Introduction

Amazon Web Services (AWS) provides low-cost data storage with high durability and availability. AWS offers storage choices for backup, archiving, and disaster recovery use cases and provides block, file, and object storage.

Amazon S3

Amazon Simple Storage Service (Amazon S3) provides developers and IT teams secure, durable, highly scalable object storage at a very low cost.1 You can store and retrieve any amount of data, at any time, from anywhere on the web through a simple web service interface.

You can write, read, and delete objects containing from 1 byte to 5 TB of data. Amazon S3 is highly scalable, allowing concurrent read or write access to data by many separate clients or application threads.

Amazon S3 offers a range of storage classes designed for different use cases including the following:

 Amazon S3 Standard, for general-purpose storage of frequently accessed data

 Amazon S3 Standard-Infrequent Access (Standard-IA), for long-lived, but less frequently accessed data

 Amazon Glacier, for low-cost archival data

Usage Patterns

There are four common usage patterns for Amazon S3.

First, Amazon S3 is used to store and distribute static web content and media. This content can be delivered directly from Amazon S3 because each object in Amazon S3 has a unique HTTP URL.

Alternatively, Amazon S3 can serve as an origin store for a content delivery network (CDN), such as Amazon CloudFront.

The elasticity of Amazon S3 makes it particularly well suited for hosting web content that requires bandwidth for addressing extreme demand spikes. Also, because no storage provisioning is required, Amazon S3 works well for fast-growing websites hosting data-intensive, user-generated content, such as video-and photo-sharing sites.

Second, Amazon S3 is used to host entire static websites. Amazon S3 provides a low-cost, highly available, and highly scalable solution, including storage for static HTML files, images, videos, and client-side scripts in formats such as JavaScript.

Third, Amazon S3 is used as a data store for computation and large-scale analytics, such as financial transaction analysis, clickstream analytics, and media transcoding. Because of the horizontal scalability of Amazon S3, you can access your data from multiple computing nodes concurrently without being constrained by a single connection.

Finally, Amazon S3 is often used as a highly durable, scalable, and secure solution for backup and archiving of critical data. You can easily move cold data to Amazon Glacier using lifecycle management rules on data stored in Amazon S3.

You can also use Amazon S3 cross-region replication to automatically copy objects across S3 buckets in different AWS Regions asynchronously, providing disaster recovery solutions for business continuity.

Amazon EBS

Amazon Elastic Block Store (Amazon EBS) volumes provide durable block-level storage for use with EC2 instances.28 Amazon EBS volumes are network-attached storage that persists independently from the running life of a single EC2 instance.

After an EBS volume is attached to an EC2 instance, you can use the EBS volume like a physical hard drive, typically by formatting it with the file system of your choice and using the file I/O interface provided by the instance operating system.

Most Amazon Machine Images (AMIs) are backed by Amazon EBS, and use an EBS volume to boot EC2 instances. You can also attach multiple EBS volumes to a single EC2 instance. Note, however, that any single EBS volume can be attached to only one EC2 instance at any time.

EBS also provides the ability to create point-in-time snapshots of volumes, which are stored in Amazon S3. These snapshots can be used as the starting point for new EBS volumes and to protect data for long-term durability.

To learn more about Amazon EBS durability, see the EBS Durability and Availability section of this whitepaper. The same snapshot can be used to instantiate as many volumes as you want. These snapshots can be copied across AWS Regions, making it easier to leverage multiple AWS Regions for geographical expansion, data center migration, and disaster recovery.

Sizes for EBS volumes range from 1 GiB to 16 TiB, depending on the volume type, and are allocated in 1 GiB increments.

Usage Patterns

Amazon EBS is meant for data that changes relatively frequently and needs to persist beyond the life of EC2 instance. Amazon EBS is well-suited for use as the primary storage for a database or file system, or for any application or instance (operating system) that requires direct access to raw block-level storage.

Amazon EBS provides a range of options that allow you to optimize storage performance and cost for your workload. These options are divided into two major categories:

solid-state drive (SSD)-backed storage for transactional workloads such as databases and boot volumes (performance depends primarily on IOPS) and hard disk drive (HDD)-backed storage for throughput-intensive workloads such as big data, data warehouse, and log processing (performance depends primarily on MB/s).

**General Purpose SSD (gp2)** volumes offer cost-effective storage that is ideal for a broad range of workloads. These volumes deliver single-digit millisecond latencies, the ability to burst to 3,000 IOPS for extended periods of time, and a baseline performance of 3 IOPS/GiB up to a maximum of 10,000 IOPS (at 3,334 GiB).

The gp2 volumes can range in size from 1 GiB to 16 TiB. These volumes have a throughput limit range of 128 MiB/second for volumes less than or equal to 170 GiB; for volumes over 170 GiB, this limit increases at the rate of 768 KiB/second per GiB to a maximum of 160 MiB/second (at 214 GiB and larger).

**Provisioned IOPS SSD (io1)** volumes are designed to deliver predictable high performance for I/O-intensive workloads with small I/O size where the dominant performance attribute is IOPS, such as database workloads that are sensitive to storage performance and consistency in random access I/O throughput.

You specify an IOPS rate when creating a volume, and then Amazon EBS delivers within 10 percent of the provisioned IOPS performance 99.9 percent of the time over a given year, when attached to an EBS-optimized instance.

The io1 volumes can range in size from 4 GiB to 16 TiB, and you can provision up to 20,000 IOPS per volume. The ratio of IOPS provisioned to the volume size requested can be a maximum of 50. For example, a volume with 5,000 IOPS must be at least 100 GB in size.

**Throughput Optimized HDD (st1)** volumes are ideal for frequently accessed, throughput-intensive workloads with large datasets and large I/O sizes, where the dominant performance attribute is throughput (MiB/s), such as streaming workloads, big data, data warehouse, log processing, and ETL workloads.

These volumes deliver performance in terms of throughput, measured in MiB/s, and include the ability to burst up to 250MiB/s per TiB, with a baseline throughput of 40MiB/s per TiB and a maximum throughput of 500MiB/s per volume.

The st1 volumes are designed to deliver the expected throughput performance 99 percent of the time and has enough I/O credits to support a full-volume scan at the burst rate. The st1 volumes can’t be used as boot volumes.

**Cold HDD (sc1)** volumes provide the lowest cost per GiB of all EBS volume types. These are ideal for infrequently accessed workloads with large, cold datasets with large I/O sizes, where the dominant performance attribute is throughput (MiB/s).

Similarly to st1, sc1 volumes provide a burst model and can burst up to 80 MiB/s per TiB, with a baseline throughput of 12 MiB/s per TiB and a maximum throughput of 250 MB/s per volume.

The sc1 volumes are designed to deliver the expected throughput performance 99 percent of the time and have enough I/O credits to support a full-volume scan at the burst rate. The sc1 volumes can’t be used as boot volumes.