This exercise has 3 webservers using two volumes:

* 1 volume (8gb Standard) acting as a root volume for the OS
* 1 volume (10 gb gp2) acting as extra storage. It stores /data (10 files)

We want to use an EFS to store all the files from /data.

All the servers will mount this EFS drive and then we will remove the /data drive stored locally in each webserver.

To do so:

* Create the EFS called SharedWeb, see how to do it below.
* Create /efs in Webserver1 and mount it.
* Copy the content of /data to /efs
* Modify /etc/fstab to mount the EFS on every boot, point it to be mounted in /data
* Remove the 10 gb drive from Webserver1.
* Repeat the mounting process in the rest of the webservers and remove the local drive after.

**Commands:**

df -h

lsblk

mount

sudo umount /data

sudo mount /efs

Mount the nfs (10.0.0.136:/) into this folder /efs:

sudo mount -t nfs4 -o nfsvers=4.1,rsize=1048576,wsize=1048576,hard,timeo=600,retrans=2,noresvport 10.0.0.136:/ /efs

Mount the NFS share into /etc/fstab (file system table), to be mounted in every boot:

10.0.0.136:/ /data nfs4 nfsvers=4.1,rsize=1048576,wsize=1048576,hard,timeo=600,retrans=2,noresvport 0 0

**Reduce Storage Costs with EFS**

**Introduction**

Amazon Elastic File System (Amazon EFS) provides a simple, serverless elastic file system that lets you share file data without provisioning or managing storage. In this lab, we modify three existing EC2 instances to use a shared EFS storage volume instead of duplicated Elastic Block Store volumes. This reduces costs significantly, as we only need to store data in one location instead of three. By the end of this lab, you will understand how to create EFS volumes and attach them to an EC2 instance.

**Solution**

Log in to the AWS Management Console using the credentials provided on the lab instructions page. Make sure you're using the *us-east-1* region.

**Create an EFS File System**

**Review Your Resources**

1. Navigate to **EC2** using the **Services** menu or the unified search bar.
2. In the **Resources** section, select **Instances (running)**.
3. Click the checkbox next to **webserver-01**.

The instance details display below.

1. Select the **Storage** tab and note the 10 GiB disk attached to the volume.

This is the same configuration used for **webserver-02** and **webserver-03**.

**Create an EFS Volume**

1. In a new browser tab, navigate to **EFS**.
2. On the right, click **Create file system**.
3. Fill in the file system details:
   * **Name**: In the text box, enter *SharedWeb*.
   * **Virtual Private Cloud (VPC)**: Use the dropdown to select the provided VPC.
4. Click **Customize**.
   * For **Storage class**: Select **One Zone**.
   * For **Availability Zone**: Leave **us-east-1a** selected.
5. Click **Next** > **Next** > **Next** > **Create** to create the file system.
6. After the file system is successfully created, click **View file system** in the top right corner.
7. Select the **Network** tab and wait for the created network to become available.

**Note**: You may need to refresh the **Network** details to see an updated mount target status.

1. After the mount target state is available, click **Manage** on the right.
2. Under **Security groups**, remove the currently attached default security group and then use the dropdown menu to select the **EC2SecurityGroup** group (*not* the default group).
3. Click **Save**.

**Configure the Security Groups**

1. Navigate back to the **EC2** browser tab.
2. In the sidebar menu, select **Security Groups**.
3. Click the checkbox next to the non-default security group to show the security group details.
4. Select the **Inbound rules** tab and then click **Edit inbound rules** on the right.
5. Click **Add rule** and configure the rule:
   * **Type**: Use the dropdown to select **NFS**.
   * **Source**: Use the text box to select **0.0.0.0/0**.
6. Click **Save rules**.
7. In the sidebar menu, select **EC2 Dashboard** and then select **Instances (running)**.
8. With **webserver-01** selected, click **Connect** along the top right.
9. Click **Connect**.

This should take you to a new terminal showing your EC2 instance in a new browser tab or window.

**Mount the EFS File System and Test It**

**Mount the File System**

1. In the terminal, list your block devices:
2. lsblk
3. View the data inside the 10 GiB disk mounted to /data:
4. ls /data

You should see file.01-file.10 listed.

1. Create a directory to attach your EFS volume:
2. sudo mkdir /efs
3. Navigate back to the **EFS** tab showing the **SharedWeb** file system details.
4. In the top right, click **Attach**.
5. In the dialog, select **Mount via IP**.
6. Copy the provided NFS command to your clipboard.
7. Navigate back to the terminal and paste in the command.
8. Edit the mount point by changing efs to /efs in the command:
9. sudo mount -t nfs4 -o nfsvers=4.1,rsize=1048576,wsize=1048576,hard,timeo=600,retrans=2,noresvport 10.0.0.47:/ /efs
10. Press **Enter** to run the command.

**Test the File System**

1. View the newly mounted EFS volume:
2. ls /efs

Nothing will be returned, but that shows that the EFS volume is mounted.

1. List the block devices again:
2. lsblk

Your NFS mount is not yet listed.

1. View the mounts:
2. mount

Toward the bottom, you should see that your NFS share is mounted on /efs.

1. View file system mounts:
2. df -h

Again, you should see that your NFS share is mounted on /efs.

1. Move all files from /data to the /efs file system:
2. sudo rsync -rav /data/\* /efs
3. View the files now in the /efs file system:
4. ls /efs

This time, a list should be returned.

**Remove Old Data**

**Remove Data from webserver-01**

1. Unmount the partition:
2. sudo umount /data
3. Open the /etc/fstab file in an editor:
4. sudo nano /etc/fstab
5. Remove the line starting with UUID by placing the cursor at the beginning of the line and pressing **Ctrl+K**.
6. Build a new mount point:
   * Navigate back to the **EFS** tab and ensure the **Attach** dialog is still open from the previous objective.
   * Copy the IP address listed in the provided command.
   * Navigate back to the terminal and paste your copied IP address and append :/.
   * Press **Tab** twice so your cursor aligns with the / on the first line, and then add /data.
   * Press **Tab** and then **Space** once so your cursor aligns with ext4 on the first line, and then add nfs4.
   * Navigate back to the **EFS** tab and copy the options from the command (starting with nfsvers and ending with noresvport).
   * Navigate back to the terminal and paste your copied options so they align with defaults, discard on the first line.
   * Press **Tab** and then add 0 0 to the end of your mount point entry.

Your mount point should now look like this:

<NFS MOUNT IP>:/ /data nfs4 <OPTIONS> 0 0

1. Press **Ctrl+X** to exit Nano.
2. Press **Y** to save your changes and then press **Enter** to write to the file.
3. Unmount the /efs to confirm your edits were successful:
4. sudo umount /efs
5. View the file systems:
6. df -h

You should see that you don't have /data or /efs mounted.

1. Try and mount everything that is not already mounted:
2. sudo mount -a
3. View the file systems again and check if 10.0.0.180:/ is mounted:
4. df -h

You should see the NFS share is now mounted on /data.

1. View the contents of /data:
2. ls /data

You should see file.01-file.10 listed.

**Remove the EBS Volume Attached to webserver-01**

1. Navigate back to **EC2** tab showing the **Connect to instance** page.
2. Use the breadcrumb along the top of the page to select **EC2**.
3. In the **Resources** section of the main pane, click **Volumes**.
4. Scroll to the right and expand the **Attached Instances** column to find the 10 GiB volume attached to webserver-01.
5. Click the checkbox next to the 10 GiB volume attached to webserver-01.
6. In the top right, use the **Actions** dropdown to select **Detach volume**.
7. Click **Detach** to confirm your choice.

When the volume is detached, it will show as **Available**. You may need to refresh the page.

1. After the volume is detached, click the checkbox next to the same volume again.
2. In the top right, use the **Actions** dropdown to select **Delete volume**.
3. Click **Delete** to confirm your choice.

**Remove Data from webserver-02 and webserver-03**

1. In the **EC2** sidebar menu, select **Instances**.
2. Click the checkbox next to **webserver-02**.
3. Along the top of the page, click **Connect**.
4. Click **Connect**.

This should launch a terminal in a new browser window or tab.

1. Navigate to the webserver-01 terminal and view the contents of /etc/fstab:
2. cat /etc/fstab
3. Copy the mount point on the second line (starting with an IP) to your clipboard:
4. <NFS MOUNT IP>:/ /data nfs4 <OPTIONS> 0 0
5. Navigate back to the terminal you launched for webserver-02.
6. Unmount the /data partition:
7. sudo umount /data
8. Open the /etc/fstab file in an editor:
9. sudo nano /etc/fstab
10. Edit /etc/fstab:
    * Remove the line starting with UUID by placing the cursor at the beginning of the line and pressing **Ctrl+K**.
    * Paste in the line from your clipboard and reformat it so it aligns with the line above (it should look the same as in webserver-01).
    * Press **Ctrl+X** to exit Nano.
    * Press **Y** to save your changes and then press **Enter** to write to the file.
11. Mount the partition:
12. sudo mount -a
13. View the file systems:
14. df -h
15. View the contents of /data:
16. ls /data

You should see file.01-file.10, indicating you are using the shared EFS volume.

1. Repeat this entire process for webserver-03.

**Remove the EBS Volumes Attached to EC2**

1. Navigate back to the **EC2** tab showing the **Connect to instance** page.
2. Use the breadcrumb along the top of the page to select **EC2**.
3. In the **Resources** section, select **Volumes**.
4. Check the checkboxes for both of the 10 GiB volumes.
5. Use the **Actions** dropdown to select **Detach volume**.
6. Type *detach* into the text box to confirm your choice, and then click **Detach**.
7. After both volumes are detached, select them again using the checkboxes.
8. Use the **Actions** dropdown to select **Delete volume**.
9. Type *delete* into the text box to confirm your choice, and then click **Delete**.

**Conclusion**

Congratulations — you've completed this hands-on lab!

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