Hands-On Lab: Launch and Configure an EC2 Instance with a Web Server

This lab guides students through launching a t2.micro EC2 instance with Amazon Linux 2 AMI, configuring a security group for SSH and HTTP, connecting to the instance via SSH and EC2 Instance Connect, installing an Apache web server, and hosting a simple web page. The lab is part of Lecture 4 and assumes students have an AWS Free Tier account and AWS CLI configured.

Objectives

- Launch a t2.micro EC2 instance with Amazon Linux 2 AMI.
- Configure a security group to allow SSH (port 22) and HTTP (port 80).
- Connect to the instance using SSH and EC2 Instance Connect.
- Install and start Apache, create a simple HTML page, and access it via the instance's public IP.

Prerequisites

- AWS Free Tier account with IAM user access (preferably with `EC2FullAccess` permissions).
- AWS CLI installed and configured (from Lecture 1).
- SSH client installed (e.g., OpenSSH for Mac/Linux, PuTTY for Windows).
- Internet access and a web browser for AWS Management Console.
- (Optional) Smartphone with MFA app if root account access is needed.

Step-by-Step Instructions

Step 1: Launch an EC2 Instance

Instructions:

1. **Log in to AWS Management Console**:
    - Navigate to AWS Management Console (https://aws.amazon.com/console/) and log in with your IAM user (or root account if necessary, though IAM user is preferred).
    - Ensure you're in a region supporting Free Tier (e.g., `us-east-1`).
2. **Navigate to EC2**:
    - In the Console, search for "EC2" or select **EC2** from the services menu.

- Click **Instances** > **Launch instances**.

3. **Configure the EC2 Instance**:
   - **Name and tags**:
     - Enter `My-Web-Server` as the instance name.
   - **Application and OS Images (AMI)**:
     - Select **Amazon Linux 2 AMI (HVM), SSD Volume Type** (Free Tier eligible).
   - **Instance type**:
     - Choose `t2.micro` (Free Tier eligible, 1 vCPU, 1 GiB memory).
   - **Key pair (login)**:
     - Click **Create new key pair**.
     - **Key pair name**: `my-ec2-key`.
     - **Key pair type**: RSA.
     - **Private key file format**: `.pem` (for SSH).
     - Click **Create key pair** and download the `my-ec2-key.pem` file.
     - Store the file securely (e.g., `~/Downloads/my-ec2-key.pem`).
     - On Mac/Linux, set permissions:

       ```
       chmod 400 ~/Downloads/my-ec2-key.pem
       ```

     - On Windows, PuTTY users will convert `.pem` to `.ppk` later if needed.
   - **Network settings**:
     - **VPC**: Use the default VPC.
     - **Subnet**: Select **No preference** (uses default subnet).
     - **Auto-assign public IP**: Enable (required for SSH and HTTP access).
     - **Firewall (security groups)**:
       - Select **Create security group**.
       - **Security group name**: `Web-Server-SG`.
       - **Description**: Security group for web server access.
       - Add rules:
         - **Type**: SSH, **Protocol**: TCP, **Port**: 22, **Source**: My IP (or 0.0.0.0/0 for simplicity, but less secure).
         - **Type**: HTTP, **Protocol**: TCP, **Port**: 80, **Source**: Anywhere (0.0.0.0/0).
   - **Storage**: Keep default (1x 8 GiB gp2 volume, Free Tier eligible).
   - **Advanced details**: Leave defaults (no IAM role needed for this lab).
   - Click **Launch instance**.
4. **Verify Launch**:
   - Go to **EC2** > **Instances** and confirm `My-Web-Server` is in the “Running” state.
   - Note the instance’s **Public IPv4 address** (e.g., `54.123.45.67`) for SSH and web access.

Troubleshooting:

- **Instance Not Launching**: Ensure `t2.micro` and Amazon Linux 2 AMI are selected (Free Tier eligible).
- **No Public IP**: Verify “Auto-assign public IP” is enabled in network settings.
- **Security Group Issues**: Ensure SSH (port 22) and HTTP (port 80) rules are added correctly.

Step 2: Connect to EC2 Instance

Instructions:

1. **Connect via SSH**:
    - **Mac/Linux**:
        - Open a terminal.
        - Use the downloaded key pair to connect (replace `<public-ip>` with your instance's public IP):

```
ssh -i ~/Downloads/my-ec2-key.pem ec2-user@<public-ip>
```

            - Example: `ssh -i ~/Downloads/my-ec2-key.pem ec2-user@54.123.45.67`.
        - If prompted, type `yes` to accept the host key.
        - **Expected Output**: You should see a terminal prompt like `[ec2-user@ip-xxx-xxx-xxx-xxx ~]$`.
    - **Windows (Using PuTTY)**:
        - Convert the `.pem` file to `.ppk` using PuTTYgen:
            - Open PuTTYgen, click **Load**, select `my-ec2-key.pem`, and click **Save private key** as `my-ec2-key.ppk`.
        - Open PuTTY:
            - **Host Name**: `ec2-user@<public-ip>` (e.g., `ec2-user@54.123.45.67`).
            - **Connection > SSH > Auth**: Browse and select `my-ec2-key.ppk`.
            - Click **Open** and accept the host key if prompted.
        - **Expected Output**: A terminal window with the EC2 prompt.
    - Verify connection by running:

```
whoami
```

        - **Expected Output**: `ec2-user`.
2. **Connect via EC2 Instance Connect**:
    - In the AWS Console, go to **EC2** > **Instances** > Select `My-Web-Server`.
    - Click **Connect** > **EC2 Instance Connect** tab.
    - Ensure **User name** is `ec2-user` > Click **Connect**.
    - **Expected Output**: A browser-based terminal opens with the EC2 prompt (`[ec2-user@ip-xxx-xxx-xxx-xxx ~]$`).
    - Run:

```
whoami
```

        - **Expected Output**: `ec2-user`.
3. **Test Connectivity**:
    - In the SSH or Instance Connect terminal, run:

```
uname -a
```

    - **Expected Output**: Information about the Amazon Linux 2 system (e.g., kernel version).
  - Exit the terminal:

```
exit
```

Troubleshooting:

- **SSH Connection Refused**: Verify the security group allows port 22 from your IP (or 0.0.0.0/0) and the instance is running.
- **Permission Denied**: Ensure the key pair file has correct permissions (`chmod 400`) and you're using `ec2-user` as the username.
- **EC2 Instance Connect Fails**: Ensure the instance is in a public subnet with a public IP and the security group allows SSH.
- **Browser Issues**: Try a different browser or clear cache if Instance Connect doesn't load.

Step 3: Install a Web Server

Instructions:

1. **Connect to the EC2 Instance**:
   - Use SSH or EC2 Instance Connect to access the instance (as done in Step 2).
   - Example for SSH:

```
ssh -i ~/Downloads/my-ec2-key.pem ec2-user@<public-ip>
```

2. **Install Apache**:
   - Update the instance:

```
sudo yum update -y
```

   - Install Apache HTTP Server:

```
sudo yum install httpd -y
```

   - Start Apache:

```
sudo systemctl start httpd
```

   - Enable Apache to start on boot:

```
sudo systemctl enable httpd
```

- Verify Apache is running:

```
sudo systemctl status httpd
```

  - **Expected Output**: Shows `active (running)` status.

3. **Create a Simple HTML Page**:
   - Navigate to the Apache web directory:

```
cd /var/www/html
```

   - Create an `index.html` file:

```
sudo nano index.html
```

   - Add the following content:

```
<!DOCTYPE html>
<html>
<head>
  <title>My AWS Web Server</title>
</head>
<body>
  <h1>Welcome to My AWS EC2 Web Server!</h1>
  <p>This is a simple web page hosted on an EC2 instance.</p>
</body>
</html>
```

   - Save and exit (`Ctrl+O`, `Enter`, `Ctrl+X` in nano).
   - Set correct permissions:

```
sudo chmod 644 /var/www/html/index.html
sudo chown apache:apache /var/www/html/index.html
```

4. **Access the Web Page**:
   - In a web browser, enter the instance's public IP (e.g., `http://54.123.45.67`).
   - **Expected Output**: Displays the HTML page with "Welcome to My AWS EC2 Web Server!".
   - If using EC2 Instance Connect, open a new browser tab to test.
5. **Verify Apache Logs (Optional)**:
   - Check Apache access logs:

```
sudo cat /var/log/httpd/access_log
```

        - **Expected Output**: Shows HTTP requests from your browser.
    - Exit the terminal:

```
exit
```

Troubleshooting:

- **Web Page Not Accessible**: Ensure the security group allows HTTP (port 80) from 0.0.0.0/0 and the instance has a public IP.
- **Apache Not Running**: Restart Apache (`sudo systemctl restart httpd`) and check status.
- **Permission Issues**: Verify `index.html` permissions and ownership (`apache:apache`).
- **Browser Errors**: Ensure you're using `http://` (not `https://`) and the correct public IP.

Cleanup

- **EC2 Instance**: Terminate the instance to avoid costs:
    - Go to **EC2** > **Instances** > Select `My-Web-Server` > **Instance state** > **Terminate instance**.
- **Key Pair**: Keep `my-ec2-key.pem` for future labs (no cost).
- **Security Group**: Keep `Web-Server-SG` for future labs (no cost).
- **Billing Check**: Verify no unexpected charges in the AWS Billing Console (set up billing alerts if not done).

Expected Outcomes

- t2.micro EC2 instance launched with Amazon Linux 2 AMI.
- Security group configured to allow SSH (port 22) and HTTP (port 80).
- Successful connection to the instance via SSH and EC2 Instance Connect.
- Apache web server installed, started, and hosting a simple HTML page.
- Web page accessible via the instance's public IP in a browser.

Tips for Students

- Store the key pair file (`my-ec2-key.pem`) securely; it cannot be re-downloaded.
- Always terminate unused EC2 instances to stay within Free Tier limits.
- Use the AWS Billing Console to monitor usage and set billing alerts.
- Refer to AWS EC2 Documentation (https://docs.aws.amazon.com/ec2/) and Amazon Linux 2 Documentation (https://docs.aws.amazon.com/linux/) for more details.