Project in AWS
Practice Lab

Using EC2 Roles and Instance Profiles in AWS

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ABOUT THIS LAB

AWS Identity and Access Management (IAM) roles for Amazon Elastic Compute Cloud (EC2) provide the ability to grant instances temporary credentials. These temporary credentials can then be used by hosted applications to access permissions configured within the role. IAM roles eliminate the need for managing credentials, help mitigate long-term security risks and simplify permissions management. Prerequisites for this lab include understanding how to log in to and use the AWS Management Console, EC2 basics (including how to launch an instance), IAM basics (including users, policies, and roles), and how to use the AWS CLI. Once inside the AWS account, make sure you are using us-east-1 (N. Virginia) as the selected region.

LEARNING OBJECTIVES

- Create a Trust Policy and Role Using the AWS CLI
- Create Instance Profile and Attach Role to an EC2 Instance
- Test S3 Permissions via the AWS CLI
- Create an IAM Policy and Role Using the AWS Management Console
- Attach IAM Role to an EC2 Instance Using the AWS Management Console

AWS Documentation about EC2 and IAM:

https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/iam-roles-for-amazon-ec2.html

https://aws.amazon.com/iam/faqs/

https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_use_switch-role-ec2_instance-profiles.html

https://aws.amazon.com/developer/tools/

https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-instance-metadata.html

https://docs.aws.amazon.com/cli/latest/userguide/cli-chap-configure.html#config-settings-and-precedence

https://boto3.amazonaws.com/v1/documentation/api/latest/guide/configuration.html

https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-envvars.html

Source: https://learn.acloud.guru/course/certified-solutions-architect-associate/

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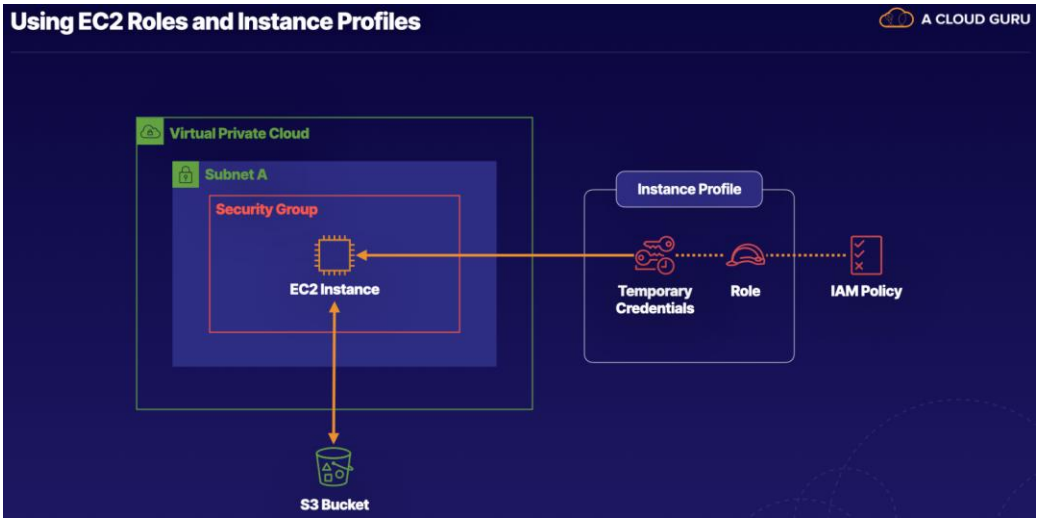
Lab Diagram



Let's look at this scenario. You are responsible for ensuring your applications hosted in Amazon EC2 are able to securely access other AWS services. Credentials need to be rotated regularly to minimize the adverse impact of a security breach. You want to minimize the time it takes to manage these credentials. AWS IAM roles provide the ability to automatically grant instances temporary credentials without the need for manual management. IAM instance profiles provide the mechanism to attach IAM roles to EC2 instances.

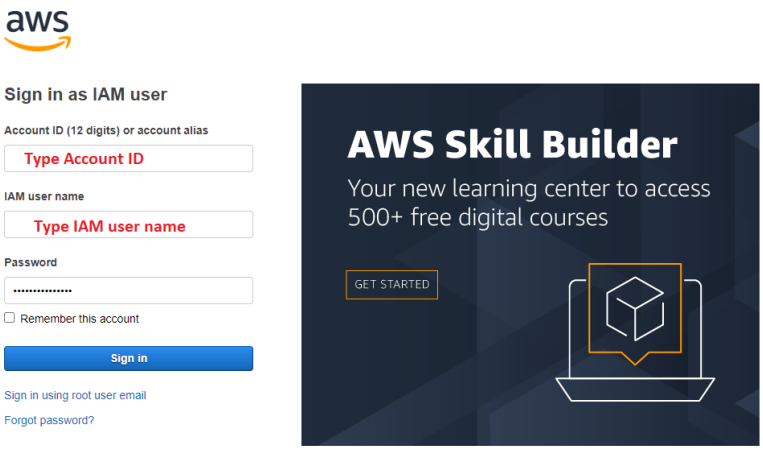
So, applications that run on an EC2 instance must include AWS credentials in their AWS API requests. You could have your developers store AWS credentials directly within the EC2 instance and allow applications in that instance to use those credentials, but developers would then have to manage their credentials and ensure they securely pass the credentials to each instance and update each instance when it's time to rotate the credentials. That's a lot of additional work, and there's definitely a better way, which is the focus on this lab.

The lab has pre-provisioned some resources for you in the environment at the start of the lab: a VPC, a subnet, EC2 instances, and S3 buckets. During the activities of this lab, we're going to create some roles and associated permissions with those roles to access the S3 buckets. The roles are entities that define a set of permissions for making AWS service requests. Think of an IAM role for EC2 as what you can do. But you can associate a role directly with an EC2 instance and you need an instance profile to do so.

An instance profile is an entity or a container that's used for connecting an IAM role to an EC2 instance. So, instance profile is like *whoami*. Instance profiles provide temporary credentials, which are rotated automatically. So, if a hacker gets into your server, they get the credentials, but those credentials live for a short period of time. When you create and attach the role to an EC2 instance in the AWS Management Console, the creation and use of the instance profile is actually handled behind the scenes.

So, we'll be creating EC2 roles and instance profiles via the AWS CLI (command line interface). Then, we'll create a role and instance profile and permissions using the AWS Management Console.

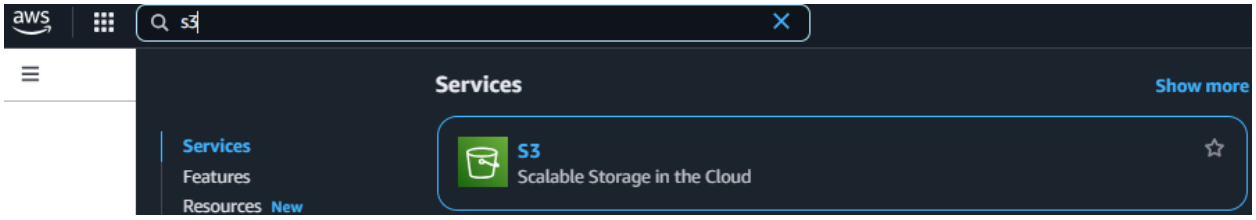
Log in to your AWS account



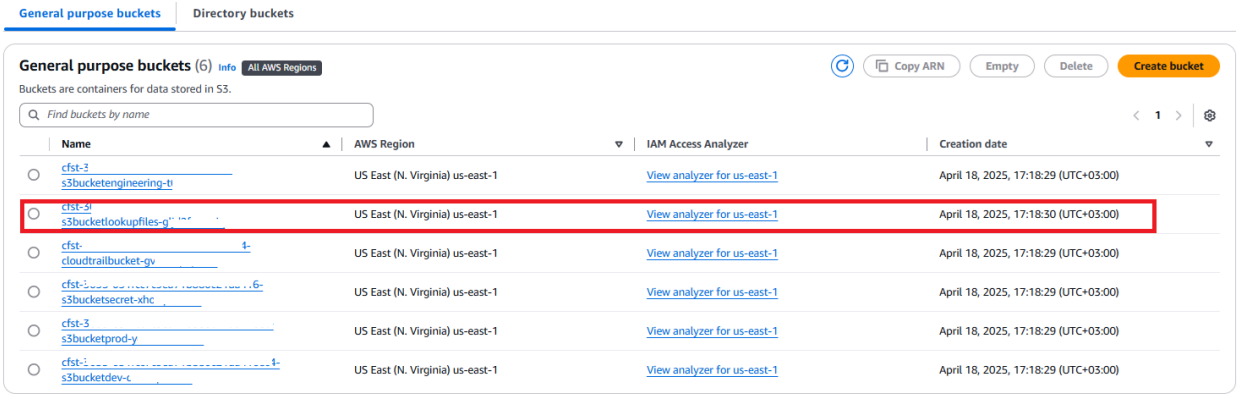
1. Create a Trust Policy and Role Using the AWS CLI

1.1. Obtain the **labreferences.txt** File

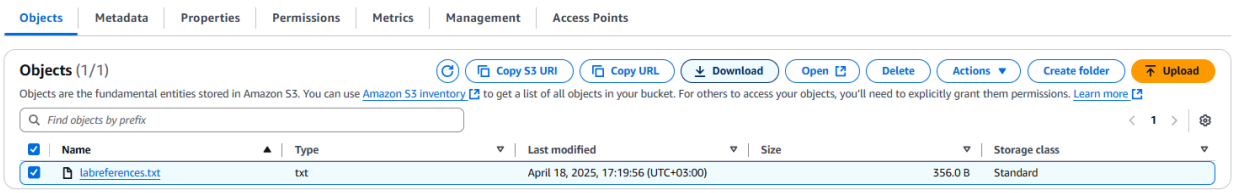
1. Once you are logged in to the AWS Management Console, navigate to S3.



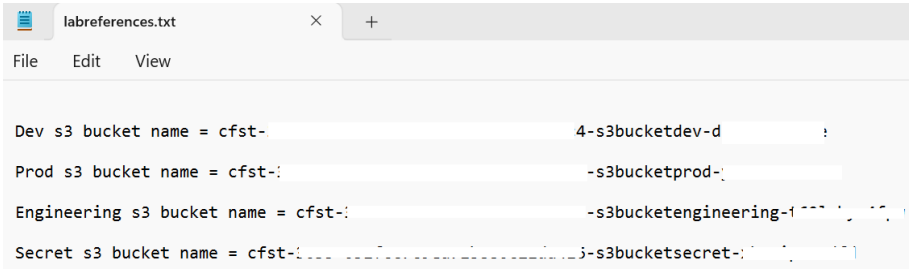
2. From the list of buckets, open the one that contains the text ***s3bucketlookupfiles*** in the middle of its name.



3. Select the ***labreferences.txt*** file and **Download**.

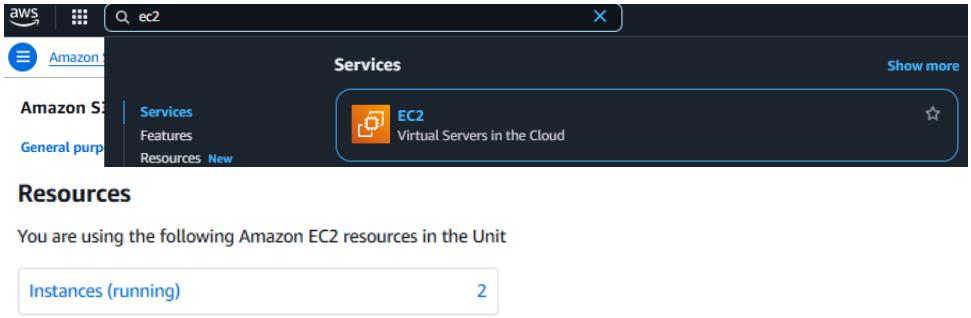


4. Open the ***labreferences.txt*** file, as we will need to reference it throughout the lab.

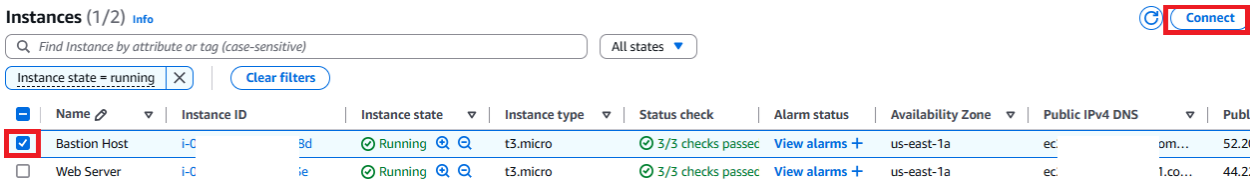


1.2. Connect to Bastion Host EC2 Instance and Set the AWS CLI Region and Output Type

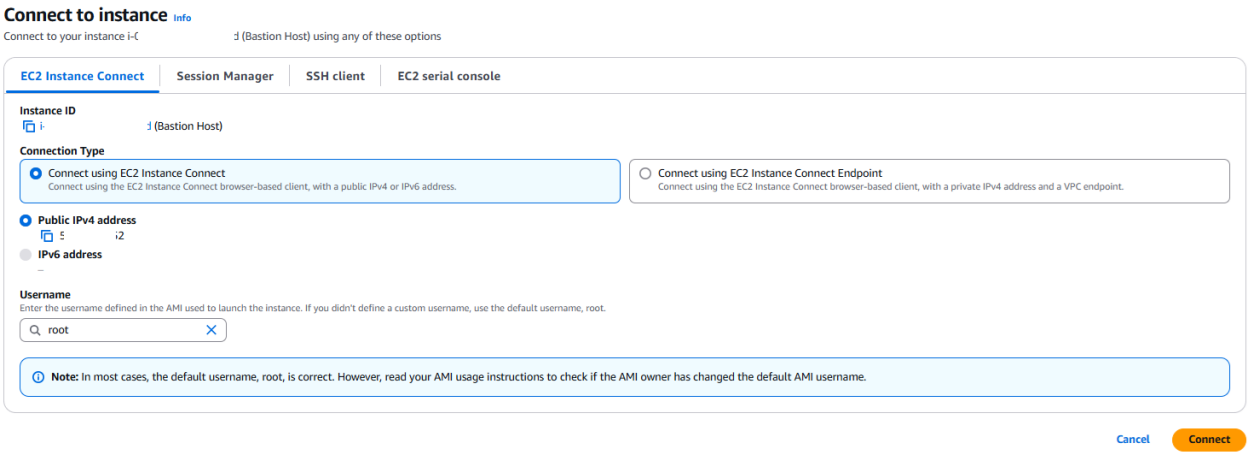
1. Navigate to **EC2 → Instances**.



2. Select ***Bastion Host*** and click **Connect**.



3. Use ***EC2 Instance Connect*** → **Connect**.



4. Switch from ***root*** to ***cloud_user***.

```
[root@ip-          ~]# sudo su - cloud_user
[cloud_user@ip-          ~]$
```

5. Run the following command: **aws configure**
6. Press **Enter** twice to leave the ***AWS Access Key ID*** and ***AWS Secret Access Key*** blank.
7. Enter **us-east-1** as the default region name.
8. Enter **json** as the default output format.

```
[cloud_user@ip-          ~]$ aws configure
AWS Access Key ID [None]:
AWS Secret Access Key [None]:
Default region name [None]: us-east-1
Default output format [None]: json
[cloud_user@ip-          ~]$
```

1.3. Create IAM Trust Policy for an EC2 Role

1. Create a file called ***trust_policy_ec2.json***: **vi trust_policy_ec2.json**

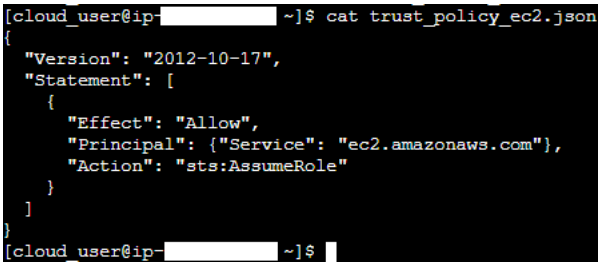
```
[cloud_user@ip-          ~]$ vi trust_policy_ec2.json
```

2. Click “i” for INSERT.

3. Paste in the following content:

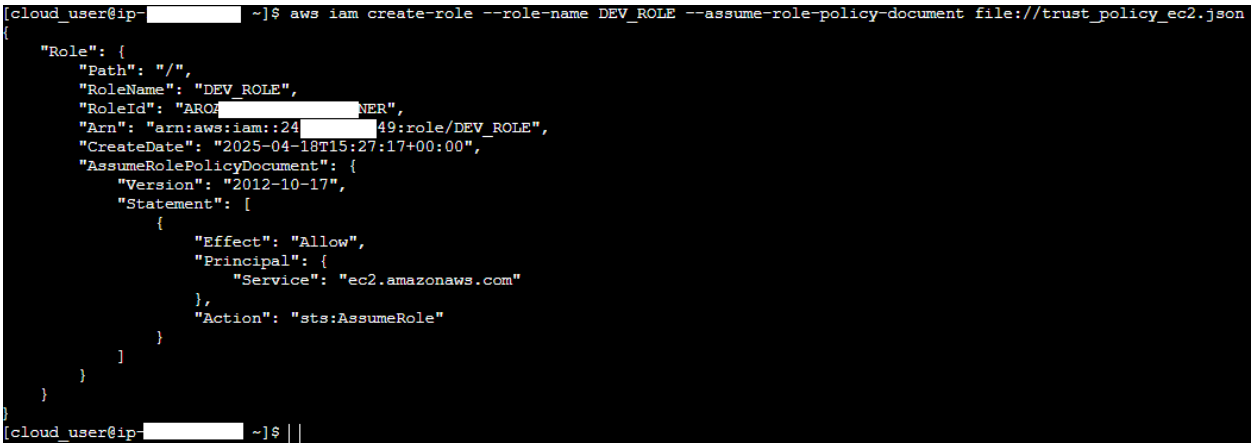
```
{
 "Version": "2012-10-17",
 "Statement": [
  {
   "Effect": "Allow",
   "Principal": {"Service": "ec2.amazonaws.com"},
   "Action": "sts:AssumeRole"
  }
 ]
}
```

4. Save and quit using "**esc**" and "**:wq**".
5. You can use "**cat**" to assure that everything was saved.



1.4. Create the **DEV_ROLE** IAM Role

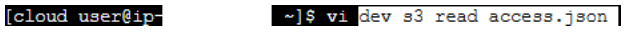
1. Run the following AWS CLI command: **aws iam create-role --role-name DEV_ROLE --assume-role-policy-document file://trust_policy_ec2.json**



Note: The policy has been created with the trust policy attached. Now we want to grant this role read-only access permissions to one of our S3 buckets. We need to create an IAM policy that defines those permissions.

1.5. Create an IAM Policy Defining Read-Only Access Permissions to an S3 Bucket

1. Create a file called ***dev_s3_read_access.json***: **vi dev_s3_read_access.json**



2. Click “i” for INSERT.

3. Paste in the following content:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "AllowUserToSeeBucketListInTheConsole",
      "Action": ["s3:ListAllMyBuckets", "s3:GetBucketLocation"],
      "Effect": "Allow",
      "Resource": ["arn:aws:s3:::*"]
    },
    {
      "Effect": "Allow",
      "Action": [
        "s3:Get*",
        "s3:List*"
      ],
      "Resource": [
        "arn:aws:s3:::<DEV_S3_BUCKET_NAME>/*",
        "arn:aws:s3:::<DEV_S3_BUCKET_NAME>"
      ]
    }
  ]
}
```

4. Replace the placeholder **<DEV_S3_BUCKET_NAME>** with the bucket name provided in the ***labreferences.txt*** file:

Note: You will see 2 resources: one has "**/***" and one has none. This policy will allow us to perform GET and LIST operations on this S3 bucket. The "**/***" at the end indicates that this applies to the objects within the bucket and without the "**/***", it indicates that it operates on just the bucket itself. So, make sure you have both of them.

5. Save and quit using "**esc**" and "**:wq**".
6. You can use "**cat**" to assure that everything was saved.

7. Create the managed policy called ***DevS3ReadAccess***: **aws iam create-policy --policy-name DevS3ReadAccess --policy-document file://dev_s3_read_access.json**

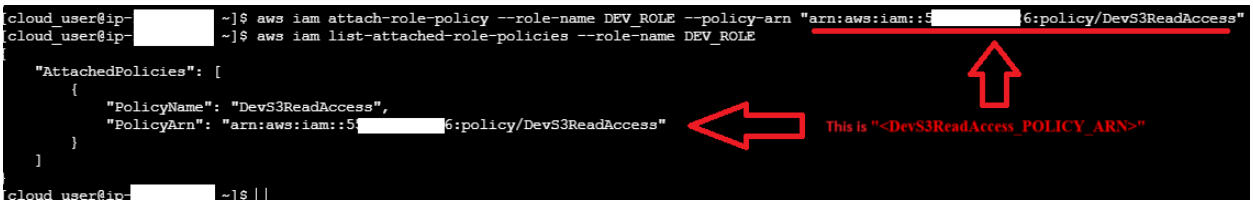
8. Copy the policy ARN (Amazon Resource Name) in the output and paste it into the ***labreferences.txt*** file — we'll need it in a minute.

2. Create Instance Profile and Attach Role to an EC2 Instance

2.1. Attach Managed Policy to Role

1. Attach the managed policy to the role, replacing **<DevS3ReadAccess_POLICY_ARN>** with the ARN you just copied: **aws iam attach-role-policy --role-name DEV_ROLE --policy-arn "<DevS3ReadAccess_POLICY_ARN>"**

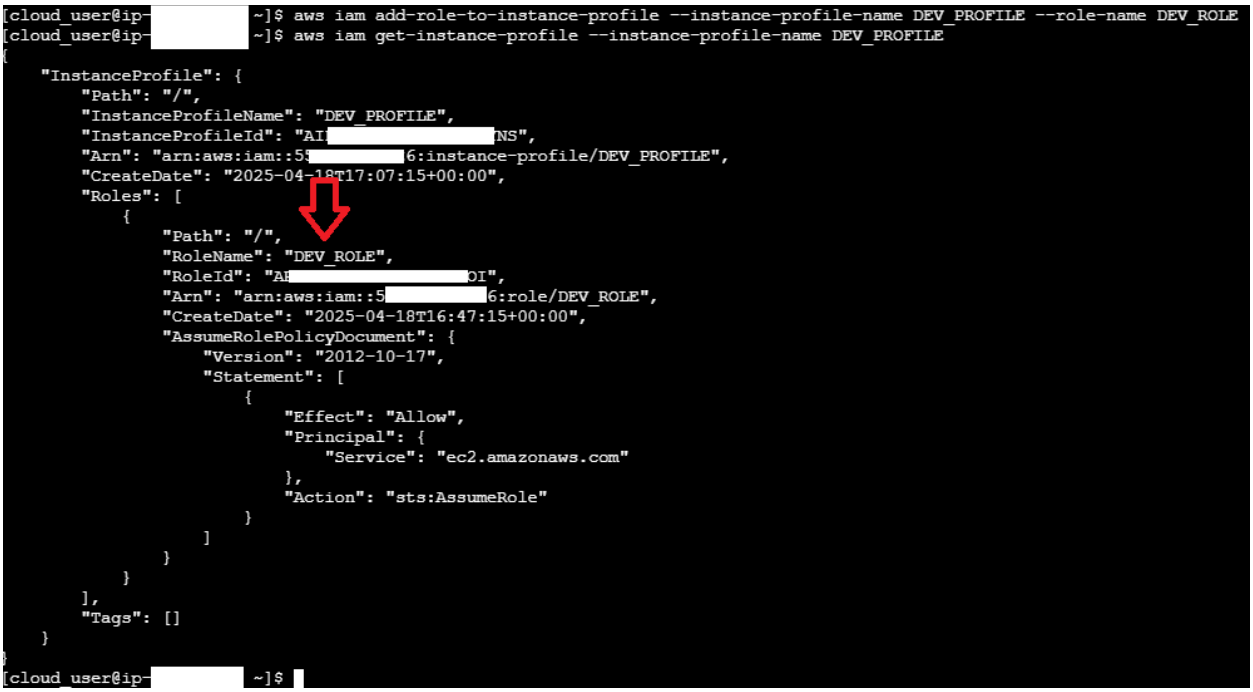
2. Verify the managed policy was attached: **aws iam list-attached-role-policies --role-name DEV_ROLE**



2.2. Create the Instance Profile and Add the DEV_ROLE via the AWS CLI

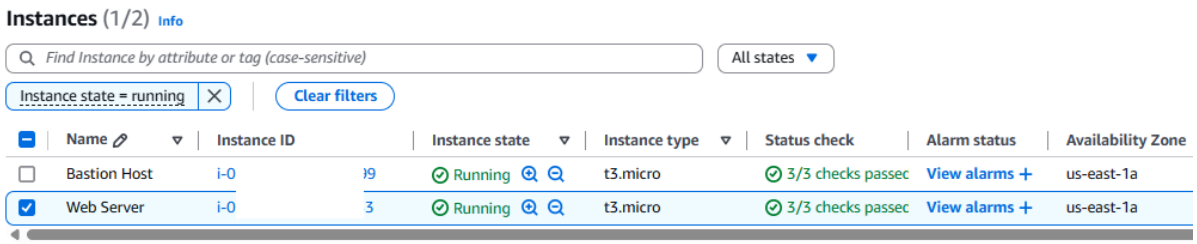
1. Create instance profile named ***DEV_PROFILE***: **aws iam create-instance-profile --instance-profile-name DEV_PROFILE**

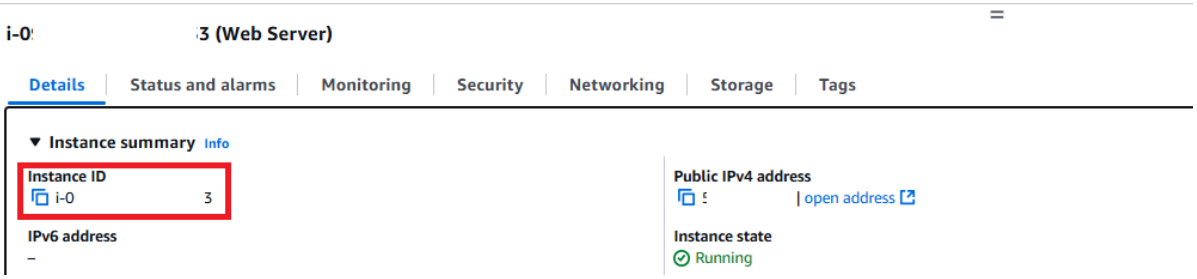
2. Add role to the ***DEV_PROFILE*** called ***DEV_ROLE***: **aws iam add-role-to-instance-profile --instance-profile-name DEV_PROFILE --role-name DEV_ROLE**
3. Verify the configuration: **aws iam get-instance-profile --instance-profile-name DEV_PROFILE**



2.3. Attach the **DEV_PROFILE** Role to an Instance

1. In the AWS console, navigate to **EC2 → Instances**.
2. Copy the **Instance ID** of the instance named ***Web Server***.





3. In the terminal, attach the ***DEV_PROFILE*** to an EC2 instance, replacing **<LAB_WEB_SERVER_INSTANCE_ID>** with the ***Web Server*** instance ID you just copied: **aws ec2 associate-iam-instance-profile --instance-id <LAB_WEB_SERVER_INSTANCE_ID> --iam-instance-profile Name="DEV_PROFILE"**

```
[cloud_user@ip-        ~]$ aws ec2 associate-iam-instance-profile --instance-id i-0                3 --iam-instance-profile Name="DEV_PROFILE"
{
    "IamInstanceProfileAssociation": {
        "AssociationId": "iip-assoc-0                4",
        "InstanceId": "i-09                3",
        "IamInstanceProfile": {
            "Arn": "arn:aws:iam::5          6:instance-profile/DEV_PROFILE",
            "Id": "AI                NS"
        },
        "State": "associating"
    }
}
[cloud_user@ip-        ~]$
```

4. Verify the configuration (be sure to replace **<LAB_WEB_SERVER_INSTANCE_ID>** with the Web Server instance ID again): **aws ec2 describe-instances --instance-ids <LAB_WEB_SERVER_INSTANCE_ID>**

```
[cloud_user@ip-        ~]$ aws ec2 describe-instances --instance-ids i-09                3
```

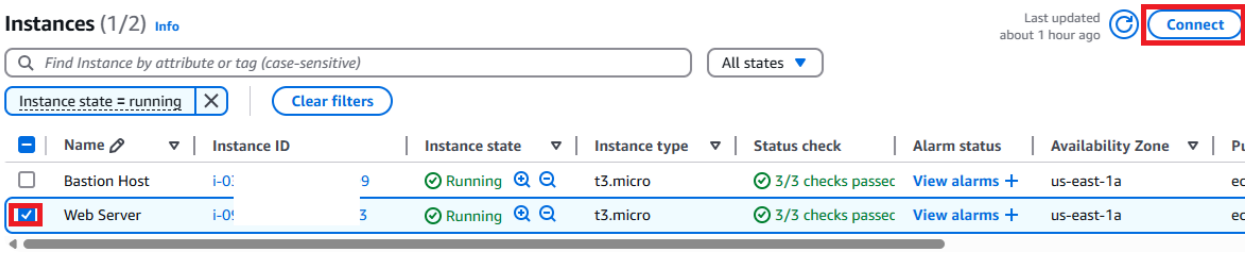
5. This command's output should show this instance is using ***DEV_PROFILE*** as an ***IamInstanceProfile***. Verify this by locating the ***IamInstanceProfile*** section in the output and look below to make sure the "ARN" ends in **/DEV_PROFILE**.

```
    "IamInstanceProfile": {
        "Arn": "arn:aws:iam::5          6:instance-profile/DEV_PROFILE",
        "Id": "AI                NS"
    },
    "NetworkInterfaces": [
```

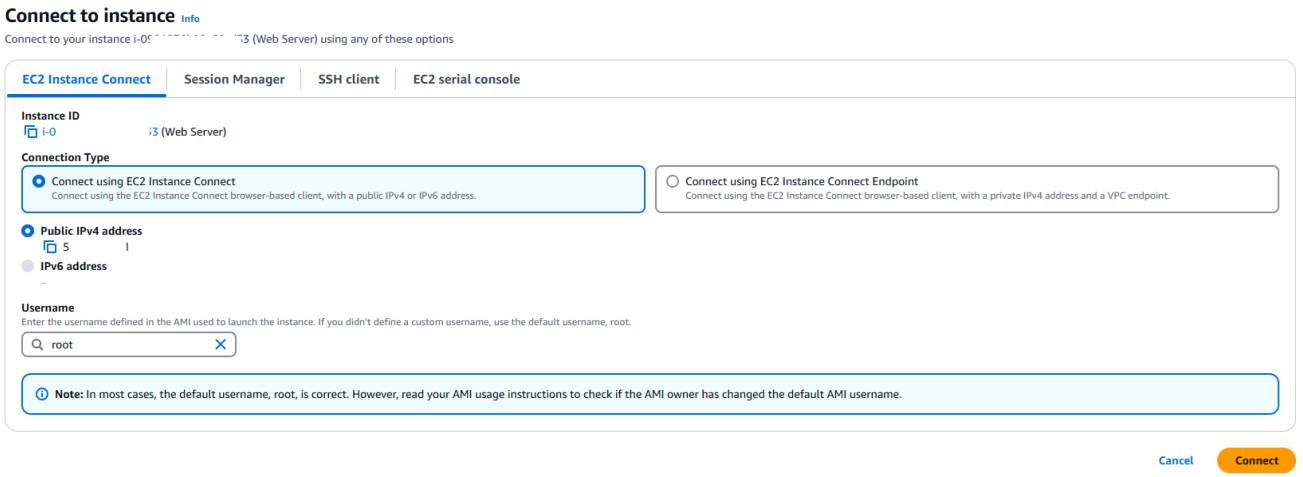
3. Test S3 Permissions via the AWS CLI

3.1. Test S3 Permissions

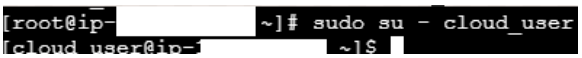
1. Return to the AWS Management Console and navigate to **EC2**.
2. On the EC2 dashboard, select ***Web Server*** and click **Connect**.



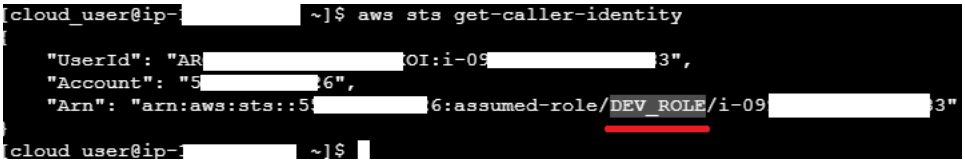
3. Use ***EC2 Instance Connect*** → **Connect**.



4. Switch from ***root*** to ***cloud_user***.

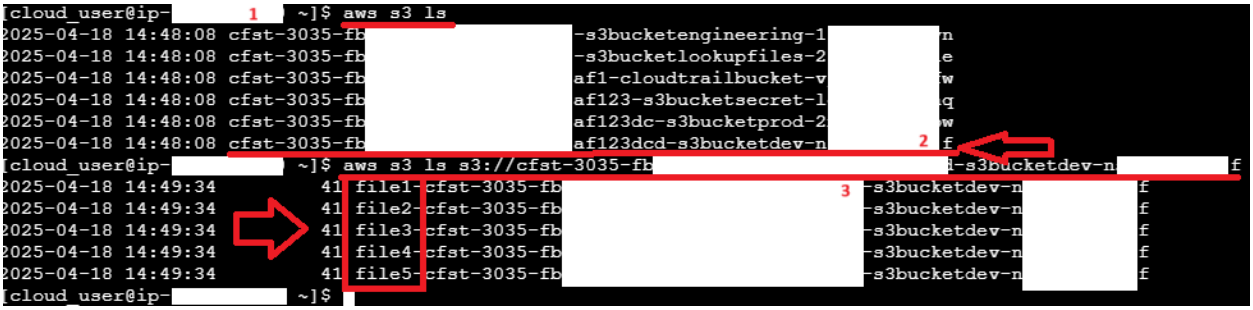


5. Verify the instance is assuming the DEV_ROLE role: **aws sts get-caller-identity**



Note: We should see DEV_ROLE in the ARN.

6. List the buckets in the account: **aws s3 ls**
7. Copy the entire name (starting with **cfst**) of the bucket with ***s3bucketdev*** in its name.
8. Attempt to view the files in the ***s3bucketdev***- bucket, replacing **<s3bucketdev-123>** with the bucket name you just copied: **aws s3 ls s3://<s3bucketdev-123>**
9. We should see a list of files.

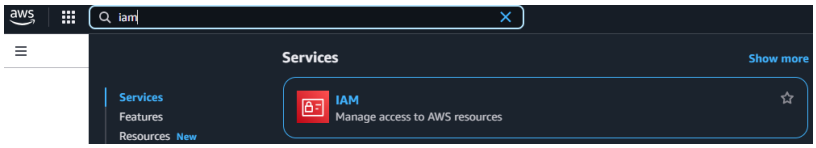


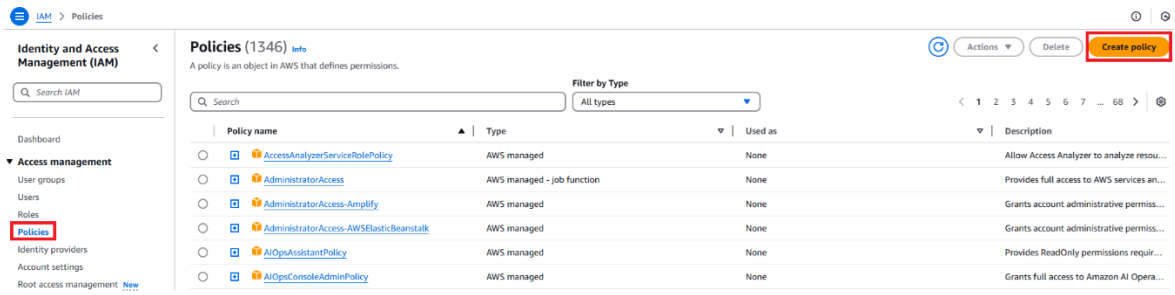
4. Create an IAM Policy and Role Using the AWS Management Console

Here we'll cover the creation of a production role, a permission policy, and an instance profile with the AWS Management Console. When you create and attach a role to an EC2 instance using the AWS Management Console, the creation and use of the instance profile is actually handled behind the scenes. From a UI perspective, it looks as we're only dealing with IAM roles. However, AWS automatically runs commands behind the scenes to replicate the steps we did in the CLI. Now, let's do this through AWS Management Console.

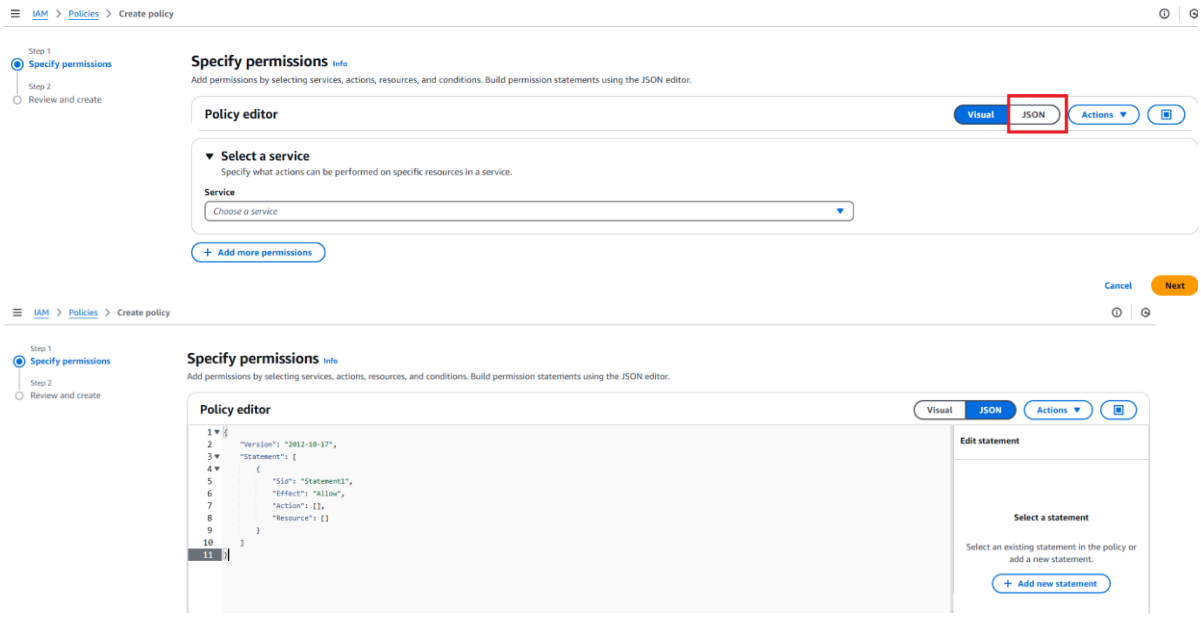
4.1. Create Policy

1. In the AWS console, navigate to **IAM → Policies**.
2. Click **Create policy**.



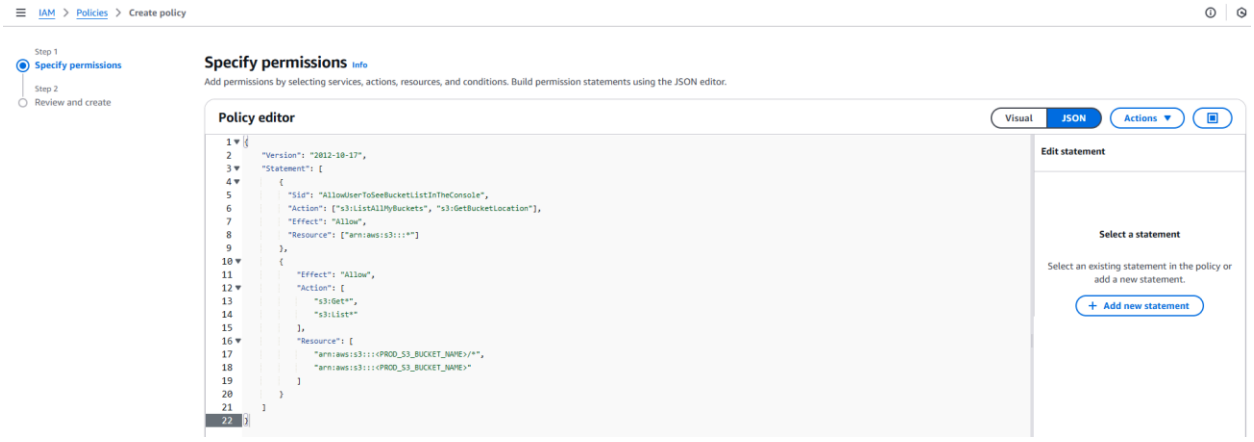


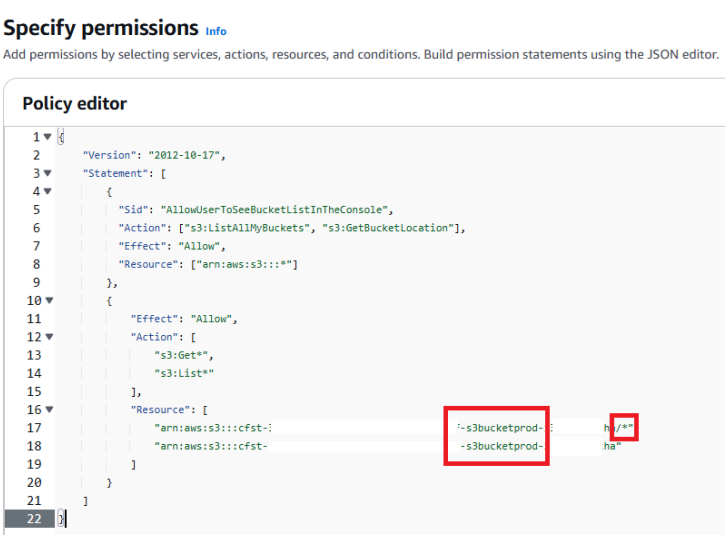
3. Click the **JSON tab**.



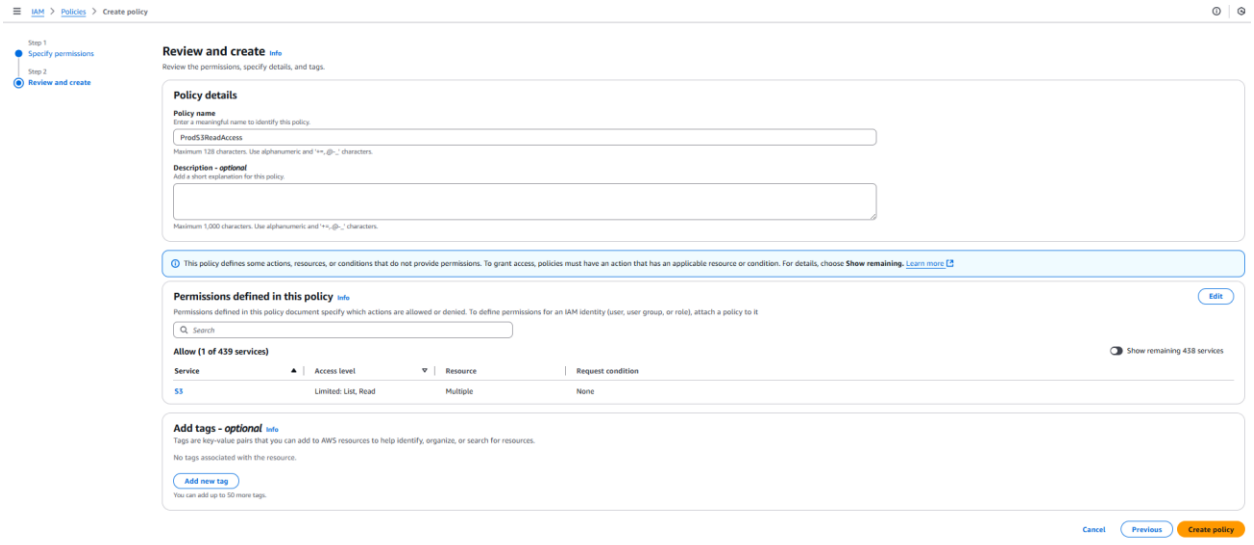
4. Paste the following text as the policy, replacing **<PROD_S3_BUCKET_NAME>** with the bucket name provided in the ***labreferences.txt*** file:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "AllowUserToSeeBucketListInTheConsole",
      "Action": ["s3:ListAllMyBuckets", "s3:GetBucketLocation"],
      "Effect": "Allow",
      "Resource": ["arn:aws:s3:::*"]
    },
    {
      "Effect": "Allow",
      "Action": [
        "s3:Get*",
        "s3:List*"
      ],
      "Resource": [
        "arn:aws:s3:::<PROD_S3_BUCKET_NAME>/*",
        "arn:aws:s3:::< PROD_S3_BUCKET_NAME>"
      ]
    }
  ]
}
```





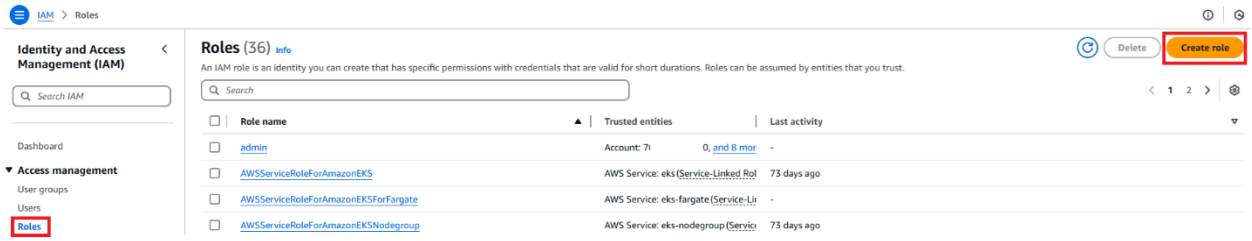
5. Click **Next**.
6. Enter **ProdS3ReadAccess** as the policy name.
7. Click **Create policy**.



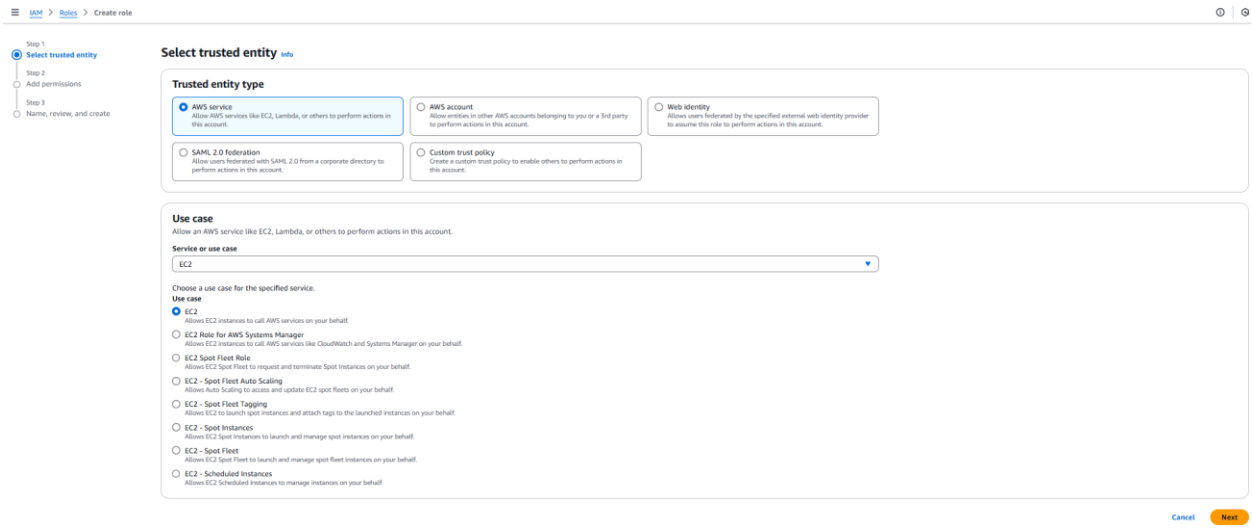
4.2. Create Role

We need to associate this policy to a role.

1. Let's navigate to **Roles → Create role**.



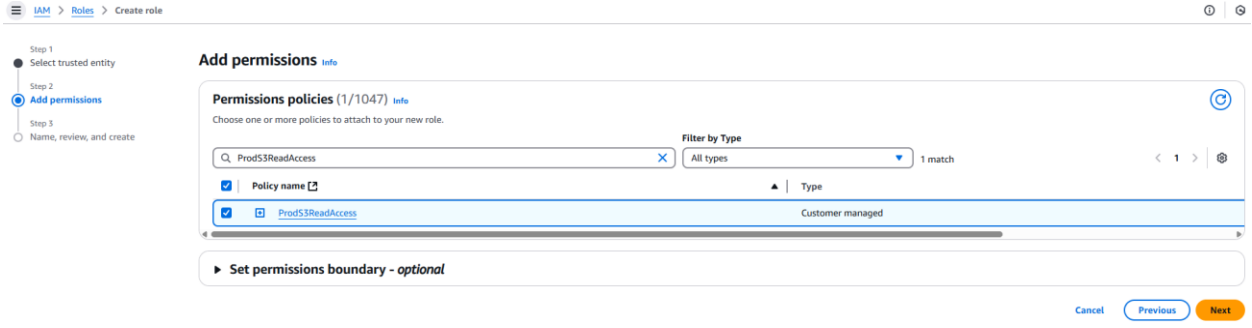
2. Under ***Choose a use case***, select **EC2**.
3. Click **Next**.



4. In the ***Filter policies*** search box, enter **ProdS3ReadAccess**.

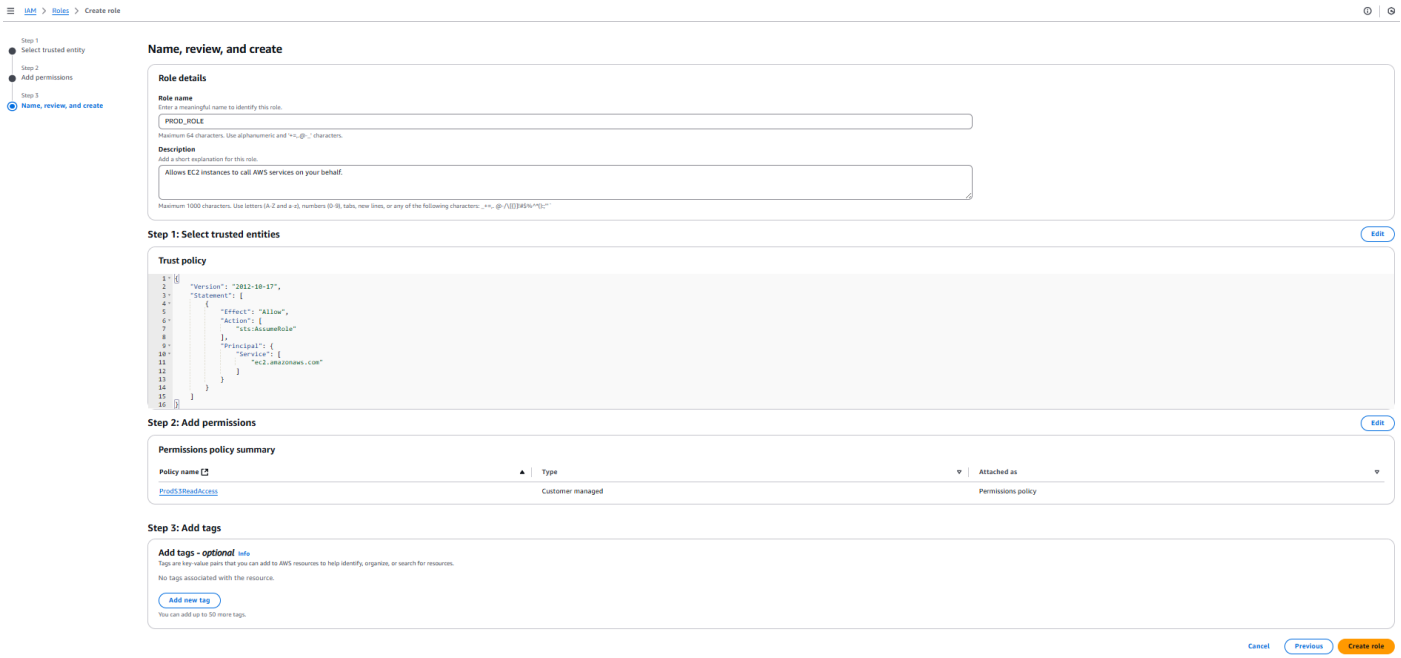
5. Click the checkbox to select **ProdS3ReadAccess**.

6. Click **Next**.



7. Give it a ***Role name*** of **PROD_ROLE**.

8. Click **Create role**.

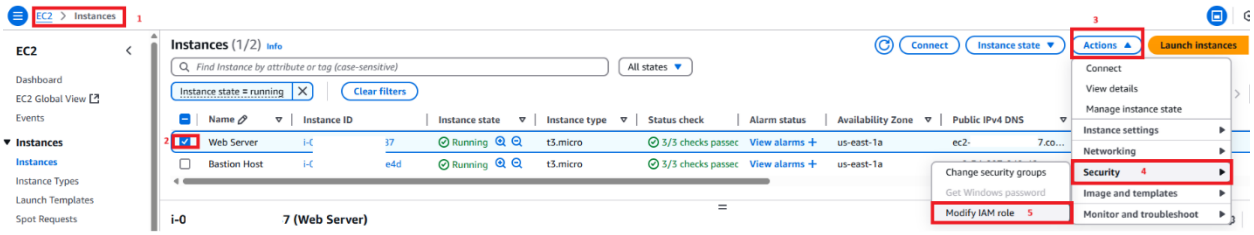


9. This automatically allows the EC2 instance to assume this role and it created an instance profile for us.

5. Attach IAM Role to an EC2 Instance Using the AWS Management Console

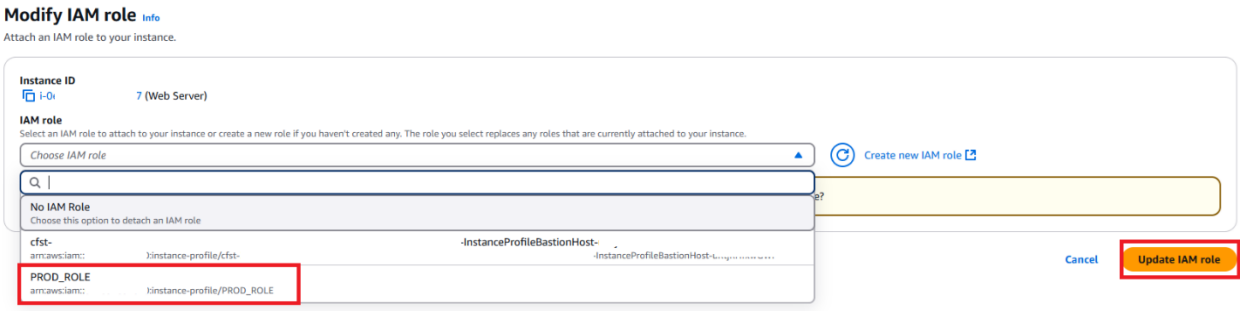
5.1. Attach the Role

1. Navigate to **EC2 → Instances**.
2. Select the ***Web Server*** instance. The current IAM role is DEV_ROLE.
3. Click **Actions → Security → Modify IAM role**.



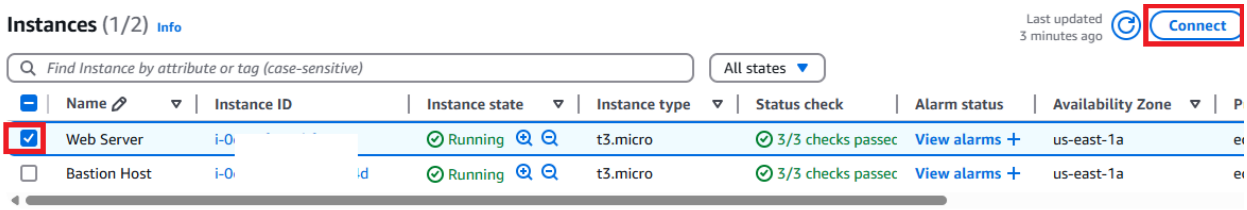
4. In the ***IAM role*** dropdown, select **PROD_ROLE**.

5. Click **Update IAM role**.

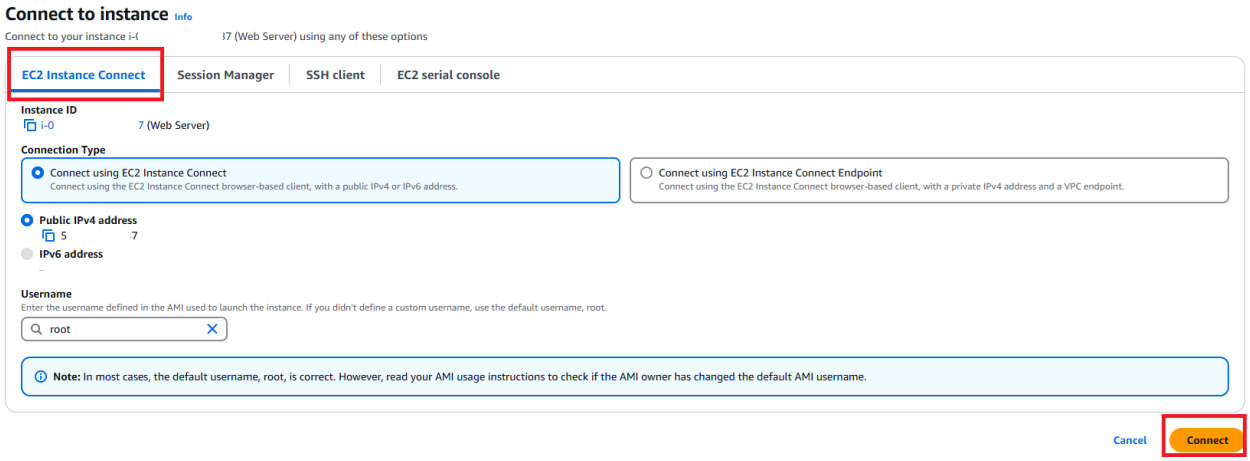


5.2. Test the Configuration

1. Select ***Web Server*** → **Connect**.



2. Use ***EC2 Instance Connect*** → **Connect**.

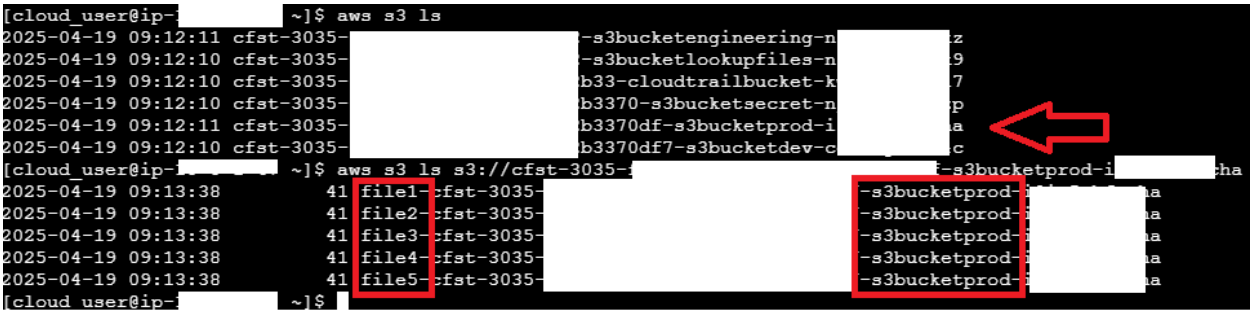


3. Determine the identity currently being used: **aws sts get-caller-identity**
4. This time, we should see **PROD_ROLE** in the ARN.

```
[cloud_user@ip-          ~]$ aws sts get-caller-identity
{
    "UserId": "AR                    7V:i-0e                7",
    "Account":                 0",
    "Arn": "arn:aws:sts::              :assumed-role/PROD_ROLE/i-                  87"
}
[cloud_user@ip-          ~]$
```

5. List the buckets: **aws s3 ls**
6. Copy the entire name (starting with **cfst**) of the bucket with ***s3bucketprod*** in its name.

7. Attempt to view the files in the ***s3bucketprod-*** bucket, replacing **<s3bucketprod-123>** with the bucket name you just copied: **aws s3 ls s3://<s3bucketprod-123>**
8. It should list the files.



9. In the **aws s3 ls** command output, copy the entire name (starting with **cfst**) of the bucket with ***s3bucketsecret*** in its name.
10. Attempt to view the files in the **<s3bucketsecret-123>** bucket, replacing **<s3bucketsecret-123>** with the bucket name you just copied: **aws s3 ls s3://<s3bucketsecret-123>**
11. This time, our access will be denied — which means our configuration is properly set up, because we haven't granted access to this bucket in our bucket policy.