Amazon Elastic Block Store (EBS) is a cloud-based block storage service provided by AWS. EBS is designed to provide persistent, high-performance storage that can be attached to Amazon EC2 instances. It offers a wide range of use cases, from hosting the operating system of your EC2 instance to running databases, data warehouses, and other high-performance applications.

Key Features of AWS EBS:

- **Block Storage:** EBS volumes function like traditional hard drives or SSDs, providing block-level storage. This means data is organized in fixed-size blocks, making it suitable for use with file systems, databases, and applications that require direct access to data at the block level.

- **Persistent Storage:** Unlike instance store volumes, EBS volumes are persistent. Data stored on an EBS volume remains intact even if the EC2 instance it is attached to is stopped or terminated.

- **Highly Available and Durable:** EBS automatically replicates data within a single Availability Zone to ensure high availability and durability.

- **Customizable Performance:** EBS offers different volume types (e.g., General Purpose SSD, Provisioned IOPS SSD, Throughput Optimized HDD) to match varying performance and cost requirements.

- **Snapshots:** You can take point-in-time snapshots of EBS volumes, which are stored in Amazon S3. These snapshots can be used for backups or to create new EBS volumes.

- **Encryption:** EBS supports encryption of data at rest and in transit, ensuring that your data is secure.
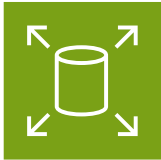
Amazon
Elastic Block Storage (EBS)

Intro Parameters

- Volume **Network Drive** (provides low latency access to data)

- Can only be mounted to 1 instance at a time (except EBS multi-attach)

- **Bound to an AZ**

- Must provision capacity in advance (size in GB & throughput in IOPS)

- By default, upon instance termination, the root EBS volume is deleted and any other attached EBS volume is not deleted (can be over-ridden using DeleteOnTermination attribute)

- To replicate an EBS volume across AZ or region, need to copy its snapshot

- EBS Multi-attach allows the same EBS volume to attach to multiple EC2 instances **in the same AZ**

- **New EBS volumes are raw block storage and do not contain any partition or file system.** You need to login to the instance and **format the EBS volume with a file system** for it to be usable.

DeleteOnTermination attribute can be updated for the root EBS volume for a running instance only from the CLI. It can be done from the console only if the instance is stopped.
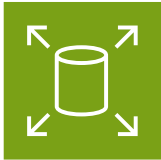
Volume Types

**General Purpose SSD**

- Good for system boot volumes, virtual desktops

- Storage: 1 GB - 16 TB

- **Max IOPS: 16,000**

- **gp3**

    o **3,000 IOPS baseline** (max 16,000 - independent of size)

    o 125 MiB/s throughput (max 1000MiB/s - independent of size)

- **gp2**

    o **Burst IOPS up to 3,000**

    o **3 IOPS per GB**

    o **Max IOPS: 16,000** (at 5,334 GB)

Provisioned IOPS SSD

- Optimized for **Transaction-intensive Applications** with high frequency of **small & random IO operations**. They are sensitive to increased I/O latency.

- Maintain high IOPS while keeping I/O latency down by maintaining a **low queue length** and a high number of IOPS available to the volume.

- **Supports EBS Multi-attach** (not supported by other types)

- **io1** or **io2**

    o Storage: **4 GB - 16 TB**

    o Max IOPS: **64,000 for Nitro EC2 instances** & **32,000 for non-Nitro**

    o **50 IOPS per GB** (64,000 IOPS at 1,280 GB)

    o io2 have more durability and more IOPS per GB (at the same price as io1)

- **io2 Block Express**

    o Storage: 4 GB - **64 TB**

    o Sub-millisecond latency

    o **Max IOPS: 256,000**

    o 1000 IOPS per GB
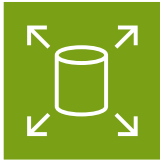
Hard Disk Drives (HDD)

- Optimized for **Throughput-intensive Applications** that require **large & sequential IO operations** and are less sensitive to increased I/O latency (big data, data warehousing, log processing)

- Maintain high throughput to HDD-backed volumes by maintaining a **high queue length** when performing large, sequential I/O

- **Cannot be used as boot volume** for an EC2 instance

- Storage: 125 MB - 16 TB

- **Throughput Optimized HDD (st1)**

    - Optimized for large sequential reads and writes (Big Data, Data Warehouses, Log Processing)

    - **Max throughput: 500 MB/s**

    - **Max IOPS: 500**

- **Cold HDD (sc1)**

    - For infrequently accessed data

    - Cheapest

    - **Max throughput: 250 MB/s**

    - **Max IOPS: 250**
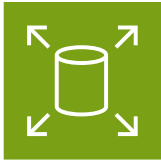
Encryption

- Optional

- For Encrypted EBS volumes

    o Data at rest is encrypted

    o **Data in-flight between the instance and the volume is encrypted**

    o All snapshots are encrypted

    o All volumes created from the snapshot are encrypted

- Encrypt an un-encrypted EBS volume

    o Create an EBS snapshot of the volume

    o Copy the EBS snapshot and encrypt the new copy

    o Create a new EBS volume from the encrypted snapshot (the volume will be automatically encrypted)

Snapshots

- **Data Lifecycle Manager (DLM)** can be used to automate the creation, retention, and deletion of snapshots of EBS volumes

- **Snapshots are incremental**

- Only the most recent snapshot is required to restore the volume
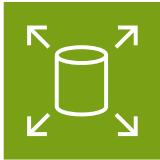
RAID (Redundant Array of Independent Tasks)

RAID (Redundant Array of Independent Disks) is a data storage technology that combines multiple disk drives into a single logical unit to improve performance, redundancy, or both. In Amazon EBS (Elastic Block Store), RAID can be configured to achieve specific storage performance and data redundancy requirements.

➔ **RAID 0**

RAID 0, also known as **striping**, distributes data across multiple disk volumes (EBS volumes in this context) without any redundancy. The data is divided into blocks, and each block is written to a separate disk. This allows for increased performance because multiple disks can be read or written to simultaneously.

- o **Improve performance** of a storage volume by distributing reads & writes in a stripe across attached volumes
- o If you add a storage volume, you get the straight addition of throughput and IOPS
- o For high performance applications

How RAID 0 Works in EBS:

- o You can create multiple EBS volumes and use software RAID (such as mdadm on Linux or Storage Spaces on Windows) to configure RAID 0 across those volumes.
- o This setup increases the aggregate throughput available to your instance, effectively combining the performance of each volume.

➔ **RAID 1**

RAID 1, also known as **mirroring**, duplicates the same data across multiple disk volumes. This setup provides redundancy, as all data is mirrored identically on each disk.

- o **Improve data availability** by mirroring data in multiple volumes
- o For critical applications

How RAID 1 Works in EBS:

- o You create multiple EBS volumes and configure RAID 1 using software RAID tools. This mirrors the data across all volumes.
- o In case of a volume failure, you can replace the failed volume and rebuild the mirror without data loss.

Amazon
Elastic Block Storage (EBS)

AWS EBS Scenario based Questions

https://lisireddy.medium.com/aws-ebs-scenario-based-questions-f296ddee158d

Wish you the best …! Happy Learning ..!

Yours' Love (@lisireddy across all the platforms)