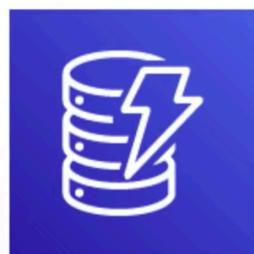


Elastic Block Store (EBS)



A **virtual hard drive** in the cloud.
Create new volumes attach to EC2 instances,
backup via snapshots and easy encryption.



Introduction to EBS

What is IOPS?

IOPS stands for Input/Output Per Second. It is the speed at which **non-contiguous reads and writes** can be performed on a storage medium. high I/O = lots of small fast reads and writes

What is Throughput?

The **data transfer rate to and from the storage** medium in megabytes per second.

What is Bandwidth?

bandwidth is **the measurement of the total possible speed of data movement along the network**



Think of **Bandwidth** as the **Pipe** and **Throughput** as the **Water**.



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Introduction to EBS

Elastic Block Store (EBS) is a highly available and durable solution for attaching persistent block storage volumes to an EC2 instance. Volumes are automatically replicated within their Availability Zone (AZ) to protect from component failure.

There are  **5 Types** of EBS Storage

1. **General Purpose (SSD)** (gp2) for general usage without specific requirements
2. **Provisioned IOPS (SSD)** (io1) when you require really fast input & output
3. **Throughput Optimized HDD** (st1) magnetic drive optimised for quick throughput
4. **Cold HDD** (sc1) Lowest cost HDD volume for infrequently access workloads
5. **EBS Magnetic** (standard) previous generation HDD



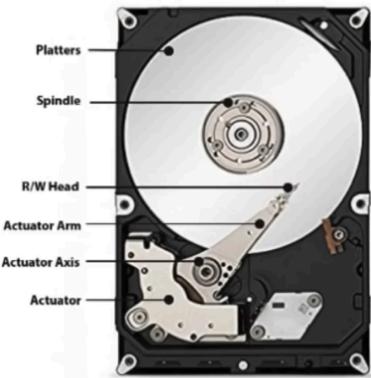
EBS - Volume Type Usage

	Solid State Drives (SSD)		Hard Disk Drives (HDD)		
Volume Type	General Purpose	Provisioned IOPS SSD	Throughput Optimized HDD	Cold HDD	EBS Magnetic
API Names	gp2	io1	st1	sc1	standard
Description	Balances price and performance	Highest SSD performance for Mission-critical low latency or high throughput	Low-cost. Designed for frequently accessed, throughput intensive workloads	Lowest HDD cost. Less frequently used workloads	
Use Cases	Most Workloads	Large Databases IOPS greater than 16,000 or Throughput greater than 250 MiB	Data Warehouses Big Data Log Processing	File Storage	Archival Storage
Volume Size	1GiB - 16TiB	4GB - 16 TiB	500GiB - 15TiB	500GiB - 15TiB	500GiB - 15TiB
Max IOPS	16,000	64,000	500	250	40-200

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Storage Volumes



Hard Disk Drive (HDD)

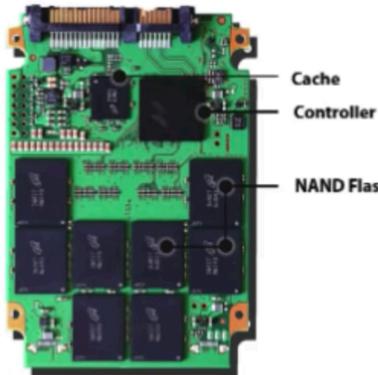
HDD is magnetic storage that uses rotating platters an actuator arm and a magnetic head (similar to record player).

HDD is very good at writing a continuously amount of data.

HDD not great for writing many small reads and write (think of the arm of record player having to lift up and down and move around)

- Better for Throughput
- Physical Moving Part

Storage Volumes



Solid State Drive (SSD)

Uses integrated circuit assemblies as memory to store data persistently, typically using flash memory. SSDs are typically more resistant to physical shock, run silently, and have quicker access time and lower latency.

- Very good frequently reads and writes (I/O)
- No physical moving parts



Storage Volumes



Magnetic Tape

A large reel of magnetic tape. A tape drive is used to write data to the tape. Medium and large-sized data centers deployed both tape and disk formats. They normally come in the form of a cassettes. Magnetic is very cheap to produce and can store considerable amount of data.

- Durable for decades
- cheap to produce



A Tape drive used to read a modern cassette



Cassettes containing magnetic tape



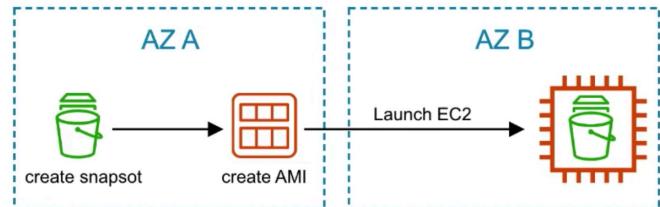
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EBS - Moving Volumes

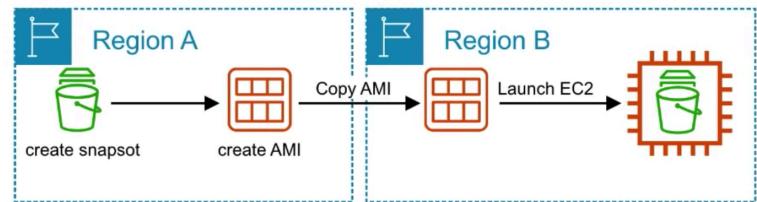
From one AZ to another

1. take a Snapshot of the volume
2. create an AMI from the Snapshot
3. launch new EC2 instance in desired AZ



From one Region to another

1. take a Snapshot of the volume
2. create an AMI from the Snapshot
3. copy the AMI to another region
4. launch a new EC2 instance from the copied AMI.





EBS - Encrypted Root Volume

When you are through the wizard launching an EC2 instance you can **encrypt the volume on creation**

The screenshot shows the 'Create New Volume' step of the EC2 instance creation wizard. It displays a table with one row for a 'Root' volume. The 'Encryption' column is highlighted with a red box and an arrow pointing to it from the text above. The dropdown menu in this column is set to 'Not Encrypted'.

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encryption
Root	/dev/xvda	snap-0e4c15b8cba3e8ae6	8	General Purpose SSD (gp2)	100 / 3000	N/A	<input checked="" type="checkbox"/>	<input type="button" value="Not Encrypted"/>

If you want to encrypt an **existing volume** you'll have to do the following:

- Take a Snapshot of the unencrypted volume
- Create a copy of that Snapshot and select the **Encryption option**
- Create a new AMI from the encrypted Snapshot
- Launch a new EC2 instance from the created AMI





EBS vs Instance Store Volumes

An EC2 instance can be backed (root device) by an **EBS Volume** or **Instance Store Volume**

lasting for a very short time



EBS Volumes



A **durable**, block-level storage device that you can attach to a single EC2 instance

EBS Volume created from an EBS Snapshot

- Can start and stop instances.
- Data will persist if your reboot your system

Ideal for when you want data to persist. In most use cases you'll want EBS backed volume

Instance Store Volumes (Ephemeral)

A **temporary** storage type located on disks that are physically attached to a host machine.

An Instance Store Volume is created from a template stored in S3

- Cannot stop instances can only terminate.
- Data will be lost in case of health host fails or instance is terminated

Ideal for temporary backup, and for storing an application's cache, logs, or other random data.



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EBS CheatSheet

- **Elastic Block Store (EBS)** is a virtual hard disk. Snapshots are a point-in-time copy of that disk.
- Volumes exist on EBS. Snapshots exist on S3.
- Snapshots are incremental, only changes made since the last snapshot are moved to S3.
- Initial Snapshots of an EC2 instance will take longer to create than subsequent Snapshots
- If taking Snapshot of a root volume, the EC2 instance should be stopped before Snapshotting
- You can take Snapshots while the instance is still running.
- You can create AMIs from Volumes, or from Snapshots.
- **EBS Volumes** A **durable**, block-level storage device that you can attach to a single EC2 instance
- **EBS Volumes** can be modified on the fly eg. storage type or volume size.
- Volumes always exist in the same AZ as the EC2 instance.
- **Instance Store Volumes** A **temporary** storage type located on disks that are physically attached to a host machine.
- **Instance Store Volumes** (ephemeral) cannot be stopped. If the host fails then you lose your data.
- EBS Backed instances can be stopped and you will not lose any data.
- By default root volumes are deleted on termination.
- **EBS Volumes** can have termination protection (don't delete the volume on termination)
- Snapshots or restored encrypted volumes will also be encrypted.
- You cannot share a snapshot if it has been encrypted.
- Unencrypted snapshots can be shared with other AWS accounts or made public.