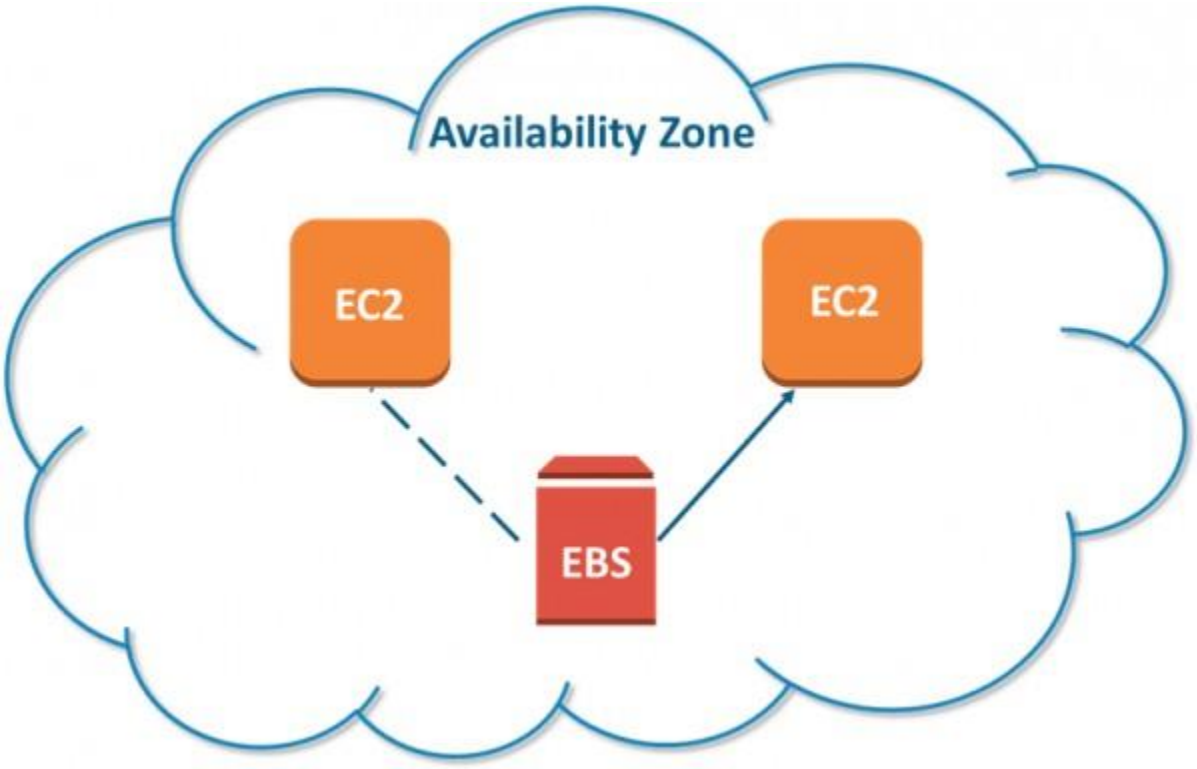
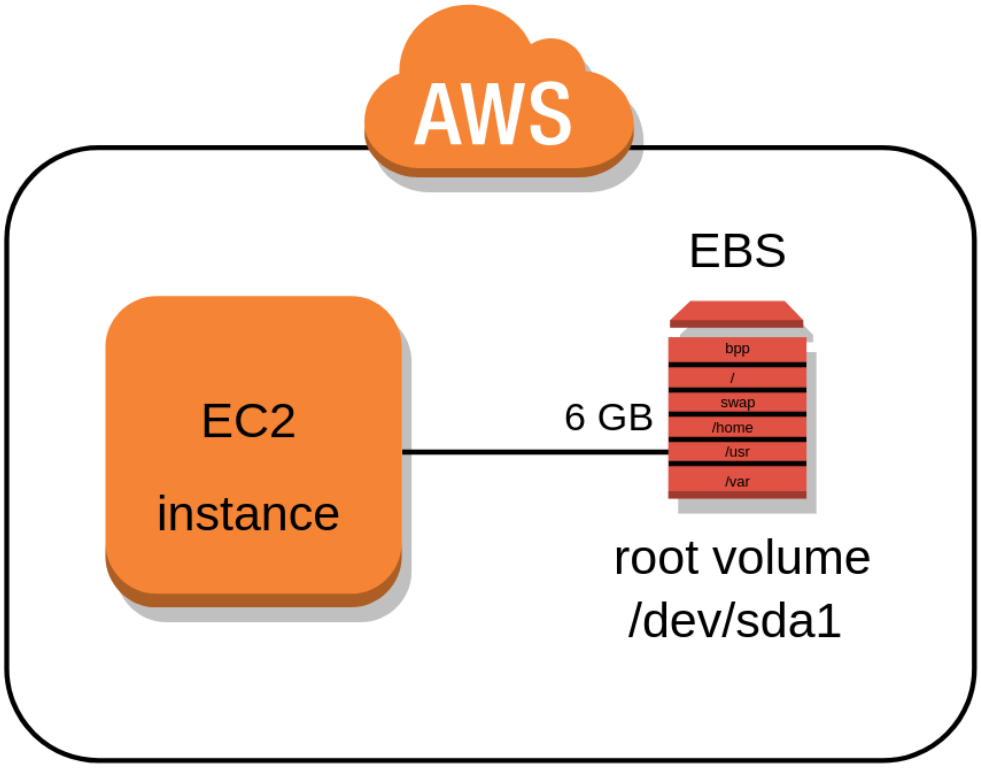
AWS EBS Volumes





AWS: Storage Choices

Amazon S3
Durable object storage for all types of data

Amazon Glacier
Archival storage for infrequently accessed data

Amazon EBS
Block storage for use with Amazon EC2

Amazon EFS
File storage for use with Amazon EC2

Economics

Pay as you go

No upfront investment
No commitment

Easy to Use

Self service administration

SDKs for simple integration

Reduce risk

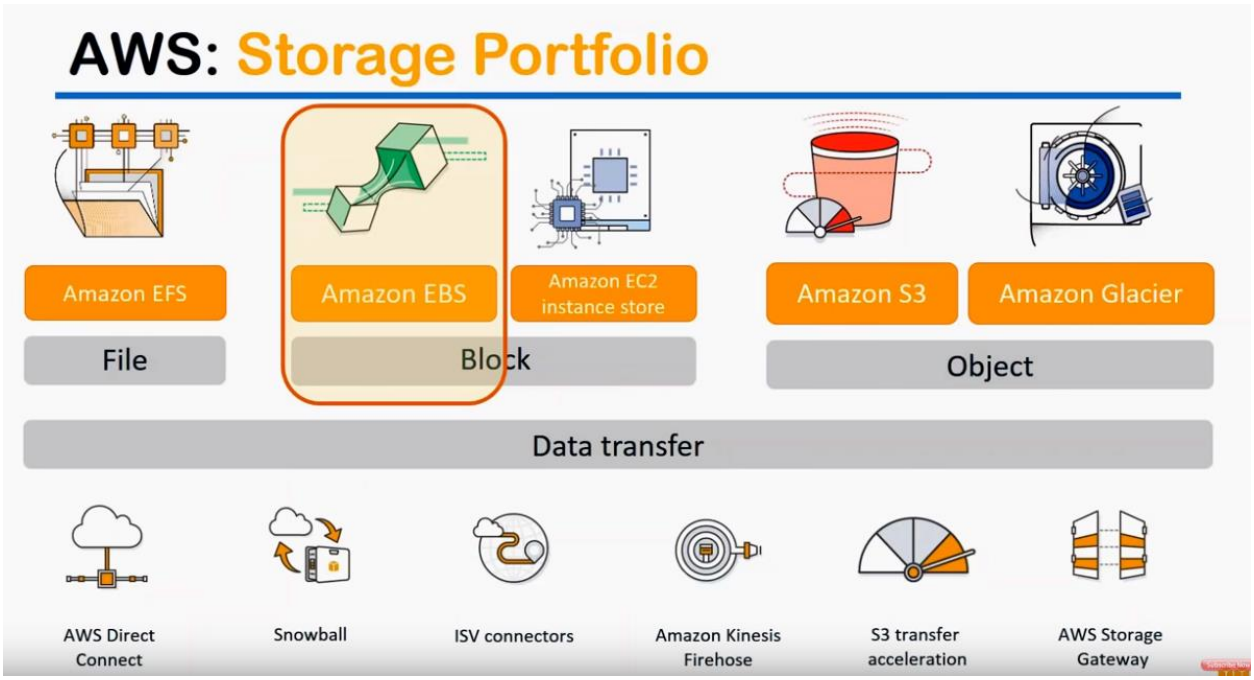
Durable and Secure

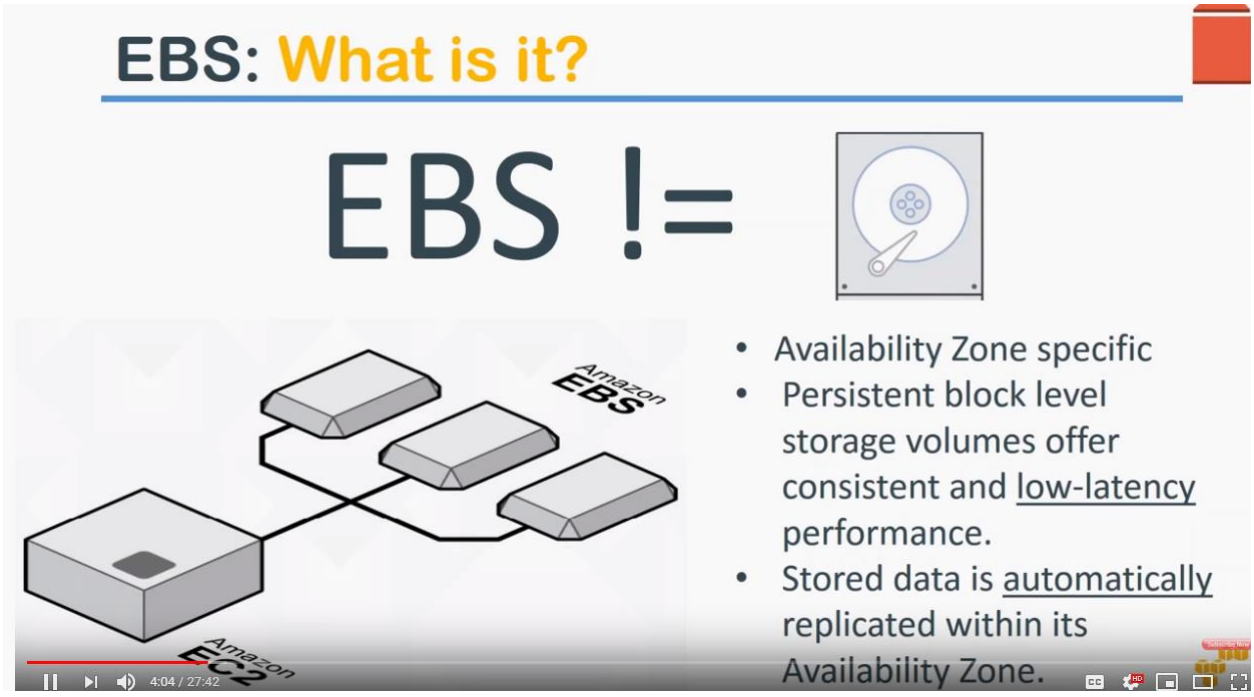
Avoid risks of physical media handling

Agility, Scale

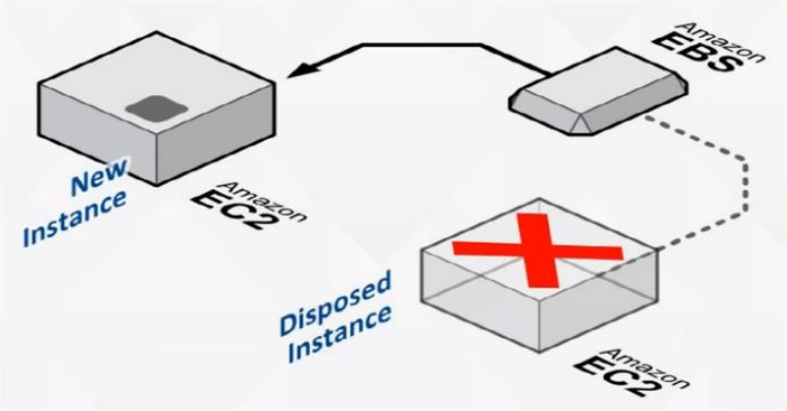
Reduce time to market

Focus on your business, not your infrastructure


AWS: Storage Portfolio
Amazon EFS
Amazon EBS
Amazon EC2 instance store
Amazon S3
Amazon Glacier
File
Block
Object
Data transfer
AWS Direct Connect
Snowball
ISV connectors
Amazon Kinesis Firehose
S3 transfer acceleration
AWS Storage Gateway


EBS: What is it?
EBS !=
Amazon EBS
Amazon EC2
4:04 / 27:42
• Availability Zone specific
• Persistent block level storage volumes offer consistent and low-latency performance.
• Stored data is automatically replicated within its Availability Zone.

EBS: What is it?



EBS: Designed for

99.999% Service Availability

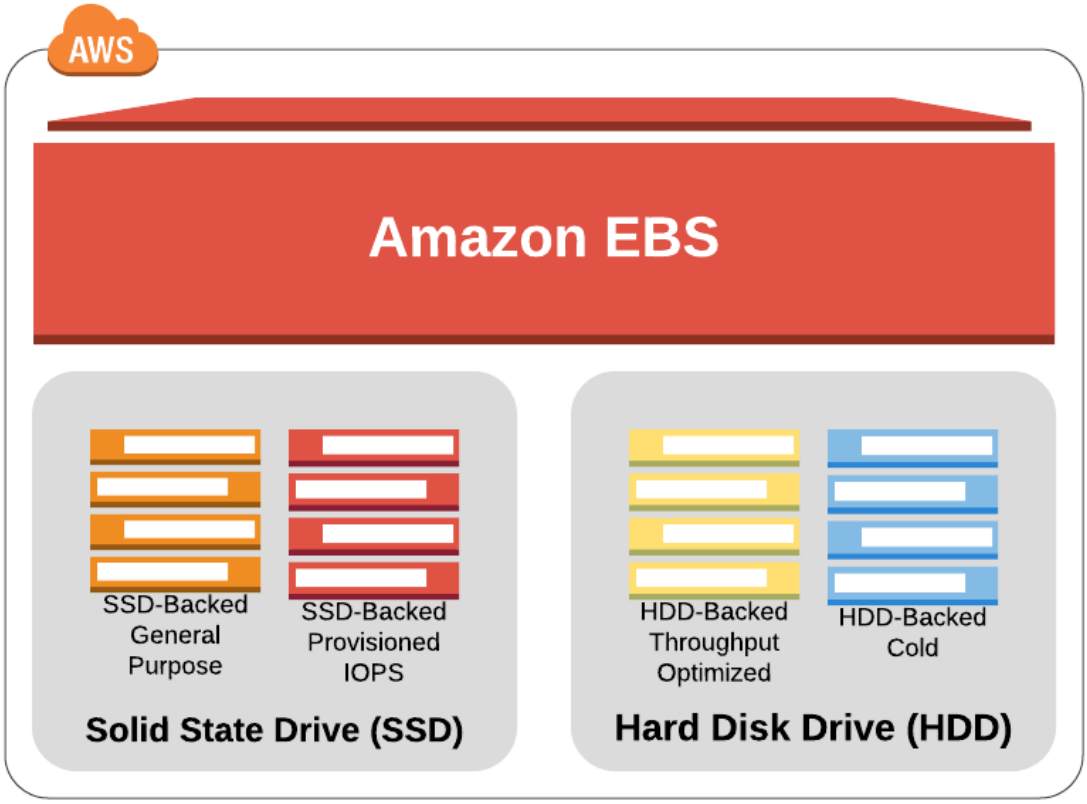
0.1% to 0.2% Annual Failure Rate (AFR)

EBS: Performance is measured by

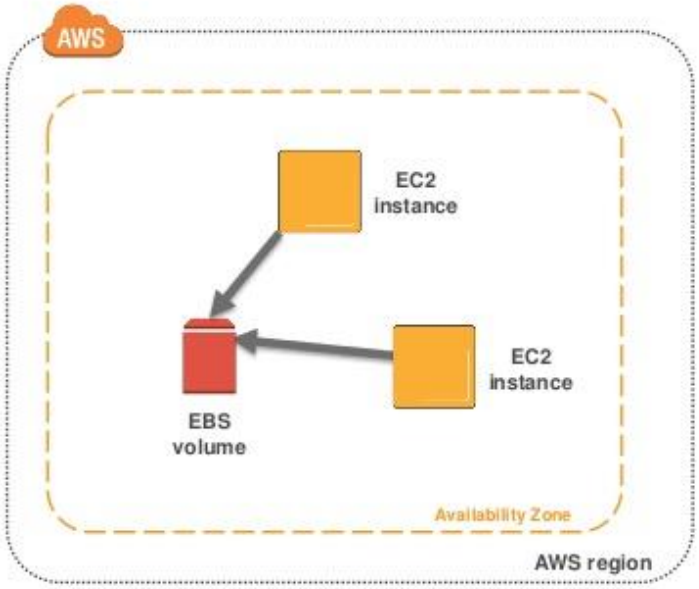
IOPS: Read/Write I/O (IOPS)

Latency: Time between I/O submission and completion (ms)

Throughput: Read/write transfer rate (MB/s);
Throughput = IOPS X I/O size



What is Amazon EBS?

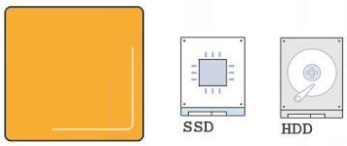


- Availability Zone specific
- Persist independently of the EC2 instance

EC2 Instance Store *vs* EBS

EC2 Instance Store

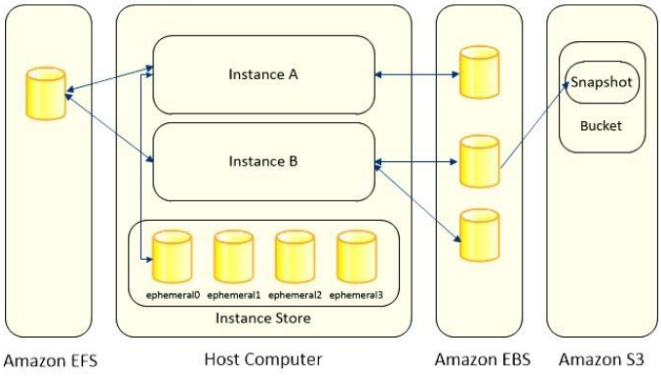
- Local to instance
- Non-persistent data store
- Data not replicated (by default)
- No snapshot support
- SSD or HDD



Elastic Block Store

- Persistent block storage volumes
- 99.999% availability
- Automatically replicated within its Availability Zone (AZ)
- Point-in-time snapshot support
- Modify volume type as needs change
- SSD or HDD
- Auto recovery

aws **Storage**



Amazon Elastic Block Store
Amazon EC2 instance store
Using Amazon EFS with Amazon EC2
Using Amazon S3 with Amazon EC2

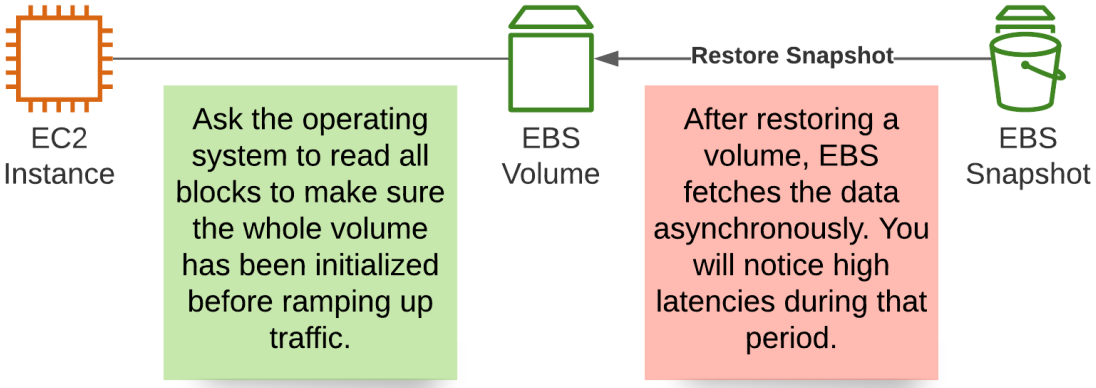
Amazon EBS volumes

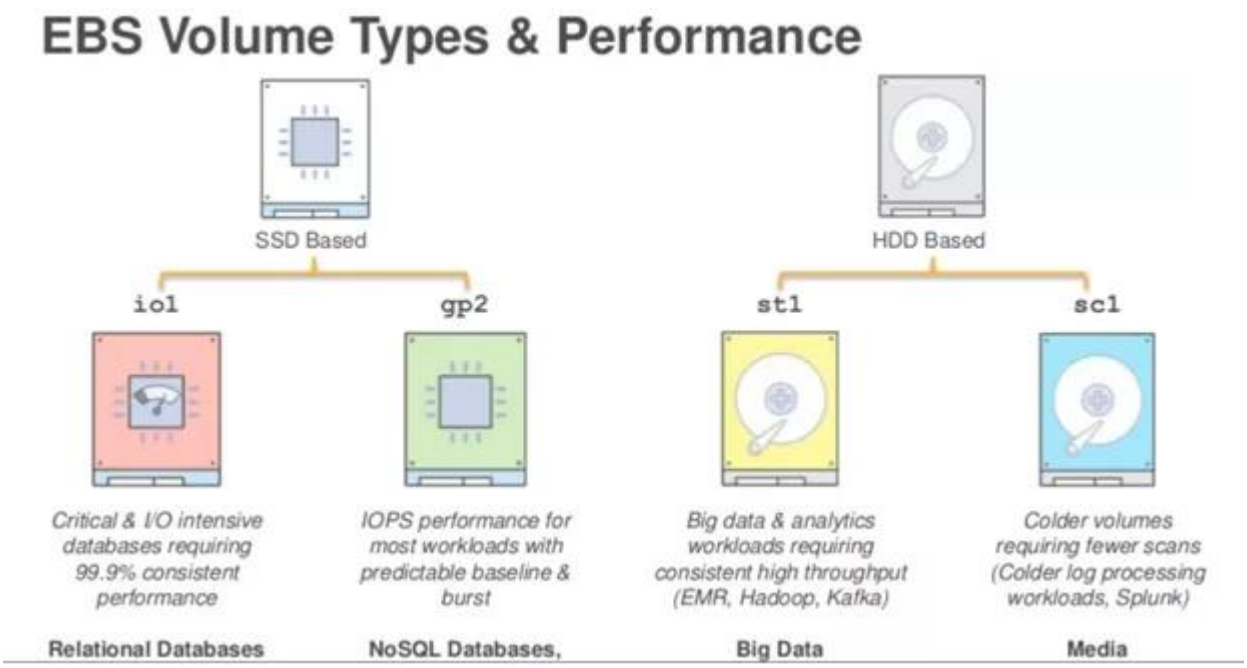
Amazon EBS volume types?

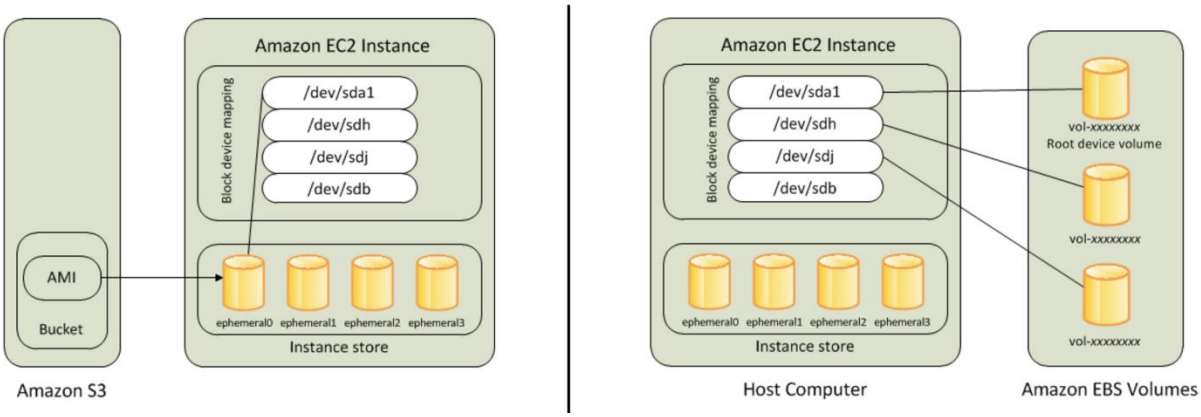
Creating an Amazon EBS volume

Attaching an Amazon EBS volume to an instance

Viewing volume information


EC2
Instance
Ask the operating system to read all blocks to make sure the whole volume has been initialized before ramping up traffic.
EBS
Volume
Restore Snapshot
After restoring a volume, EBS fetches the data asynchronously. You will notice high latencies during that period.
EBS
Snapshot

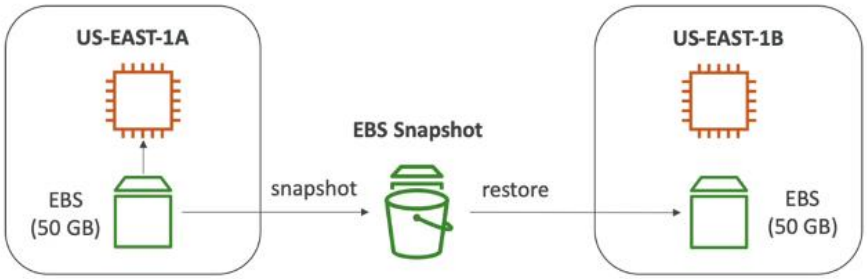

EBS Volume Types & Performance
SSD Based
HDD Based
io1
gp2
st1
sc1
Critical & I/O intensive databases requiring 99.9% consistent performance
IOPS performance for most workloads with predictable baseline & burst
Big data & analytics workloads requiring consistent high throughput (EMR, Hadoop, Kafka)
Colder volumes requiring fewer scans (Colder log processing workloads, Splunk)
Relational Databases
NoSQL Databases,
Big Data
Media

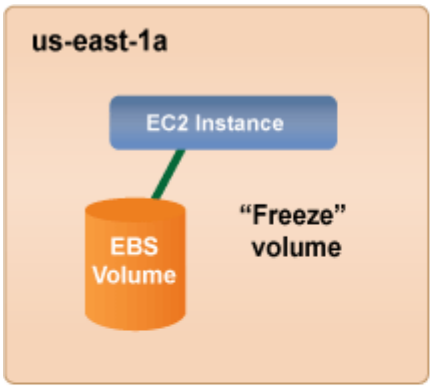


Solid State Drives (SSD)	Hard Disk Drives (HDD)
General Purpose SSD Balanced for economy and performance	**Throughput Optimized HDD**: Inexpensive, for high use, intensive workloads
Provisioned IOPS SSD High performance, for important applications	**Cold HDD** Cheap, used for infrequent access

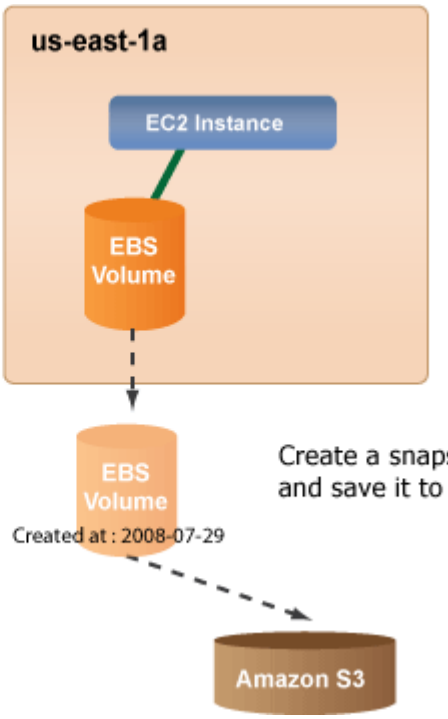
EBS Snapshots

- Make a backup (snapshot) of your EBS volume at a point in time
- Not necessary to detach volume to do snapshot, but recommended
- Can copy snapshots across AZ or Region



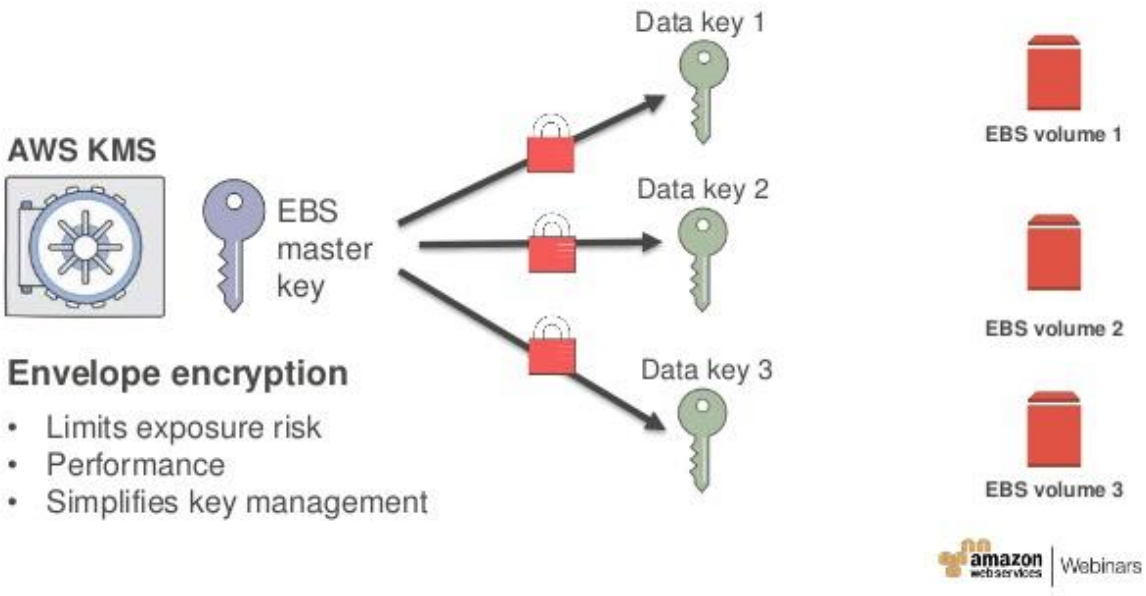


Before taking a snapshot, make sure that no more writes are being made to the volume in order to prevent data corruption and ensure that data remains synchronized.



Create a snapshot of a volume and save it to S3.

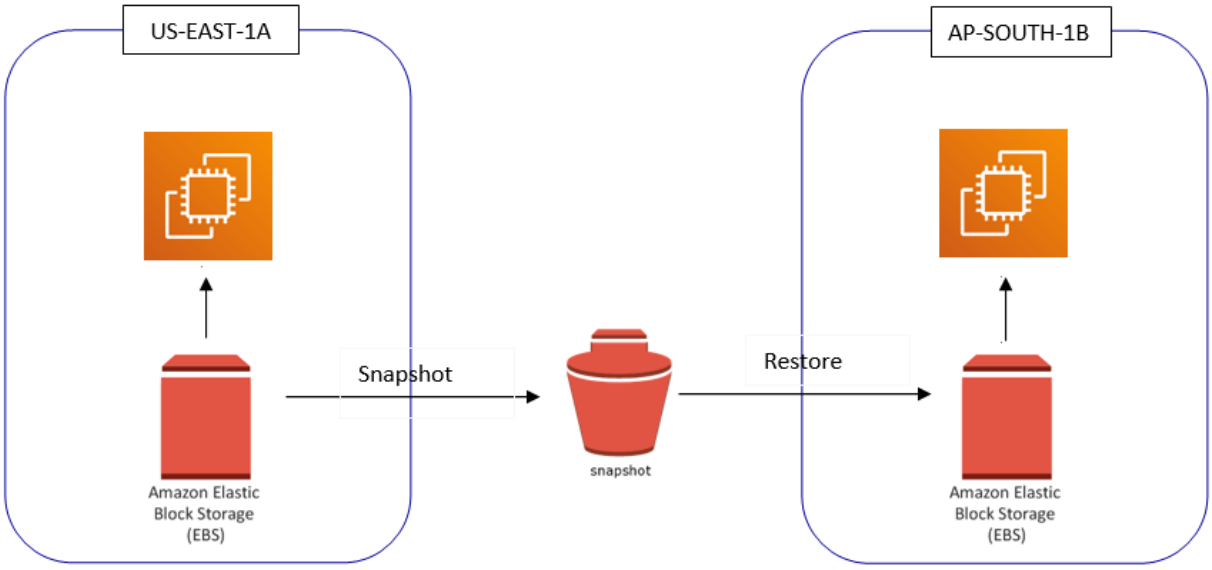
How does EBS encryption work ?



Envelope encryption

- Limits exposure risk
- Performance
- Simplifies key management

amazon web services | Webinars

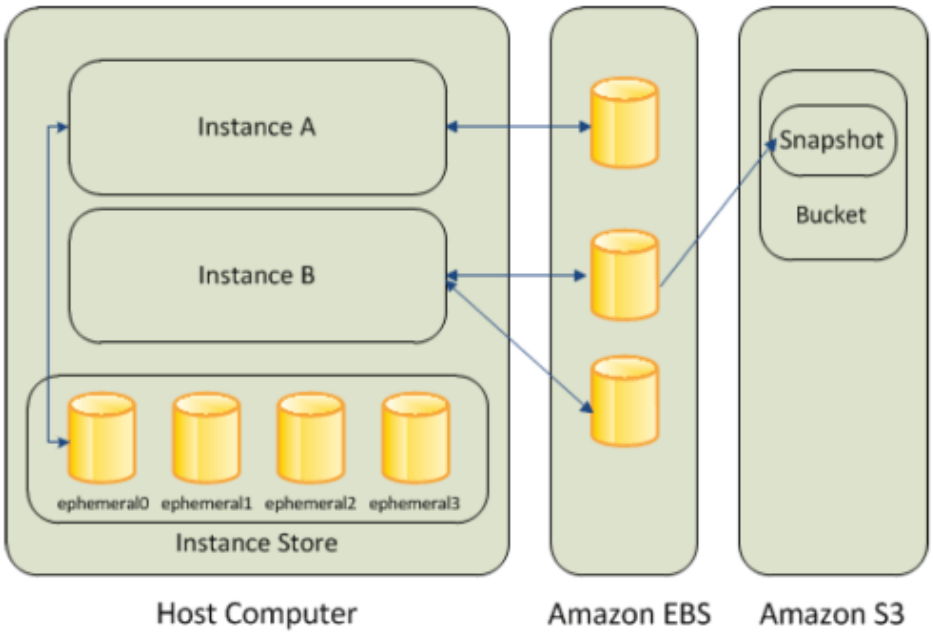


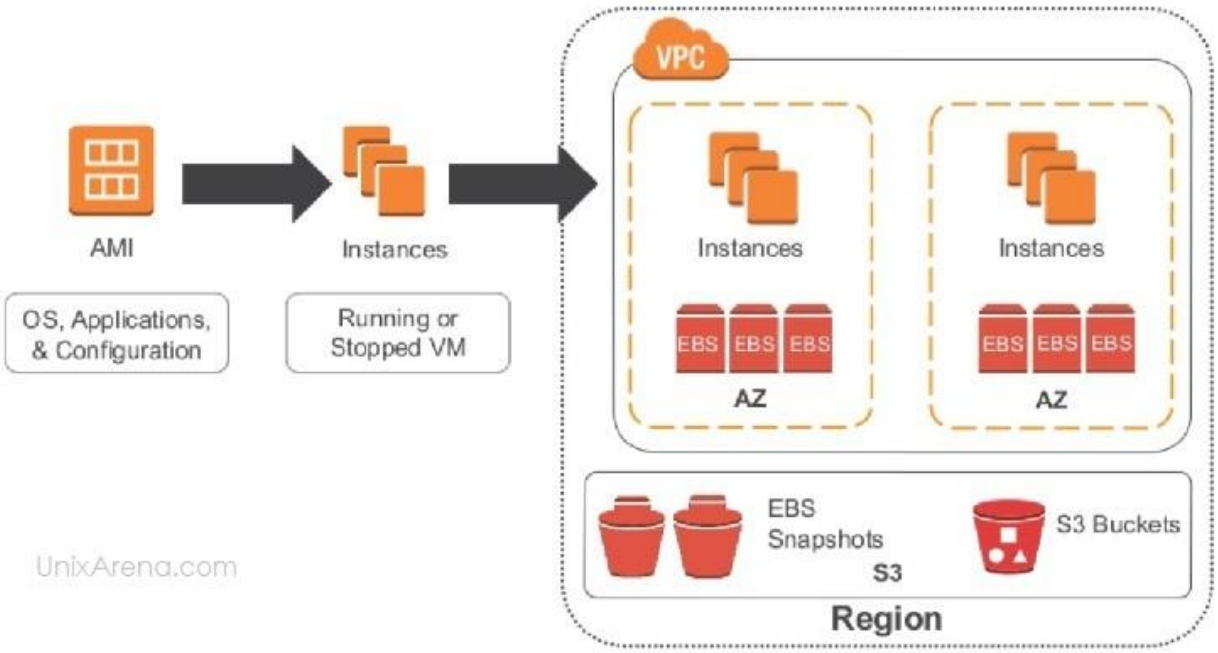
	Solid-State Drives (SSD)		Hard disk Drives (HDD)	
Volume Type	General Purpose SSD (`gp2`)*	Provisioned IOPS SSD (`io1`)	Throughput Optimized HDD (`st1`)	Cold HDD (`sc1`)
Description	General purpose SSD volume that balances price and performance for a wide variety of workloads	Highest-performance SSD volume for mission-critical low-latency or high-throughput workloads	Low cost HDD volume designed for frequently accessed, throughput-intensive workloads	Lowest cost HDD volume designed for less frequently accessed workloads
Use Cases	• Recommended for most workloads • System boot volumes • Virtual desktops • Low-latency interactive apps • Development and test environments	• Critical business applications that require sustained IOPS performance, or more than 10,000 IOPS or 160 MiB/s of throughput per volume • Large database workloads, such as: ◦ MongoDB ◦ Cassandra ◦ Microsoft SQL Server ◦ MySQL ◦ PostgreSQL ◦ Oracle	• Streaming workloads requiring consistent, fast throughput at a low price • Big data • Data warehouses • Log processing • Cannot be a boot volume	• Throughput-oriented storage for large volumes of data that is infrequently accessed • Scenarios where the lowest storage cost is important • Cannot be a boot volume
API Name	`gp2`	`io1`	`st1`	`sc1`
Volume Size	1 GiB - 16 TiB	4 GiB - 16 TiB	500 GiB - 16 TiB	500 GiB - 16 TiB
Max. IOPS/Volume**	10,000	32,000***	500	250
Max. Throughput/Volume	160 MiB/s	500 MiB/s†	500 MiB/s	250 MiB/s
Max. IOPS/Instance	80,000	80,000	80,000	80,000
Max. Throughput/Instance††	1,750 MiB/s	1,750 MiB/s	1,750 MiB/s	1,750 MiB/s
Dominant Performance Attribute	IOPS	IOPS	MiB/s	MiB/s

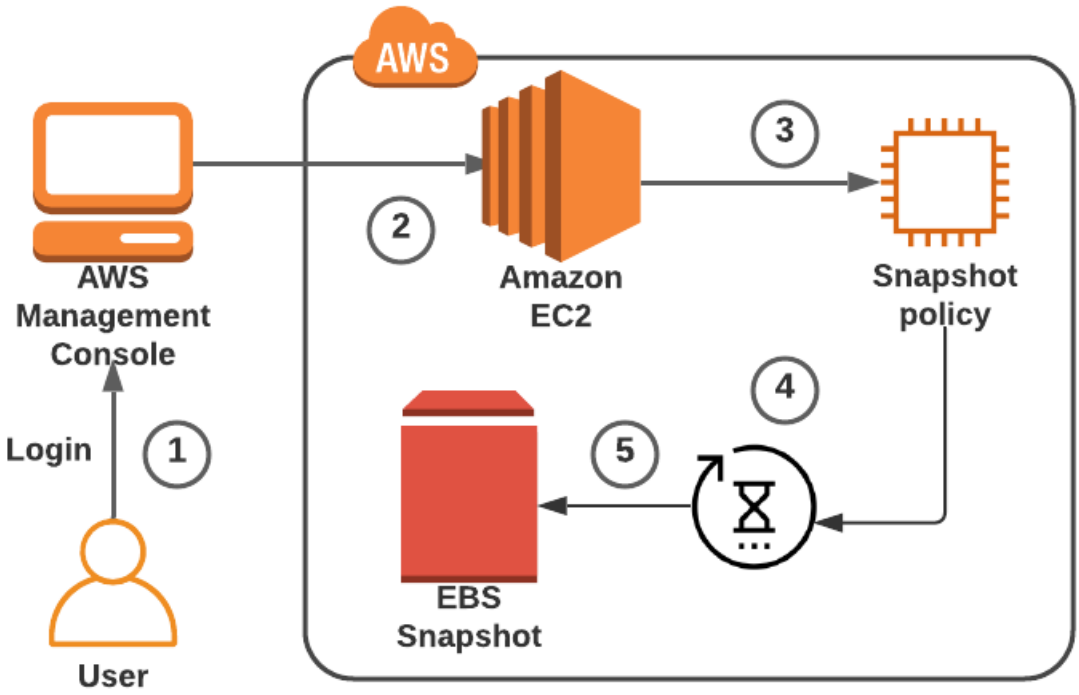
EBS – Volume Type Usage

	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

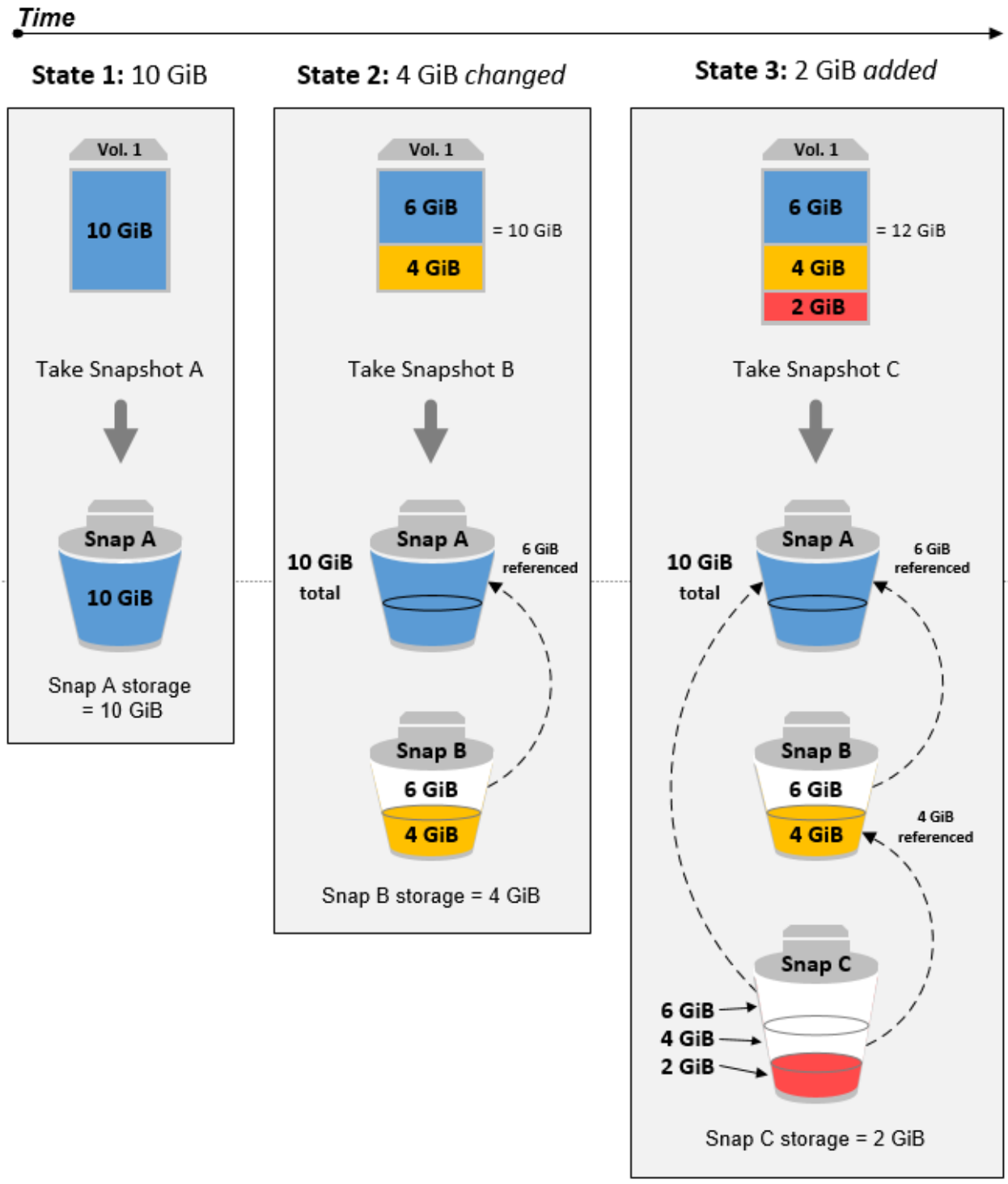
1. **General Purpose (SSD)** (gp2) for general usage without specific requirements
2. **Provisioned IOPS (SSD)** (io1) when you require really fast input & output
3. **Throughput Optimized HDD** (st1) magnetic drive optimised for quick throughput
4. **Cold HDD** (sc1) Lowest cost HDD volume for infrequently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

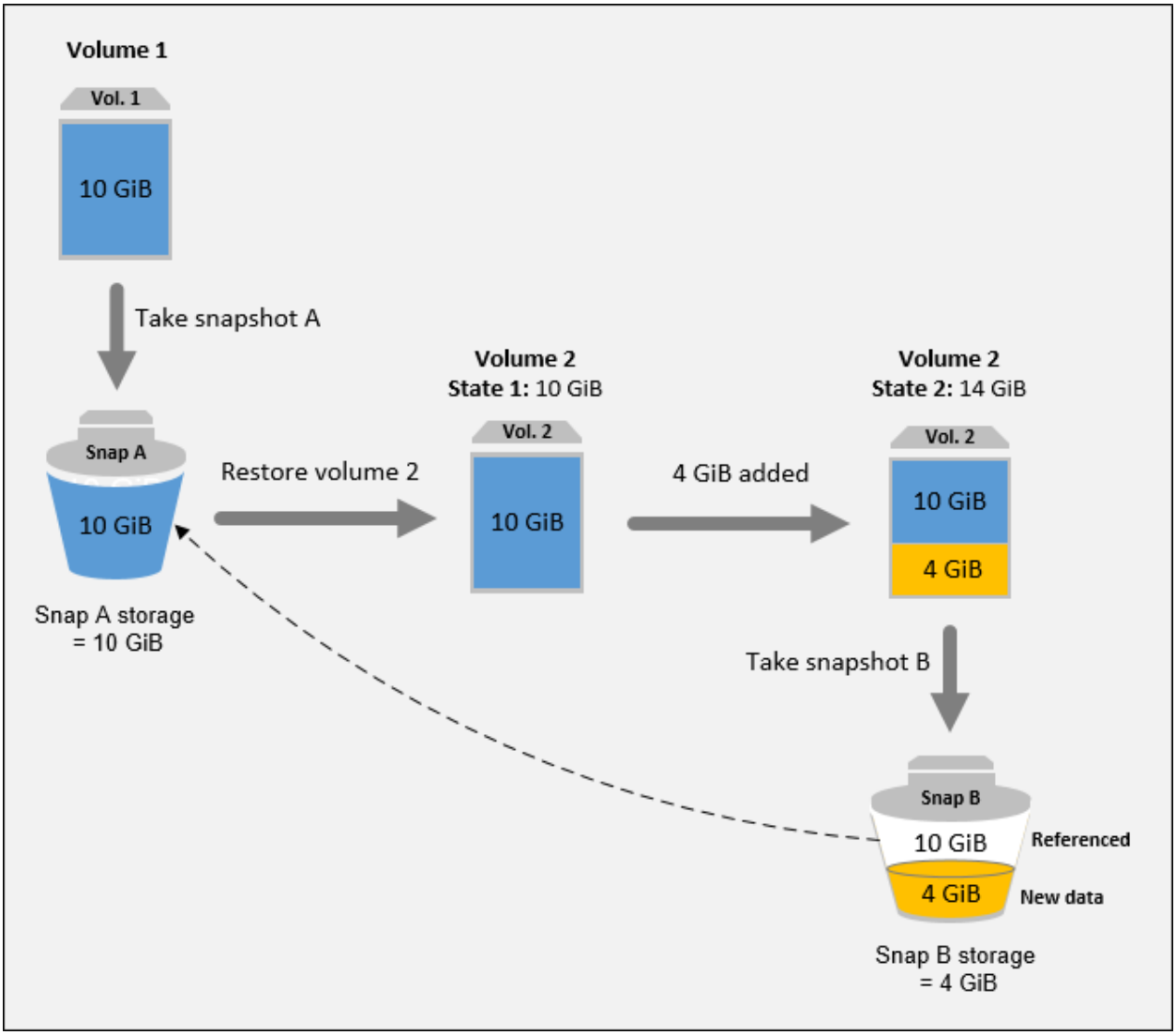

Instance A
Instance B
ephemeral0
ephemeral1
ephemeral2
ephemeral3
Instance Store
Snapshot
Bucket
Host Computer
Amazon EBS
Amazon S3


AMI
OS, Applications, & Configuration
Instances
Running or Stopped VM
VPC
Instances
EBS
EBS
EBS
AZ
Instances
EBS
EBS
EBS
AZ
EBS Snapshots
S3
S3 Buckets
Region
UnixArena.com

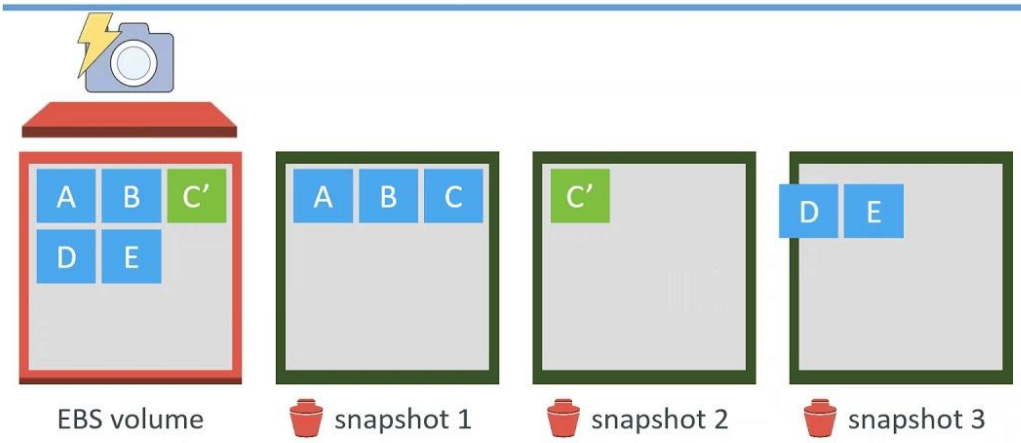


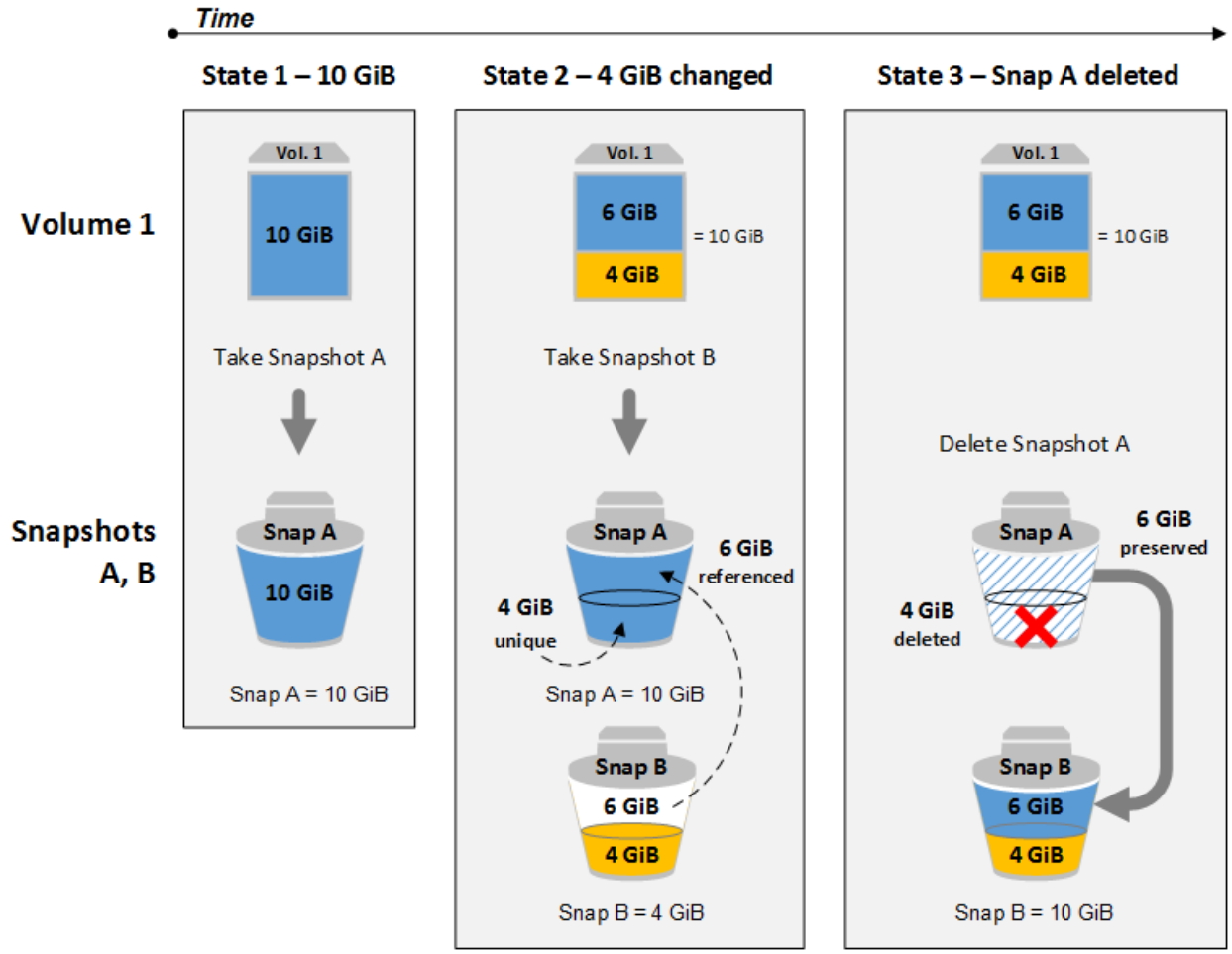
1. Launch the Lab
2. Launch an EC2 Instance
3. Create EBS Snapshot policy
4. Wait for the completion of 1 hour
5. Check the Automated EBS snapshot


Time
State 1: 10 GiB
State 2: 4 GiB changed
State 3: 2 GiB added
Vol. 1
10 GiB
Take Snapshot A
Snap A
10 GiB
Snap A storage = 10 GiB
Vol. 1
6 GiB
4 GiB
= 10 GiB
Take Snapshot B
10 GiB total
Snap A
6 GiB referenced
Snap B
6 GiB
4 GiB
Snap B storage = 4 GiB
Vol. 1
6 GiB
4 GiB
2 GiB
= 12 GiB
Take Snapshot C
10 GiB total
Snap A
6 GiB referenced
Snap B
6 GiB
4 GiB
4 GiB referenced
Snap C
6 GiB
4 GiB
2 GiB
Snap C storage = 2 GiB


Volume 1
Vol. 1
10 GiB
Take snapshot A
Snap A
10 GiB
Snap A storage
= 10 GiB
Restore volume 2
Volume 2
State 1: 10 GiB
Vol. 2
10 GiB
4 GiB added
Volume 2
State 2: 14 GiB
Vol. 2
10 GiB
4 GiB
Take snapshot B
Snap B
10 GiB
Referenced
4 GiB
New data
Snap B storage
= 4 GiB

EBS: How do Snapshots work?




Time
State 1 – 10 GiB
State 2 – 4 GiB changed
State 3 – Snap A deleted
Volume 1
Snapshots A, B
Vol. 1
10 GiB
Take Snapshot A
Snap A
10 GiB
Snap A = 10 GiB
Vol. 1
6 GiB
4 GiB
= 10 GiB
Take Snapshot B
Snap A
6 GiB
referenced
4 GiB
unique
Snap A = 10 GiB
Snap B
6 GiB
4 GiB
Snap B = 4 GiB
Vol. 1
6 GiB
4 GiB
= 10 GiB
Delete Snapshot A
Snap A
6 GiB
preserved
4 GiB
deleted
Snap B
6 GiB
4 GiB
Snap B = 10 GiB