

## Lab 4: Working with EBS

### Lab Overview

This lab focuses on Amazon Elastic Block Store (Amazon EBS), a key underlying storage mechanism for Amazon EC2 instances. In this lab, you will learn how to create an Amazon EBS volume, attach it to an instance, apply a file system to the volume, and then take a snapshot backup.

### Topics covered

By the end of this lab, you will be able to:

- Create an Amazon EBS volume
- Attach and mount your volume to an EC2 instance
- Create a snapshot of your volume
- Create a new volume from your snapshot
- Attach and mount the new volume to your EC2 instance

### Duration

This lab will require approximately **30 minutes** to complete.

## AWS service restrictions

In this lab environment, access to AWS services and service actions might be restricted to the ones that are needed to complete the lab instructions. You might encounter errors if you attempt to access other services or perform actions beyond the ones that are described in this lab.

## What is Amazon Elastic Block Store?

**Amazon Elastic Block Store (Amazon EBS)** offers persistent storage for Amazon EC2 instances. Amazon EBS volumes are network-attached and persist independently from the life of an instance. Amazon EBS volumes are highly available, highly reliable volumes that can be leveraged as an Amazon EC2 instances boot partition or attached to a running Amazon EC2 instance as a standard block device.

When used as a boot partition, Amazon EC2 instances can be stopped and subsequently restarted, enabling you to pay only for the storage resources used while maintaining your instance's state. Amazon EBS volumes offer greatly improved durability over local Amazon EC2 instance stores because Amazon EBS volumes are automatically replicated on the backend (in a single Availability Zone).

For those wanting even more durability, Amazon EBS provides the ability to create point-in-time consistent snapshots of your volumes that are then stored in Amazon Simple Storage Service (Amazon S3) and automatically replicated across multiple Availability Zones. These snapshots can be used as the starting point for new Amazon EBS volumes and can protect your data for long-term durability. You can also easily share these snapshots with co-workers and other AWS developers.

This lab guide explains basic concepts of Amazon EBS in a step-by-step fashion. However, it can only give a brief overview of Amazon EBS concepts. For further information, see the [Amazon EBS documentation](#).

## Amazon EBS Volume Features

Amazon EBS volumes deliver the following features:

- **Persistent storage:** Volume lifetime is independent of any particular Amazon EC2 instance.
- **General purpose:** Amazon EBS volumes are raw, unformatted block devices that can be used from any operating system.
- **High performance:** Amazon EBS volumes are equal to or better than local Amazon EC2 drives.
- **High reliability:** Amazon EBS volumes have built-in redundancy within an Availability Zone.

- **Designed for resiliency:** The AFR (Annual Failure Rate) of Amazon EBS is between 0.1% and 1%.
- **Variable size:** Volume sizes range from 1 GB to 16 TB.
- **Easy to use:** Amazon EBS volumes can be easily created, attached, backed up, restored, and deleted.

## Accessing the AWS Management Console

1. At the top of these instructions, choose **Start Lab**.
  - The lab session starts.
  - A timer displays at the top of the page and shows the time remaining in the session.

**Tip:** To refresh the session length at any time, choose **Start Lab** again before the timer reaches 0:00.

- Before you continue, wait until the circle icon to the right of the AWS link in the upper-left corner turns green.
2. To connect to the AWS Management Console, choose the **AWS** link in the upper-left corner.
    - A new browser tab opens and connects you to the console.

**Tip:** If a new browser tab does not open, a banner or icon is usually at the top of your browser with the message that your browser is preventing the site from opening pop-up windows. Choose the banner or icon, and then choose **Allow pop-ups**.

3. Arrange the AWS Management Console tab so that it displays along side these instructions. Ideally, you will be able to see both browser tabs at the same time, to make it easier to follow the lab steps.

## Getting Credit for your work

At the end of this lab you will be instructed to submit the lab to receive a score based on your progress.

**Tip:** The script that checks your work may only award points if you name resources and set configurations as specified. In particular, values in these instructions that appear in This Format should be entered exactly as documented (case-sensitive).

## Task 1: Create a New EBS Volume

In this task, you will create and attach an Amazon EBS volume to a new Amazon EC2 instance.

4. In the AWS Management Console, in the search box next to **Services** , search for and select **EC2**.
5. In the left navigation pane, choose **Instances**.

An Amazon EC2 instance named **Lab** has already been launched for your lab.

6. Note the **Availability Zone** of the instance. It will look similar to *us-east-1a*.
7. In the left navigation pane, choose **Volumes**.

You will see an existing volume that is being used by the Amazon EC2 instance. This volume has a size of 8 GiB, which makes it easy to distinguish from the volume you will create next, which will be 1 GiB in size.

8. Choose **Create volume** then configure:
  - **Volume Type:** *General Purpose SSD (gp2)*
  - **Size (GiB):** 1. **NOTE:** You may be restricted from creating large volumes.
  - **Availability Zone:** Select the same availability zone as your EC2 instance.
  - Choose **Add tag**
  - In the Tag Editor, enter:
    - **Key:** Name
    - **Value:** My Volume

9. Choose **Create Volume**

Your new volume will appear in the list, and will move from the *Creating* state to the *Available* state. You may need to choose **refresh** to see your new volume.

## **Task 2: Attach the Volume to an Instance**

In this task you will attach the new EBS volume to the Amazon EC2 instance.

10. Select **My Volume**.
11. In the **Actions** menu, choose **Attach volume**.

12. Choose the **Instance** field, then select the **Lab** instance.

Note that the **Device** name is set to `/dev/sdf`. Notice also the message displayed that "Newer Linux kernels may rename your devices to `/dev/xvdf` through `/dev/xvdp` internally, even when the device name entered here (and shown in the details) is `/dev/sdf` through `/dev/sdp`."

13. Choose **Attach volume**

The volume state is now *In-use*.

### Task 3: Connect to Your Amazon EC2 Instance

In this task, you will connect to the EC2 instance using EC2 Instance Connect which provides access to a terminal in the browser.

14. In the AWS Management Console, in the search box next to **Services** , search for and select **EC2**.

15. Choose **Instances**.

16. Select the **Lab** instance, and then choose **Connect**.

17. On the **EC2 Instance Connect** tab, choose **Connect**.

An EC2 Instance Connect terminal session opens and displays a \$ prompt.

### Task 4: Create and Configure Your File System

In this task, you will add the new volume to a Linux instance as an ext3 file system under the `/mnt/data-store` mount point.

18. View the storage available on your instance:

Run the following command:

```
df -h
```

You should see output similar to:

Filesystem	Size	Used	Avail	Use%	Mounted on
devtmpfs	4.0M	0	4.0M	0%	/dev
tmpfs	475M	0	475M	0%	/dev/shm
tmpfs	190M	2.8M	188M	2%	/run

```
/dev/xvda1    8.0G  1.6G  6.5G  20% /  
tmpfs        475M    0 475M   0% /tmp  
tmpfs        95M    0  95M   0% /run/user/1000
```

The output shows that the original 8GB **/dev/xvda1** disk volume mounted at **/** which indicates that it is the root volume. It hosts the Linux operating system of the EC2 instance.

The 1GB other volume that you attached to the Lab instance is not listed, because you have not yet created a file system on it or mounted the disk. Those actions are necessary so that Linux operating system can make use of the new storage space. You will take those actions next.

19. Create an ext3 file system on the new volume:

```
sudo mkfs -t ext3 /dev/sdf
```

The output should indicate that a new file system was created on the attached volume.

20. Create a directory for mounting the new storage volume:

```
sudo mkdir /mnt/data-store
```

21. Mount the new volume:

```
sudo mount /dev/sdf /mnt/data-store
```

To configure the Linux instance to mount this volume whenever the instance is started, you will need to add a line to */etc/fstab*. Run the command below to accomplish that:

```
echo "/dev/sdf /mnt/data-store ext3 defaults,noatime 1 2" | sudo tee -a /etc/fstab
```

22. View the configuration file to see the setting on the last line:

```
cat /etc/fstab
```

23. View the available storage again:

```
df -h
```

The output will look similar to what is shown below.

```
Filesystem    Size  Used Avail Use% Mounted on  
devtmpfs      484M    0 484M   0% /dev  
tmpfs         492M    0 492M   0% /dev/shm
```

```
tmpfs      492M 460K 491M 1% /run
tmpfs      492M  0 492M 0% /sys/fs/cgroup
/dev/xvda1  8.0G 1.5G 6.6G 19% /
tmpfs      99M  0 99M 0% /run/user/0
tmpfs      99M  0 99M 0% /run/user/1000
/dev/xvdf   976M 1.3M 924M 1% /mnt/data-store
```

Notice the last line. The output now lists `/dev/xvdf` which is the new mounted volume.

24. On your mounted volume, create a file and add some text to it.

```
sudo sh -c "echo some text has been written > /mnt/data-store/file.txt"
```

25. Verify that the text has been written to your volume.

```
cat /mnt/data-store/file.txt
```

Leave the EC2 Instance Connect session running. You will return to it later in this lab.

### Task 5: Create an Amazon EBS Snapshot

In this task, you will create a snapshot of your EBS volume.

You can create any number of point-in-time, consistent snapshots from Amazon EBS volumes at any time. Amazon EBS snapshots are stored in Amazon S3 with high durability. New Amazon EBS volumes can be created out of snapshots for cloning or restoring backups. Amazon EBS snapshots can also be easily shared among AWS users or copied over AWS regions.

26. In the **EC2 Console**, choose **Volumes** and select **My Volume**.

27. In the **Actions** menu, select **Create snapshot**.

28. Choose **Add tag** then configure:

- **Key:** Name
- **Value:** My Snapshot
- Choose **Create snapshot**

29. In the left navigation pane, choose **Snapshots**.

Your snapshot is displayed. The status will first have a state of *Pending*, which means that the snapshot is being created. It will then change to a state of *Completed*.

Note: Only used storage blocks are copied to snapshots, so empty blocks do not occupy any snapshot storage space.

30. In your EC2 Instance Connect session, delete the file that you created on your volume.

```
sudo rm /mnt/data-store/file.txt
```

31. Verify that the file has been deleted.

```
ls /mnt/data-store/
```

Your file has been deleted.

## Task 6: Restore the Amazon EBS Snapshot

If you ever wish to retrieve data stored in a snapshot, you can **Restore** the snapshot to a new EBS volume.

### Create a Volume Using Your Snapshot

32. In the **EC2 console**, select **My Snapshot**.

33. In the **Actions** menu, select **Create volume from snapshot**.

34. For **Availability Zone**, select the same availability zone that you used earlier.

35. Choose **Add tag** then configure:

- **Key:** Name
- **Value:** Restored Volume
- Choose **Create volume**

**Note:** When restoring a snapshot to a new volume, you can also modify the configuration, such as changing the volume type, size or Availability Zone.

### Attach the Restored Volume to Your EC2 Instance



36. In the left navigation pane, choose **Volumes**.

37. Select **Restored Volume**.

38. In the **Actions** menu, select **Attach volume**.

39. Choose the **Instance** field, then select the **Lab** instance that appears.

Note that the **Device** field is set to `/dev/sdg`. You will use this device identifier in a later task.

40. Choose **Attach volume**

The volume state is now *in-use*.

### **Mount the Restored Volume**

41. Create a directory for mounting the new storage volume:

```
sudo mkdir /mnt/data-store2
```

42. Mount the new volume:

```
sudo mount /dev/sdg /mnt/data-store2
```

43. Verify that volume you mounted has the file that you created earlier.

```
ls /mnt/data-store2/
```

You should see `file.txt`.

### **Submitting your work**

44. To record your progress, choose **Submit** at the top of these instructions.

45. When prompted, choose **Yes**.

After a couple of minutes, the grades panel appears and shows you how many points you earned for each task. If the results don't display after a couple of minutes, choose **Grades** at the top of these instructions.

**Tip:** You can submit your work multiple times. After you change your work, choose **Submit** again. Your last submission is recorded for this lab.

46. To find detailed feedback about your work, choose **Submission Report**.

**Tip:** For any checks where you did not receive full points, there are sometimes helpful details provided in the submission report.

## **Conclusion**

Congratulations! You now have successfully:

- Created an Amazon EBS volume
- Attached the volume to an EC2 instance
- Created a file system on the volume
- Added a file to volume
- Created a snapshot of your volume
- Created a new volume from the snapshot
- Attached and mounted the new volume to your EC2 instance
- Verified that the file you created earlier was on the newly created volume

## **Lab Complete**

Congratulations! You have completed the lab.

47. Choose End Lab at the top of this page and then choose **Yes** to confirm that you want to end the lab.

A panel will appear, indicating that "DELETE has been initiated... You may close this message box now."

48. Choose the **X** in the top right corner to close the panel.

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