Lab 3 AWS EC2

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1. Amazon Web Service Portal

1.1. Preparations

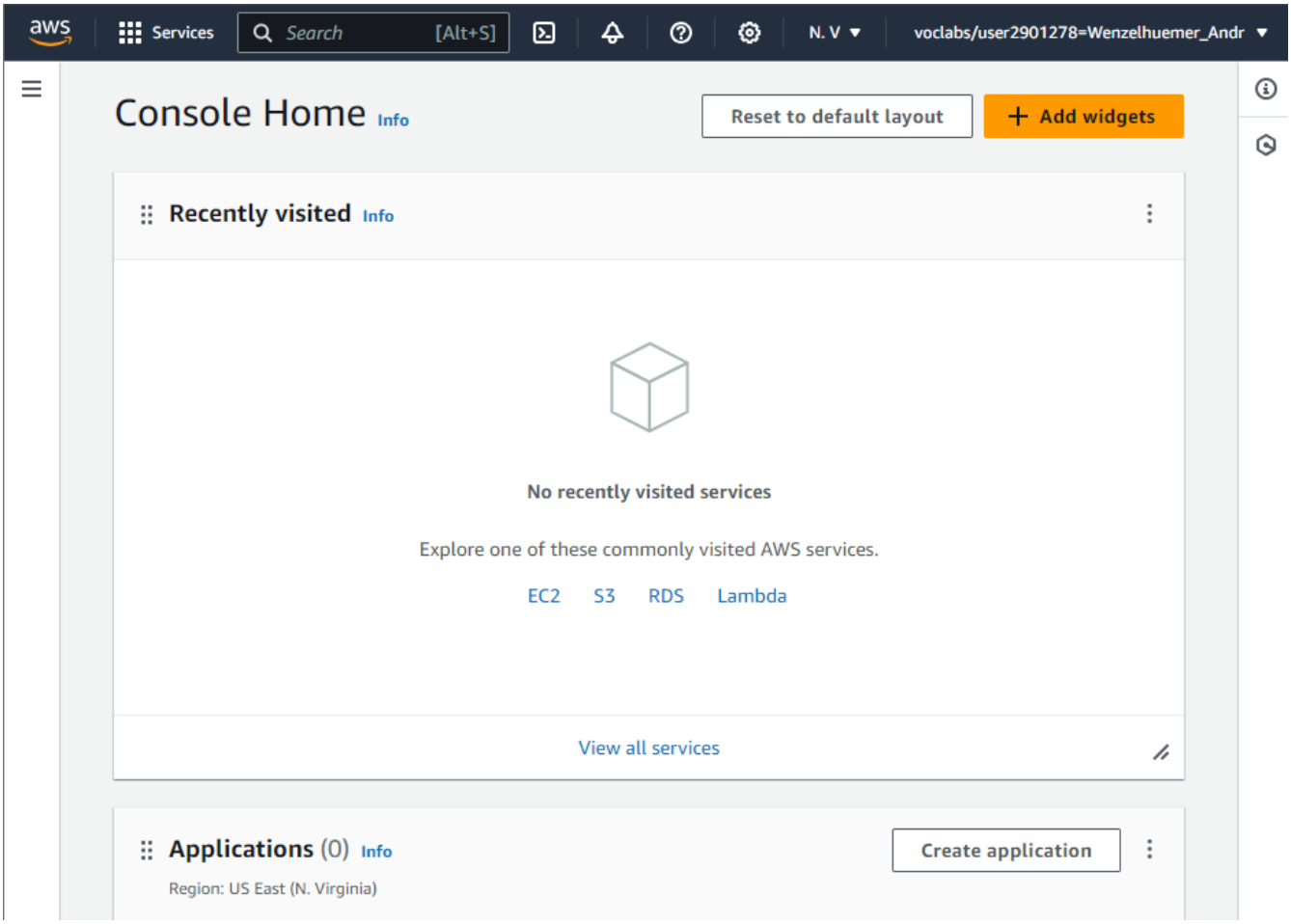


Figure 1. Amazon Web Services Portal

1.2. Launch of an EC2 Instance

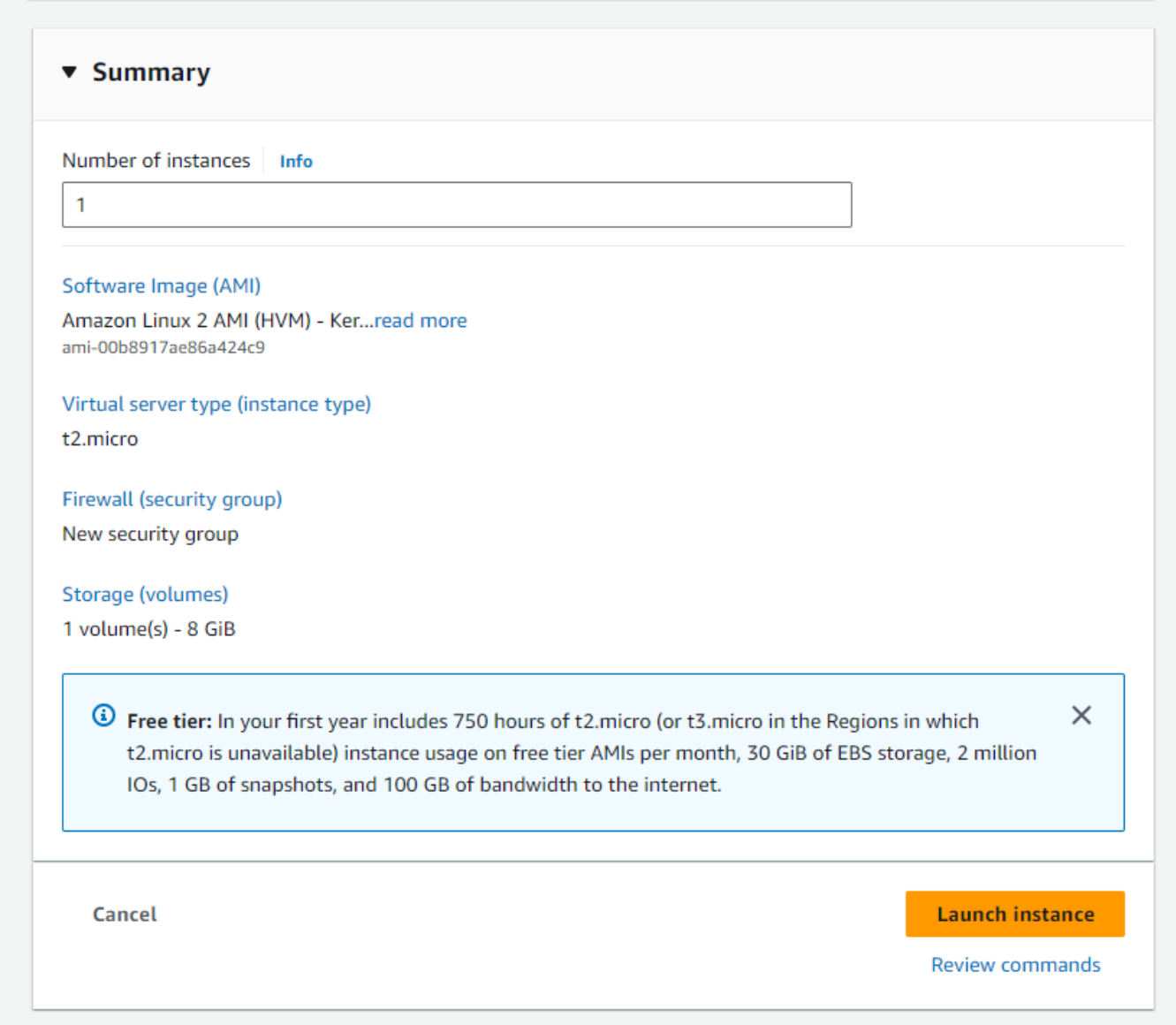


Figure 2. Create new instance

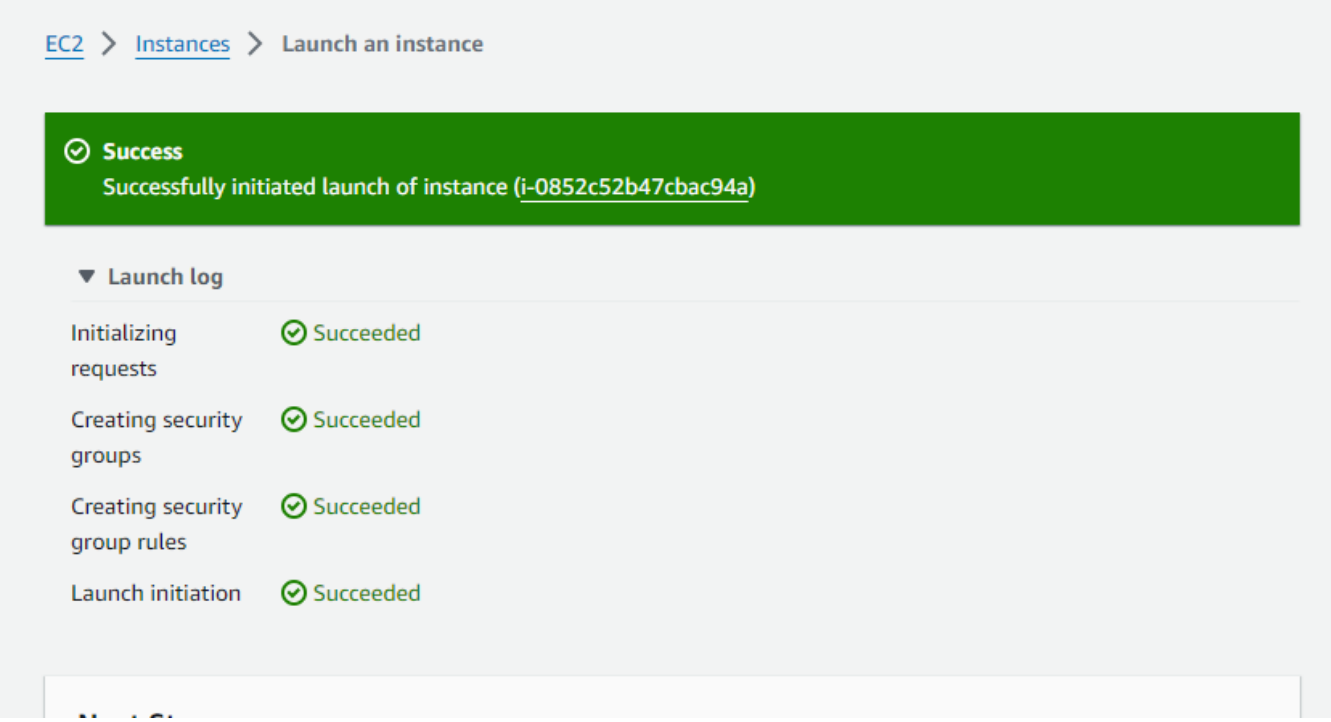


Figure 3. Instance launched

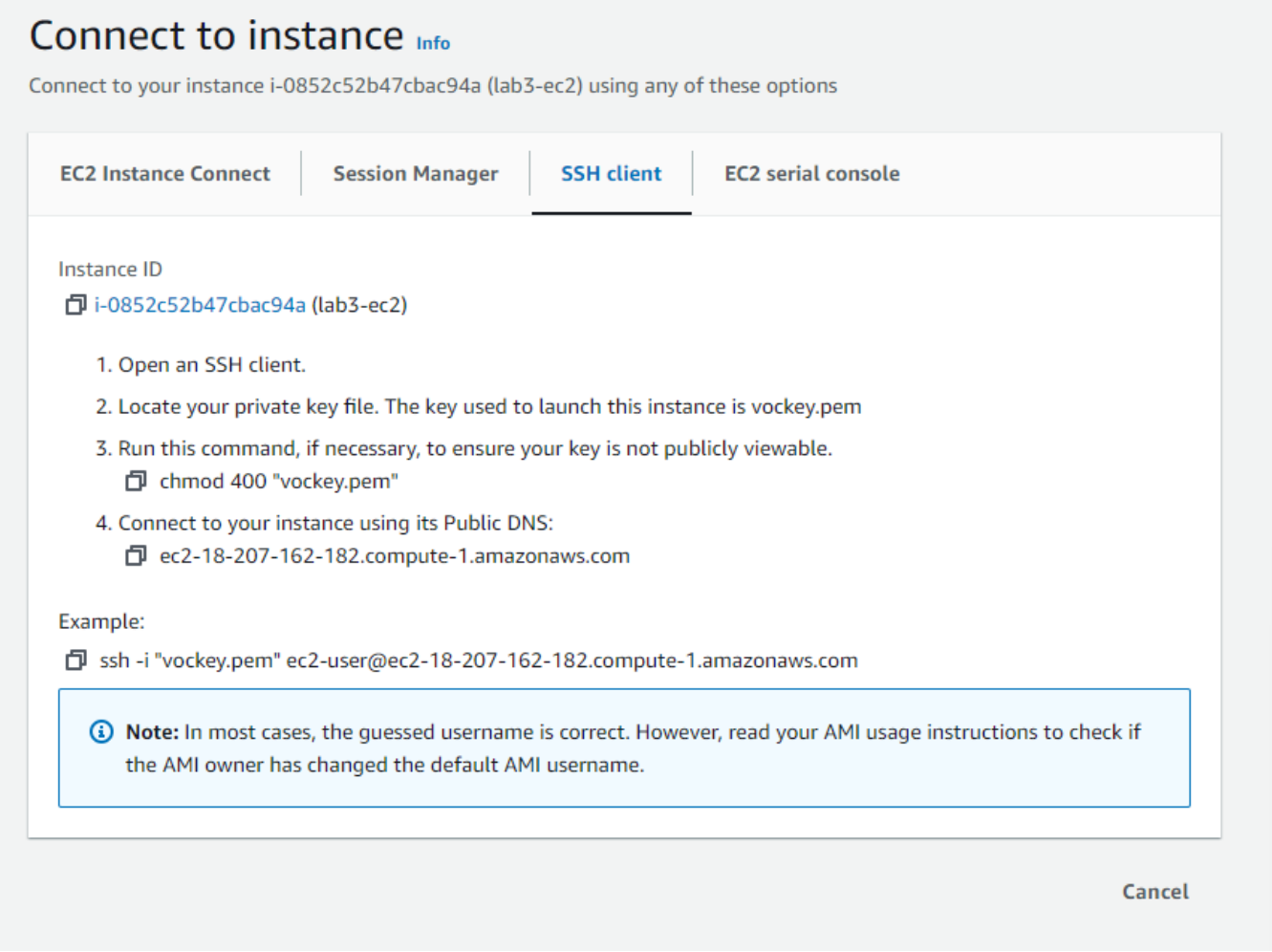


Figure 4. Connect to instance over ssh

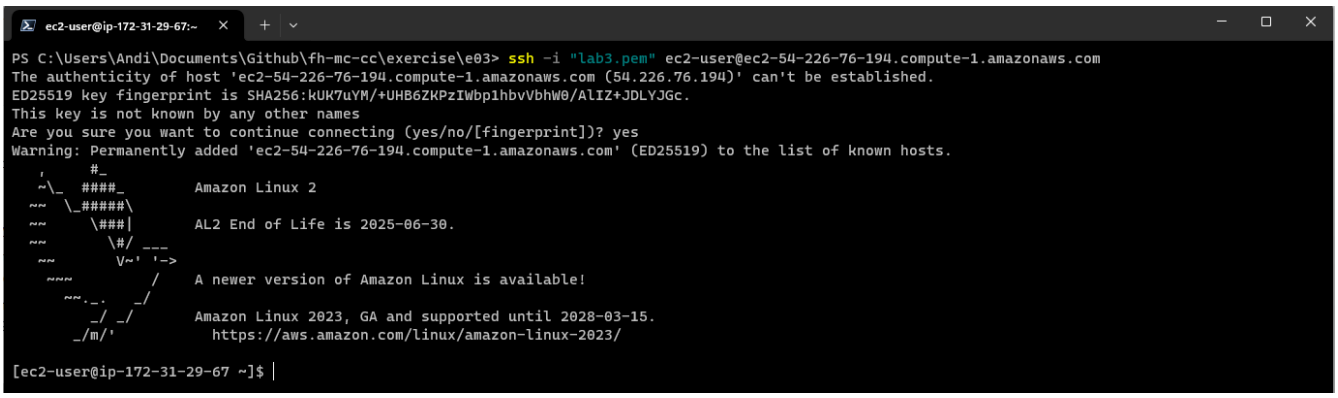


Figure 5. SSH connection established

1.3. Security Groups

Install Apache Web Server:

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

Turn on the Server:

```
Complete!
[ec2-user@ip-172-31-29-67 ~]$ service httpd status
Redirecting to /bin/systemctl status httpd.service
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disabled)
   Active: inactive (dead)
     Docs: man:httpd.service(8)
[ec2-user@ip-172-31-29-67 ~]$ service httpd start
Redirecting to /bin/systemctl start httpd.service
Failed to start httpd.service: The name org.freedesktop.PolicyKit1 was not provided by any .service files
See system logs and 'systemctl status httpd.service' for details.
[ec2-user@ip-172-31-29-67 ~]$ sudo service httpd start
Redirecting to /bin/systemctl start httpd.service
[ec2-user@ip-172-31-29-67 ~]$ chkconfig httpd on
Note: Forwarding request to 'systemctl enable httpd.service'.
Failed to execute operation: The name org.freedesktop.PolicyKit1 was not provided by any .service files
[ec2-user@ip-172-31-29-67 ~]$ sudo chkconfig httpd on
Note: Forwarding request to 'systemctl enable httpd.service'.
Created symlink from /etc/systemd/system/multi-user.target.wants/httpd.service to /usr/lib/systemd/system/httpd.service.
[ec2-user@ip-172-31-29-67 ~]$
```

Figure 6. Turn on Server (Don't forget sudo..)

Add html and try to access it.

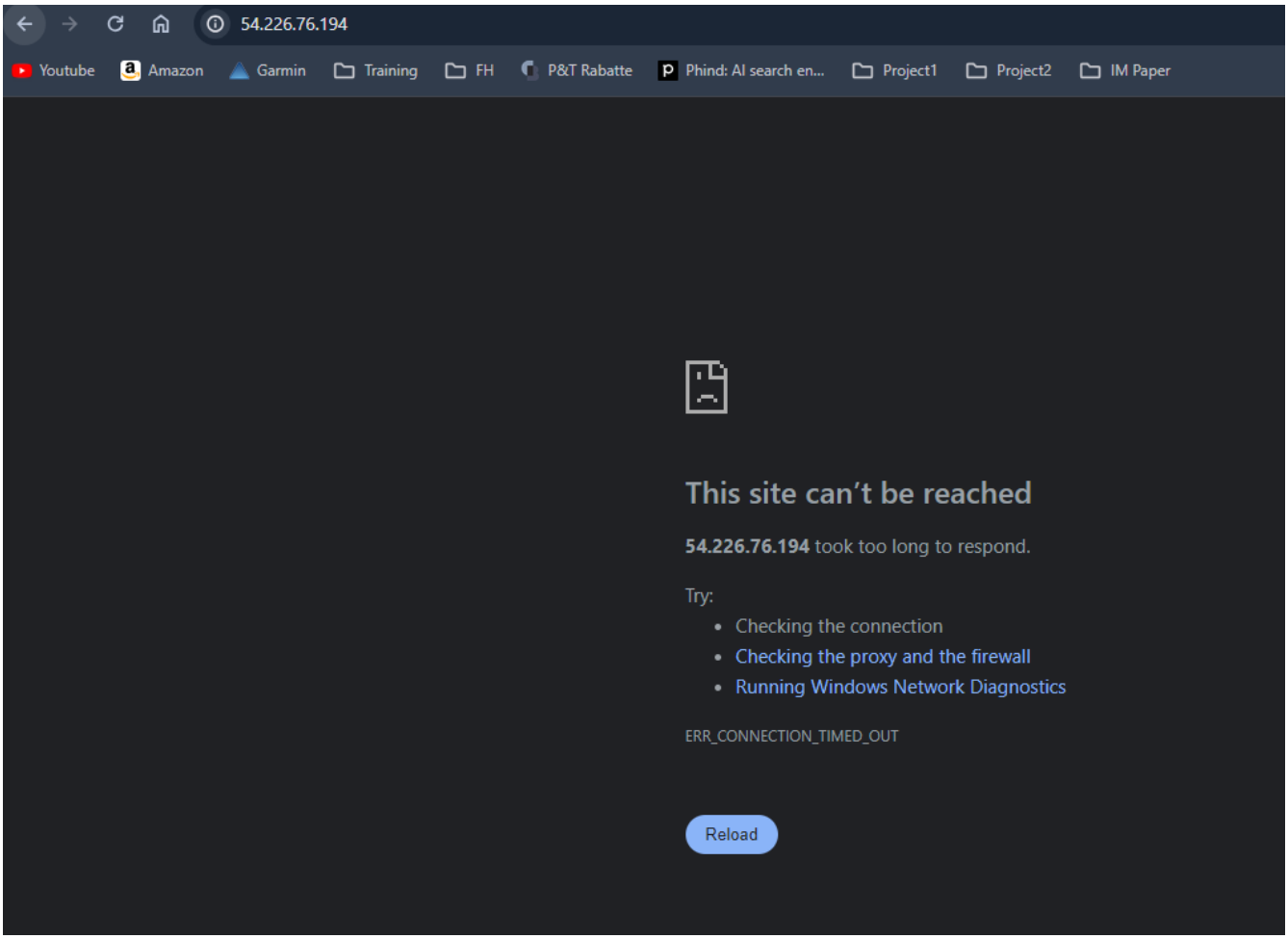


Figure 7. Show html page

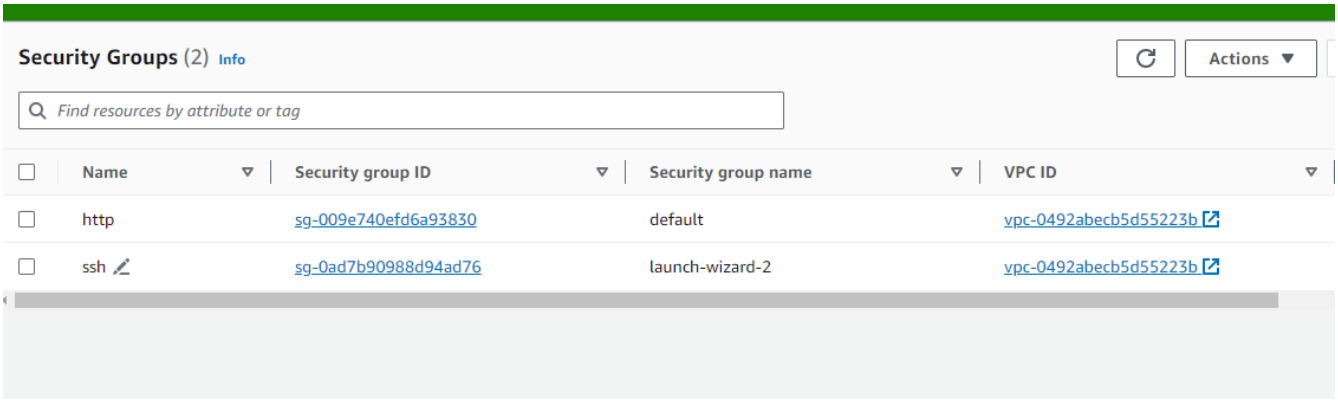


Figure 8. Add rules for http requests

After adding rules the web server can be accessed.

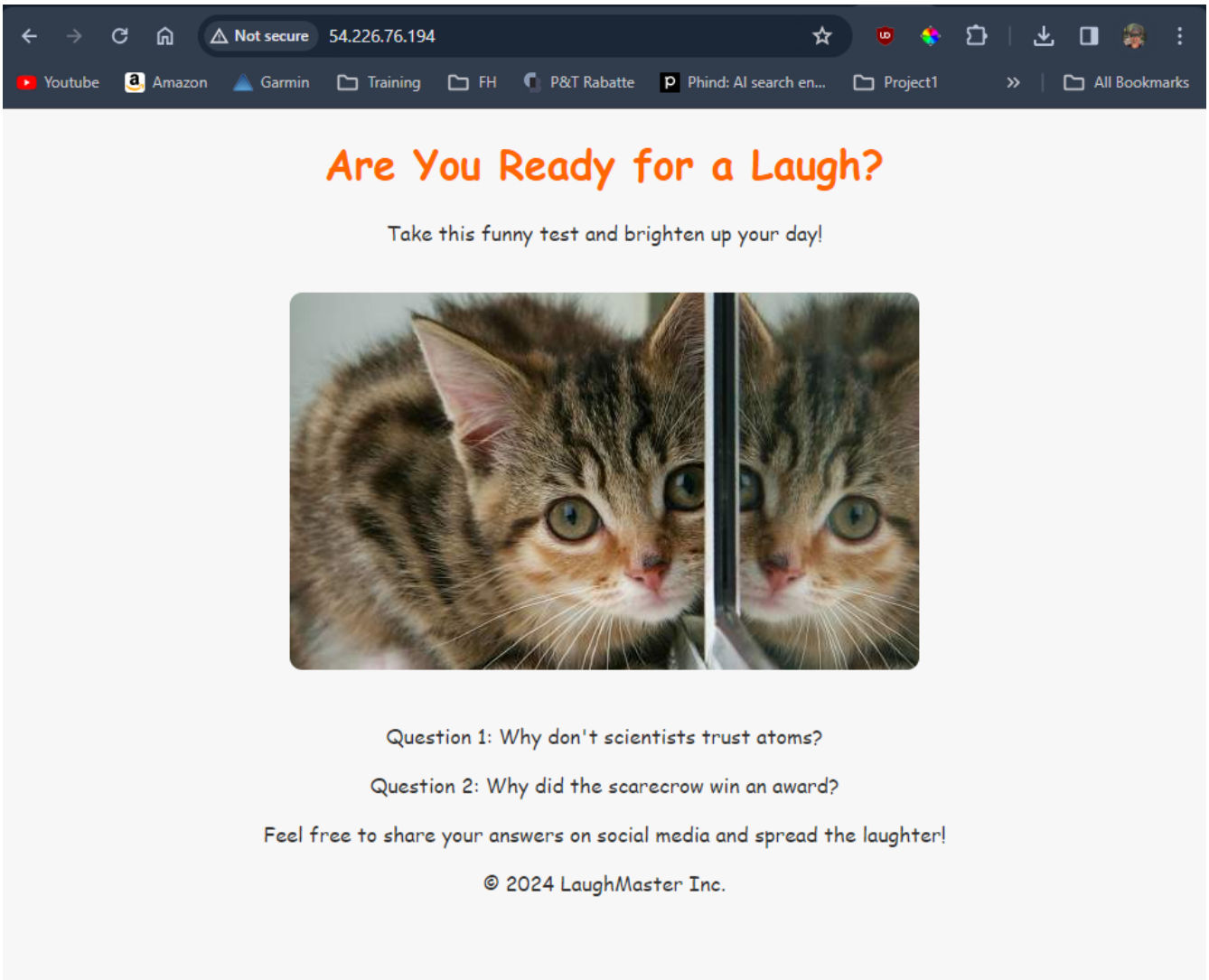


Figure 9. Web page (ChatGPT generated test page)

1.4. Volumes and Snapshots

Create a new volume and attach it to your instance.

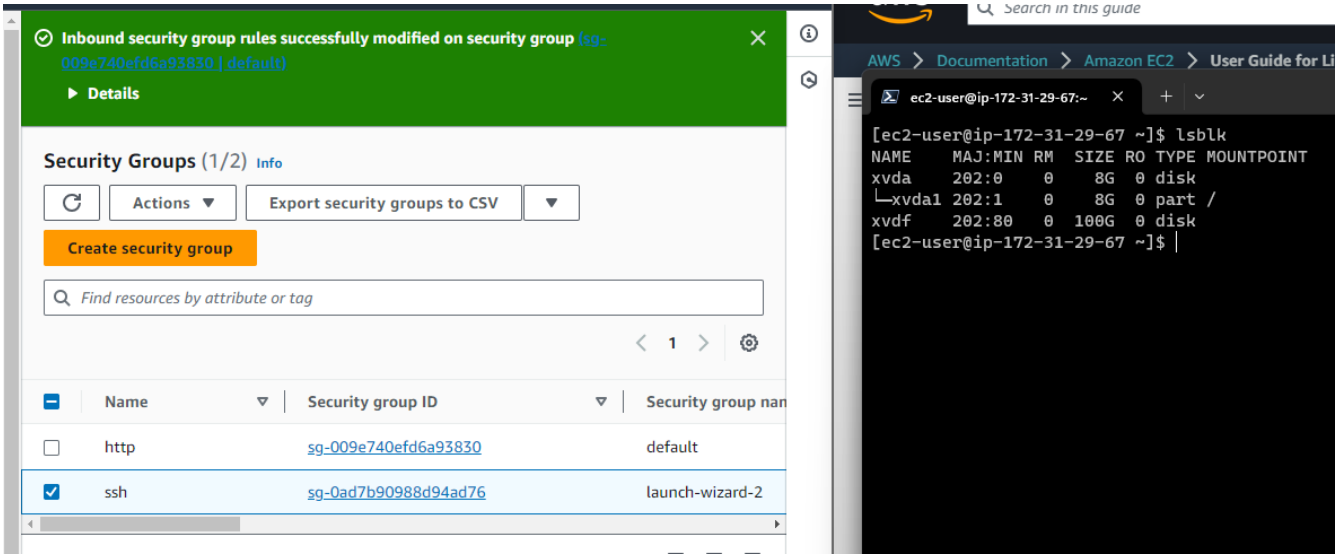


Figure 10. New volume

Check type of the volume.

```
sudo file -s /dev/xvdf
```

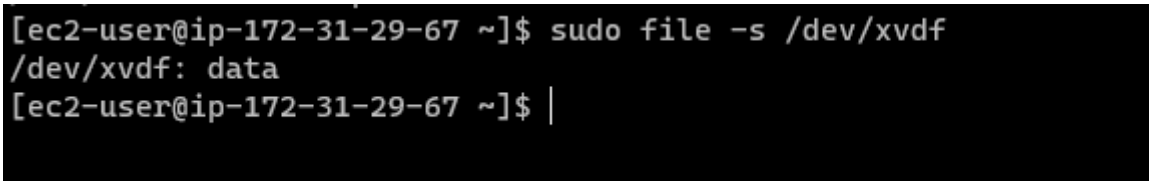


Figure 11. Type

```
[ec2-user@ip-172-31-29-67 ~]$ sudo mkfs -t ext4 /dev/xvdf
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
6553600 inodes, 26214400 blocks
1310720 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2174746624
800 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done

[ec2-user@ip-172-31-29-67 ~]$ mkdir /fileserver
mkdir: cannot create directory '/fileserver': Permission denied
[ec2-user@ip-172-31-29-67 ~]$ sudo mkdir /fileserver
[ec2-user@ip-172-31-29-67 ~]$ mount /dev/xvdf /fileserver
mount: only root can do that
[ec2-user@ip-172-31-29-67 ~]$ sudo mount /dev/xvdf /fileserver
[ec2-user@ip-172-31-29-67 ~]$
```

Figure 12. Create filesystem and mount

```
[ec2-user@ip-172-31-29-67 fileserver]$ sudo touch i-was-here
[ec2-user@ip-172-31-29-67 fileserver]$ ls -l
total 16
-rw-r--r-- 1 root root     0 Jan  8 15:21 i-was-here
drwx------ 2 root root 16384 Jan  8 15:19 lost+found
```

Figure 13. Create file on new partition

```
[ec2-user@ip-172-31-29-67 ~]$ ls -l
total 0
-rw-rw-r-- 1 ec2-user ec2-user 0 Jan  8 15:21 i-was-here
[ec2-user@ip-172-31-29-67 ~]$ cd /
[ec2-user@ip-172-31-29-67 /]$ ls
bin  boot  dev  etc  fileserver  home  lib  lib64  local  m
[ec2-user@ip-172-31-29-67 /]$ sudo umount /dev/xvdf
[ec2-user@ip-172-31-29-67 /]$ cd /fileserver
[ec2-user@ip-172-31-29-67 fileserver]$ ls
[ec2-user@ip-172-31-29-67 fileserver]$ ls -l
total 0
[ec2-user@ip-172-31-29-67 fileserver]$
```

Figure 14. Unmount

EC2 > Snapshots > Create snapshot

Create snapshot Info

Create a point-in-time snapshot of an EBS volume and use it as a baseline for new volumes or for data backup. You can create snapshots from an individual volume, or you can create multi-volume snapshots from all of the volumes attached to an instance.

Snapshot settings

Resource type Info

- Volume — Create a snapshot from a specific volume.
- Instance — Create multi-volume snapshots from an instance.

Volume ID
The volume from which to create the snapshot.
vol-05ff315174425a542

Description
Add a description for your snapshot.

255 characters maximum

Encryption Info
Not encrypted

Tags Info

A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tags to search and filter your resources or track your AWS costs.

No tags associated with the resource.

Add tag

You can add 50 more tags.

Cancel | Create snapshot

Figure 15. Create snapshot of volume

Successfully deleted volume vol-05ff315174425a542.

Volumes (1) Info | Actions | Create volume

Search | 1

Name	Volume ID	Type	Size	IOPS	Throughput
–	vol-0f7be7717f9fb0b5e	gp2	8 GiB	100	-

Figure 16. Volume deleted

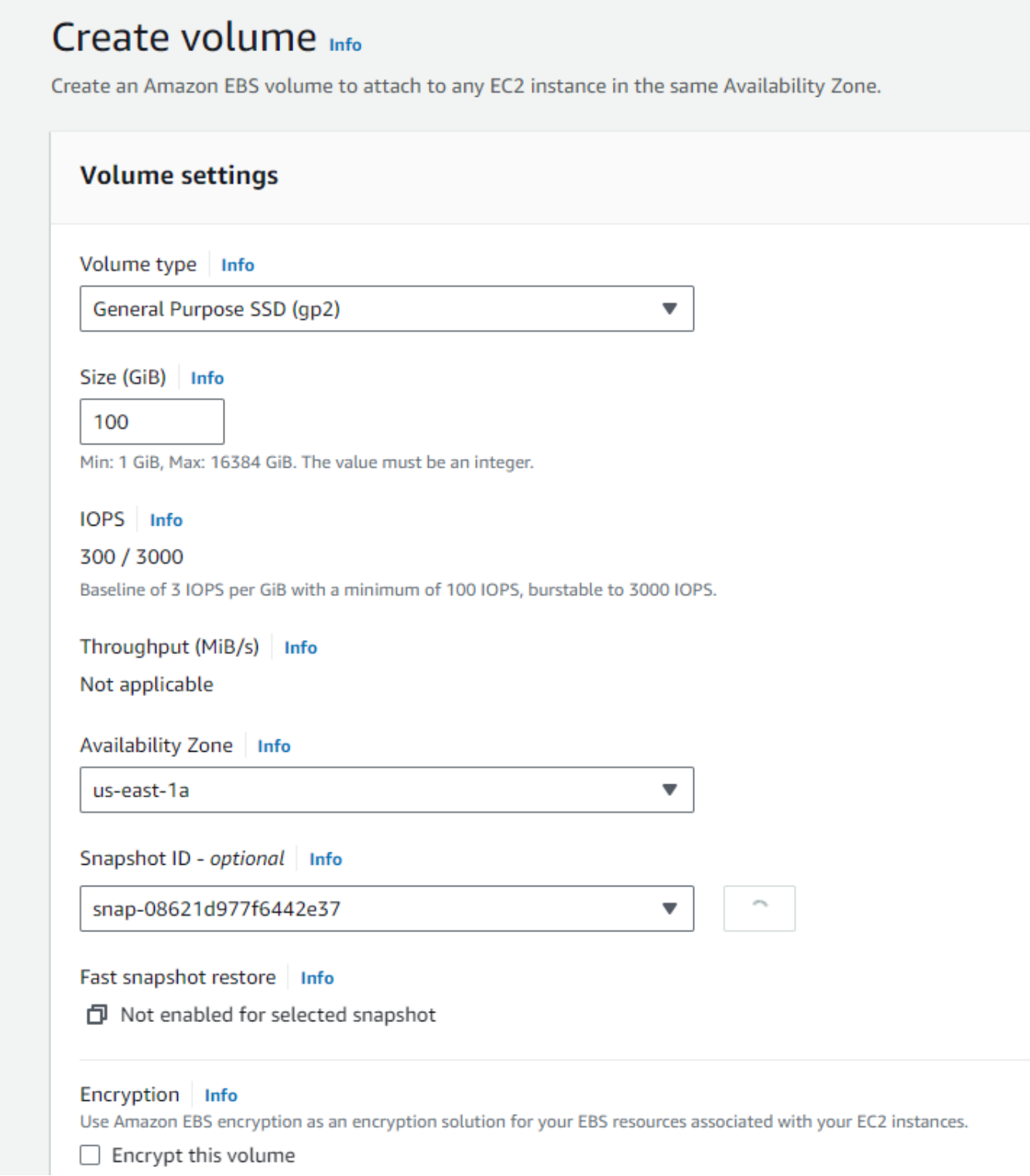


Figure 17. Create from snapshot

```
[ec2-user@ip-172-31-29-67 /]$ sudo mount /dev/xvdf /fileserver
[ec2-user@ip-172-31-29-67 /]$ cd fileserver/
[ec2-user@ip-172-31-29-67 fileserver]$ ls
i-was-here  lost+found
[ec2-user@ip-172-31-29-67 fileserver]$
```

Figure 18. Mount and check if file exists

1.5. Load Balancers

1.5.1. Classic Load Balancing

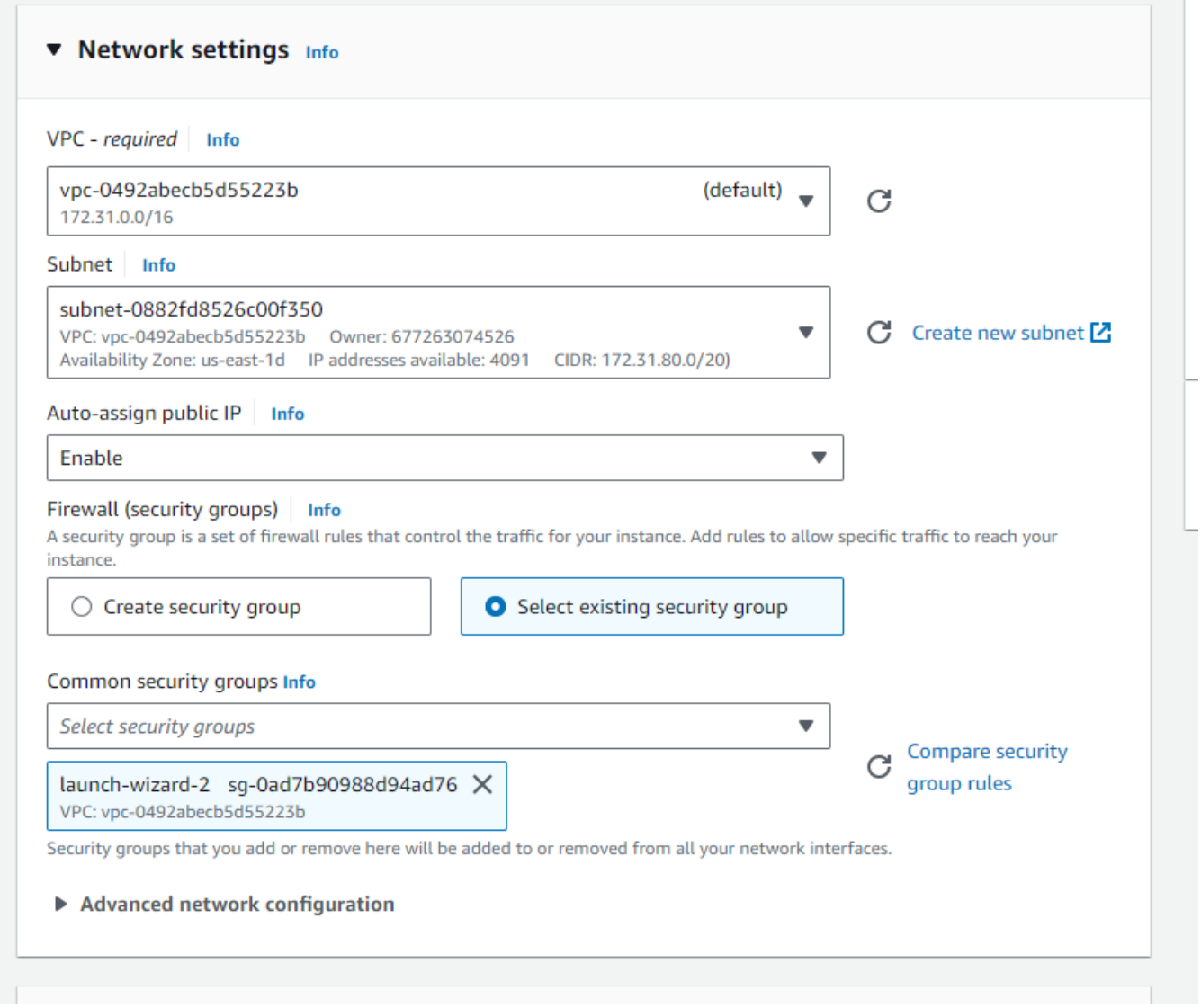


Figure 19. Create instance with different availability zone

Create new load balancer and new instance target group for routing.

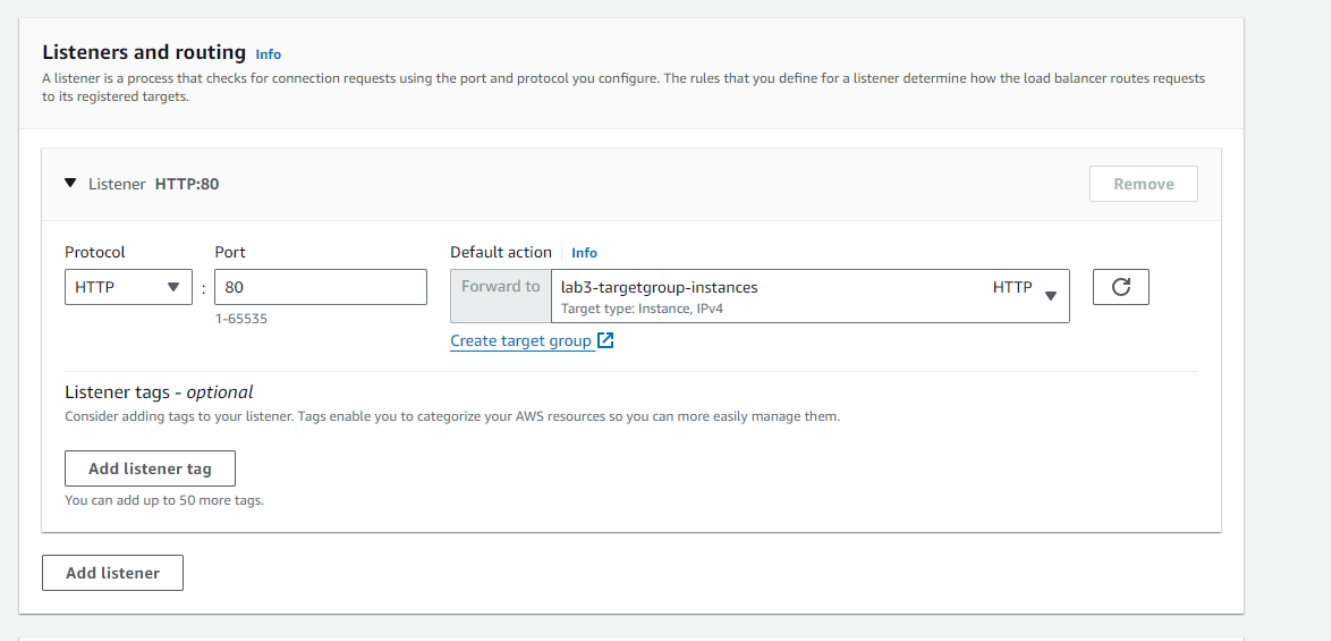


Figure 20. Target group with instances

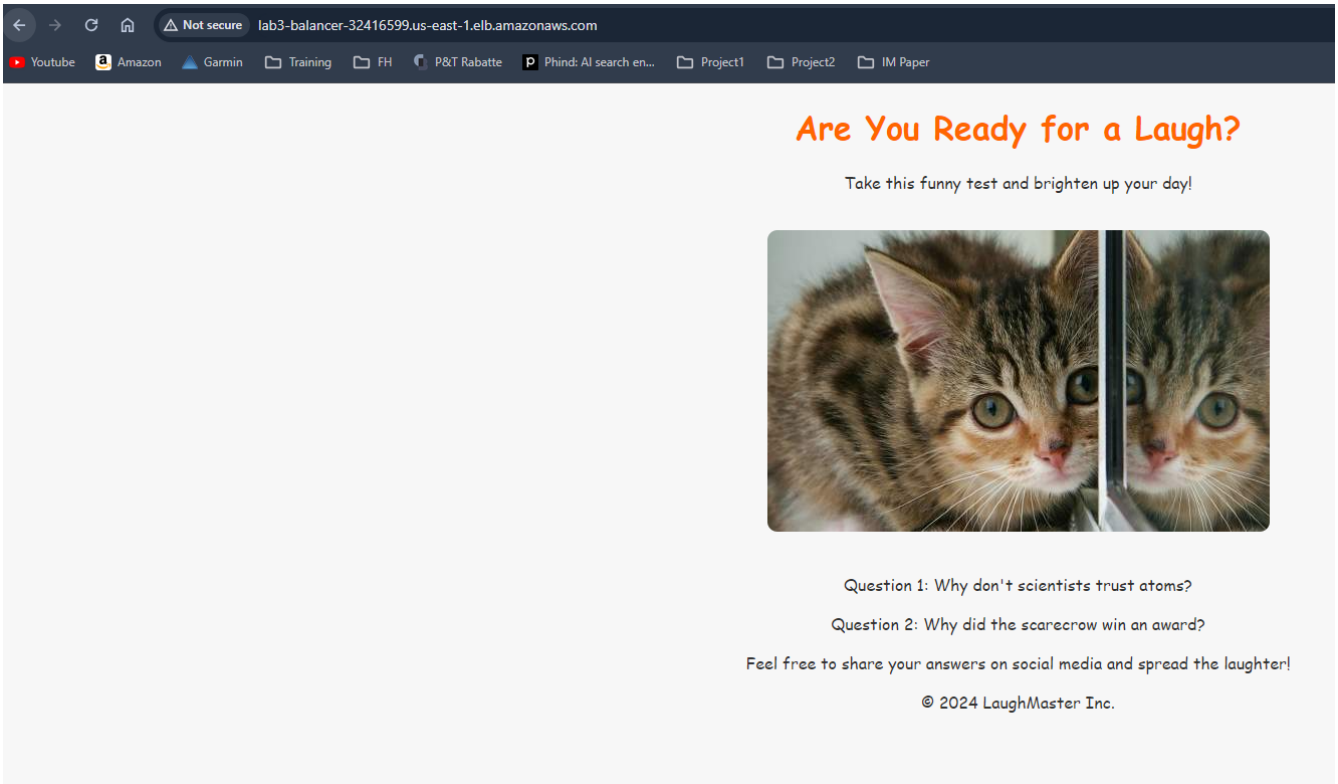


Figure 21. Access through load balancer (Instance 1 reached)

Second instance is missing the http security group that's why its unhealthy.

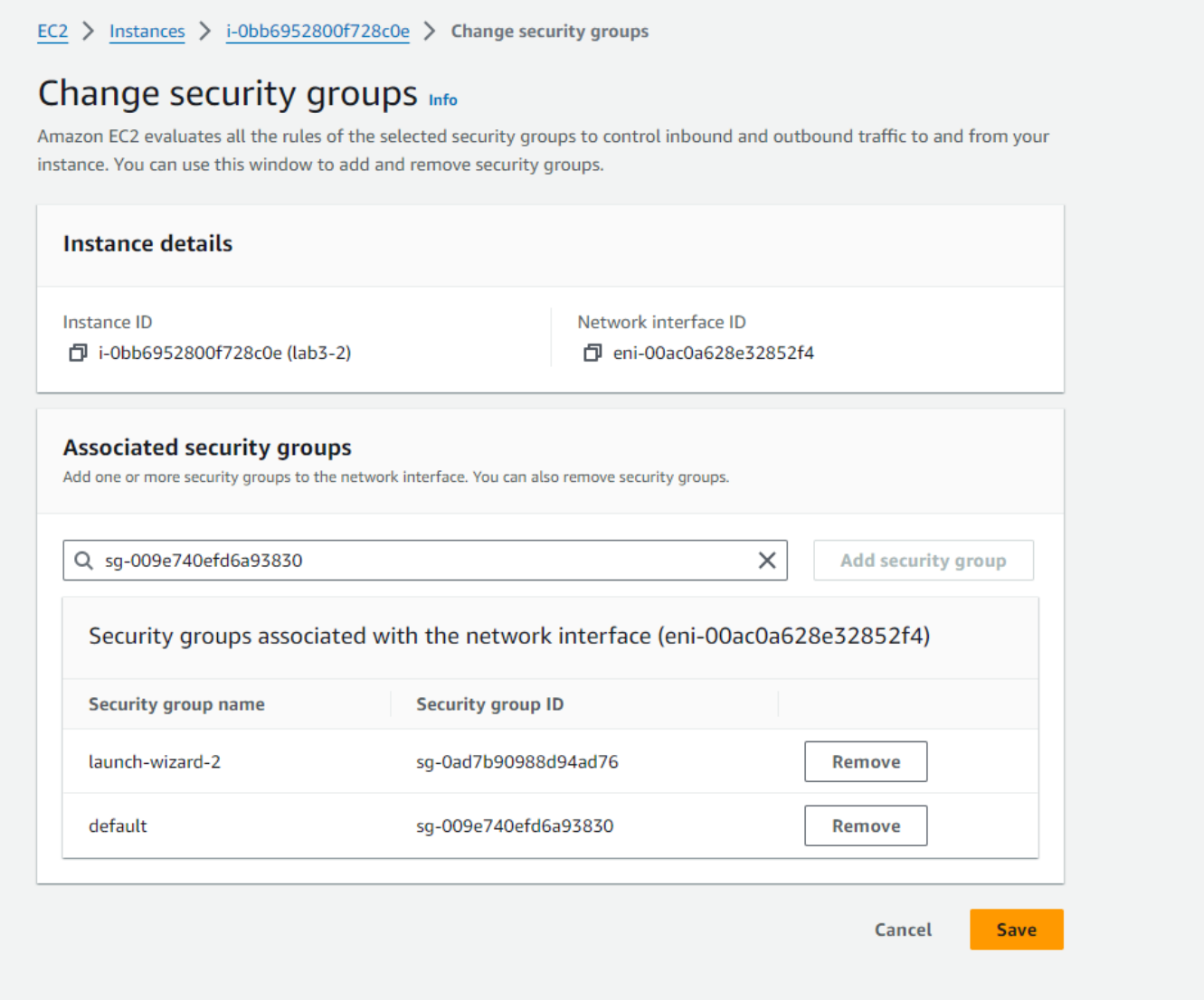


Figure 22. Add second security group

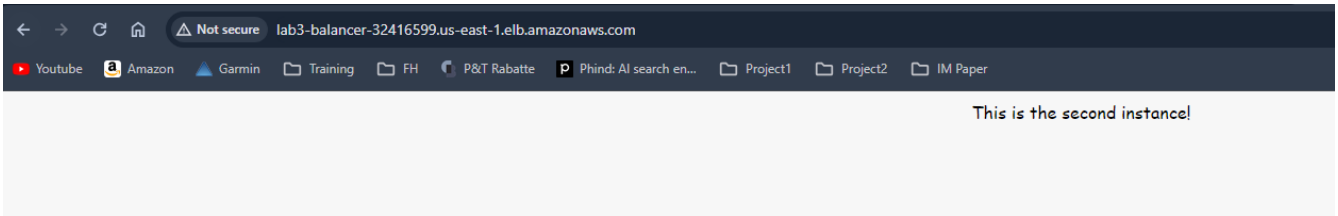


Figure 23. Both instances are healthy

The load balancer is now routing to both instances, that's why the website changes from one instance to the other.

1.5.2. Path-Based Load Balancing

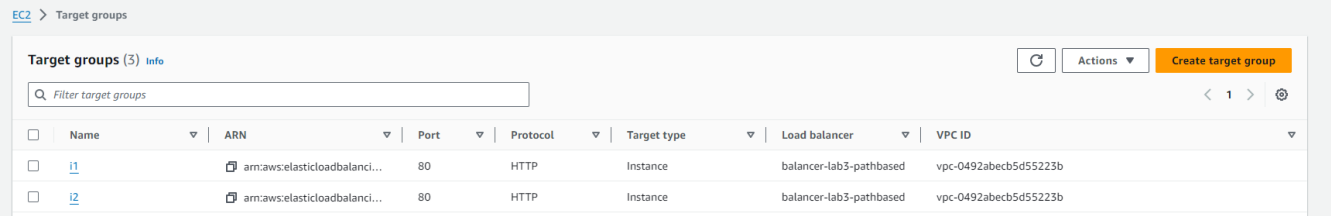


Figure 24. Add two target groups i1 and i2

Add folders i1 and i2 and add html file there.

After that rules for the different paths have to be added.

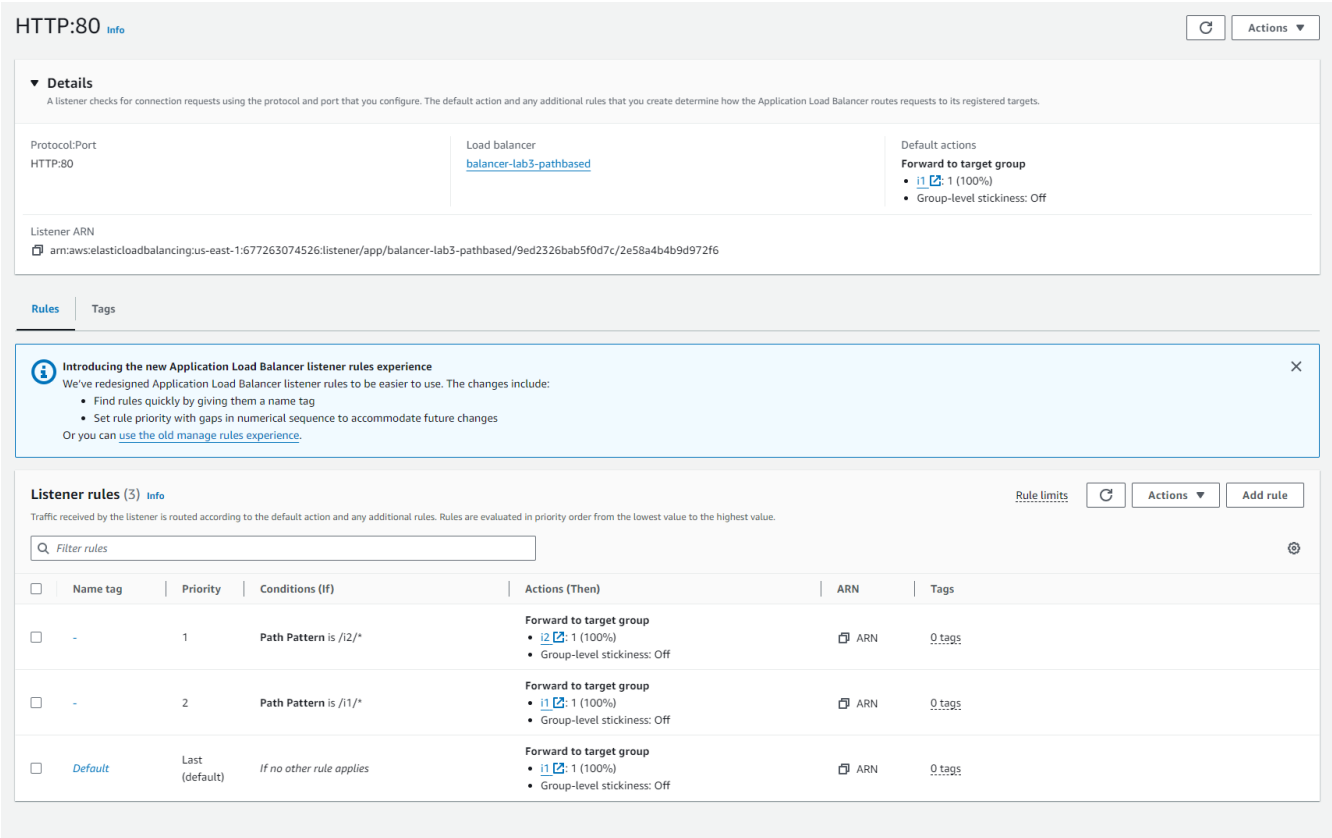
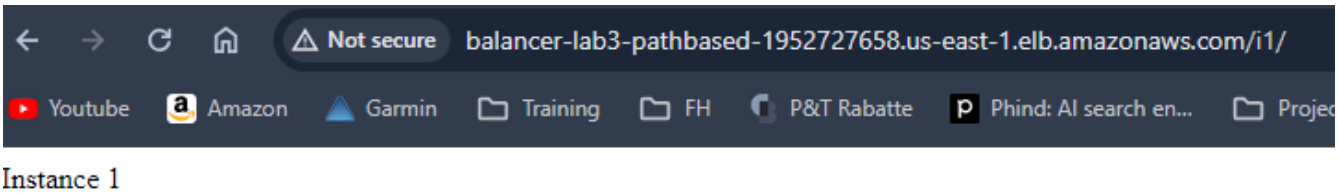
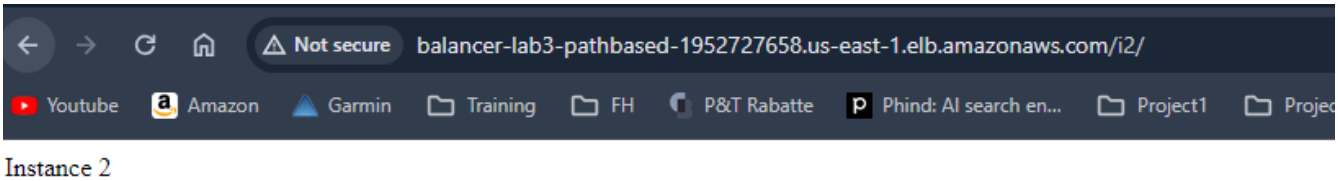


Figure 25. Set rules



Instance 1

Figure 26. Verify routing (Instance 1)



Instance 2

Figure 27. Verify routing (Instance 2)

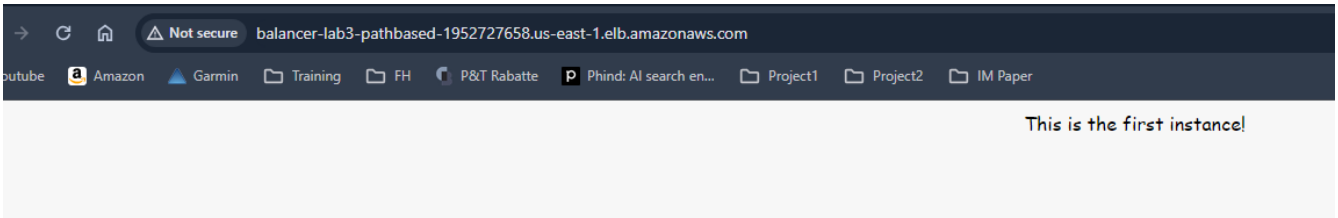


Figure 28. Fallback (Root index.html from instance 1)

2. AWS CLI

2.1. Configuration

Install the aws shell:

```
pip install aws-shell
```

```
PS C:\Users\Andi\Documents\Github\fh-mc-cc\exercise\e03> aws-shell
First run, creating autocomplete index...
Creating doc index in the background. It will be a few minutes before all documentation is available

aws>
```

Add credentials file from aws portal to ~/.aws/credentials.

Configure aws shell:

```
aws> configure
AWS Access Key ID [****************5CEY]:
AWS Secret Access Key [****************j/7B]:
Default region name [us-east-1]:
Default output format [json]:
aws>
```

Figure 29. aws-shell configure

```
aws> ec2 describe-instances
{
    "Reservations": [
        {
            "Groups": [],
            "Instances": [
                {
                    "AmiLaunchIndex": 0,
                    "ImageId": "ami-00b8917ae86a424c9",
                    "InstanceId": "i-0c65ff9bcbf527ea3",
                    "InstanceType": "t2.micro",
                    "KeyName": "ssh-key",
                    "LaunchTime": "2024-01-08T17:17:32.000Z",
                    "Monitoring": {
                        "State": "disabled"
                    },
                    "Placement": {
                        "AvailabilityZone": "us-east-1a",
```

Figure 30. Test command after credential configuration

2.2. AWS CLI with EC2

2.2.1. Key-Pairs

```
Default output format [json]:
aws> ec2 describe-key-pairs
{
    "KeyPairs": [
        {
            "KeyPairId": "key-038c4273dd1a6d524",
            "KeyFingerprint": "bb:20:e0:ad:d1:20:17:a0:fa:4d:0d:0d:16:b4:7c:c0:f8:07:1d:9a",
            "KeyName": "ssh-key",
            "KeyType": "rsa",
            "Tags": [],
            "CreateTime": "2024-01-08T13:21:00.674Z"
        },
        {
            "KeyPairId": "key-0ee589ac2e54abf5a",
            "KeyFingerprint": "a4:95:6f:e1:f6:94:e3:35:84:bf:47:a1:49:23:08:b0:90:17:54:24",
            "KeyName": "vockey",
            "KeyType": "rsa",
            "Tags": [],
            "CreateTime": "2024-01-08T17:17:38.778Z"
        }
    ]
}
aws>
```

2.2.2. Virtual Private Cloud - VPC

```
aws> ec2 describe-vpcs
{
    "Vpcs": [
        {
            "CidrBlock": "172.31.0.0/16",
            "DhcpOptionsId": "dopt-0c61c4fcf2427827b",
            "State": "available",
            "VpcId": "vpc-0492abecb5d55223b",
            "OwnerId": "677263074526",
            "InstanceTenancy": "default",
            "CidrBlockAssociationSet": [
                {
                    "AssociationId": "vpc-cidr-assoc-03d668ab340b533b1",
                    "CidrBlock": "172.31.0.0/16",
                    "CidrBlockState": {
                        "State": "associated"
                    }
                }
            ],
            "IsDefault": true
        }
    ]
}
aws>
```

Figure 31. Describe the VPCs

```
aws> ec2 describe-subnets --filters Name=vpc-id,Values=vpc-0492abecb5d55223b
{
    "Subnets": [
        {
            "AvailabilityZone": "us-east-1e",
            "AvailabilityZoneId": "use1-az3",
            "AvailableIpAddressCount": 4091,
            "CidrBlock": "172.31.48.0/20",
            "DefaultForAz": true,
            "MapPublicIpOnLaunch": true,
            "MapCustomerOwnedIpOnLaunch": false,
            "State": "available",
            "SubnetId": "subnet-09fec55be67f9079a",
            "VpcId": "vpc-0492abecb5d55223b",
            "OwnerId": "677263074526",
            "AssignIpv6AddressOnCreation": false,
            "Ipv6CidrBlockAssociationSet": [],
            "SubnetArn": "arn:aws:ec2:us-east-1:677263074526:subnet/subnet-09fec55be67f9079a",
            "EnableDns64": false,
            "Ipv6Native": false,
```

Figure 32. Filter by id

2.2.3. Run instance

```
aws ec2 run-instances --image-id ami-00b8917ae86a424c9 --instance-type t2.micro --key-name ssh-key --security-group-ids sg-0ad7b90988d94ad76 --subnet-id subnet-0882fd8526c00f350 --tags "Key=Name,Value=i1"
```

```
}
nstances --image-id ami-0d5eff06f840b45e9 --instance-type t2.micro --key-name ssh-key --security-group-ids sg-0ad
7b90988d94ad76 --subnet-id subnet-0882fd8526c00f350
{
    "Groups": [],
    "Instances": [
        {
            "AmiLaunchIndex": 0,
            "ImageId": "ami-0d5eff06f840b45e9",
            "InstanceId": "i-004b3e568e5442c96",
            "InstanceType": "t2.micro",
            "KeyName": "ssh-key",
            "LaunchTime": "2024-01-09T07:25:10.000Z",
```

Figure 33. Using the aws shell

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
lab3	i-0c65ff9bcbf527ea3	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1a	ec2-52-207-187-131.co...
lab3-2	i-0bb6952800f728c0e	Running	t2.micro	2/2 checks passed	View alarms +	us-east-1d	ec2-34-207-128-71.co...
	i-004b3e568e5442c96	Pending	t2.micro	–	View alarms +	us-east-1d	ec2-3-86-208-219.com...

Figure 34. New instance

2.2.4. Querying output

Command for querying all instances by instance id and state:

```
aws ec2 describe-instances --query "Reservations[].Instances[].{InstanceId:InstanceId,State:State.Name}"
```

```
aws> ec2 describe-instances --query "Reservations[].Instances[].{InstanceId:InstanceId,State:State.Name}"
[
    {
        "InstanceId": "i-0c65ff9bcbf527ea3",
        "State": "running"
    },
    {
        "InstanceId": "i-0bb6952800f728c0e",
        "State": "running"
    },
    {
        "InstanceId": "i-004b3e568e5442c96",
        "State": "running"
    }
]
```

Figure 35. Querying all instances

2.3. Working with the CLI

2.3.1. Instances

Create second instance with different availability zone

```
aws ec2 run-instances --image-id ami-00b8917ae86a424c9 --instance-type t2.micro --key-name ssh-key --security-group-ids sg-0ad7b90988d94ad76 --subnet-id subnet-0882fd8526c00f350 --placement AvailabilityZone=us-east-1d
```

Querying all instances

```
aws ec2 describe-instances --query "Reservations[].Instances[].{InstanceId:InstanceId,State:State.Name}"
```

```
PS C:\Users\Andi> aws ec2 describe-instances --query "Reservations[].Instances[].{InstanceId:InstanceId,State:State.Name}"
[
    {
        "InstanceId": "i-0c65ff9bcbf527ea3",
        "State": "running"
    },
    {
        "InstanceId": "i-026593dc99ac2c157",
        "State": "running"
    },
    {
        "InstanceId": "i-0bb6952800f728c0e",
        "State": "running"
    },
    {
        "InstanceId": "i-004b3e568e5442c96",
        "State": "terminated"
    },
    {
        "InstanceId": "i-0f32f2bd79deab496",
        "State": "running"
    }
]
```

Figure 36. 4 Instances and 1 test instance which got terminated.

2.3.2. Security Groups

Create security group

```
aws ec2 create-security-group --group-name httpsg --description "HTTP Security Group"
```

Allow http traffic from my ip only

```
aws ec2 authorize-security-group-ingress --group-name MyHTTPSG --protocol tcp --port 80 --cidr 77.220.105.192/32
```

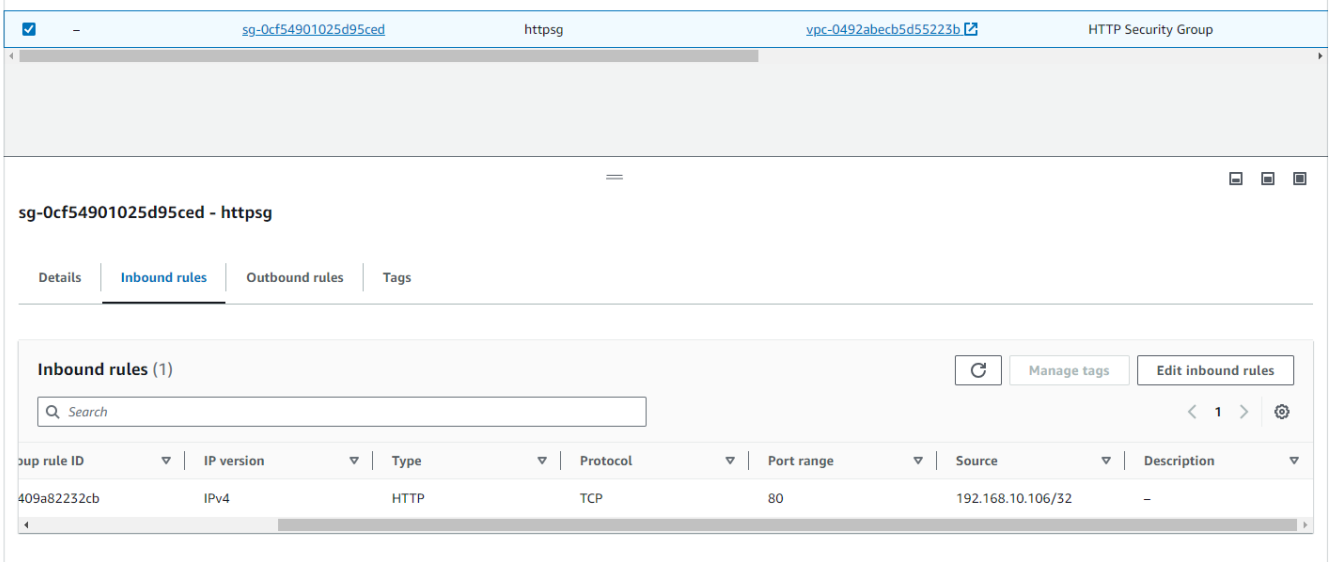


Figure 37. Create Security Group with inbound rule

Change security groups of the instances:

```
aws ec2 modify-instance-attribute --instance-id i-026593dc99ac2c157 --groups sg-0cf54901025d95ced sg-0ad7b90988d94ad76
```

```
aws ec2 modify-instance-attribute --instance-id i-0f32f2bd79deab496 --groups sg-0cf54901025d95ced sg-0ad7b90988d94ad76
```

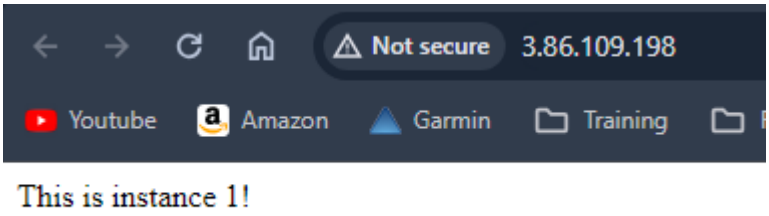


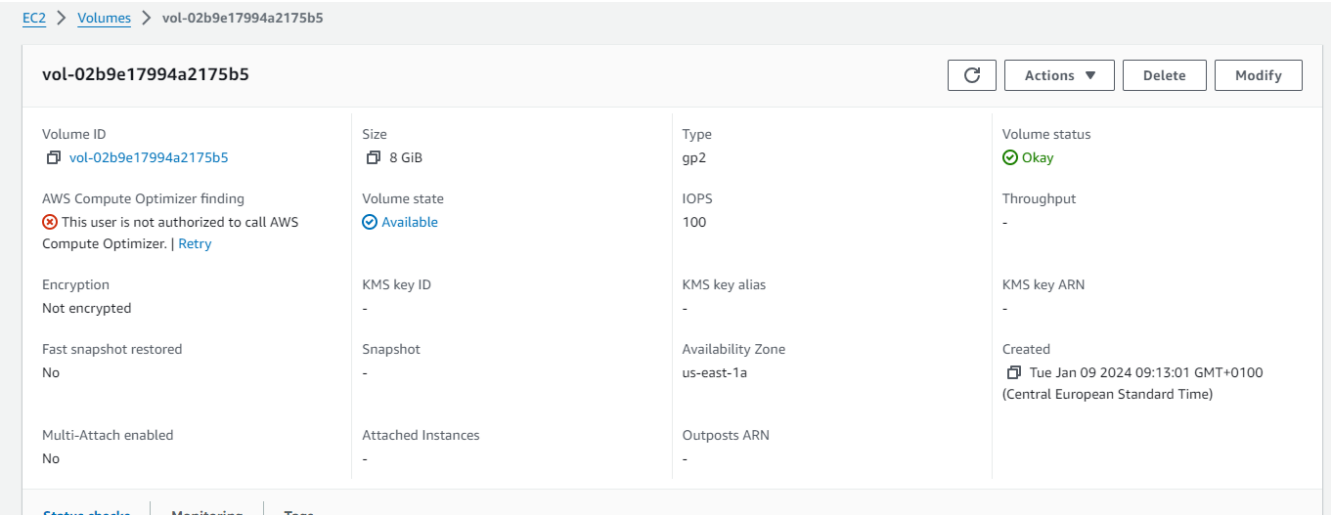
Figure 38. Check if access is possible

2.3.3. Volumes and Snapshots

Create volume

```
aws ec2 create-volume --availability-zone us-east-1d --size 8
```

Created volume



Attach volume to instance

```
aws ec2 attach-volume --volume-id vol-0d509bb887609d1c8 --instance-id i-026593dc99ac2c157 --device /dev/sdg
```

Attached volume

```
PS C:\Users\Andi\Documents\Github\fh-mc-cc\exercise\e03> aws ec2 attach-volume --volume-id vol-0d509bb887609d1c8
--instance-id i-026593dc99ac2c157 --device /dev/sdg
{
    "AttachTime": "2024-01-09T08:18:54.309Z",
    "Device": "/dev/sdg",
    "InstanceId": "i-026593dc99ac2c157",
    "State": "attaching",
    "VolumeId": "vol-0d509bb887609d1c8"
}
```

Create snapshot

```
aws ec2 create-snapshot --volume-id vol-0d509bb887609d1c8 --description "Test snapshot"
```

Detach volume

```
aws ec2 detach-volume --volume-id vol-0d509bb887609d1c8
```

Delete volume

```
aws ec2 delete-volume --volume-id vol-0d509bb887609d1c8
```

Create volume from snapshot

```
aws ec2 create-volume --snapshot-id snap-0007714f04824ed3d --availability-zone us-east-1d
```

Check if file exists

i-was-here still exists

```
[ec2-user@ip-172-31-80-122 /]$ sudo mount /dev/xvdg /fileserver
[ec2-user@ip-172-31-80-122 /]$ cd /fileserver/
[ec2-user@ip-172-31-80-122 fileserver]$ ls
i-was-here  lost+found
[ec2-user@ip-172-31-80-122 fileserver]$
```

2.3.4. Load Balancer

Create load balancer

```
aws elbv2 create-load-balancer --name my-load-balancer --subnets subnet-0882fd8526c00f350 subnet-08e8a61e2b32bc655 --security-groups sg-0cf54901025d95ced
```

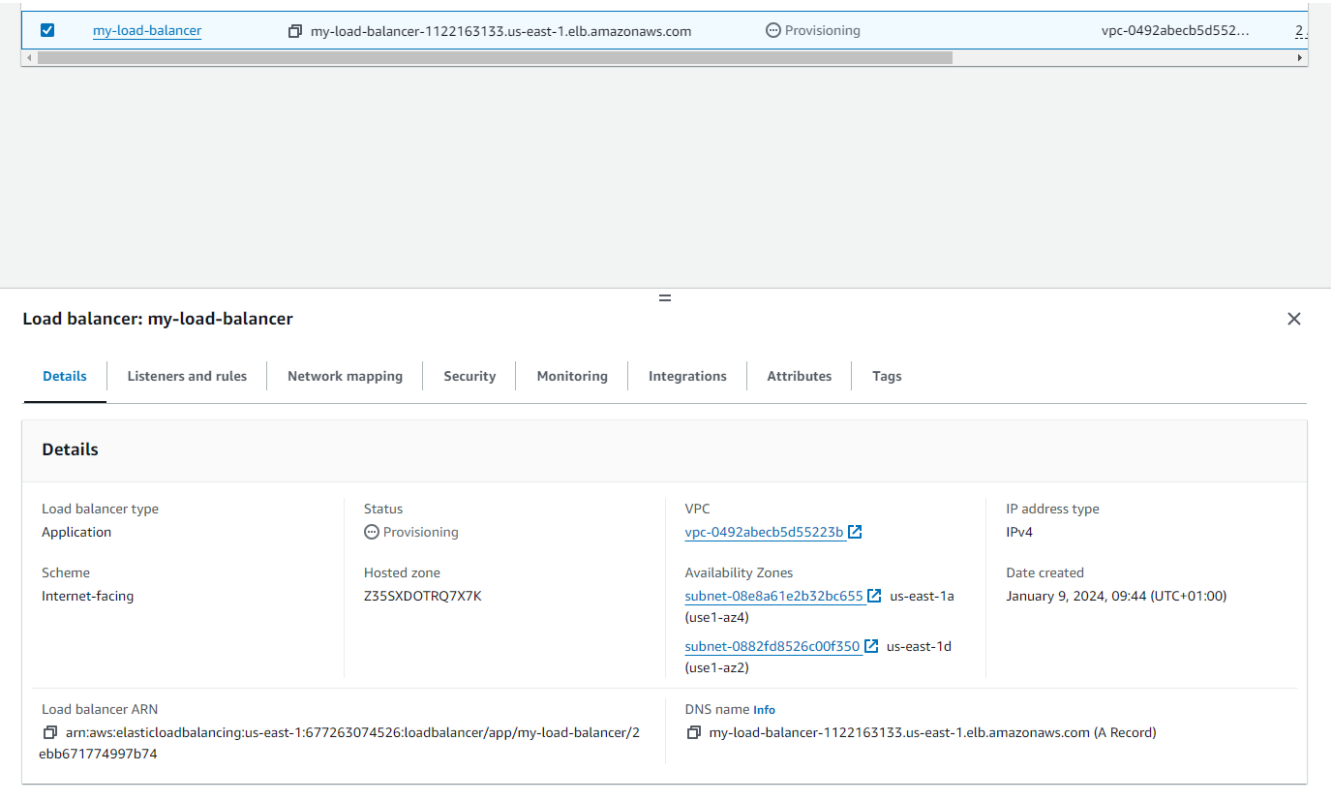


Figure 39. Created load balancer "my-load-balancer"

Create new target group

```
aws elbv2 create-target-group --name MyTargetGroup --protocol HTTP --port 80 --vpc-id vpc-0492abecb5d55223
```

Create new listener for load balancer with target group

```
aws elbv2 create-listener --load-balancer-arn arn:aws:elasticloadbalancing:us-east-1:677263074526:loadbalancer/app/my-load-balancer/2ebb671774997b74 --protocol HTTP --port 80 --default-actions Type=forward,TargetGroupArn=arn:aws:elasticloadbalancing:us-east-1:677263074526:targetgroup/MyTargetGroup/0d709139aa1c35bb
```

Register instances as targets to the target group

```
aws elbv2 register-targets --target-group-arn arn:aws:elasticloadbalancing:us-east-1:677263074526:targetgroup/MyTargetGroup/0d709139aa1c35bb --targets "Id=i-026593dc99ac2c157" "Id=i-0bb2c09b1f9587e15"
```

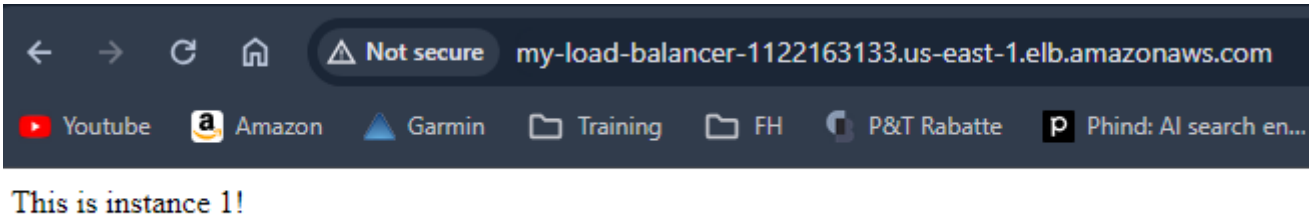
Remove existing security group rule

```
aws ec2 revoke-security-group-ingress --group-id sg-0cf54901025d95ced --protocol tcp --port 80 --cidr 77.220.105.192/32
```

Add new security group rule

```
aws ec2 authorize-security-group-ingress --group-id sg-0cf54901025d95ced --protocol tcp --port 80 --cidr 0.0.0.0/0
```

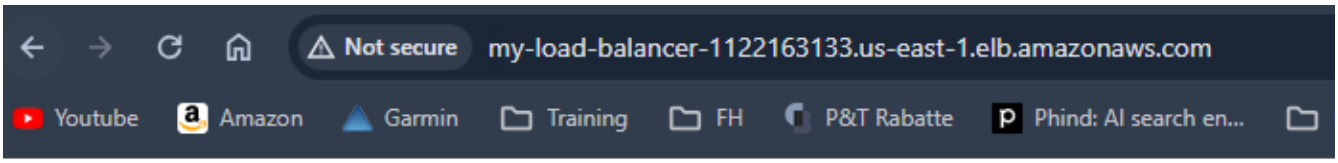
Test load balancer



This is instance 1!

Figure 40. Instance 1

Instance 2



This is instance 2