Using Amazon Elastic File System (EFS) for Shared Storage on EC2

What is Amazon EFS?

Amazon Elastic File System (EFS) is a scalable, fully managed, shared file storage service in AWS. It supports the NFS protocol and provides access to file systems for multiple EC2 instances. EFS automatically scales to meet storage needs and offers high availability and durability.

Why Use Amazon EFS?

1. **Shared Storage**: Multiple EC2 instances can access the same data concurrently, making it ideal for distributed applications.
2. **Scalability**: Automatically scales as data is added or removed, ensuring you only pay for what you use.
3. **High Performance**: Supports low-latency access for file read/write operations.
4. **Encryption**: Supports encryption both **at rest** and **in transit**, enhancing data security.

Steps to Configure Amazon EFS and Mount it on EC2 Instances

1. Create an Amazon EFS File System

1. **Navigate to the EFS console**:
    - Go to the **AWS Management Console** and open the **Amazon EFS** service.
2. **Create a File System**:
    - Click on **Create file system**.
    - Select your **VPC** where the EC2 instances are located.
    - Leave the default options for performance (unless you have specific performance requirements).
3. **Enable Encryption**:
    - EFS automatically encrypts data at rest. Confirm encryption settings before proceeding.
4. **Configure Access Points (Optional)**:
    - You can configure **Access Points** for better permission control, if needed.
5. **Review and Create**:
    - Click **Create** to provision the file system.

---

2. Configure Security Groups

1. **EFS Security Group**:

- Ensure the **security group attached to the EFS mount target** allows inbound NFS traffic (port **2049**) from the EC2 instances.

2. **EC2 Security Group**:
   - Ensure the **security group of the EC2 instances** allows outbound traffic on port **2049** to the EFS file system.

---

3. Mount the EFS File System to EC2 Instances

1. **Log in to EC2 Instances**:
   - Use SSH to connect to your EC2 instances in the same VPC.
2. **Install NFS Utilities**:
   - For Amazon Linux/Ubuntu:

     ```
     sudo yum install -y nfs-utils  # Amazon Linux
     sudo apt install -y nfs-common # Ubuntu
     ```

3. **Get the Mount Command**:
   - In the EFS console, navigate to your file system and click on the **Attach** button.
   - Copy the mount command (something like this):

     ```
     sudo mount -t nfs4 -o nfsvers=4.1,tls <file-system-
     id>.efs.<region>.amazonaws.com:/ /mnt/efs
     ```

4. **Mount the EFS File System**:
   - Create a directory to serve as the mount point:

     ```
     sudo mkdir -p /mnt/efs
     ```

   - Mount the EFS file system:

     ```
     sudo mount -t nfs4 -o nfsvers=4.1,tls <file-system-
     id>.efs.<region>.amazonaws.com:/ /mnt/efs
     ```

5. **Verify the Mount**:
   - Run the following command to confirm:

     ```
     df -h
     ```

   - You should see the EFS file system mounted.
6. **Persist the Mount** (Optional):
   - Edit the `/etc/fstab` file to ensure the EFS file system is mounted on reboot:

     ```
     echo "<file-system-id>.efs.<region>.amazonaws.com:/ /mnt/efs nfs4
     defaults,_netdev 0 0" | sudo tee -a /etc/fstab
     ```

---

4. Test File Read/Write Operations

1. **Create and Modify Files**:
    - Navigate to the mounted directory:

      ```
      cd /mnt/efs
      ```

    - Create files and directories:

      ```
      echo "Hello, EFS!" | sudo tee testfile.txt
      ```

2. **Verify on Multiple Instances**:
    - Mount the EFS file system on other EC2 instances in the same VPC.
    - Check if the created files are visible and accessible.

---

5. Use EFS for a Shared Web Server

1. **Install a Web Server (e.g., Apache)**:
    - On the EC2 instances, install Apache or Nginx:

      ```
      sudo yum install -y httpd  # Amazon Linux
      sudo apt install -y apache2 # Ubuntu
      ```

2. **Serve Content from EFS**:
    - Link the web server's document root to the EFS directory:

      ```
      sudo ln -s /mnt/efs /var/www/html/shared
      ```

3. **Access via Web Browser**:
    - Navigate to `http://<EC2-public-IP>/shared/testfile.txt` to confirm the shared storage is accessible.

---

6. Enable Encryption in Transit

- Encryption in transit is enabled by adding the `tls` option during the mount:

  ```
  sudo mount -t nfs4 -o nfsvers=4.1,tls <file-system-
  id>.efs.<region>.amazonaws.com:/ /mnt/efs
  ```

Testing and Validation

1. **File Sync**:
    - Modify a file on one EC2 instance and verify the changes on another instance.
2. **Web Server Test**:
    - Access files served by the web server from both EC2 instances.

3. **Encryption Validation**:
    - Verify encryption settings in the AWS Console (EFS File System > Encryption tab).

Conclusion

By implementing Amazon EFS, we created a scalable shared storage solution accessible across multiple EC2 instances. The system was tested for file synchronization, and encryption was enabled both at rest and in transit. EFS proved to be an efficient solution for applications requiring shared access to data, such as web servers or distributed applications.