Elastic block Store - EBS:

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--> EBS provides Block Based storage for your EC2 Instances.

--> EBS Can provide secure block-based storage in terms of VOLUMES

--> EBS can provide the Volumes with Either HDD or SSD as per our requirement

Types of Volumes:

1. Root Volume --> Is the Volume of the EC2 instance, in which the operating System installed

2. EBS volume --> All other additional volumes of the EC2 instance

Note: Root volume will be deleted automatically along with the EC2 instance termination

Note2: EBS volumes, we have to delete manually after the EC2 instance termination

--> As per our requirement, we need to choose the appropriate size to create the VOLUMES

--> EBS offers, different types of volumes for different use cases

1. General Purpose SSD

- gp2

- gp3

2. Provisioned IOPS SSD

- io1

- io2

3. Cold HDD - sc1

4. Throughput optimized HDD - st1

5. Magnetic - standard (Previous generation)

--> SSD hard disks will have the dominance performance of IOPS, whereas HDD's dominance performance will be in Throughput (MB/S)

General Purpose SSD -gp2:

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UseCase:

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1. Create an EBS volume of 1GB size using gp2 type in us-east-1a AZ with a name tag "1gb-gp2-1a"

Durability - 99.8% - 99.9%

Min Size - 1 GB

Max Size - 16 TB

IOPS - Not Customizable

IOPS Ratio - [1:3, GB:IOPS], with minimum of 100 IOPS

MAX IOPS - 16000 IOPS

Throughput - Not Applicable, Upto 250 MB/s

Free Tier - Yes, Upto 30GB per Month

Boot/Root Volume - Yes

Multi-Attach - Not Supported

General purpose SSD - gp3:

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2. Create an EBS Volume of 2GB size using gp3 type in us-east-1b AZ with a name tag "2gb-gp3-1b"

Durability - 99.8% - 99.9%

Min Size - 1 GB

Max Size - 16 TB

IOPS - Can Be customized

IOPS Ratio - up to [1:500, GB:IOPS], Min of 3000 IOPS

MAX IOPS - 16000 IOPS

Throughput - 250 MB/s - 1000 Mb/s - [1:4, MB/s:IOPS]

Free Tier - Yes, upto 30GB per Month

Boot/Root Volume - Yes

Mult-Attach - Not Supported

Provisioned IOPS SSD - io1:

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3. Create an EBS volume of io1 type with 4GB size in us-east-1c AZ with a name tag of "4gb-io1-1c"

Durability - 99.8% - 99.9%

Min Size - 4 GB

Max Size - 16 TB

IOPS - Can be customized

IOPS Ratio - up to [1:50, GB:IOPS], min of100 IOPS

MAX IOPS - 64000 IOPS

Throughput - Not applicable, up to 1000MB/S

Free Tier - Not Eligible

Boot/Root Volume - Supported

Multi-Attach - Supported

Multi-Attach Limitations: Multi-Attach enabled volumes can be attached to up to 16 Linux instances built on the Nitro System that are in the same Availability Zone.

Nitro Based: https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/instance-types.html#ec2-nitro-instances

provisioned IOPS SSD - io2:

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4. Create an EBS volume of io2 type with 5GB size in us-east-1a AZ with a name tag of "5gb-io2-1a"

Durability - 99.999%

Min Size - 4 GB

Max Size - 64 TB

IOPS - Can be customized

IOPS Ratio - up to [1:1000, GB:IOPS], Min of 100 IOPS

MAX IOPS - 256000

Throughput - Not Applicable, up to 4000 MB/S

Free Tier - Not Eligible

Boot/Root Volume - Supported

Multi-Attach - Yes

Note: io2 Block Express volumes are supported with C6a, C6in, C7a, C7g, C7gd, C7gn, C7i, Inf2, M6a, M6in, M6idn, M7a, M7g, M7gd, M7i, M7i-flex, P5, R5b, R6a, R6in, R6idn, R7a, R7g, R7gd, R7i, R7iz, Trn1, Trn1n, X2idn, and X2iedn instances.

--> Provisioned IOPS SSD (io2) volumes with a size greater than 16 TiB, IOPS greater than 64,000, or IOPS:GiB ratio greater than 500:1 are supported only with instance types that support io2 Block Express.

Cold HDD - sc1:

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5. Create an EBS volume of sc1 with 125GB size in us-east-1b AZ with a name tag of "125gb-sc1-1b"

Durability - 99.8% - 99.9%

Min Size - 125 GB

Max Size - 16 TB

IOPS - Not Applicable, up to 250 IOPS

Throughput - Not Customizable

Throughput Ratio - [12:1, MB/s:TB], min of 2MB/S

Max Throughput - 250 MB/s

Free Tier - Not Eligible for free-tier

Boot/Root Volume - Not Supported

Multi-Attach - not Supported

Throughput optimized HDD - st1:

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6. Create an EBS volume of st1 type with 130GB size in us-east-1e AZ with a name tag of "130gb-st1-1e"

Durability - 99.8 - 99.9%

Min Size - 125 GB

Max Size - 16 TB

IOPS - Not Applicable, upto 500 IOPS

Throughput - Not Customizable

Throughput Ratio - [40:1, MB/s:TB], min of 5 MB/s

Throughput - 500 MB/s

Free Tier - Not Eligible

Boot/Root Volume - Not Suported

Multi-Attach - Not Supported

Magnetic - Standard:

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7. Create an EBS volume of standard type with 3GB size in us-east-1f AZ with a name tag of "3gb-std-1f"

Durability - 99.8% - 99.9%

Min Size - 1 GB

Max Size - 1 TB

IOPS - Not Applicable

Throughput - Not Applicable

Free Tier - Yes, up to 30GB Per month

Boot/Root Volume - Supported

Multi-Attach - not Supported

8. Create 3 EC2 instances with windows Operating system as mentioned below

SERVER1-A --> us-east-1a

SERVER2-A --> us-east-1a

SERVER3-B --> us-east-1b

Note: observe what type of volumes can be used as root/boot volumes

--> EBS volumes have 2 states

- Available --> Volume is available, and it is not attached with any Instance

- In-Use --> Volume is attached to an EC2 instance

--> By default, the EBS volumes can be attached to a single EC2 instance at a time.

--> EBS volumes can be attached to the EC2 instances in the same AZ

--> If Multi-Attach feature is enabled on the EBS volume, then the Volume can be attached to multiple EC2 instances at a time.

9. Attach the EBS volume "1gb-gp2-1a" to the EC2 instance "SERVER1-A"

10. Login to the SERVER1-A and observe the EBS volumes (30GB & 1GB)

Note: By Default, The New EBS volumes attached to a EC2 instance will be in Offline Mode.

--> To use the EBS volume, we need to make it Online & Initialize

--> Still, The EBS volume is not usable, as it doesn't have any valid File system.

--> We need to create a valid Filesystem depends on the operating system of the EC2 instance in order to use the volume to store the data.

11. Make the EBS Volume attached to SERVER1-A as Online & Initialize. Also Create a simple volume with NTFS File System

Note: diskmgmt.msc command can be used to open the diskmanagement window

12. Create 10 Files into the D:\ Drive (1gb-gp2-1a)

13. Attach the same volume "1gb-gp2-1a" to the EC2 instance SERVER2-A, without detaching from SERVER1-A (testing multi-attach) NOT POSSIBLE

14. Detach the Volume "1gb-gp2-1a" from SERVER1-A and attach it to the Instance "SERVER2-A. Observe that no data Loss.

--> As we cannot attach the Volumes across different AZ, we have a process to make the data available in a different AZ.

a) Create a Snapshot of the Volume (it contains all the data from the volume)

b) Create a new EBS volume from the above snapshot and select the desired AZ at the time of volume creation (Volume contains all the data from the snapshot)

c) Attach the newly created volume in the desired AZ with the EC2 instance.

15. Create a Snapshot "snapshotof1gbin1a" from the EBS volume "1gb-gp2-1a"

16. Create a new EBS volume "1gb-gp2-1b" in us-east-1b AZ using the abve snapshot "snapshotof1gbin1a"

17. attach the EBS volume "1gb-gp2-1b" with the EC2 instance SERVER3-B

18. Login to SERVER3-B and observe the data from D:\ Drive

--> To make the data of the EBS volume to be available in a different region, we need to copy the snapshot to the desired region. and then create a new EBS volume from the copied snapshot.

19. Copy the snapshot from N.Virginia to Mumbai region

20. Create a new EBS volume in 1a AZ of the Mumbai region using the copied snapshot.

Note: copying the snapshot from one region to another is chargeable.

Automated Snapshot:

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--> The process of creating the snapshot automatically at a regular interval of time is called as automated snapshot.

--> We need to use the "LifeCycle Manager" to create automated snapshot of the EBS volumes or EC2 instances.

--> We will create a life cycle rule, which can process the automated snapshots as per the requirment.

--> In the life cycle rule we will mention the below configuration

- When to create the Automated snapshot

- What volume sto be included for the Automated snapshot

- when to delete the Old (Expired) Snapshot

Note: If we target the EC2 instance for the automated snapshot, then all the EBS volumes attached to the ec2 instance will be automatically included for the snapshot

ex: If SERVER1-A is attached with 3 EBS volumes (1 root vol, 2 adtnl volumes), and if we add the target as EC2 instance then the snapshot of all the 3 EBS volumes will be automatically taken.

NOTE: We can target the EBS volume or EC2 instance, using a tag (ex: "Backup:Yes" or "abc:xyz" )

1. Create a Life Cycle rule to capture automated snapshots of all EBS volumes having a Tag "Backup:Yes" as per below requirement

- Snapshot to be created everyday morning 6:30 AM IST

- If the snapshot is more than 7 days older, it must be deleted.

a) Assign a tag "Backup:Yes" to atleast 4 EBS Volumes

b) Create life cycle rule as per the above requirement