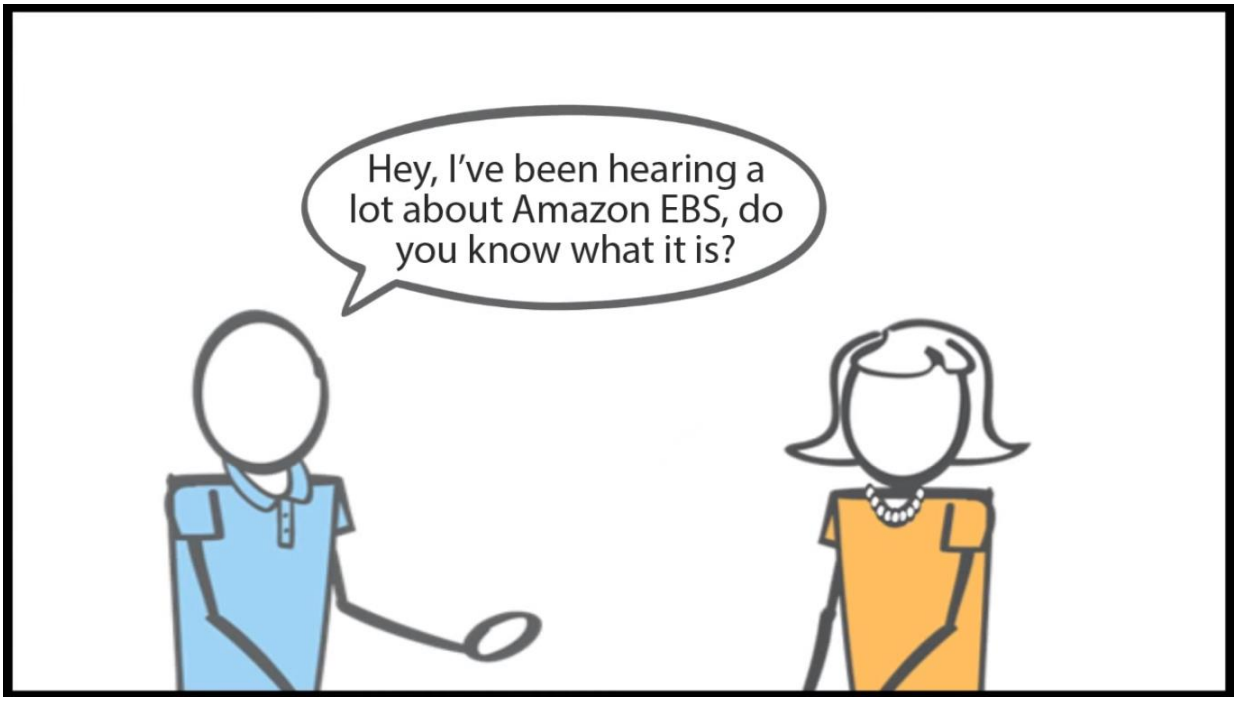
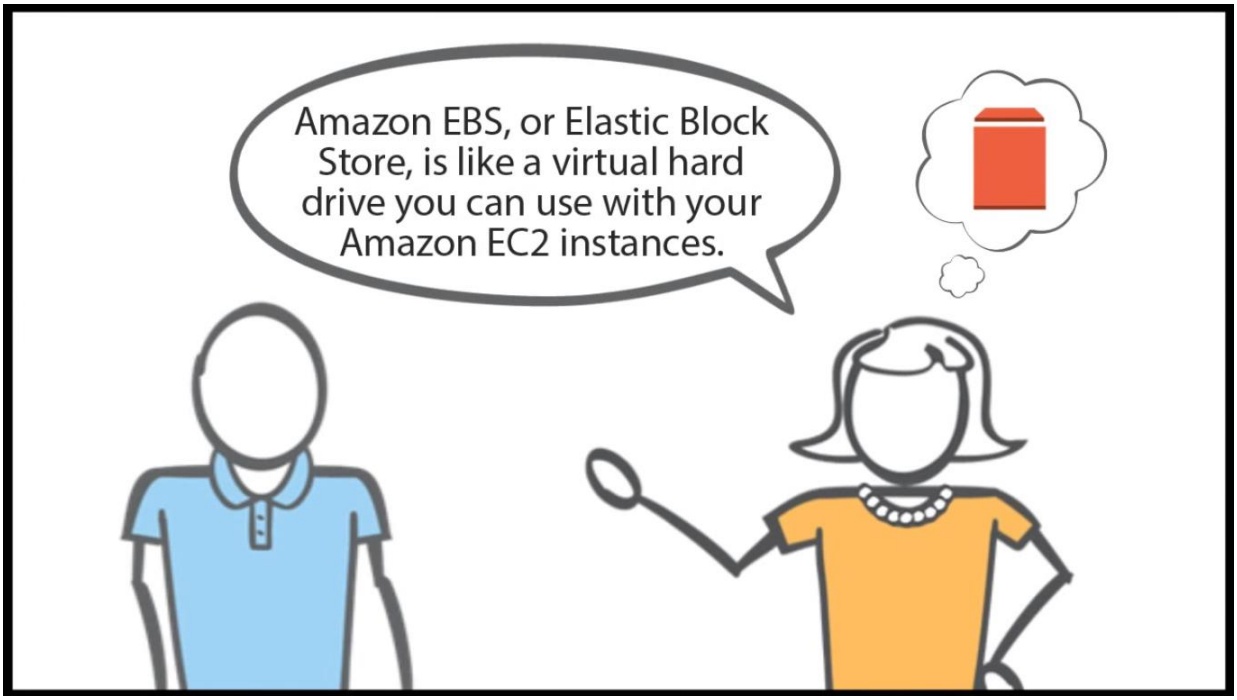
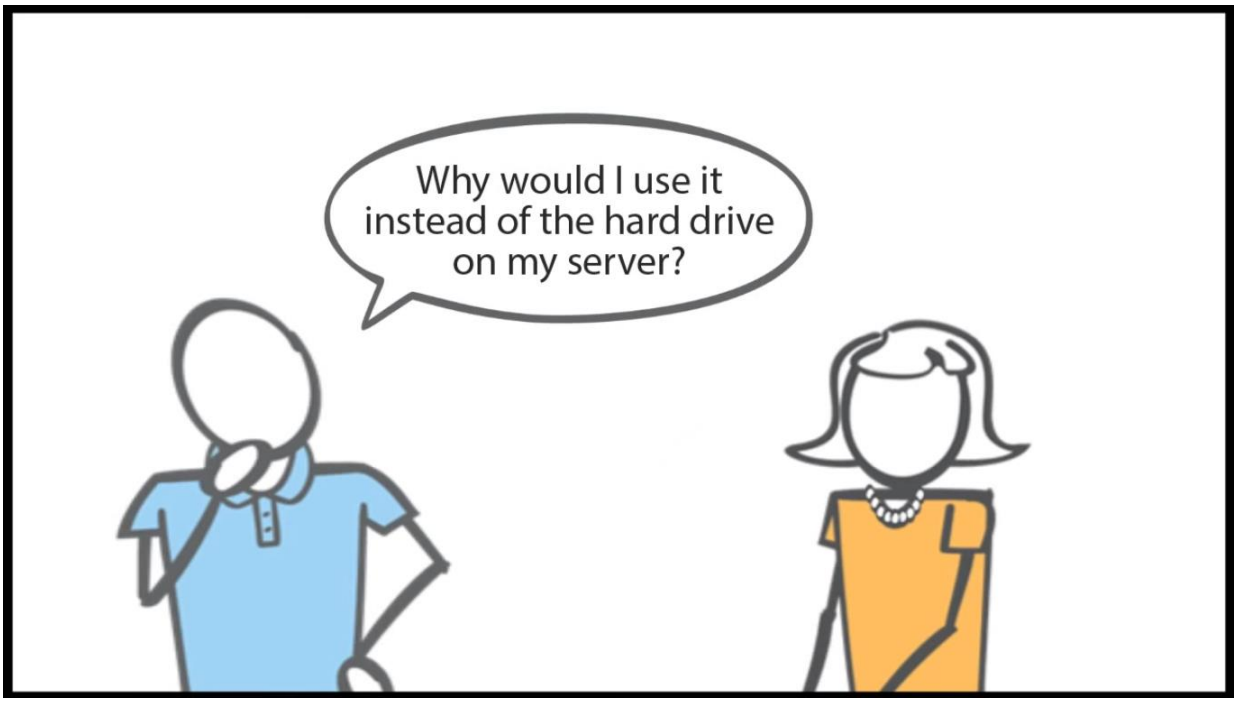
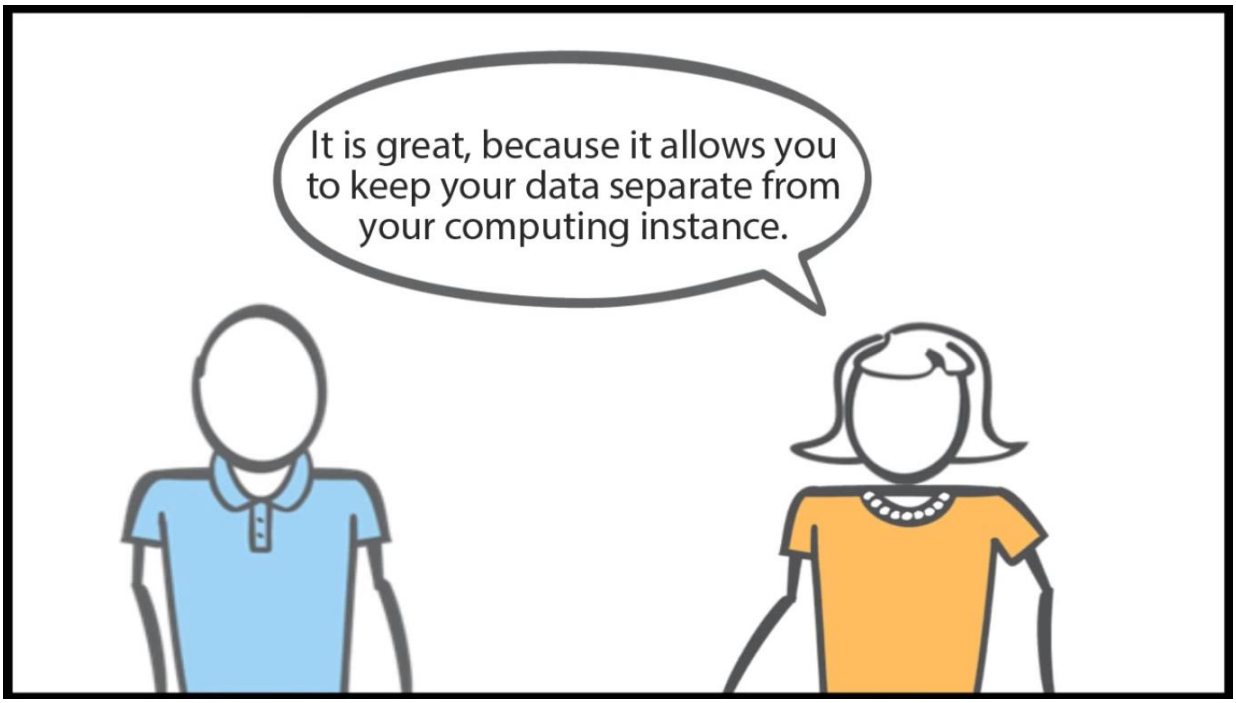
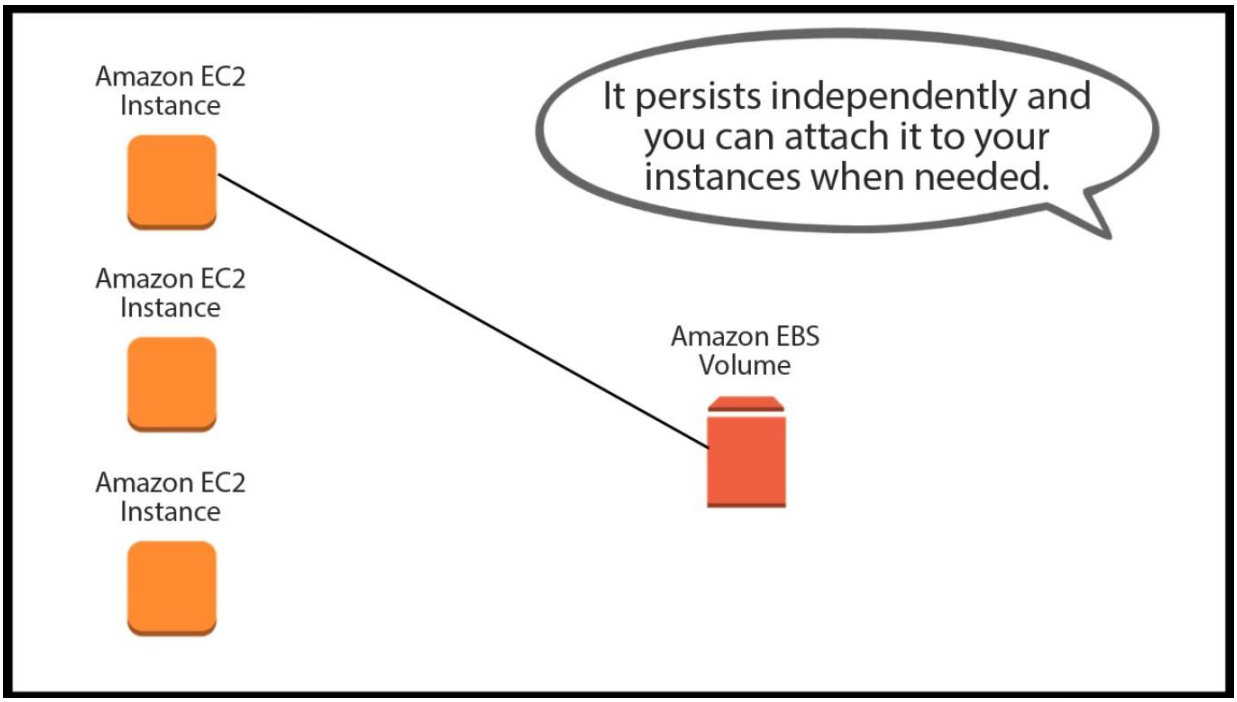
Amazon EBS interactive tutorial and lab!

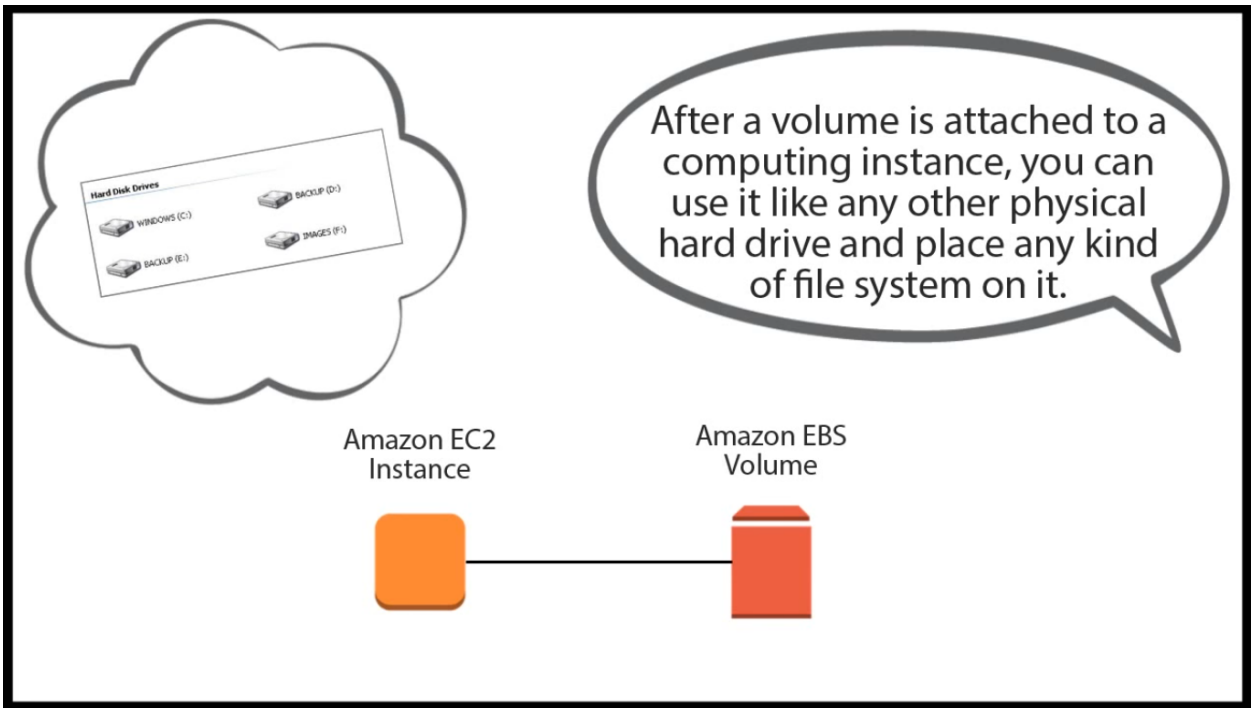


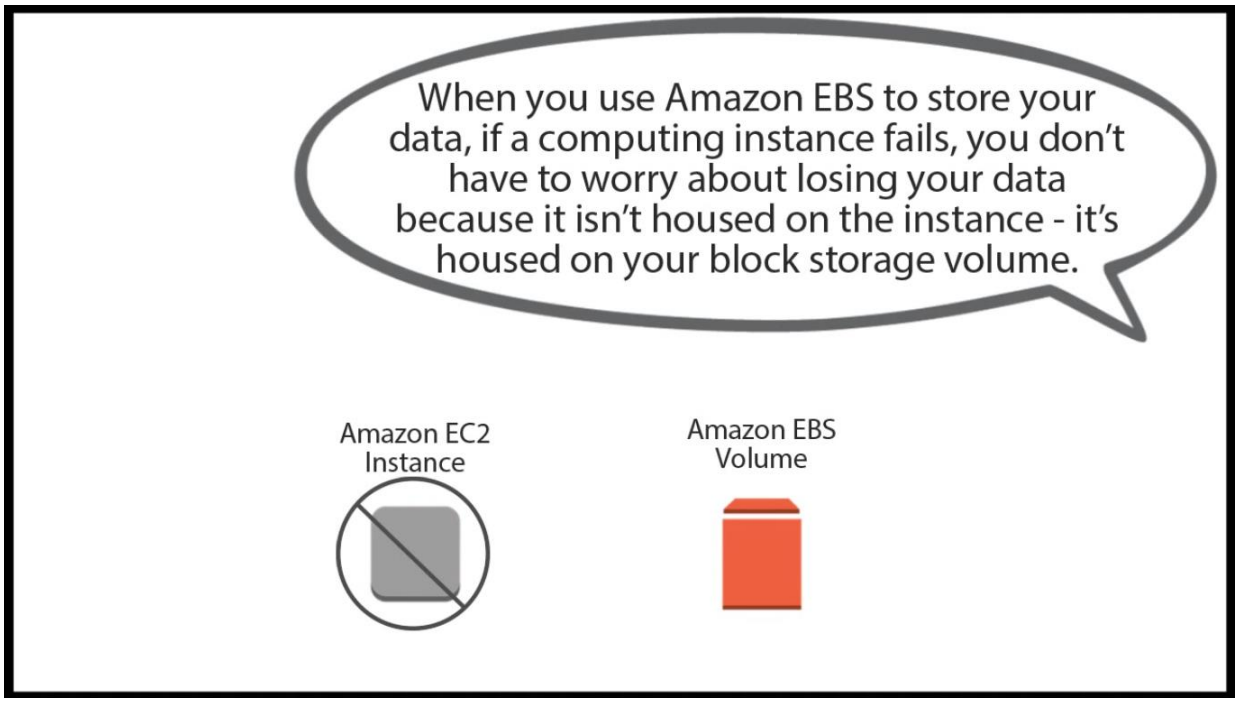


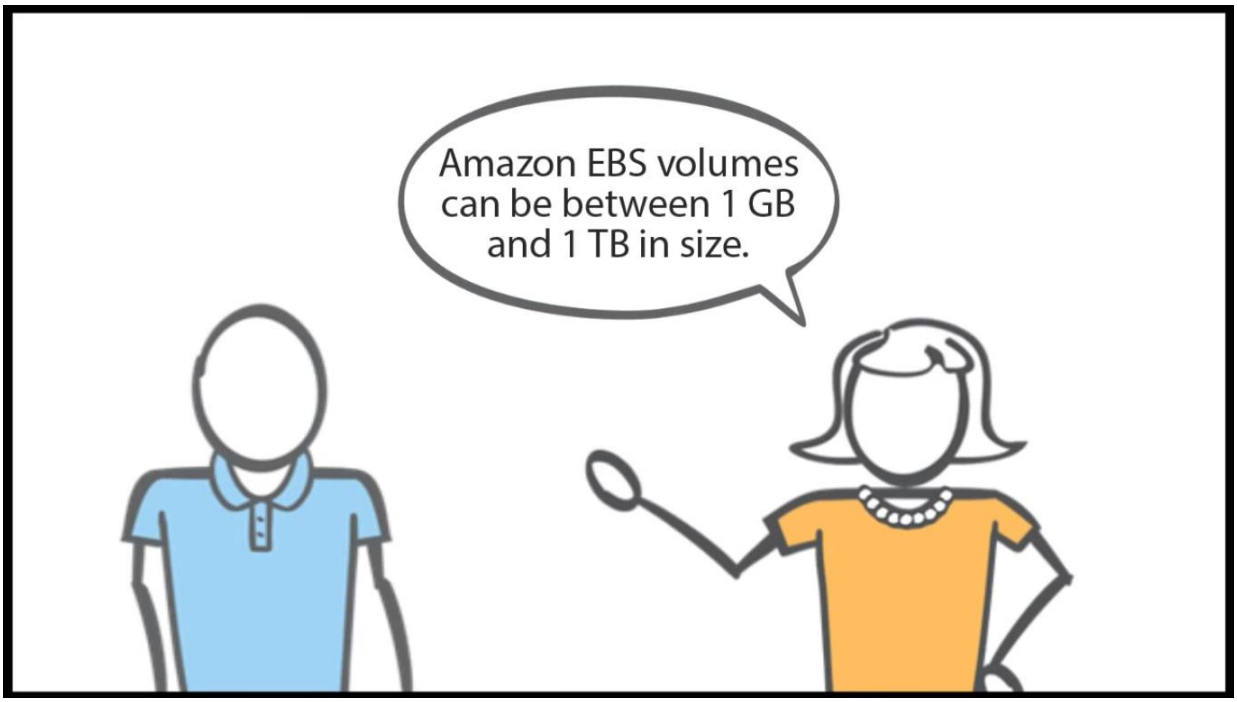

Why would I use it instead of the hard drive on my server?

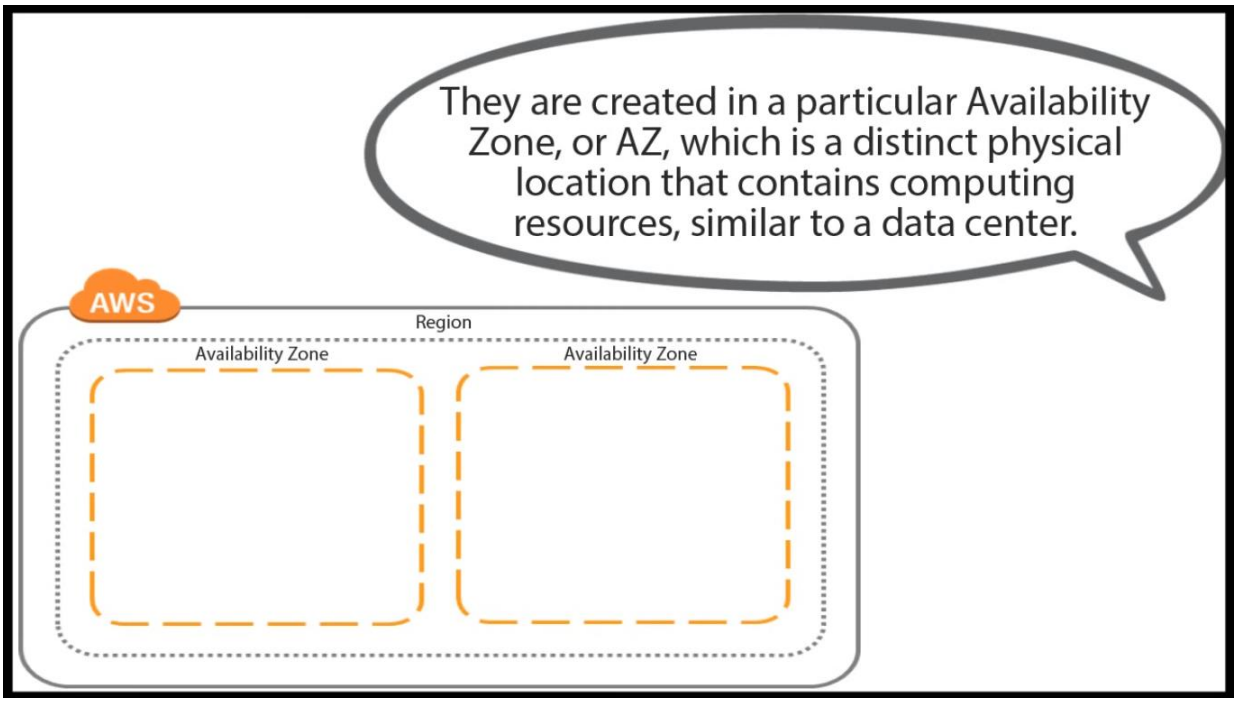

It is great, because it allows you to keep your data separate from your computing instance.

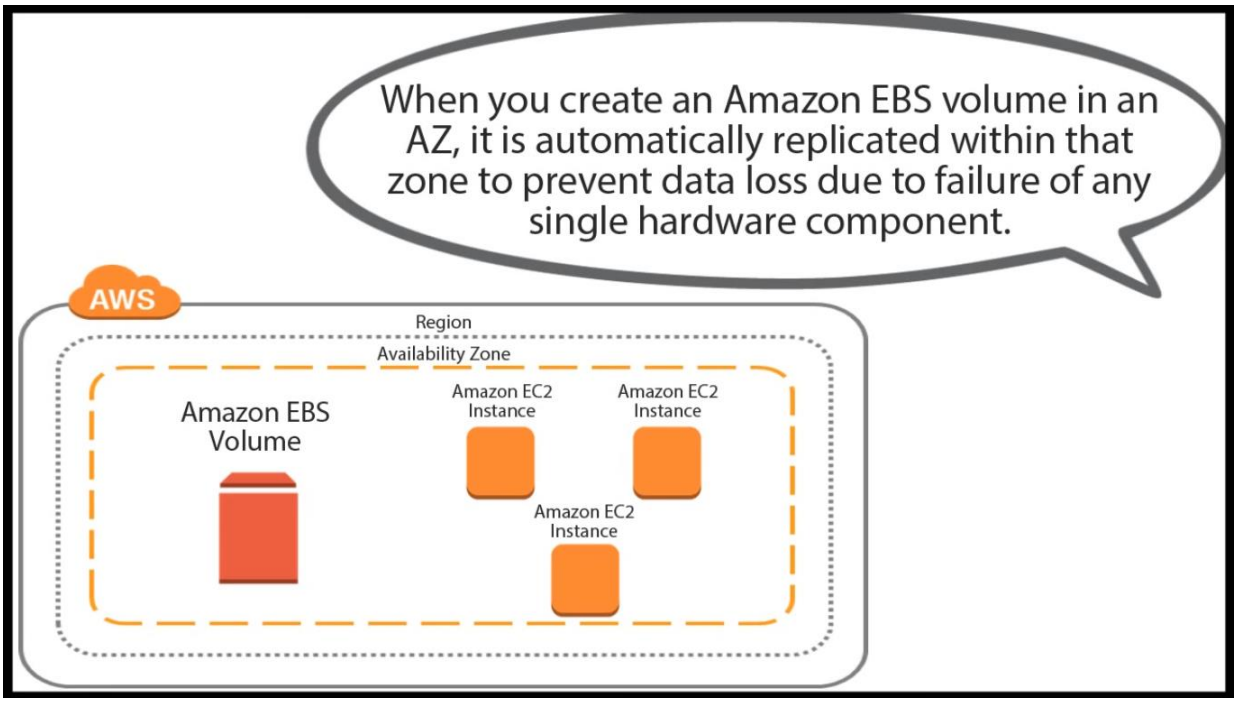

Amazon EC2
Instance
Amazon EC2
Instance
Amazon EC2
Instance
It persists independently and you can attach it to your instances when needed.
Amazon EBS
Volume

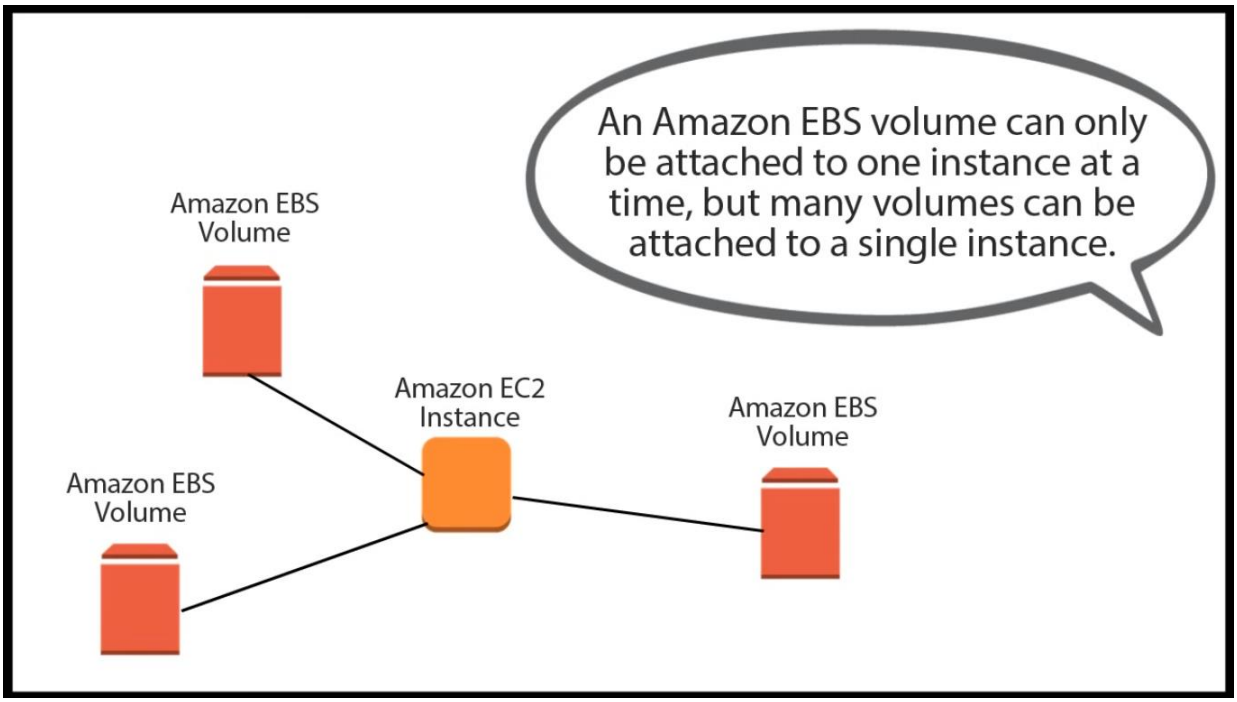

Hard Disk Drives
WINDOWS (C:)
BACKUP (D:)
BACKUP (E:)
IMAGES (F:)
After a volume is attached to a computing instance, you can use it like any other physical hard drive and place any kind of file system on it.
Amazon EC2
Instance
Amazon EBS
Volume

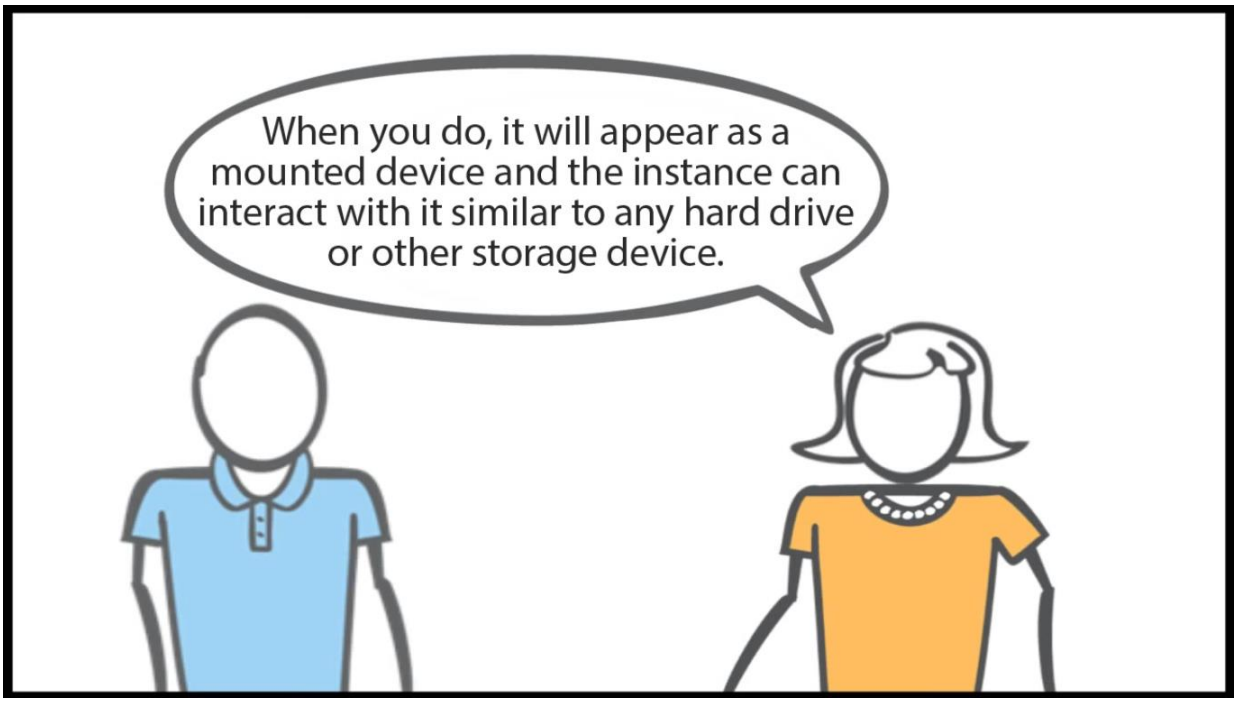

When you use Amazon EBS to store your data, if a computing instance fails, you don't have to worry about losing your data because it isn't housed on the instance - it's housed on your block storage volume.
Amazon EC2 Instance
Amazon EBS Volume

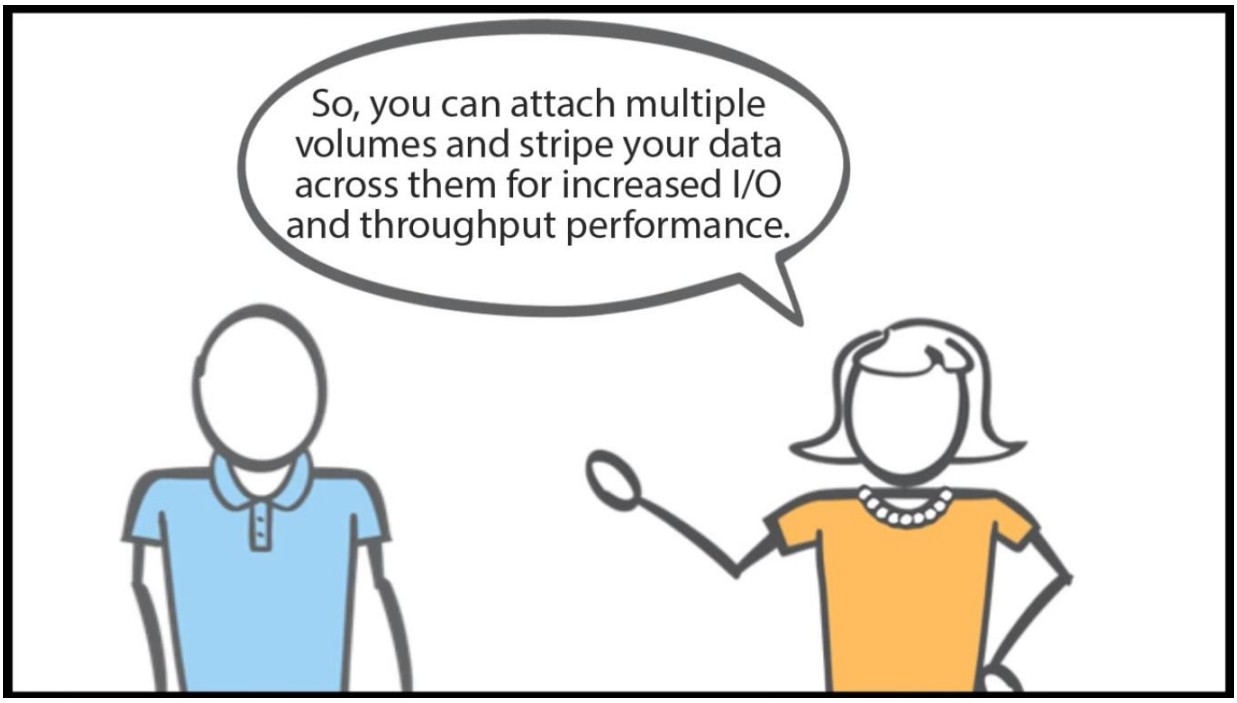

Amazon EBS volumes can be between 1 GB and 1 TB in size.

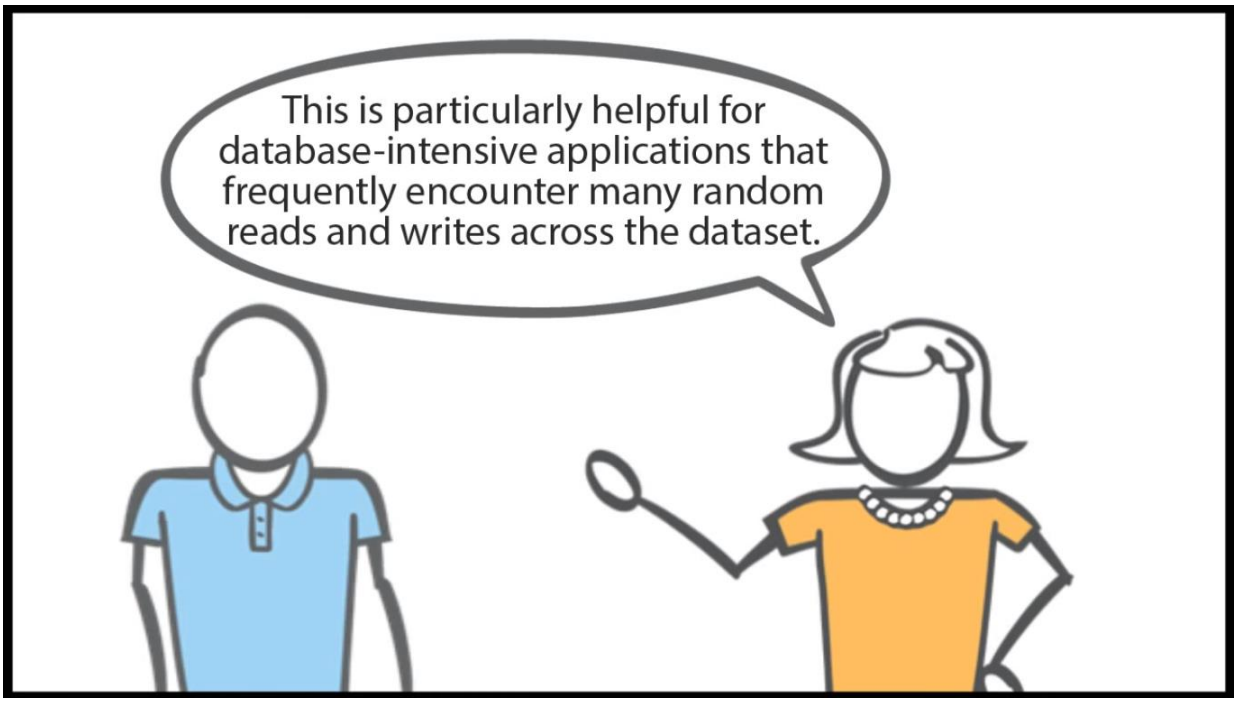

They are created in a particular Availability Zone, or AZ, which is a distinct physical location that contains computing resources, similar to a data center.
AWS
Region
Availability Zone
Availability Zone

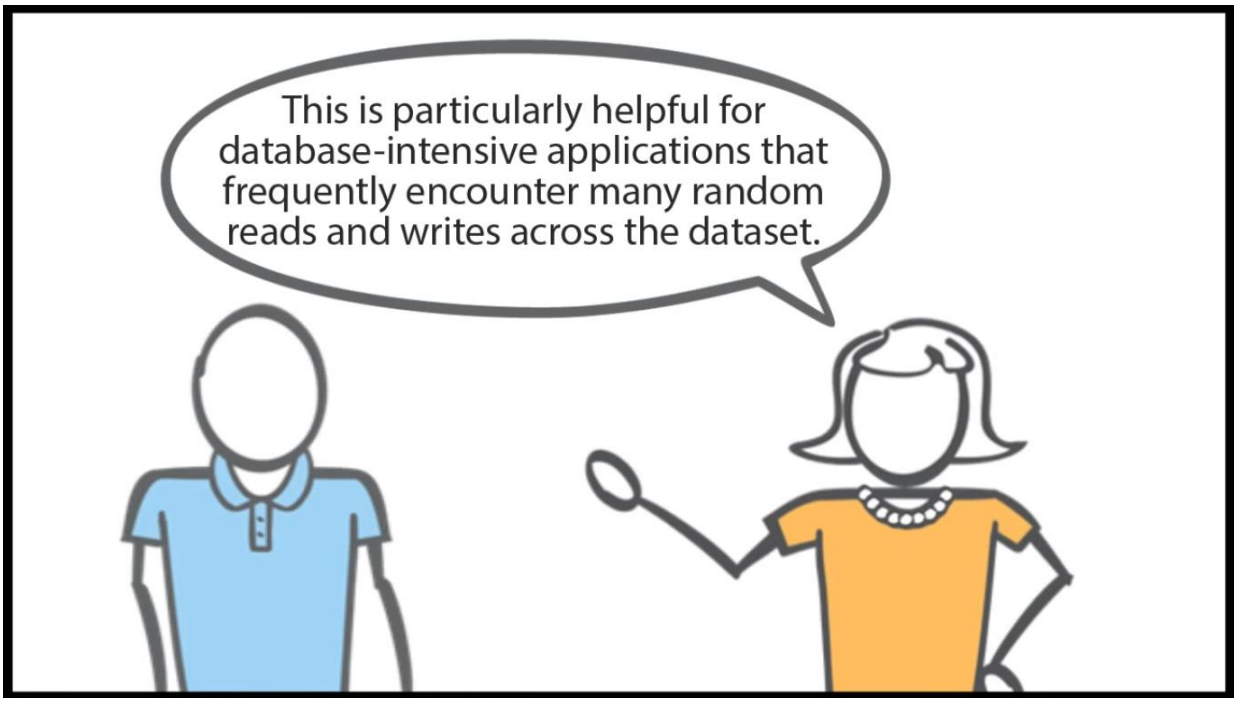

When you create an Amazon EBS volume in an AZ, it is automatically replicated within that zone to prevent data loss due to failure of any single hardware component.
AWS
Region
Availability Zone
Amazon EBS Volume
Amazon EC2 Instance
Amazon EC2 Instance
Amazon EC2 Instance


An Amazon EBS volume can only be attached to one instance at a time, but many volumes can be attached to a single instance.
Amazon EBS Volume
Amazon EC2 Instance
Amazon EBS Volume
Amazon EBS Volume


When you do, it will appear as a mounted device and the instance can interact with it similar to any hard drive or other storage device.


So, you can attach multiple volumes and stripe your data across them for increased I/O and throughput performance.


This is particularly helpful for database-intensive applications that frequently encounter many random reads and writes across the dataset.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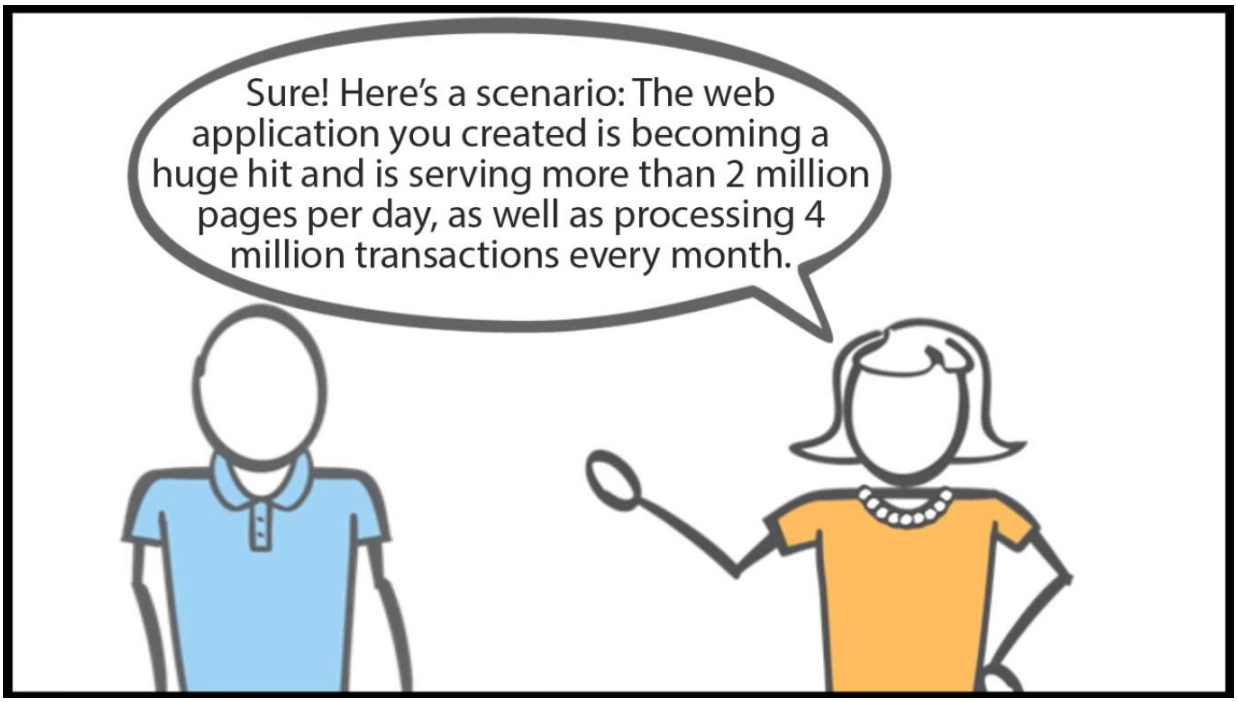
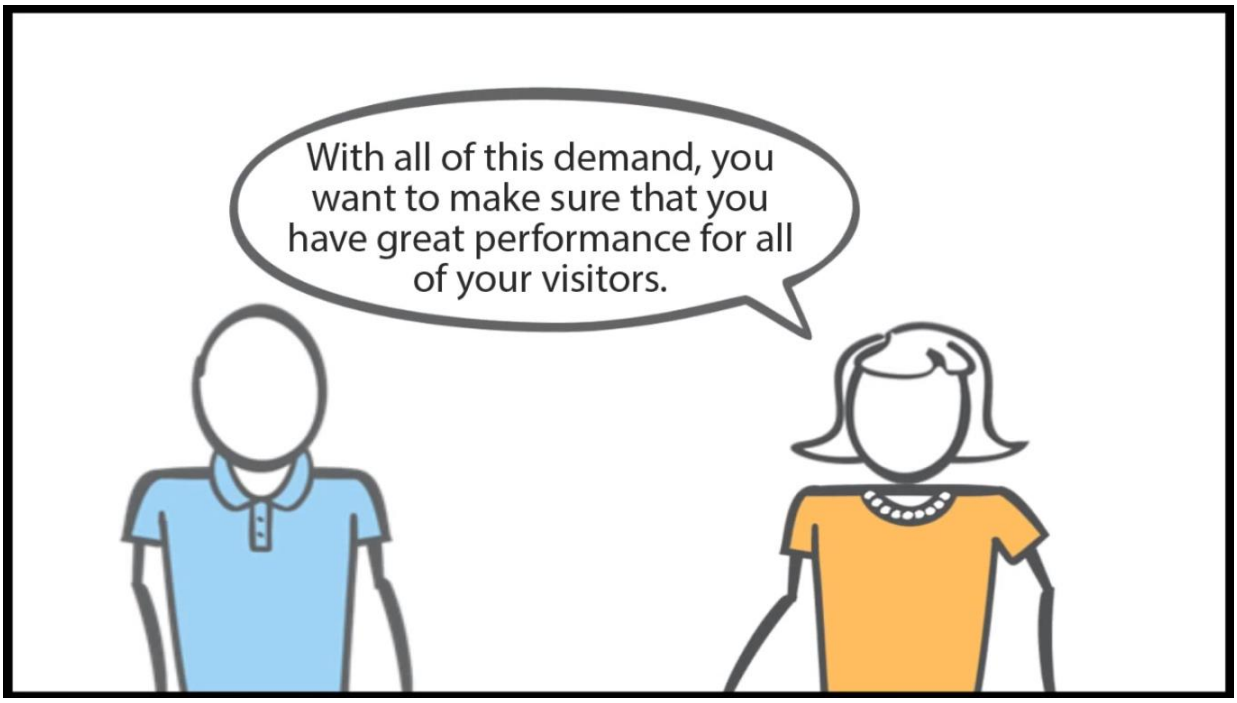
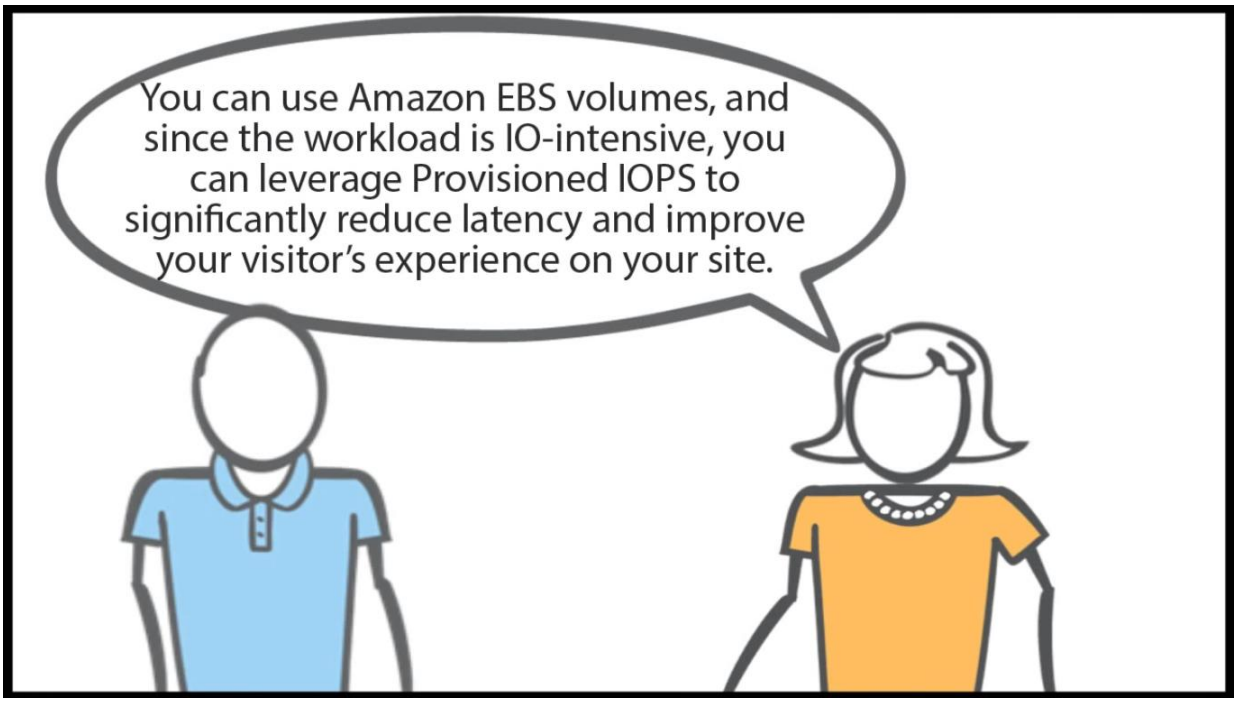
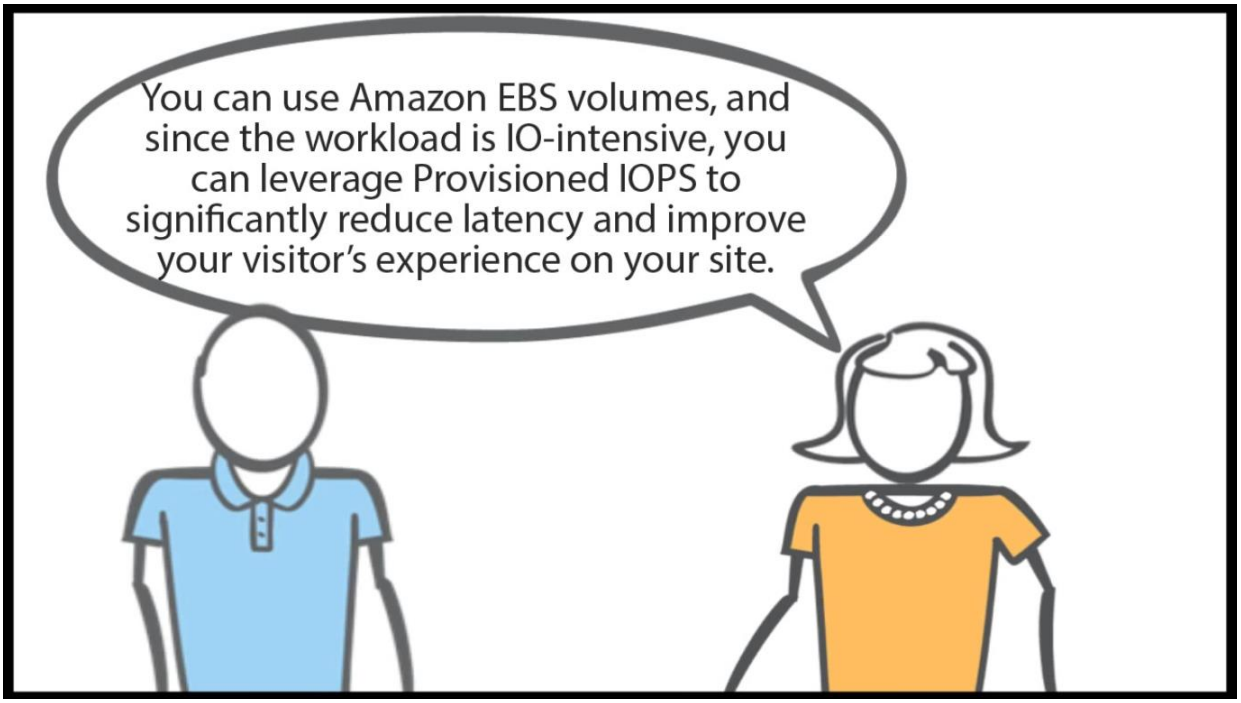

Sure! Here's a scenario: The web application you created is becoming a huge hit and is serving more than 2 million pages per day, as well as processing 4 million transactions every month.


With all of this demand, you want to make sure that you have great performance for all of your visitors.


You can use Amazon EBS volumes, and since the workload is IO-intensive, you can leverage Provisioned IOPS to significantly reduce latency and improve your visitor's experience on your site.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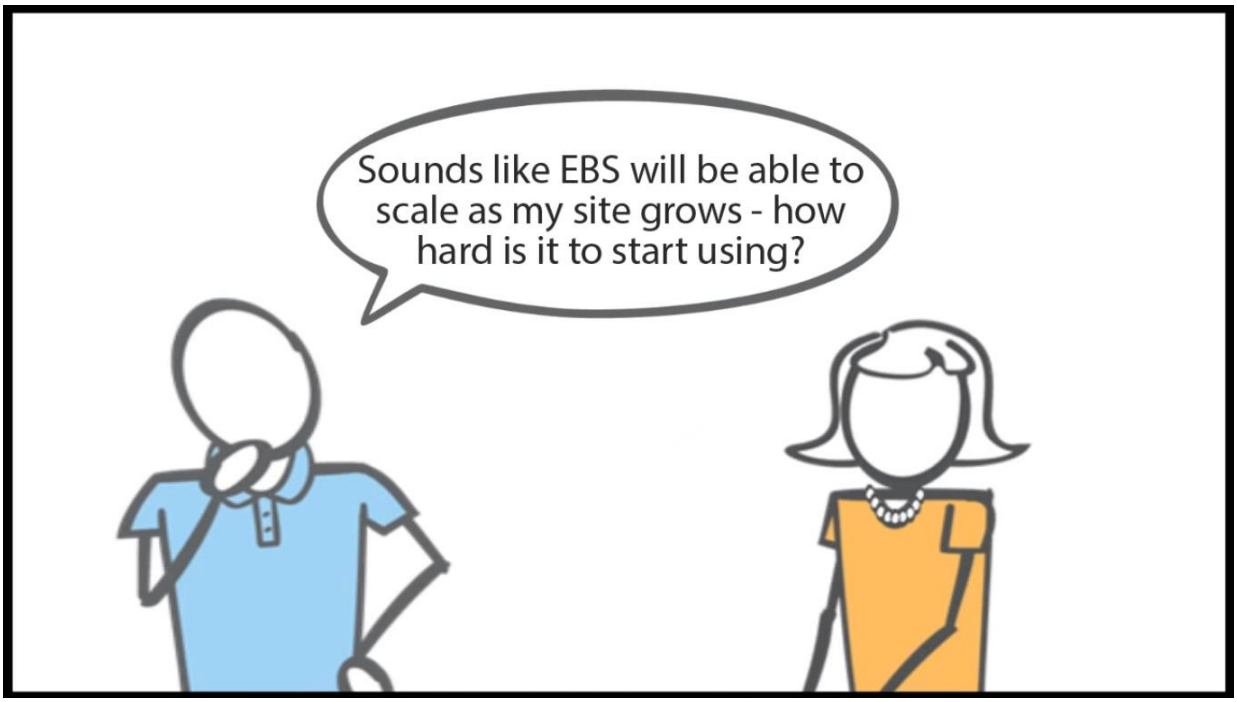
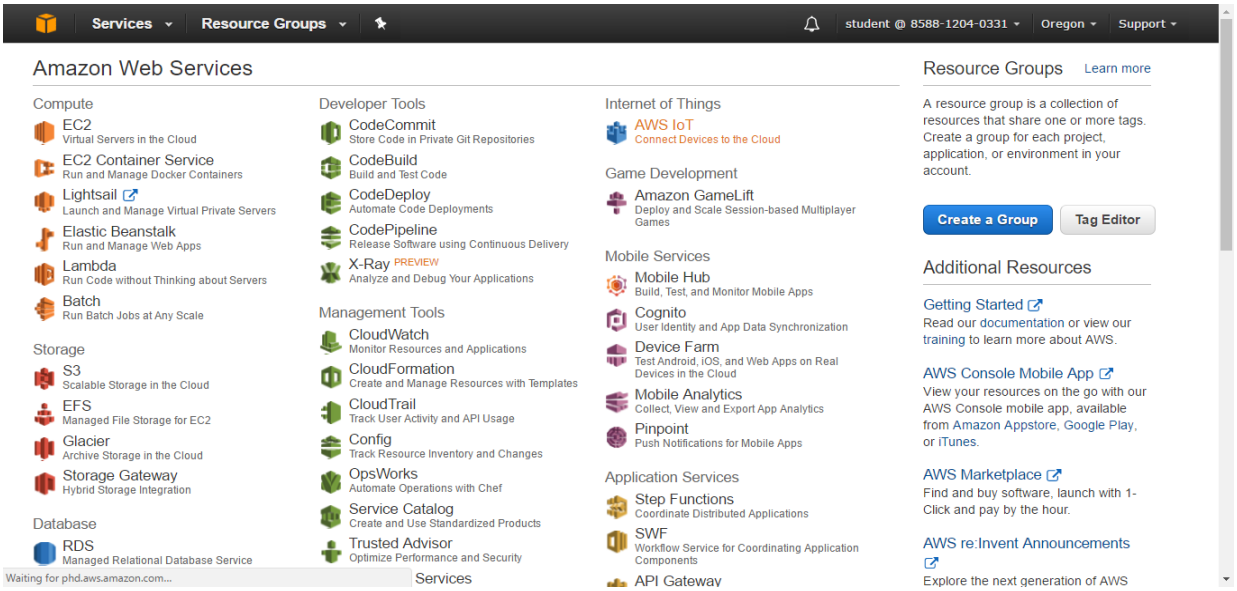


How hard is it to start using?

Lets do a lab on working with EBS

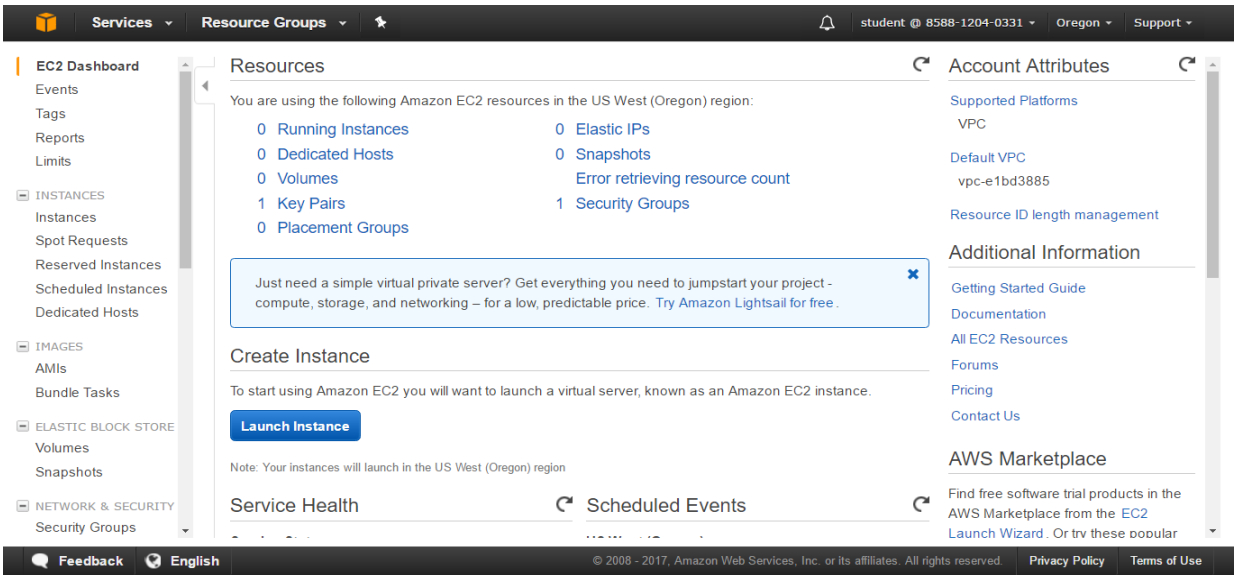
Lab objective: Create an EBS backed instance and create a snapshot for it and use that snapshot as a root volume

1.Login to your console and click on EC2

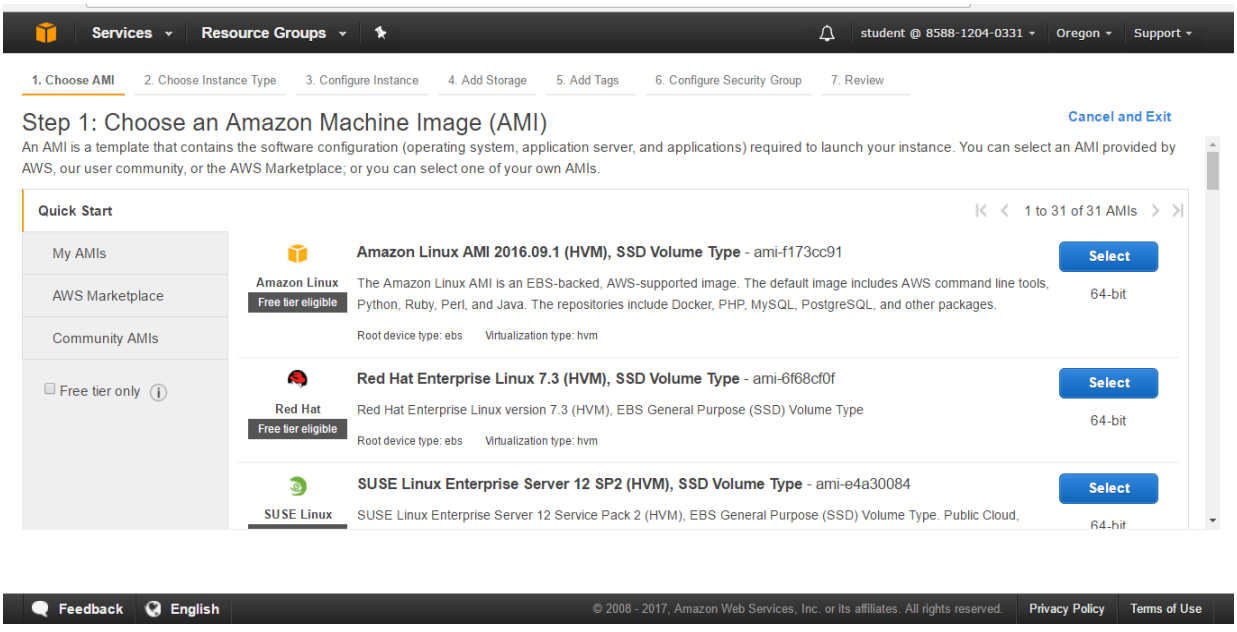


2.Create a basic instance and SSH into it.

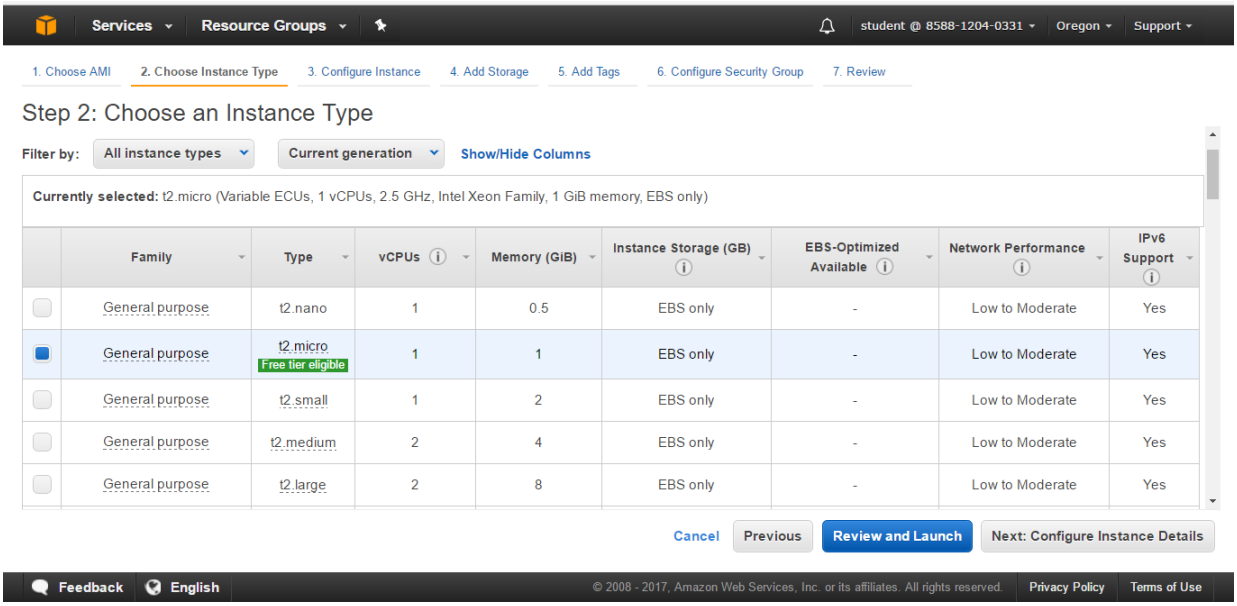
a. Click on Launch instance:



b.Choose AMI.I choose Linux AMI the first one

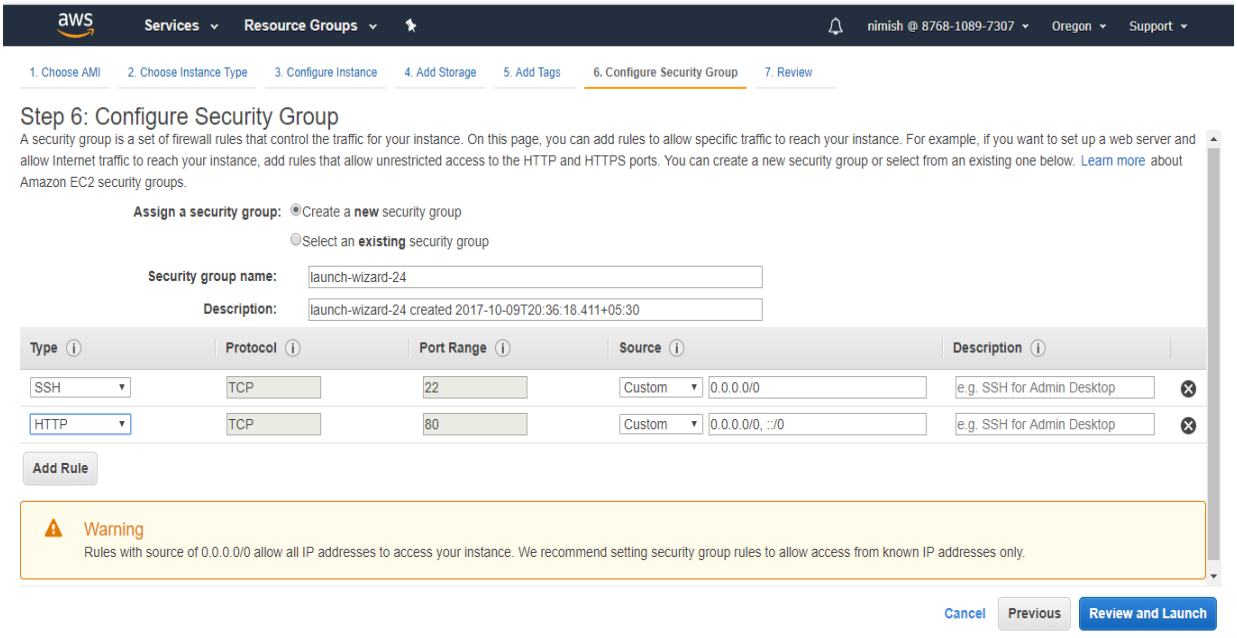


C.Choose the free tier:

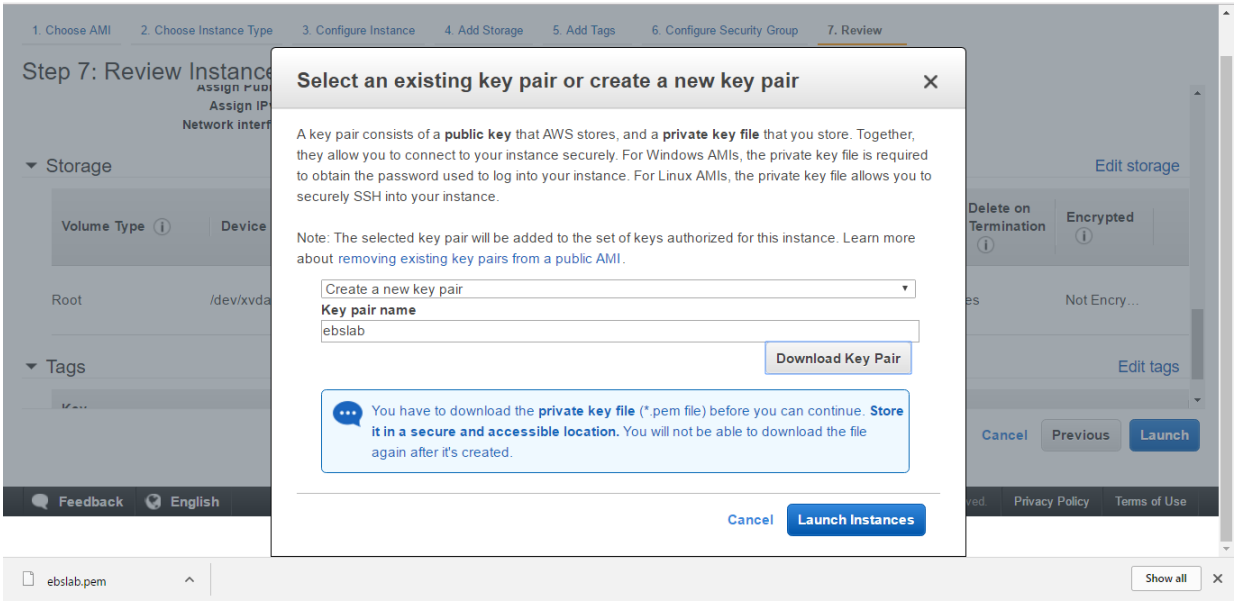


And keep everything defaults and click next until you reach 'Configure security groups'

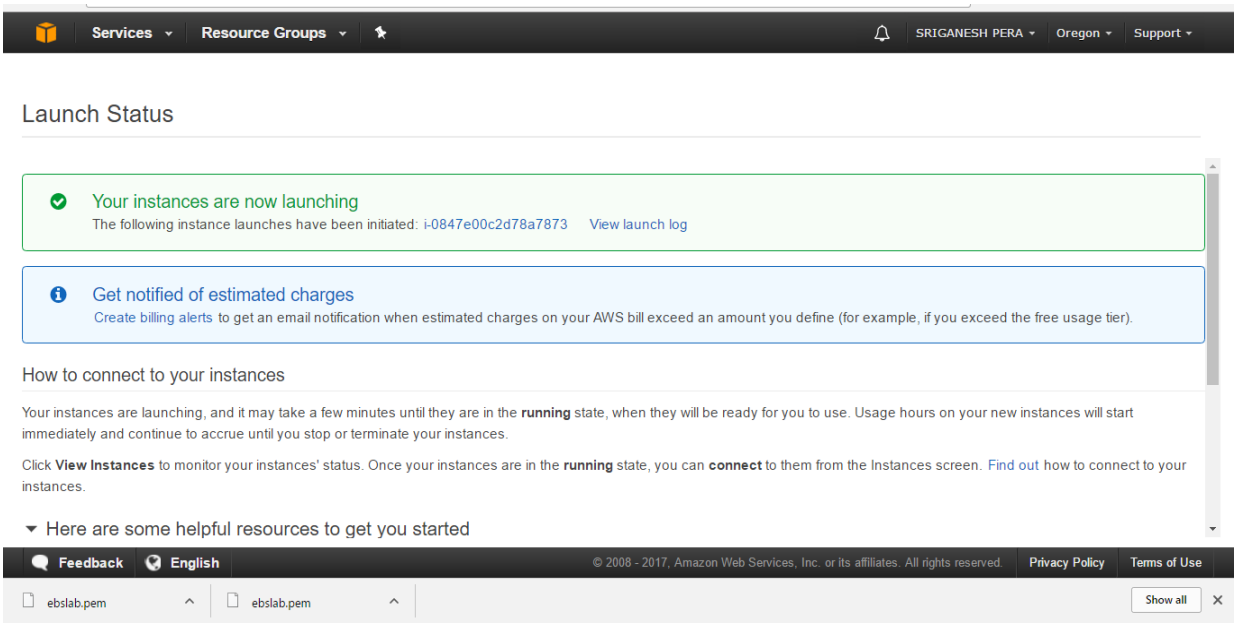
D.configure security groups then click Review and Launch



e.Create a new key pair,download the key(I named my key as ebslab) and click on launch instance



f. go to EC2 dashboard to see your instance running

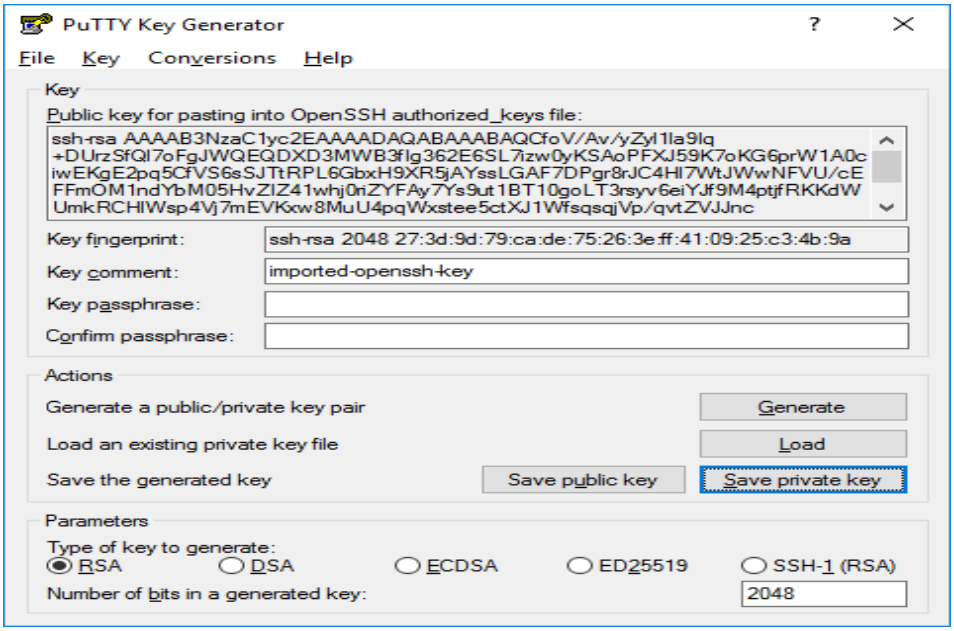


(g)Now we connect to our instance and check whatever the 'drives' we have with our instacne

(i) open Puttygen and convert my downloaded key ebslabs.pem to ebslabs.ppk

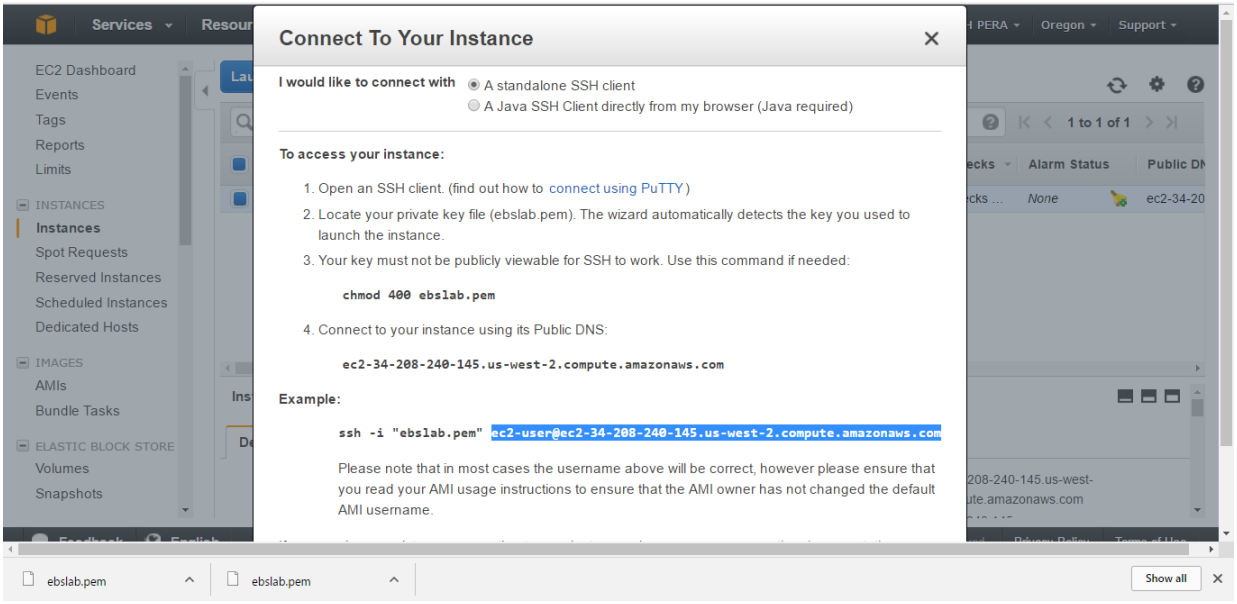
First you open Puttygen and click on Load button and locate the ebslab.pem key you have just download and then click on save private key and save it with the same name ebslab.ppk

This is how you convert the format of .pem to .ppk

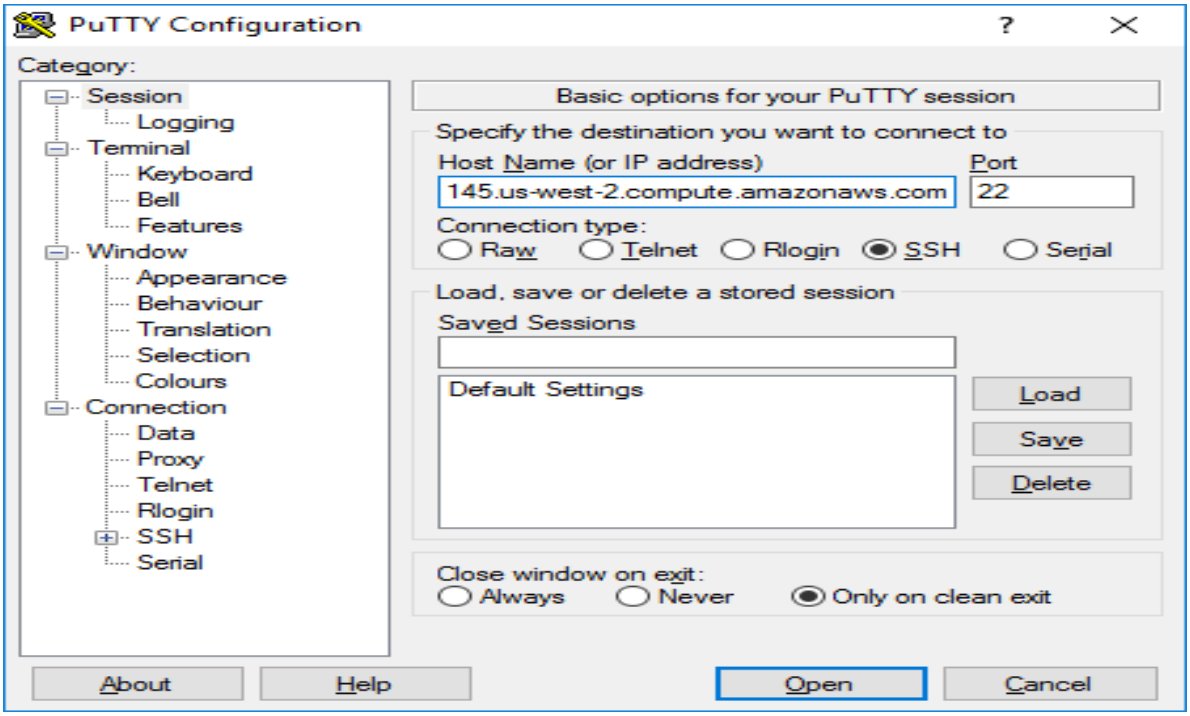


(ii) Now open Putty and paste your Public IP of your instance in host

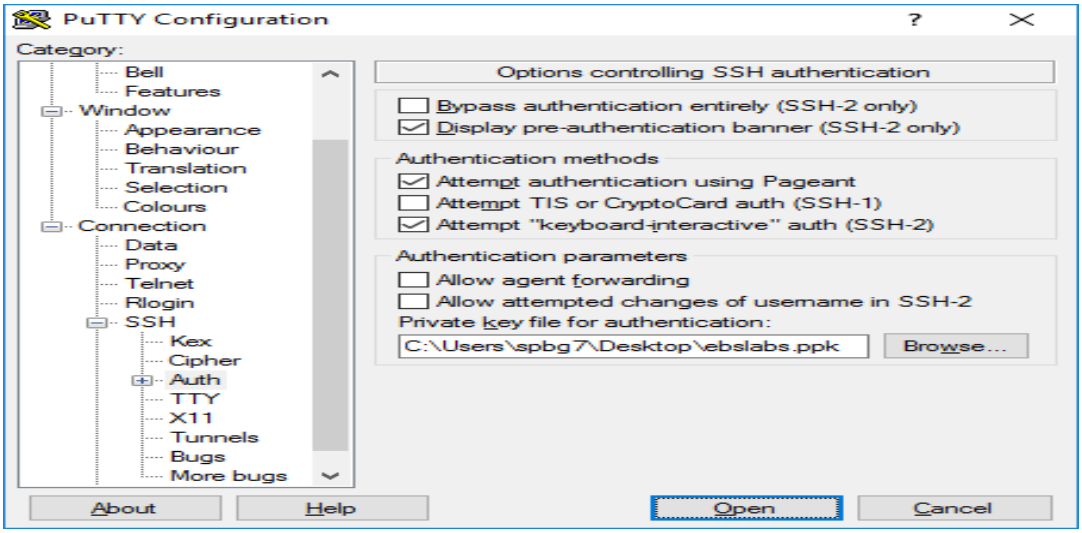
You can find your public IP of your instance in EC2 dashboard -> actions -> connect to your instance.



Copy that and past it in host field box of Putty

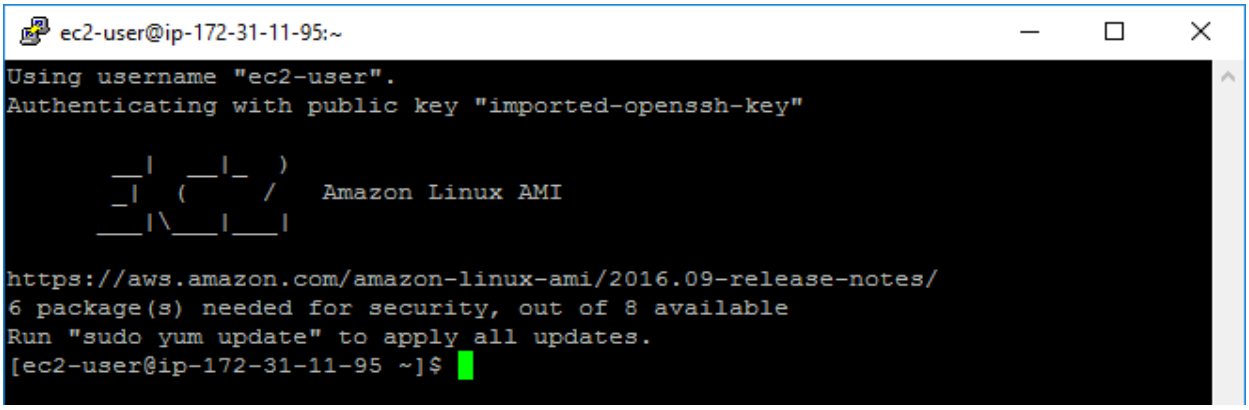


Now click on SSH-> Auth and load the ebslab.ppk we just converted using PuttyGen and click on Open



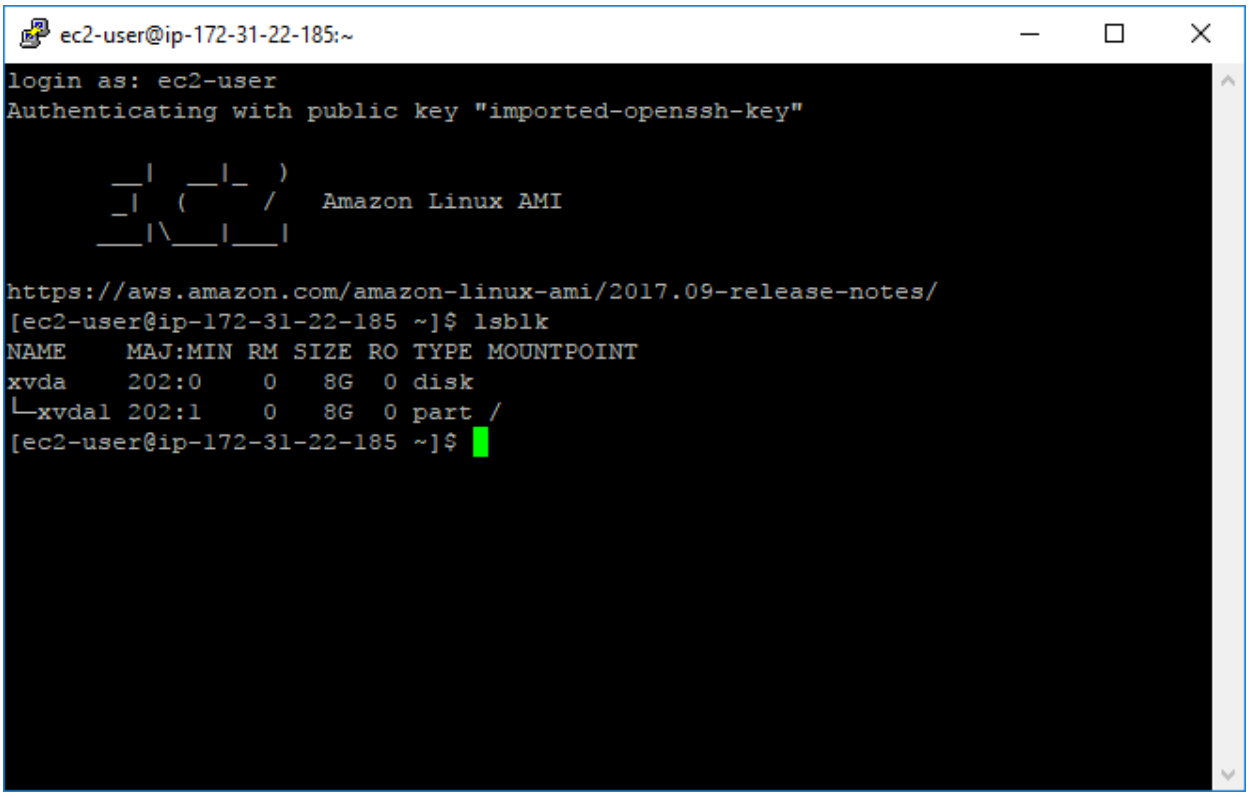
If you get a pop-up box just click on Yes.

If you see the below screenshot then you've successfully connected to your EC2 instance

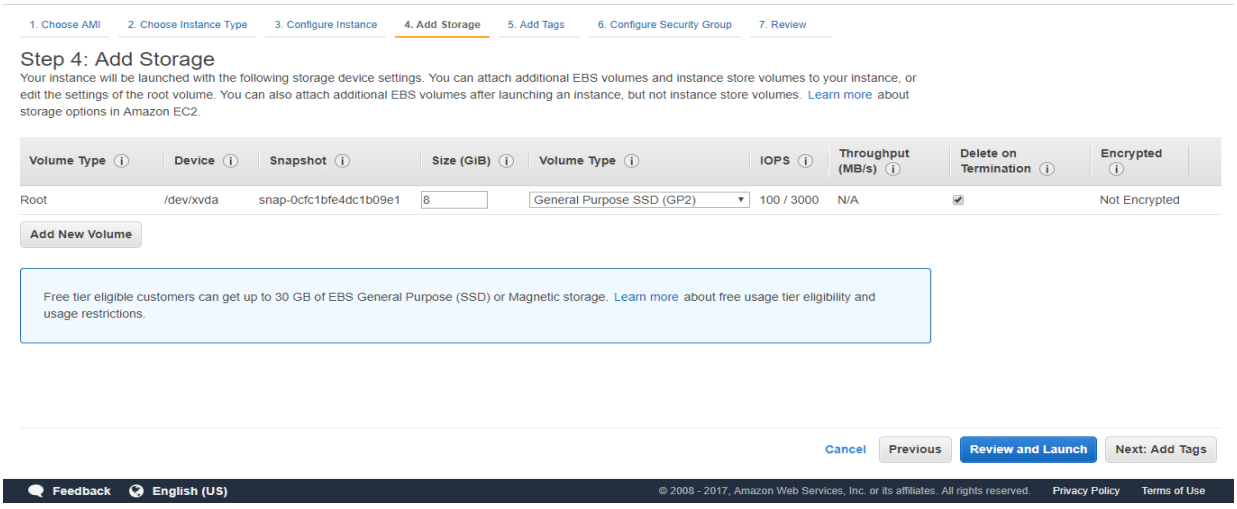


Now in the command prompt click on 'lsblk'

The lsblk command allows you to display a list of available block devices

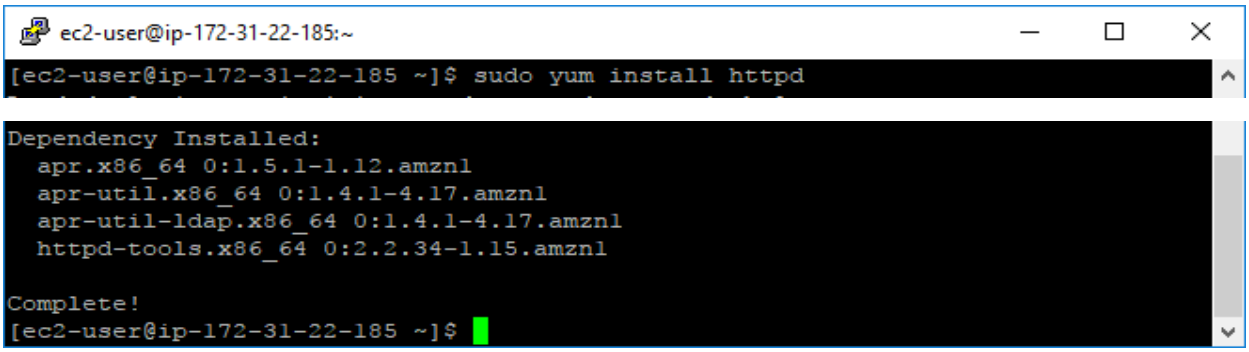


As you notice there is one drive :xvda(root volume) .As you remember when were launching an instance you might have noticed ‘Add storage’



Where we have added a 8 GB root volume to our instance which is why it shows XVDA 8G in the shell.

(h) Now we will install a websever and create a simple static webpage and host it on our webserver

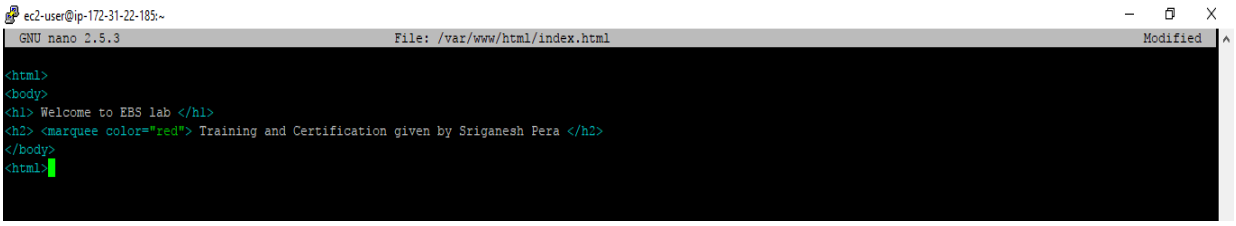


As you noticed we've installed an Apache webserver(httpd) on our instances.

Now turn on the Apache webserver using the following commands:

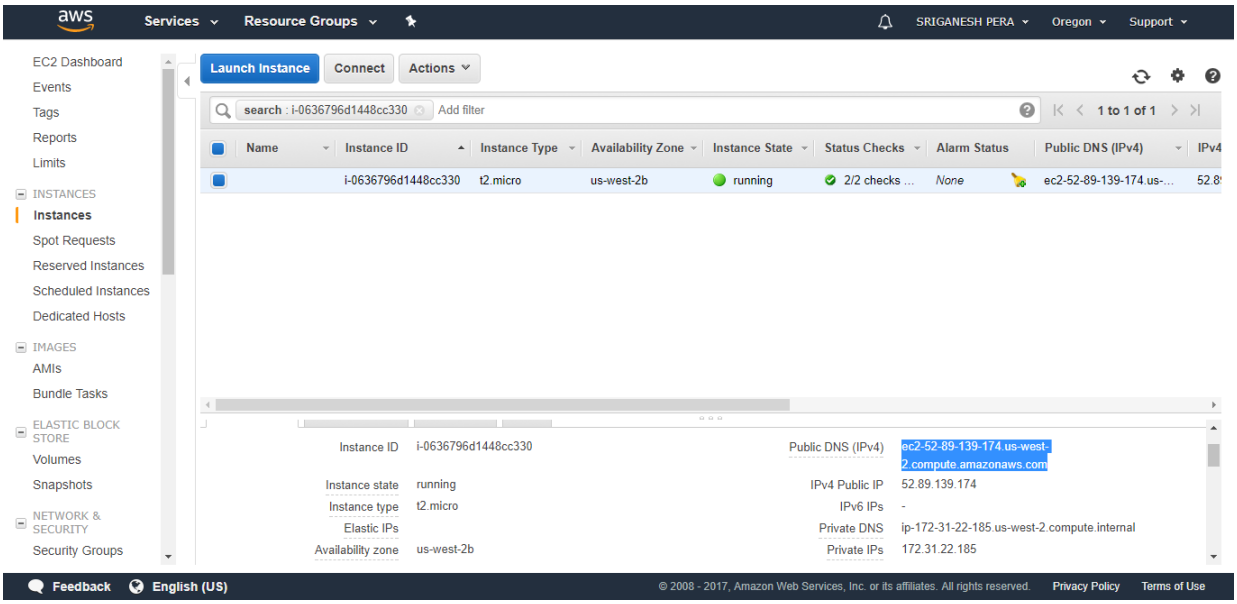
Now we 'll create a static html webpage.Just follow the commands on the terminal.

As soon as you type the command a terminal pops out.Now write the following code on the terminal

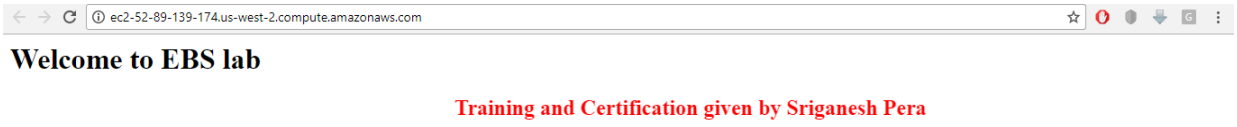


Now save it and exit by typing ctrl O and Ctrl X.

Now we have created a static web page hosted on our server.Now copy and paste the Public DNS of ec2,which is located in bottom part of EC2 dashboard



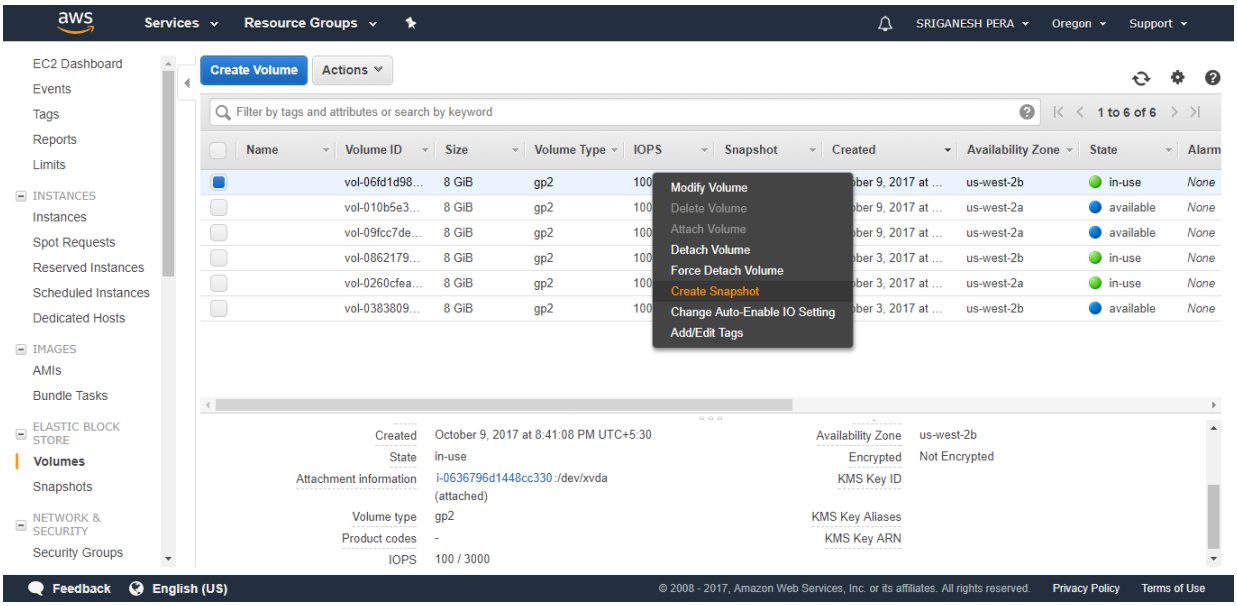
Now copy and paste it in web browser.You'll see this.



Now take the snapshot of EBS ,which contains this data(Web page hosted on a webserver)

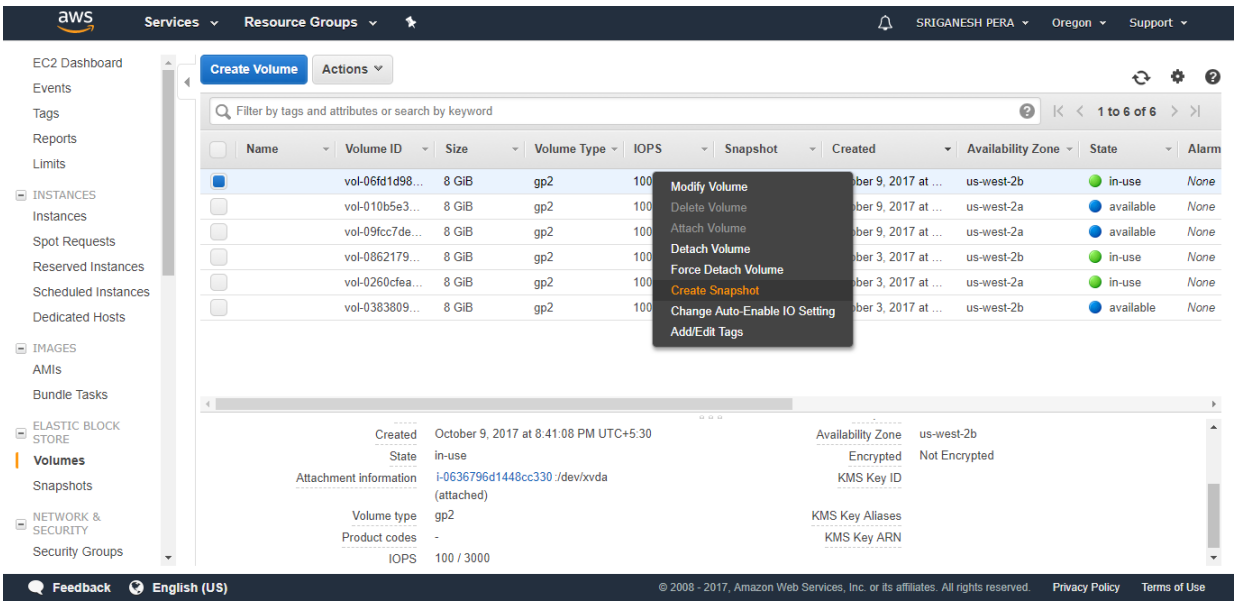
(i) Taking snapshot of EBS volume and create volume from it.

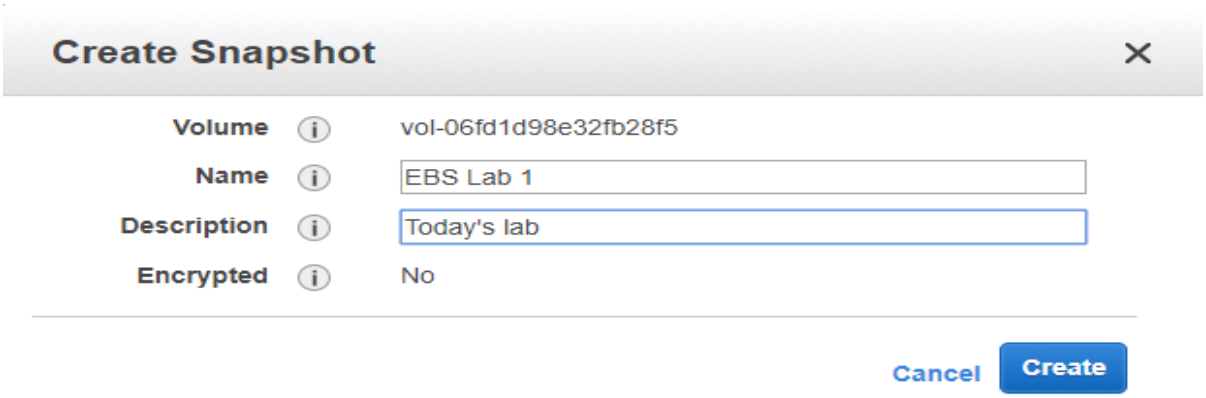
Now Check the region of ec2 instance and click on volumes on the left-handed column in EC2 dashboard.Now right click in the volume that we're using right now and click on create snapshot.

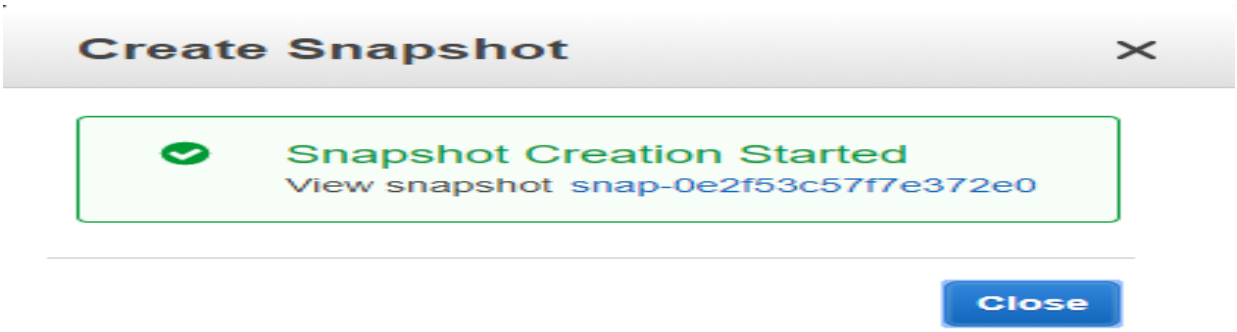


As you can see my volume which is in us-west-2b in the state of ‘in-use’ which means running..

Now name the snapshot with whatever the name you want and create it

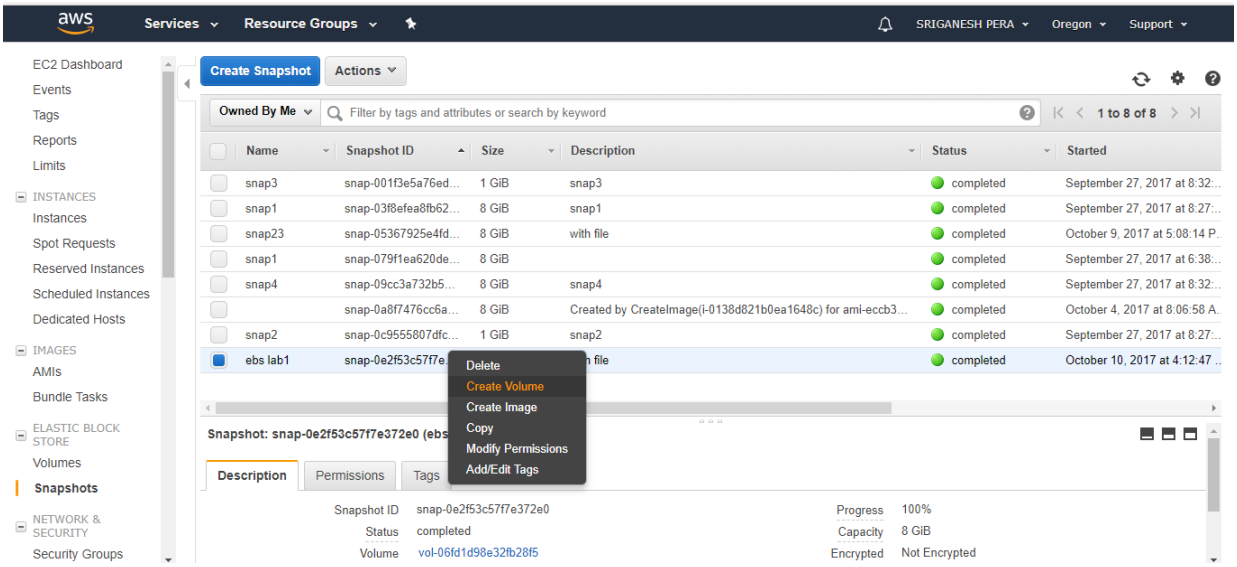






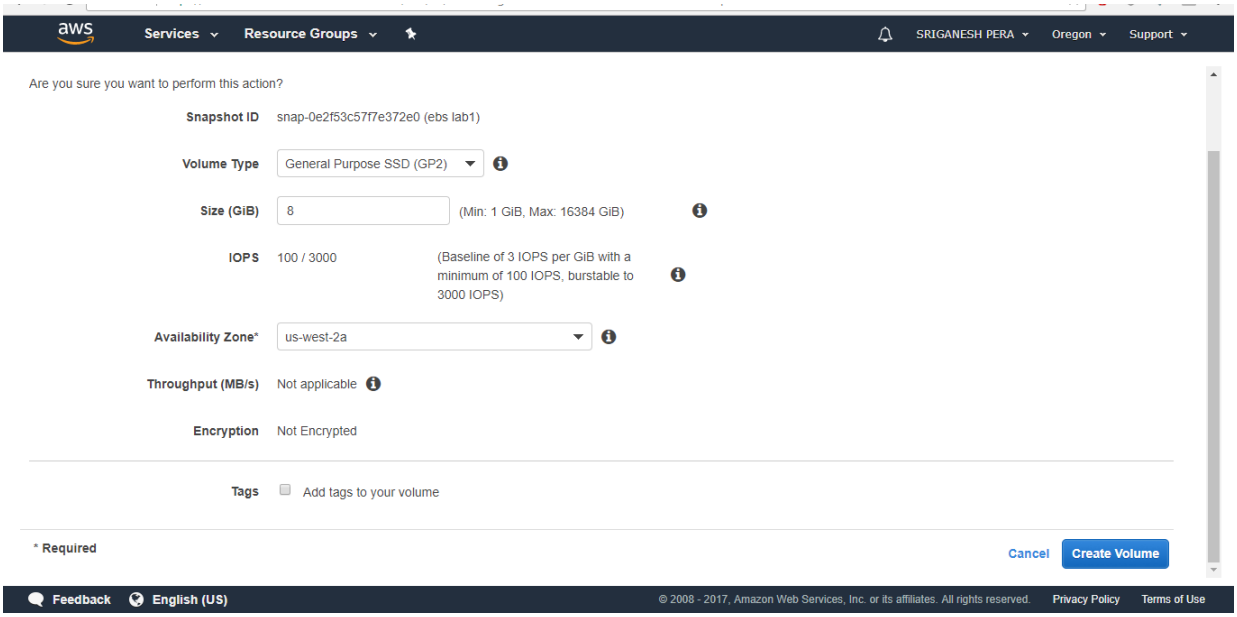
You will find the newly created snapshot under Snapshots column.

Now click on the snapshot and select the snapshot ,ricgh click on it anc create a volume from it.



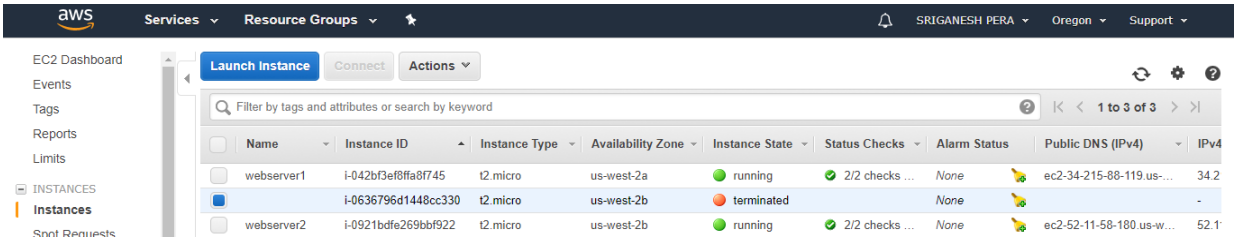
The reason why we create a volume from snapshot is that we will use the newly created volume which has our static webpage and use it to another instance,which demonstrates how our data is isolated from an instance and how we cankeep back up of that data and use it for any instance we want it to.

Now I create the volume from the snapshot in avaliability zone:**US-west 2a**



Click on create Volume.

*** Now terminate the instance we've created as we no longer required.**



As you can see the instance is terminated.

What have we done so far?

1.We launched an instance in us-west 2a

2.We installed an Apached webserver on our instace and created a static webpage on it.

3.We created a snapshot(backup) of the Root volume which contains a static webpage launched on a webserver.

4.We created a volume from the snapshot itself.

What we are going to do now?

1.Terminate the previous instance and launch new instance with new volume

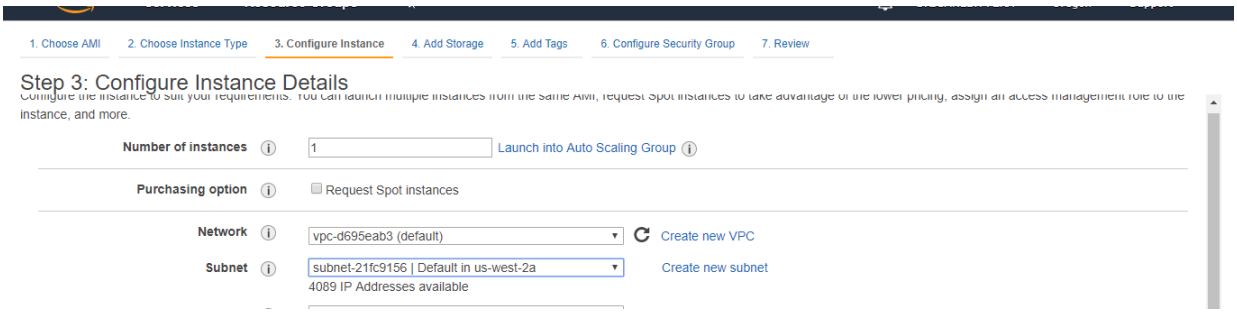
2.Detach new volume and attach volume created from snapshot as new volume

3.Check Public DNS to see the change of volume swap.

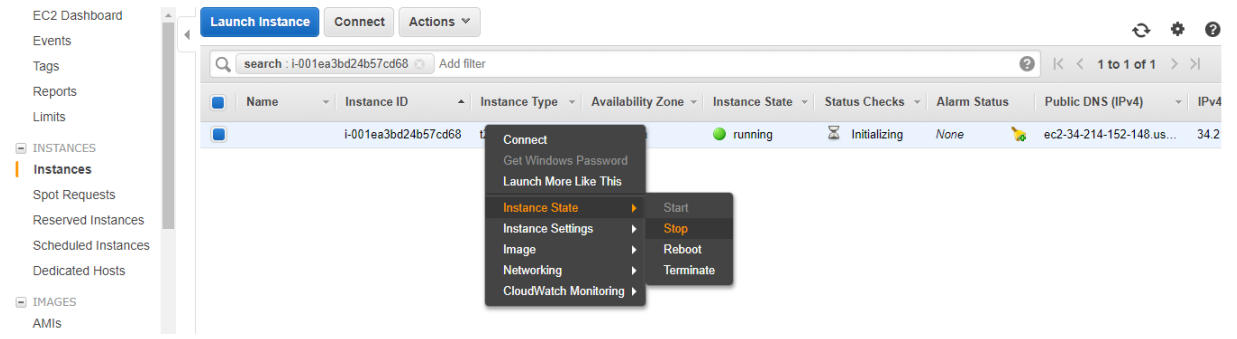
(j) Launch a new instance

Repeat steps from (a) to (g)

Make sure that your instance is launched in **us-west 2a(in 'Configure Instance select the subnet as 'us-west 2a')** as our volume is created within the same region.

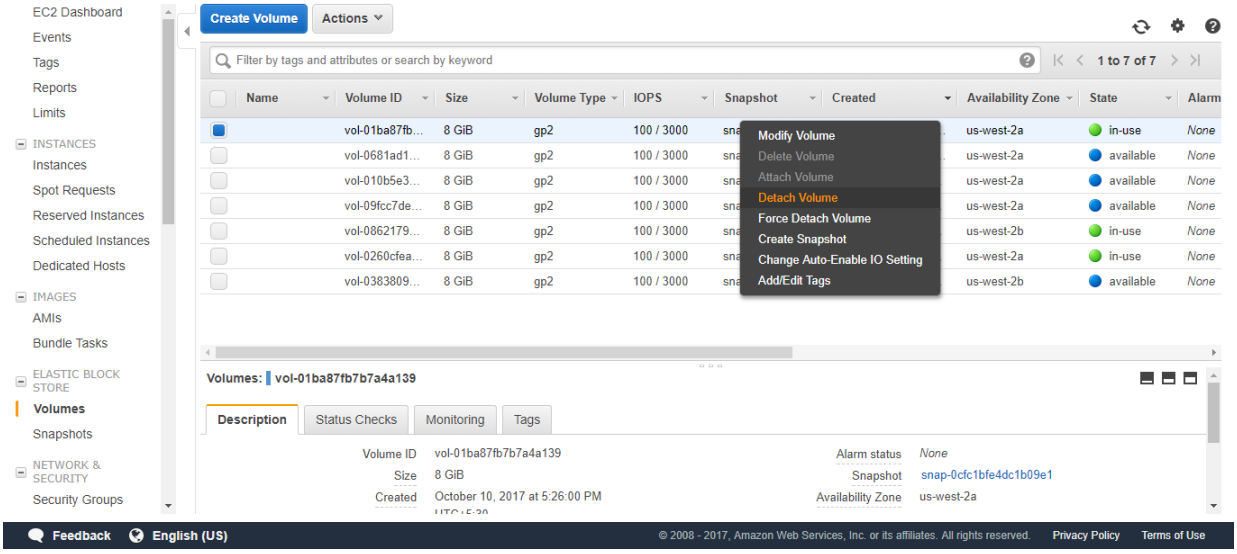


As soon as the instance is luanched.Stop the instance.



(k) Now go to volumes and detach the root volume of this new instance and attach the volume we created from snapshot as root volume

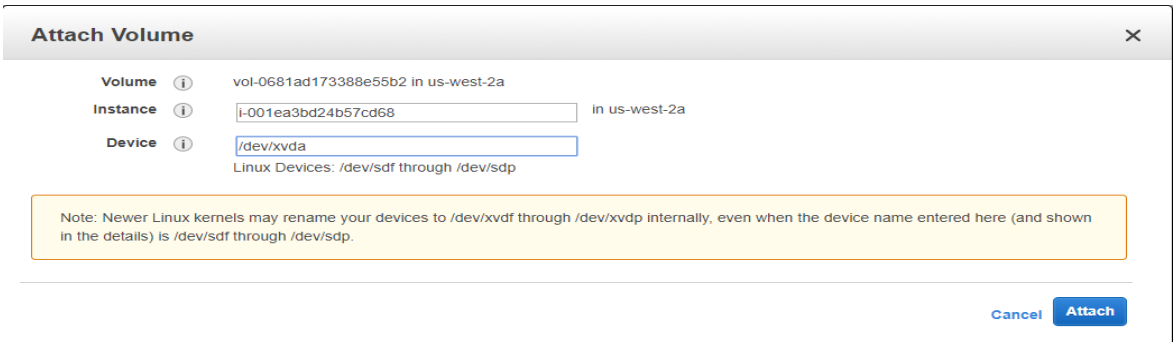
You can see that the volume 'in-use' is the volume we need to detach from the instance



As soon as it is detached it goes to 'availiable' mode.Now attach the volume created from snapshot as rootvolume to the stopped instance,which is in the same region(us-west 2a) as that of the instance

And in the device change the 'sdf' to 'xvda' .

This change tells that our volume is attached as root volume xvda.If you go to page 18 we used lsblk command to see the location of rootvolume which is 'xvda'.



And click on Attach.

(l) Now start the instance and copy the public DNS and paste it in a browser and reload it.You'll see the same static website we built on volume for the 1st instance when we created it.

This is how we create backup of data and use it for other instances depending on the need and requirement.

(m) **Cleanup:**

Terminate all the instances,and delete volmes and snapshots as it incur costs if you keep it running.

-------End of Lab 1--------

Important questions to ponder:

1.What is Amzon EBS?

Amazon Elastic Block Store (Amazon EBS) provides **persistent block storage volumes** for use with Amazon EC2 instances in the AWS Cloud. Each Amazon EBS volume is automatically **replicated** within its Availability Zone to protect you from component failure, offering high availability and durability.'

2.What are EBS volume types?

Amazon EBS Volume Types

The following table shows use cases and performance characteristics of current generation EBS volumes:

	Solid State Drives (SSD)		Hard Disk Drives (HDD)	
Volume Type	EBS Provisioned IOPS SSD (io1)	EBS General Purpose SSD (gp2)*	Throughput Optimized HDD (st1)	Cold HDD (sc1)
Short Description	Highest performance SSD volume designed for latency-sensitive transactional workloads	General Purpose SSD volume that balances price performance for a wide variety of transactional workloads	Low cost HDD volume designed for frequently accessed, throughput intensive workloads	Lowest cost HDD volume designed for less frequently accessed workloads
Use Cases	I/O-intensive NoSQL and relational databases	Boot volumes, low-latency interactive apps, dev & test	Big data, data warehouses, log processing	Colder data requiring fewer scans per day
API Name	io1	gp2	st1	sc1
Volume Size	4 GB - 16 TB	1 GB - 16 TB	500 GB - 16 TB	500 GB - 16 TB
Max IOPS**/Volume	20,000	10,000	500	250
Max Throughput/Volume	320 MB/s	160 MB/s	500 MB/s	250 MB/s
Max IOPS/Instance	65,000	65,000	65,000	65,000
Max Throughput/Instance	1,250 MB/s	1,250 MB/s	1,250 MB/s	1,250 MB/s
Price	$0.125/GB-month $0.065/provisioned IOPS	$0.10/GB-month	$0.045/GB-month	$0.025/GB-month
Dominant Performance Attribute	IOPS	IOPS	MB/s	MB/s

3. What is an IOPS?

Input/output operations per second (IOPS, pronounced eye-ops) is a performance measurement used to characterize computer storage devices like hard disk drives (HDD), solid state drives (SSD), and storage area networks (SAN).

4.What are EBS snapshots?

1.Amazon EBS snapshots are nothing but back up of EBS volumes.

2.It provides the ability to save point-in-time snapshots of your volume which is saved in **Amazon S3**.

3.Amazon EBS Snapshots are stored incrementally: which means only the blocks that have changed after your last snapshot are saved, and you are billed only for the changed blocks.**When you delete a snapshot**, only the **data unique to that snapshot is removed.**

for ex: If you have a device with 100 GB of data but only 5 GB has changed after your last snapshot, a subsequent snapshot consumes only 5 additional GB and you are billed only for the additional 5 GB of snapshot storage, even though both the earlier and later snapshots appear complete.

4. Snapshots that are taken from encrypted volumes are automatically encrypted. Volumes that are created from encrypted snapshots are also automatically encrypted.

Features of Snapshots:

1. **Immediate access to Amazon EBS volume data**
2. **Resizing Amazon EBS volumes**
3. **Sharing Amazon EBS Snapshots-** You can share with co-workers or with AWS community
4. **Copying Amazon EBS Snapshots across AWS regions-**Amazon EBS's ability to copy snapshots across AWS regions makes it easier to leverage multiple AWS regions for geographical expansion, data center migration and disaster recover.
5. **Amazon EBS Encryption and AWS Identity and Access Management**- Amazon EBS encryption offers seamless encryption of EBS data volumes, boot volumes and snapshots, eliminating the need to build and manage a secure key management infrastructure.

5.Can an EBS volume be attached to multiple instances?

Each **EBS volume can** be **attached** to only one **instance.**

6. **What are elastic Volumes in EBS?**

When you attach a **general-purpose** volume to your instance with a fixed size 8 GB, but you'd like to increase the size of EBS or change the type to provisioned IOPS. You need to detach the EBS volume and announce a downtime if your instance is a production instance.

If you use elastic volume to your instance you can dynamically increase capacity, tune performance, and change the type of live volumes with no downtime or performance impact unlike what you do with general purpose volume.

Further study: If you want to be a certified developer you need to dig deep into AWS documentation

1.https://aws.amazon.com/premiumsupport/knowledge-center/instance-store-vs-ebs/

2. http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EBSVolumes.html

3.Do it for youself lab:

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/creating-an-ami-ebs.html

After studying these make sure you understand and answer these questions:

Exam Scenario Questions :-

1. EC2 EBS-backed (EBS root) instance is stopped, what happens to the data on any ephemeral store volumes?

(a) Data is automatically saved in an EBS volume.

(b) Data is unavailable until the instance is restarted.

(c) Data will be deleted and will no longer be accessible.

(d) Data is automatically saved as an EBS snapshot.

2. When an EC2 instance that is backed by an S3-based AMI is terminated, what happens to the data on the root volume?

(A) Data is automatically saved as an EBS snapshot.

(b) Data is automatically saved as an EBS volume.

(c) Data is unavailable until the instance is restarted.

(d) Data is automatically deleted.

3. Which of the following will occur when an EC2 instance in a VPC (Virtual Private Cloud) with an associated Elastic IP is stopped and started? (Choose 2 answers)

The Elastic IP will be dissociated from the instance

(a) All data on instance-store devices will be lost

(b) All data on EBS (Elastic Block Store) devices will be lost

(c) The ENI (Elastic Network Interface) is detached

(d) The underlying host for the instance is changed