type of file to Amazon S3, such as images, videos, text files, and so on. For example, you might use Amazon S3 to store backup files, media files for a website, or archived documents. Amazon S3 offers unlimited storage space. The maximum file size for an object in Amazon S3 is 5 TB.

When you upload a file to Amazon S3, you can set permissions to control visibility and access to it. You can also use the Amazon S3 versioning feature to track changes to your objects over time.

Amazon S3 storage classes

With Amazon S3, you pay only for what you use. You can choose from [a range of storage classes](#) to select a fit for your business and cost needs. When selecting an Amazon S3 storage class, consider these two factors:

- How often you plan to retrieve your data
- How available you need your data to be

S3 Standard

- Designed for frequently accessed data
- Stores data in a minimum of three Availability Zones

S3 Standard provides high availability for objects. This makes it a good choice for a wide range of use cases, such as websites, content distribution, and data analytics. S3 Standard has a higher cost than other storage classes intended for infrequently accessed data and archival storage.

S3 Standard-Infrequent Access (S3 Standard-IA)

- Ideal for infrequently accessed data
- Similar to S3 Standard but has a lower storage price and higher retrieval price

S3 Standard-IA is ideal for data infrequently accessed but requires high availability when needed. Both S3 Standard and S3 Standard-IA store data in a minimum of three Availability Zones. S3 Standard-IA provides the same level of availability as S3 Standard but with a lower storage price and a higher retrieval price.

S3 One Zone-Infrequent Access (S3 One Zone-IA)

- Stores data in a single Availability Zone
- Has a lower storage price than S3 Standard-IA

Compared to S3 Standard and S3 Standard-IA, which store data in a minimum of three Availability Zones, S3 One Zone-IA stores data in a single Availability Zone. This makes it a good storage class to consider if the following conditions apply:

- You want to save costs on storage.
- You can easily reproduce your data in the event of an Availability Zone failure.

S3 Intelligent-Tiering

- Ideal for data with unknown or changing access patterns
- Requires a small monthly monitoring and automation fee per object

In the S3 Intelligent-Tiering storage class, Amazon S3 monitors objects' access patterns. If you haven't accessed an object for 30 consecutive days, Amazon S3 automatically moves it to the infrequent access tier, S3 Standard-IA. If you access an object in the infrequent access tier, Amazon S3 automatically moves it to the frequent access tier, S3 Standard.

S3 Glacier

- Low-cost storage designed for data archiving
- Able to retrieve objects within a few minutes to hours

S3 Glacier is a low-cost storage class that is ideal for data archiving. For example, you might use this storage class to store archived customer records or older photos and video files.

S3 Glacier Deep Archive

- Lowest-cost object storage class ideal for archiving
- Able to retrieve objects within 12 hours

When deciding between Amazon S3 Glacier and Amazon S3 Glacier Deep Archive, consider how quickly you need to retrieve archived objects. You can retrieve objects stored in the S3 Glacier storage class within a few minutes to a few hours. By comparison, you can retrieve objects stored in the S3 Glacier Deep Archive storage class within 12 hours.

Amazon Elastic File System (Amazon EFS)

File storage



In **file storage**, multiple clients (such as users, applications, servers, and so on) can access data that is stored in shared file folders. In this approach, a storage server uses block storage with a local file system to organize files. Clients access data through file paths.

Compared to block storage and object storage, file storage is ideal for use cases in which a large number of services and resources need to access the same data at the same time.

[Amazon Elastic File System \(Amazon EFS\)](#) is a scalable file system used with AWS Cloud services and on-premises resources. As you add and remove files, Amazon EFS grows and shrinks automatically. It can scale on demand to petabytes without disrupting applications.

Comparing Amazon EBS and Amazon EFS

Select each flashcard to flip it.

<p>An Amazon EBS volume stores data in a single Availability Zone.</p> <p>To attach an Amazon EC2 instance to an EBS volume, both the Amazon EC2 instance and the EBS volume must reside within the same Availability Zone.</p> 	<p>Amazon EFS is a regional service. It stores data in and across multiple Availability Zones.</p> <p>The duplicate storage enables you to access data concurrently from all the Availability Zones in the Region where a file system is located. Additionally, on-premises servers can access Amazon EFS using AWS Direct Connect.</p> 
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Amazon Relational Database Services (Amazon RDS)

Relational databases

In a **relational database**, data is stored in a way that relates it to other pieces of data.

An example of a relational database might be the coffee shop's inventory management system. Each record in the database would include data for a single item, such as product name, size, price, and so on.

Relational databases use **structured query language (SQL)** to store and query data. This approach allows data to be stored in an easily understandable, consistent, and scalable way. For example, the coffee shop owners can write a SQL query to identify all the customers whose most frequently purchased drink is a medium latte.

Example of data in a relational database:

ID	Product name	Size	Price
1	Medium roast ground coffee	12 oz.	\$5.30
2	Dark roast ground coffee	20 oz.	\$9.27

Amazon Relational Database Service

[Amazon Relational Database Service \(Amazon RDS\)](#) is a service that enables you to run relational databases in the AWS Cloud.

Amazon RDS is a managed service that automates tasks such as hardware provisioning, database setup, patching, and backups. With these capabilities, you can spend less time completing administrative tasks and more time using data to innovate your applications. You can integrate Amazon RDS with other services to fulfill your business and operational needs, such as using AWS Lambda to query your database from a serverless application.

Amazon RDS provides a number of different security options. Many Amazon RDS database engines offer encryption at rest (protecting data while it is stored) and encryption in transit (protecting data while it is being sent and received).

Amazon RDS database engines

Amazon RDS is available on six database engines, which optimize for memory, performance, or input/output (I/O). Supported database engines include:

- Amazon Aurora
- PostgreSQL
- MySQL
- MariaDB
- Oracle Database
- Microsoft SQL Server

Amazon Aurora

[Amazon Aurora](#) is an enterprise-class relational database. It is compatible with MySQL and PostgreSQL relational databases. It is up to five times faster than standard MySQL databases and up to three times faster than standard PostgreSQL databases.

Amazon Aurora helps to reduce your database costs by reducing unnecessary input/output (I/O) operations, while ensuring that your database resources remain reliable and available.

Consider Amazon Aurora if your workloads require high availability. It replicates six copies of your data across three Availability Zones and continuously backs up your data to Amazon S3.

Amazon DynamoDB

Nonrelational databases

In a **nonrelational database**, you create tables. A table is a place where you can store and query data.

Nonrelational databases are sometimes referred to as “NoSQL databases” because they use structures other than rows and columns to organize data. One type of structural approach for nonrelational databases is key-value pairs. With key-value pairs, data is organized into items (keys), and items have attributes (values). You can think of attributes as being different features of your data.

In a key-value database, you can add or remove attributes from items in the table at any time. Additionally, not every item in the table has to have the same attributes.

Example of data in a nonrelational database:

Key	Value
1	Name: John Doe Address: 123 Any Street Favorite drink: Medium latte
2	Name: Mary Major Address: 100 Main Street Birthday: July 5, 1994

Amazon DynamoDB

[Amazon DynamoDB](#) is a key-value database service. It delivers single-digit millisecond performance at any scale.

To learn about features of DynamoDB, select each flashcard to flip it.

<p>DynamoDB is serverless, which means that you do not have to provision, patch, or manage servers.</p> <p>You also do not have to install, maintain, or operate software.</p>	<p>As the size of your database shrinks or grows, DynamoDB automatically scales to adjust for changes in capacity while maintaining consistent performance.</p> <p>This makes it a suitable choice for use cases that require high performance while scaling.</p>
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Amazon Redshift

Amazon Redshift

[Amazon Redshift](#) is a data warehousing service that you can use for big data analytics. It offers the ability to collect data from many sources and helps you to understand relationships and trends across your data.

AWS Data Migration Service

AWS Database Migration Service (AWS DMS)

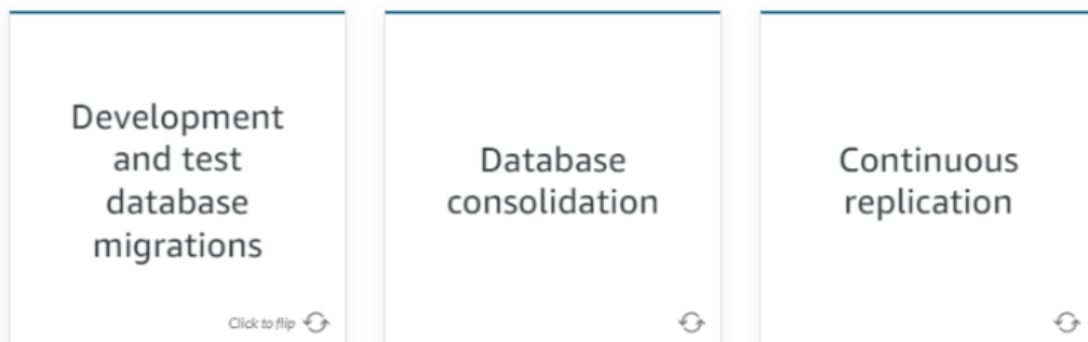
[AWS Database Migration Service \(AWS DMS\)](#) enables you to migrate relational databases, nonrelational databases, and other types of data stores.

With AWS DMS, you move data between a source database and a target database. [The source and target databases](#) can be of the same type or different types. During the migration, your source database remains operational, reducing downtime for any applications that rely on the database.

For example, suppose that you have a MySQL database that is stored on premises in an Amazon EC2 instance or in Amazon RDS. Consider the MySQL database to be your source database. Using AWS DMS, you could migrate your data to a target database, such as an Amazon Aurora database.

Other use cases for AWS DMS

Select each card to flip it.



Other use cases for AWS DMS

Select each card to flip it.



Additional Database Services

Amazon DocumentDB

[Amazon DocumentDB](#) is a document database service that supports MongoDB workloads. (MongoDB is a document database program.)

Amazon Neptune

[Amazon Neptune](#) is a graph database service.

You can use Amazon Neptune to build and run applications that work with highly connected datasets, such as recommendation engines, fraud detection, and knowledge graphs.

Amazon Quantum Ledger Database (Amazon QLDB)

[Amazon Quantum Ledger Database \(Amazon QLDB\)](#) is a ledger database service.

You can use Amazon QLDB to review a complete history of all the changes that have been made to your application data.

Amazon Managed Blockchain —

[Amazon Managed Blockchain](#) is a service that you can use to create and manage blockchain networks with open-source frameworks.

Blockchain is a distributed ledger system that lets multiple parties run transactions and share data without a central authority.

Amazon ElastiCache —

[Amazon ElastiCache](#) is a service that adds caching layers on top of your databases to help improve the read times of common requests.

It supports two types of data stores: Redis and Memcached.

Amazon DynamoDB Accelerator —

[Amazon DynamoDB Accelerator \(DAX\)](#) is an in-memory cache for DynamoDB.

It helps improve response times from single-digit milliseconds to microseconds.