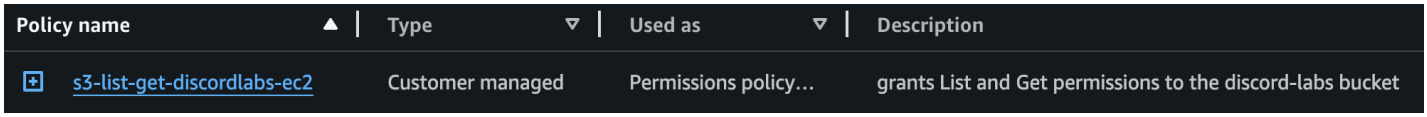
Lab 3 Submission - b.ho.o
07/10/2025

4.1. Create a Custom IAM Policy

Created IAM policy which grants list and get permissions to lab bucket

As seen In AWS Console:



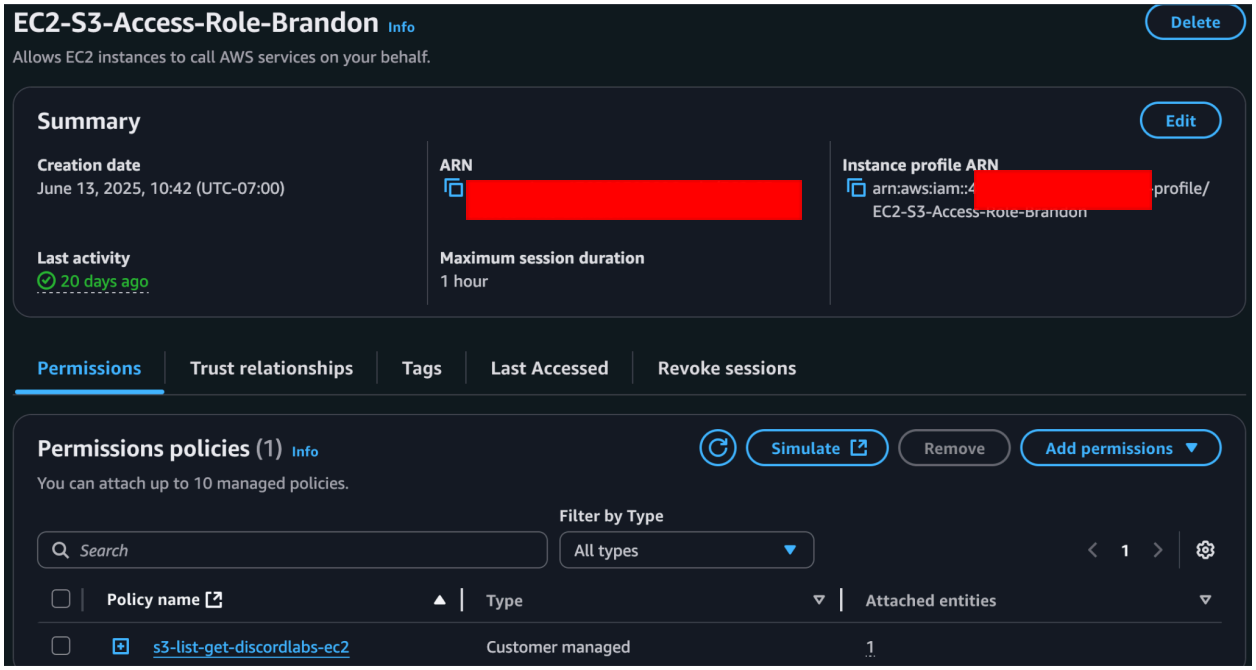
Policy name	Type	Used as	Description
s3-list-get-discordlabs-ec2	Customer managed	Permissions policy...	grants List and Get permissions to the discord-labs bucket

Policy:

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "s3:ListBucket",
            "Resource": [
                "arn:aws:s3:::[redacted]"
            ]
        },
        {
            "Effect": "Allow",
            "Action": "s3:GetObject",
            "Resource": [
                "arn:aws:s3:::[redacted]/*"
            ]
        }
    ]
}
```

4.2. Create an IAM Role for EC2

Created IAM role and attached policy to it



4.3. Attach the Role to Your EC2 Instance

I previously attached a role to the EC2 in lab2, and needed to replace it with the newly created IAM role above. First, had to get the existing AssociationId (using describe-iam-instance-profile-associations)

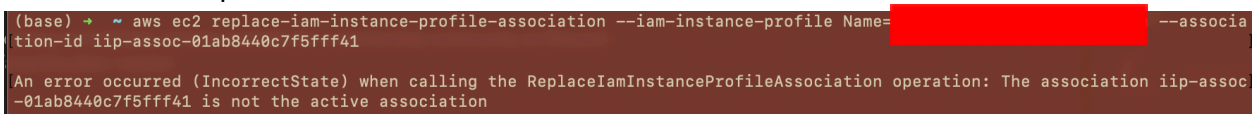
```
aws ec2 describe-iam-instance-profile-associations \
  --filters Name=instance-id,Values=i-0d0a94a78842272ff
```

After getting the association ID, attempted the below options to replace but kept running into errors from both methods:

- Replace-iam-instance-profile-association
- Replacing instance profile from AWS console

Error from AWS Console replacement:

Error from CLI replacement:



I ended up having to fully dissociate the role using:

aws ec2 disassociate-iam-instance-profile

Then associated the newly created role with:

Aws ec2 associate-iam-instance-profile

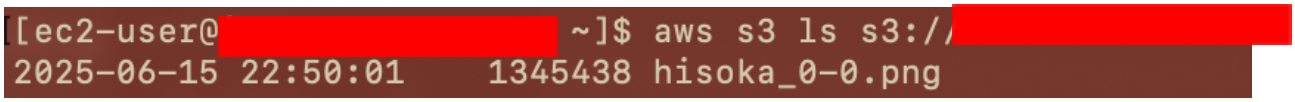
https://docs.aws.amazon.com/cli/latest/reference/ec2/associate-iam-instance-profile.html

4.4. Verify Access from the EC2 Instance

Validating access to my bucket:

`ssh -i /path/to/key.pem ec2-user@<EC2_PUBLIC_IP>`

After SSHing in, was able to list bucket contents



Alternative: As I make incremental changes to policy, use simulate-principal-policy to test access (e.g. in example below, testing ability to get specific object in bucket)

```
aws iam simulate-principal-policy \
 --policy-source-arn arn:aws:iam::476569303606:role/EC2-S3-Access-Role-Brandon \
 --action-names s3:GetObject \
 --resource-arns arn:aws:s3:::discord-labs/hisoka_0-0.png
```

5. Stretch Goals

Create bucket policy that blocks all public access but allows the previously created IAM role

In the lab .md, a policy statement that denies insecure transport (denies all access over HTTP) is provided.

To combine the given policy statement with a statement that “allows your IAM role” (defining the IAM role as principal, Action as all s3 commands, Resource as the lab bucket, Condition as requiring secure transport i.e. over HTTPS):

- Made sure to include Sids for each statement for clarity
- To make changes from AWS console: bucket -> permissions -> bucket policy -> edit -> paste in contents from VSCode below

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "DenyInsecureTransport",
      "Effect": "Deny",
      "Principal": "*",
      "Action": "s3:*",
      "Resource": [
        "arn:aws:s3:::[redacted]
        "arn:aws:s3:::[redacted]
      ],
      "Condition": {
        "Bool": {
          "aws:SecureTransport": "false"
        }
      }
    },
    {
      "Sid": "AllowAccessToSpecificIAMRole",
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::[redacted]"
      },
      "Action": "s3:*",
      "Resource": [
        "arn:aws:s3:::[redacted]
        "arn:aws:s3:::[redacted]
      ],
      "Condition": {
        "Bool": {
          "aws:SecureTransport": "true"
        }
      }
    }
  ]
}
```

Restrict to IP Address:

I created a statement which allows requests coming from my IP to list or read objects in the bucket.

I then adapted it for my existing Policy statement (which allowed access to my IAM role), by changing the Principal from * to my IAM role in order to tighten up access.

To do the same from CL (taken from lab instructions):

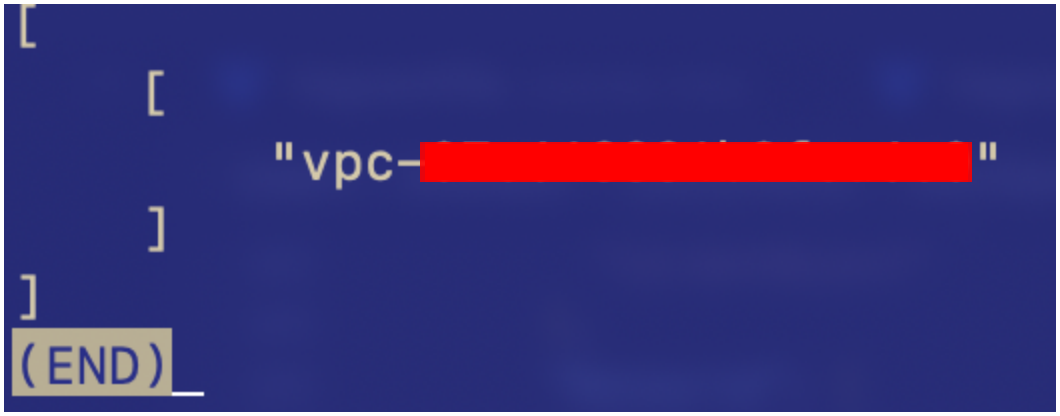
Save the JSON above to a file `bucket-ip-policy.json`, then run:

```
aws s3api put-bucket-policy \ --bucket your-bucket-name \
--policy file://bucket-ip-policy.json
```

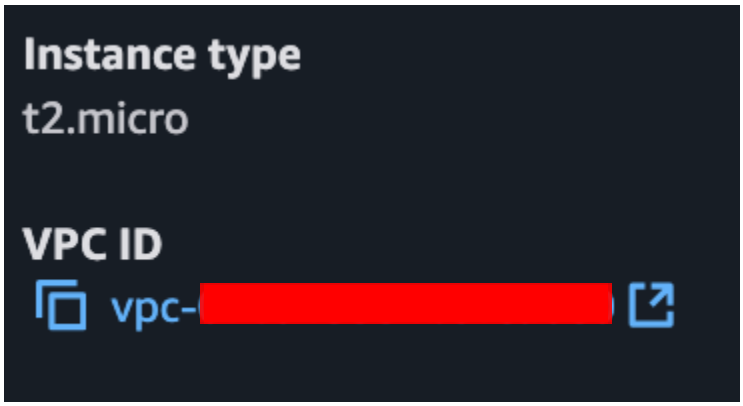
Experiment with requiring MFA or VPC conditions

To determine VPC ID from CLI:

```
aws ec2 describe-instances \
  --instance-ids <my instance ID>\
  --query "Reservations[*].Instances[*].VpcId" \
  --region us-east-1
```



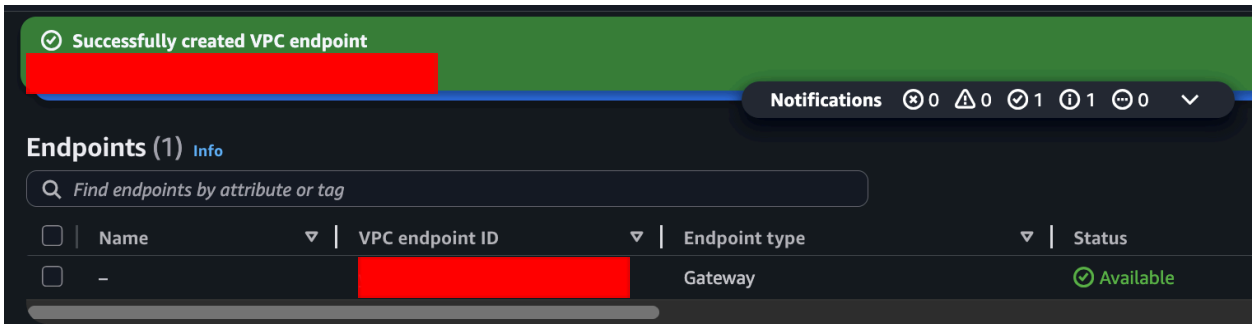
Alternatively, to determine VPC from AWS Console, navigate to the EC2 instance details page:



TODO: Need to create a VPC Gateway Endpoint in order to add in sourceVPC condition in my bucket policy

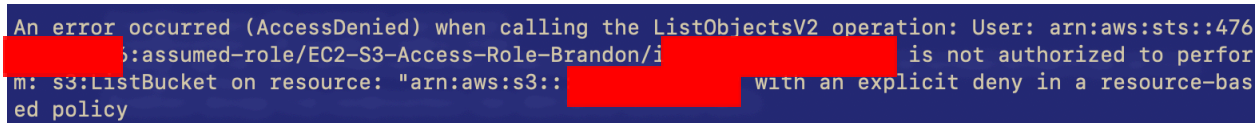
Creating VPC Endpoint (with com.amazonaws.us-east-1.s3 gateway service, with existing vpc)


Type Info
Select a category
AWS services
Connect to services provided by Amazon with an Interface endpoint, or a Gateway endpoint
PrivateLink Ready partner services
Connect to SaaS services which have AWS Service Ready designation with an Interface endpoint. Uses AWS PrivateLink
EC2 Instance Connect Endpoint
An elastic network interface that allows you to connect to resources in a private subnet
Resources - New
Connect to resources like Amazon Relational Database Services (RDS) with a Resource endpoint. Uses AWS PrivateLink
Endpoint services that use NLBs and GWLBs
Find services shared with you by service name. Connect to a Network LoadBalancer (NLB) service with an Interface endpoint or to a Gateway LoadBalancer (GWLB) service with a Gateway Load Balancer endpoint
Services (1/6)
Search
s3
Clear filters
Service Name
Owner
Type
Service Region
com.amazonaws.s3-global.accesspoint
amazon
Interface
us-east-1
com.amazonaws.us-east-1.s3
amazon
Gateway
us-east-1


Successfully created VPC endpoint
[redacted]
Notifications 0 0 1 1 0
Endpoints (1) Info
Find endpoints by attribute or tag
Name
VPC endpoint ID
Endpoint type
Status
–
[redacted]
Gateway
Available

After setting up a VPC Endpoint, I decided to edit the bucket policy in a way such that any traffic NOT coming from my VPC was denied, rather than add it as an additional condition to the policy statement permitting access (as my EC2 has access regardless due to the IAM Role policy).

I also experimented with temporarily changing the condition's SourceVpc value to a different VPC ID, to validate that the policy was indeed taking effect properly:



Host a Static Site

TODO Was not able to get to this yet, but see below for outline of how to carry it out in the future:

Steps

Create S3 bucket (static file storage)
Enable static website hosting (serve via HTTP)
Add public read policy (allow browsers to fetch files)
Route 53 CNAME or Alias (connect DNS name to S3)
CloudFront + ACM (Enable HTTPS with SSL)

c. Further EC2 Exploration on Free Tier

1. **Snapshots & AMIs**

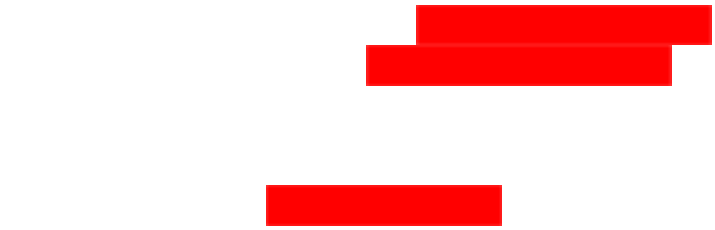
    - Create an EBS snapshot of `/dev/xvda`.
        - /dev/xvda is the device name assigned to the root EBS (Elastic Block Storage, the storage device) volume of the EC2 instance
            1. Can think of it as main hard drive for EC2 (like C:\ for Windows)
            2. Where OS is installed, typically maps to / . usually the first block device attached when launching EC2 instance
        - Then create snapshot from console or CLI
            1. CLI:
                a. Get Volume ID (describe-instances with query containing Ebs.VolumeId)

```
(base) ➜  ~ aws ec2 describe-instances --instance-id i-[redacted] --query "Reservations[*]
.Instances[*].BlockDeviceMappings[*].{DeviceName:DeviceName,Ebs:Ebs.VolumeId}" --output table
```

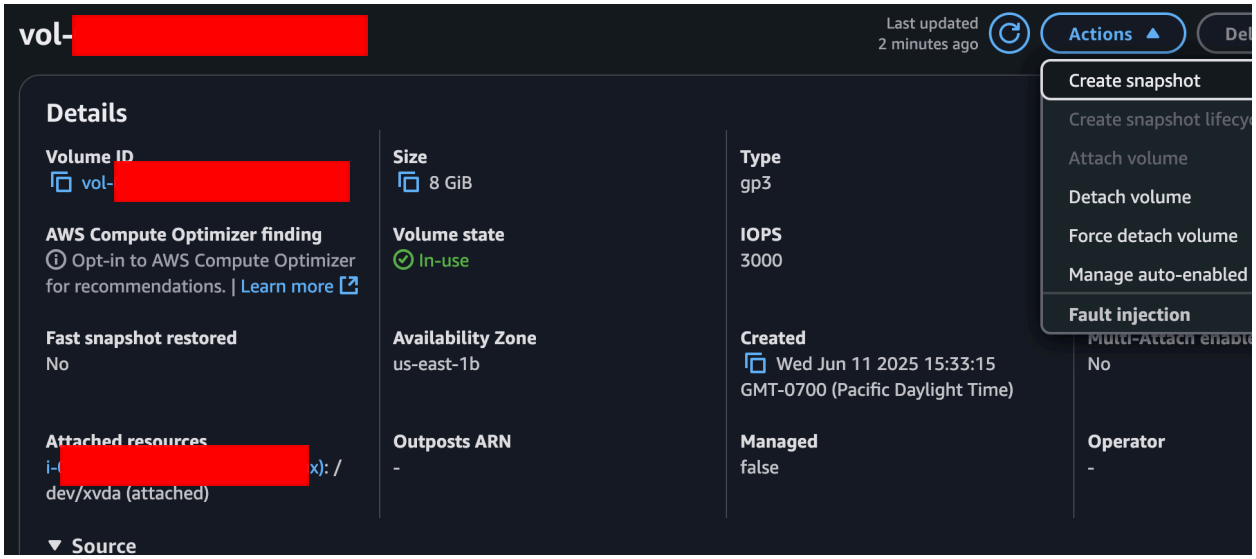
```
-------------------------------------------
|           DescribeInstances             |
+-------------+---------------------------+
| DeviceName  |            Ebs            |
+-------------+---------------------------+
|  /dev/xvda  |  [redacted]               |
+-------------+---------------------------+
(END)
```

                b. Create snapshot (using create-snapshot of volume ID found above)

```
{
    "Tags": [],
    "SnapshotId": "snap-015ed2c42bfee9240",
    "VolumeId": "vol-0e398f3f1047b6e1f",
    "State": "pending",
```



2. AWS Console:



- Register or create an AMI from that snapshot. Understand how you can "version" a server with snapshots. Why is this useful?
  - Some sources online recommend using create-image command (rather than create-snapshot -> register-image, as snapshots alone don't contain **launch config**, **boot info**, or **kernel info**). But see below for my running of register-image:

```
(base) ➜  ~ aws ec2 create-snapshot --volume-id vol- --description "Snapshot of
root volume /dev/xdva for discord lab 3"
```

Register-image (using snapshot ID of snapshot generated above)

```
(base) ➜  ~ aws ec2 register-image \
  --name "Lab3-AMIFromSnapshot" \
  --architecture x86_64 \
  --root-device-name /dev/xvda \
  --block-device-mappings "[{\"DeviceName\": \"/dev/xvda\",\"Ebs\":{\"SnapshotId\":\"[redacted]
[redacted] \
  --virtualization-type hvm
```

```
{
    "ImageId": "ami-[redacted]
}
```

To query for AMI ID (use describe-images to output a table containing image ID):

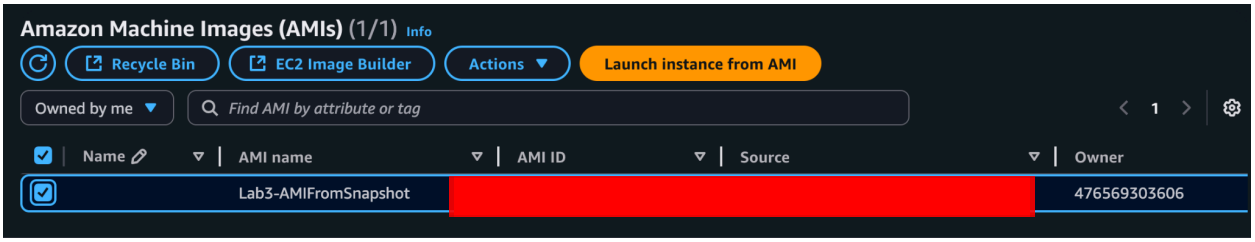
```
(base) ➜  ~ aws ec2 describe-images \
  --owners self \
  --query "Images[*].{ID:ImageId,Name:Name}" \
  --output table
```

- It's useful to 'version' a server using snapshots similar to how it's useful to version your codebase using a code repository. Before carrying out a change, you can take a snapshot of your server for contingency/rollback purposes if something goes astray.

- Launch a new instance from your AMI
  - From CLI:
    1. Utilize run-instances command (passing in the AMI ID into the image-id parameter, security-group-ids, subnet-id, etc)

```
(base) ➜  ~ aws ec2 run-instances \
  --image-id [redacted]
  --count 1 \
  --instance-type t3.micro \
  --key-name my-key-pair \
  --security-group-ids sg-xxxxxxxxxxxx \
  --subnet-id subnet-xxxxxxxxxxxx \
  --tag-specifications 'ResourceType=instance,Tags=[{Key=Name,Value=My
```

- From AWS Console



2. **Linux & Security Tooling**

   TODO: Did not get to this

   - Use `ss -tulpn`, `lsof`, and `auditctl` to inspect services and audit.
   - Install and run:
     - `nmap localhost`
     - `tcpdump -c 20 -ni eth0`
     - `lynis audit system`
     - `fail2ban-client status`
     - OSSEC/Wazuh or ClamAV.

3. **Scripting & Automation**

   TODO: Did not get to this

   - Bash: report world-writable files (research any commands you don't know!):

     ```
     find / -perm -002 -type f > ww-files.txt
     ```

   - Python with `boto3`: list snapshots, start/stop instances.

8. Reflection

Given my general unfamiliarity with AWS, I had to repeatedly backtrack and review the steps I took earlier in the lab to find incorrect configurations. For example, when testing out policy changes using simulate-principal-policy (to test ability to get-object from my s3), I ran into an implicit deny message. I then figured out I incorrectly specified "arn:aws:s3:::<my bucket name>" as the resource for the getobject action, instead of "arn:aws:s3:::<my bucket name>/* ". After making the change, I was able to successfully run getObject using simulate-principal-policy.

The lab was definitely illuminating in terms of the potential number of potential security issues that can arise when provisioning/maintaining a larger environment, as security/policy creation took a lot of thought even when working with only 2 components. I faced a few policy design decisions that took me a while to weigh the pro's and con's of (e.g. whether to add the IP or VPC condition as part of an 'Allow' action (if the source value matched) or as part of a 'Deny' (if the source value did NOT match).

As part of this, a key realization I made and (hope to drill into my brain haha) is that each statement in a bucket policy is evaluated independently, and that permissions are cumulative (unless there's an explicit Deny).