Case Study 03

Infrastructure as Code with Terraform

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- **Concepts Used**: Terraform, AWS S3, and EC2.
- **Problem Statement**: "Use Terraform to provision an AWS EC2 instance and an S3 bucket. Deploy a sample static website on the S3 bucket using the EC2 instance as the backend server."
- **Tasks**:
  - Write a Terraform script to create an EC2 instance and an S3 bucket.
  - Deploy the static website on the S3 bucket.
  - Use the EC2 instance to interact with the S3 bucket and log the actions.

SOLUTION

Overview
This report covers the use of Terraform to provision an AWS EC2 instance and S3 bucket, deploy a static website on the S3 bucket, and use the EC2 instance to interact with the S3 bucket and log actions. The tasks were completed step by step, with screenshots provided after each step to demonstrate successful execution.

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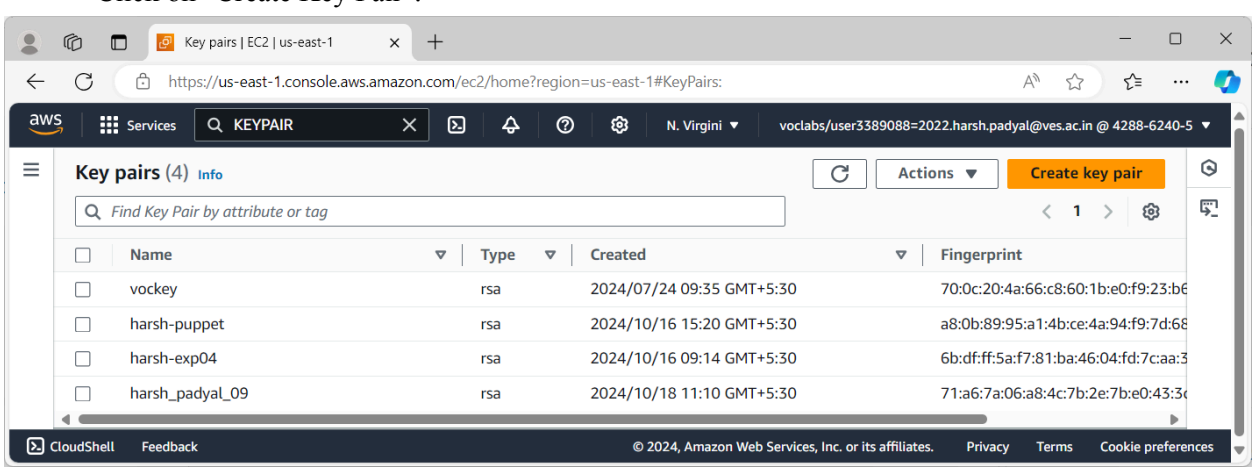
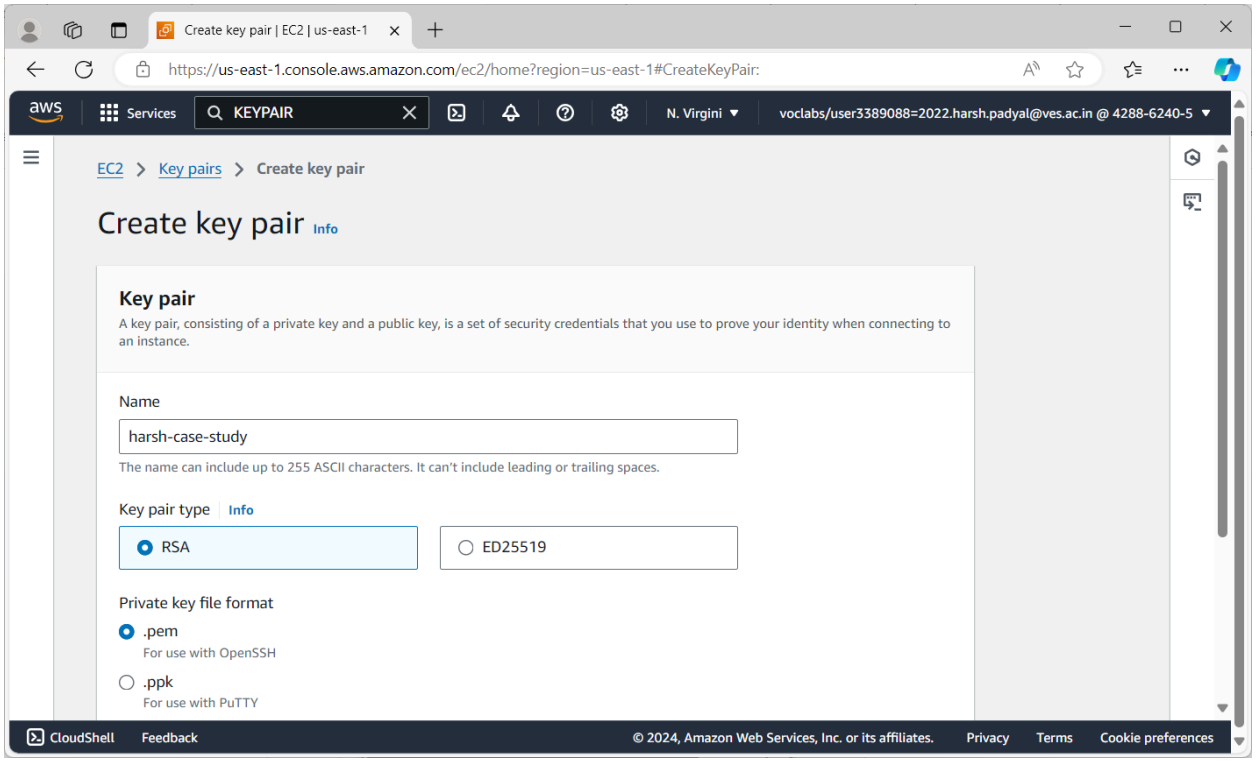
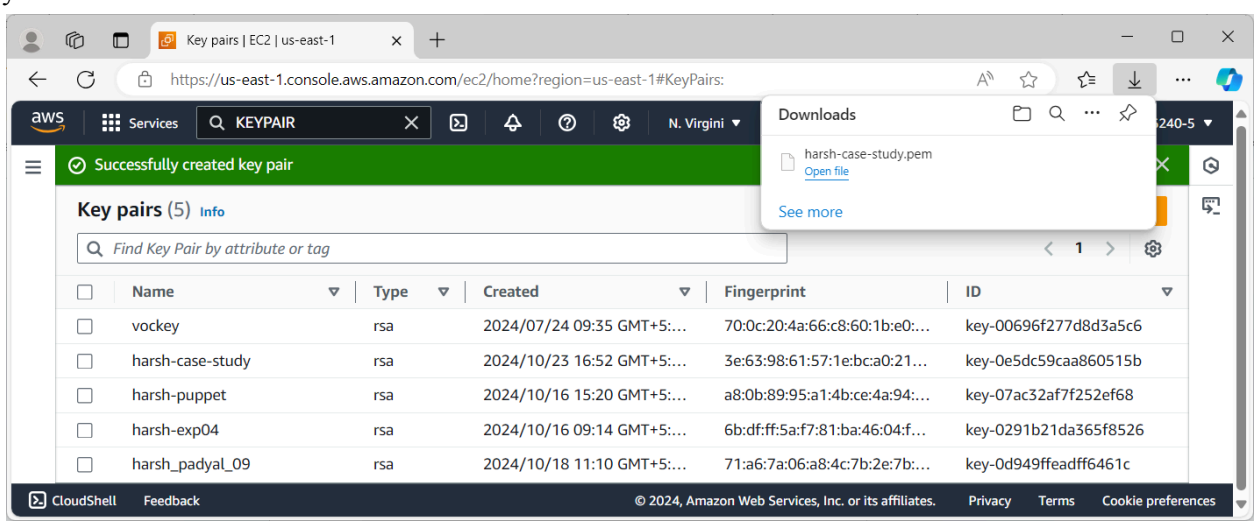
1. Go to the AWS Management Console and create a key pair in the EC2 section:
   - Open the EC2 Dashboard.
   - Click on "Key Pairs" under Network & Security.
   - Click on "Create Key Pair".



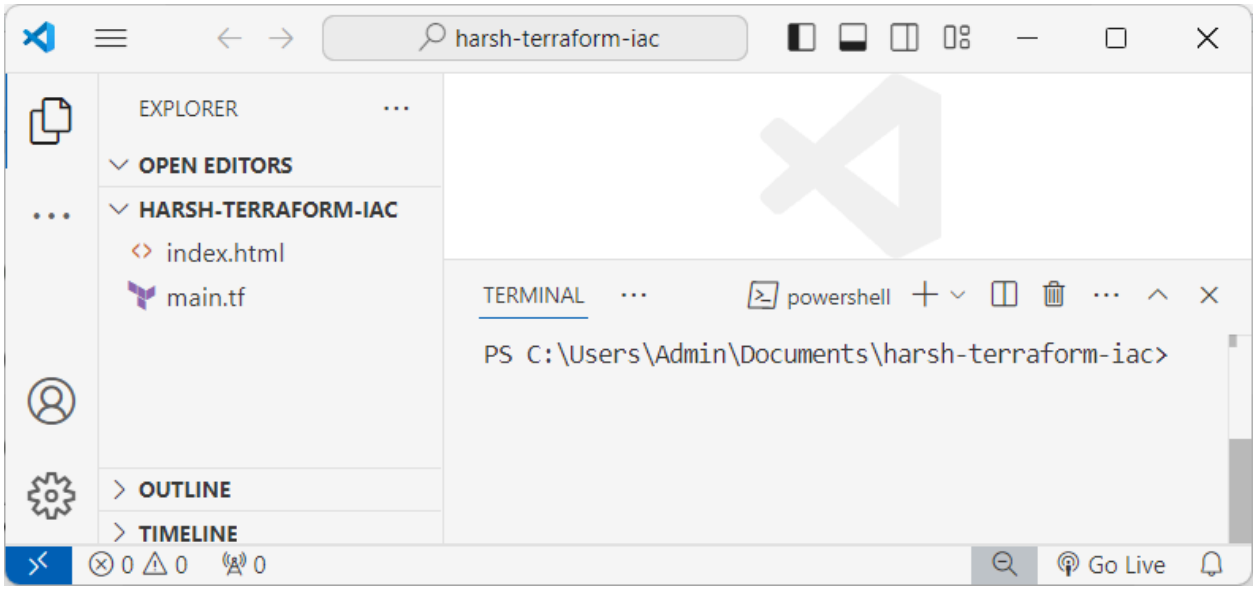
Name the key pair, e.g., harsh-case-study, and click Create Key Pair.



The .pem file will automatically download. Ensure it's saved securely, as you'll need it later to connect to your EC2 instance.



2. Open VS Code and generate two files (main.tf and index.html):
   - Create a new folder in your local workspace.
   - Inside that folder, create two files: main.tf (Terraform configuration) and index.html (the static website content).

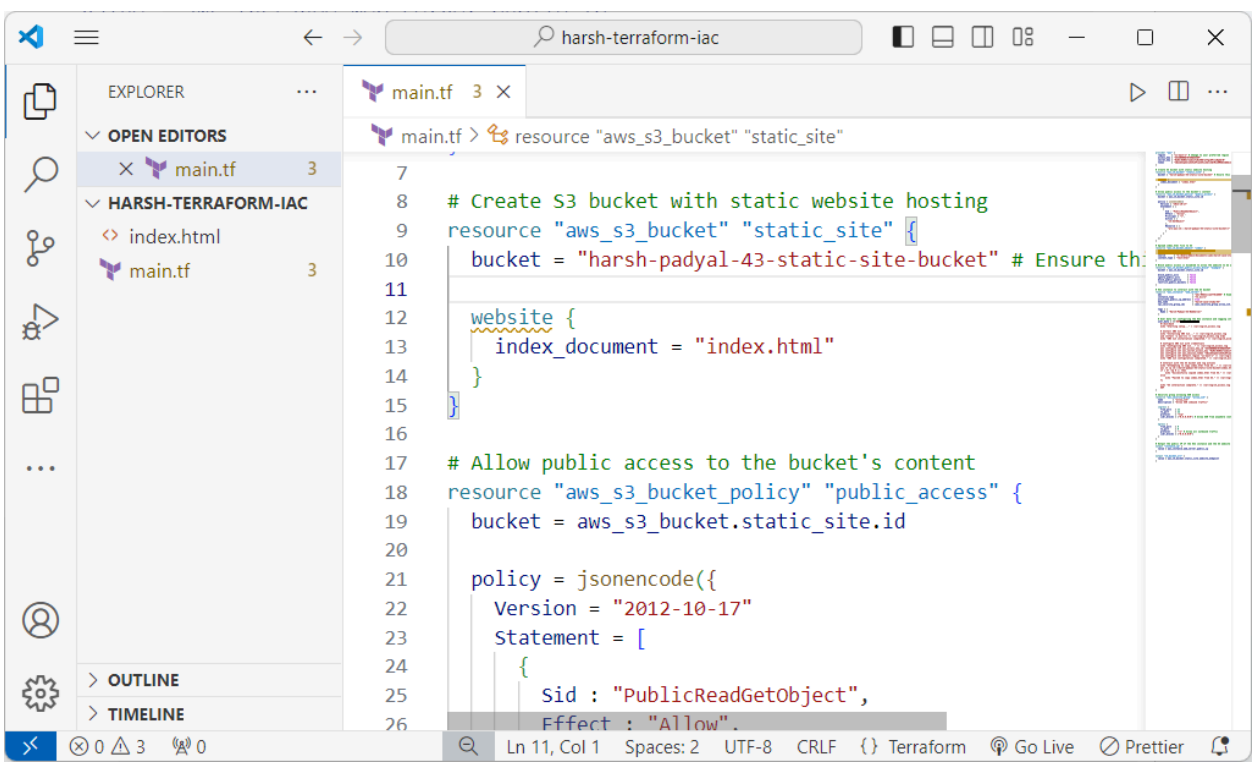


- Paste the following content into main.tf:

```
provider "aws" {
  region     = "us-east-1"
  access_key = "YOUR_ACCESS_KEY"
  secret_key = "YOUR_SECRET_KEY"
  token      = "YOUR_SESSION_TOKEN"
}

resource "aws_s3_bucket" "static_site" {
  bucket = "harsh-padyal-43-static-site-bucket"

  website {
    index_document = "index.html"
  }
}

resource "aws_s3_bucket_policy" "public_access" {
  bucket = aws_s3_bucket.static_site.id

  policy = jsonencode({
    Version = "2012-10-17"
    Statement = [
      {
        Sid : "PublicReadGetObject",
        Effect : "Allow",
        Principal = "*",
        Action = [
          "s3:GetObject"
        ],
        Resource = [
          "arn:aws:s3:::harsh-padyal-43-static-site-bucket/*"
        ]
```

```
    }
  ]
 })
}

resource "aws_s3_bucket_object" "index" {
 bucket       = aws_s3_bucket.static_site.bucket
 key          = "index.html"
 source       = "C:/Users/Admin/Documents/harsh-terraform-iac/index.html"
 content_type = "text/html"
}

resource "aws_s3_bucket_public_access_block" "example" {
 bucket = aws_s3_bucket.static_site.id

 block_public_acls       = false
 ignore_public_acls      = false
 block_public_policy     = false
 restrict_public_buckets = false
}

resource "aws_instance" "web_server" {
 ami                         = "ami-06b21ccaeff8cd686"
 instance_type               = "t2.micro"
 associate_public_ip_address = true
 key_name                    = "harsh-case-study"
 vpc_security_group_ids      = [aws_security_group.allow_ssh.id]

 tags = {
  Name = "Harsh-Padyal-43-WebServer"
 }

 user_data = <<-EOF
  #!/bin/bash
  echo "Starting setup..." > /var/log/s3_access.log

  yum install -y aws-cli >> /var/log/s3_access.log 2>&1
  aws configure set aws_access_key_id "YOUR_ACCESS_KEY" >> /var/log/s3_access.log 2>&1
  aws configure set aws_secret_access_key "YOUR_SECRET_KEY" >> /var/log/s3_access.log 2>&1
  aws configure set aws_session_token "YOUR_SESSION_TOKEN" >> /var/log/s3_access.log 2>&1
  aws configure set default.region "us-east-1" >> /var/log/s3_access.log 2>&1

  aws s3 cp s3://harsh-padyal-43-static-site-bucket/index.html /home/ec2-user/index.html >>
/var/log/s3_access.log 2>&1
 EOF
}

resource "aws_security_group" "allow_ssh" {
 name       = "allow_ssh"
```

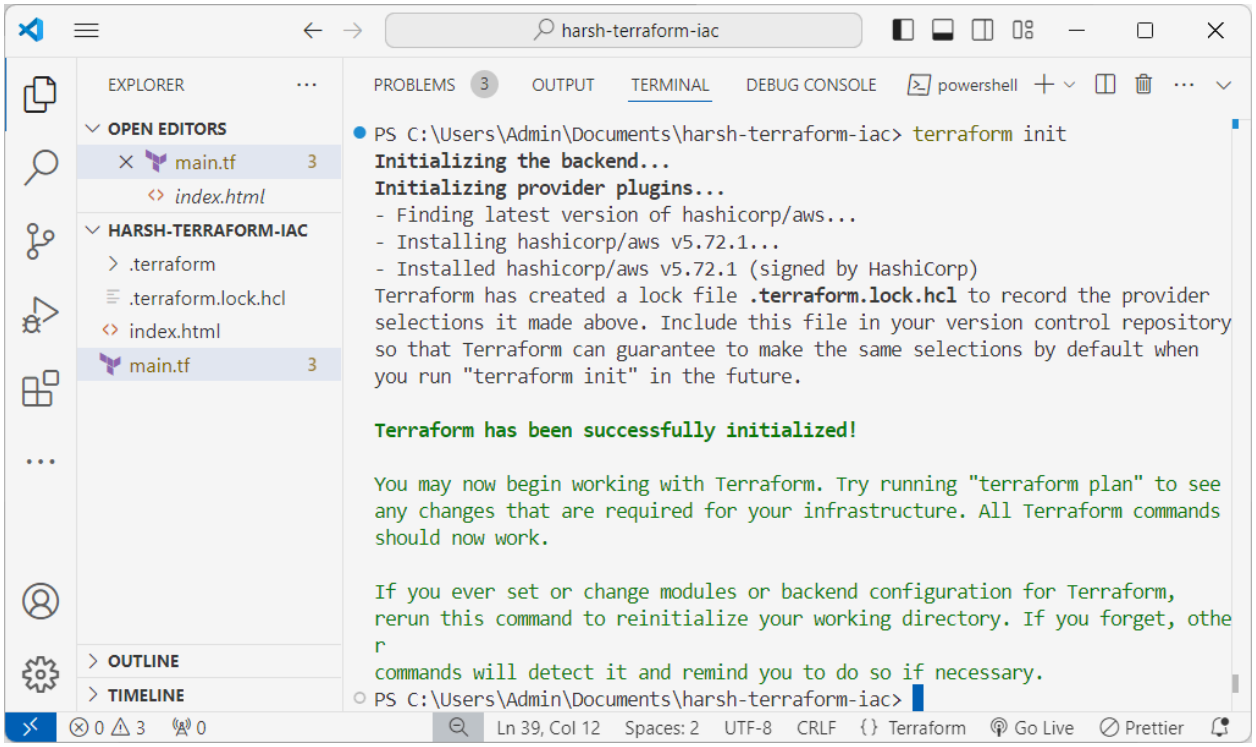
```
  description = "Allow SSH inbound traffic"

  ingress {
    from_port   = 22
    to_port     = 22
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

  egress {
    from_port   = 0
    to_port     = 0
    protocol    = "-1"
    cidr_blocks = ["0.0.0.0/0"]
  }
}

output "instance_ip" {
  value = aws_instance.web_server.public_ip
}

output "s3_bucket_url" {
  value = aws_s3_bucket.static_site.website_endpoint
}
```



Create index.html with content:

3. Initialize Terraform:
   - Open the terminal in VS Code, navigate to the folder containing main.tf, and run:

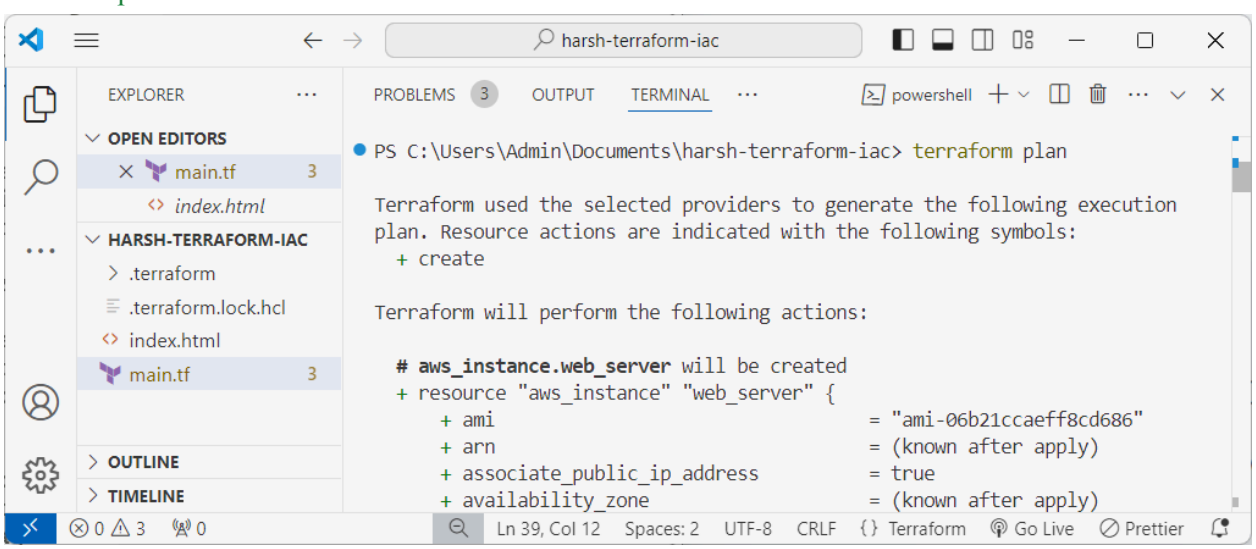
terraform init



- This will initialize Terraform and download necessary provider plugins.

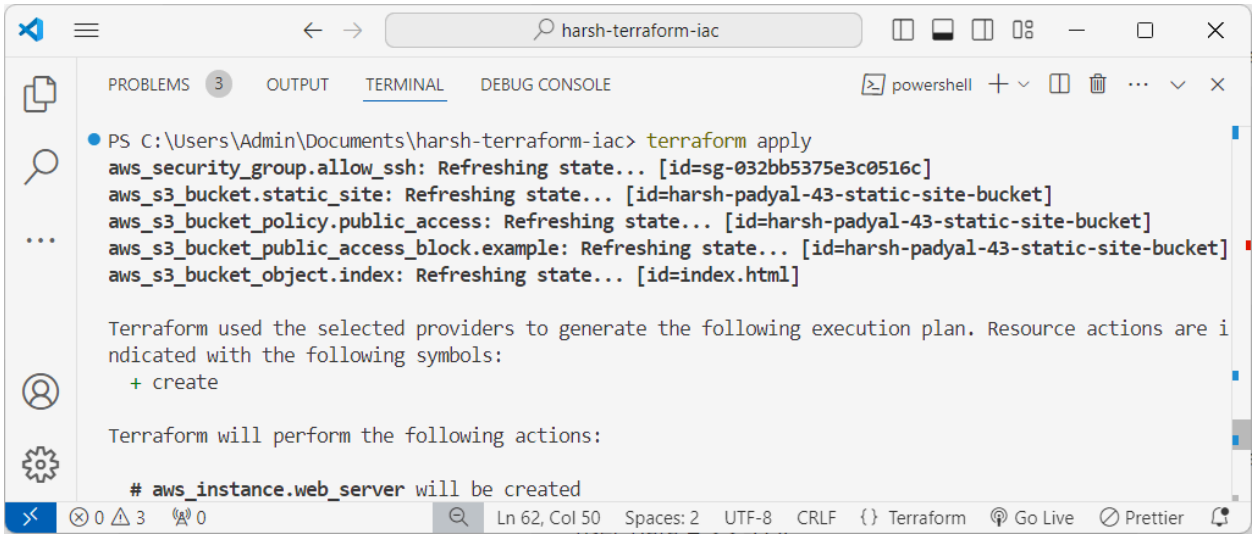
4. Plan and apply Terraform configuration:
   - Run the following commands to plan and deploy resources:

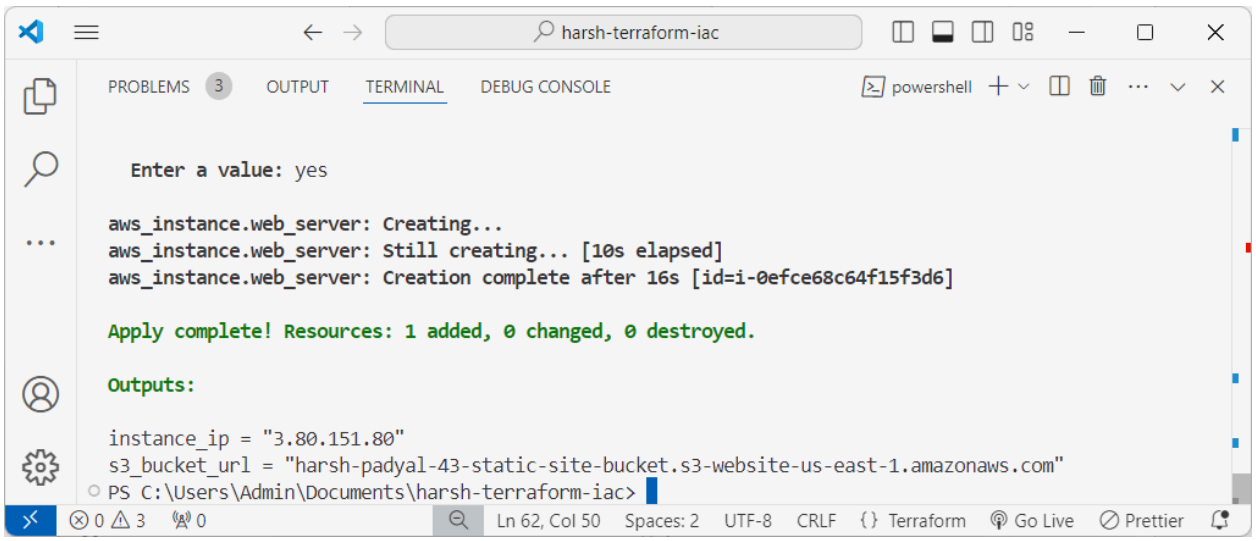
terraform plan



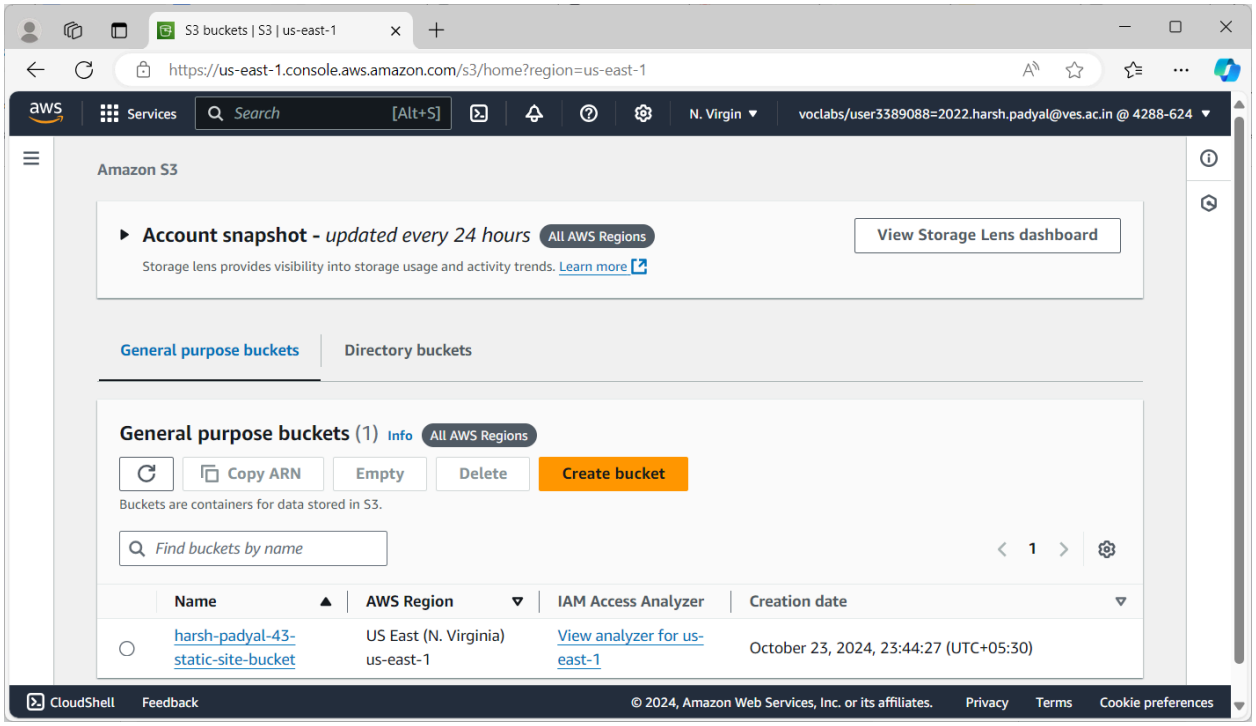
terraform apply

- Type yes when prompted to proceed.

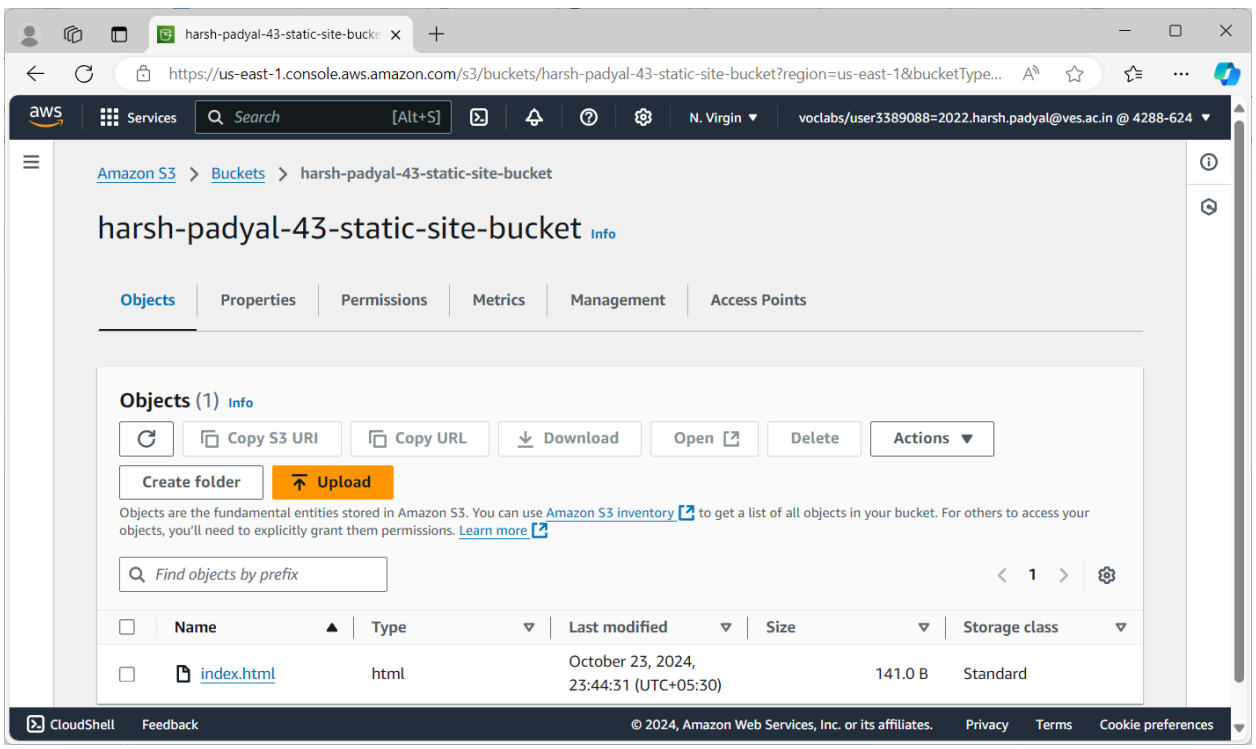




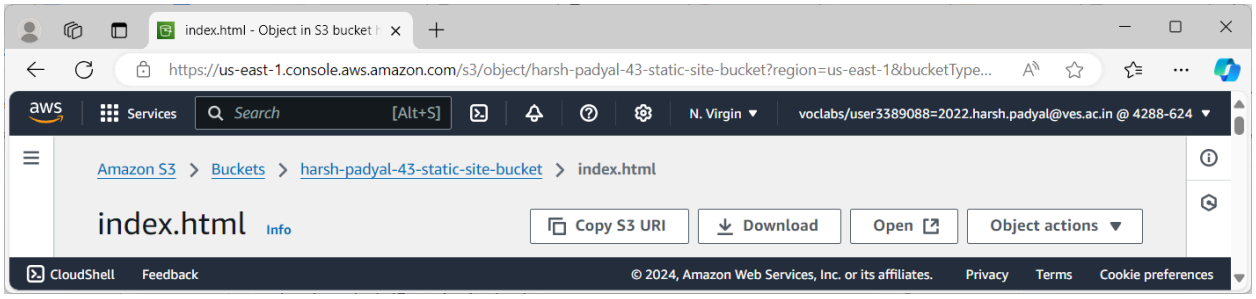
5. Verify S3 bucket creation:
   - Once the resources are created, go to the S3 console and verify that the bucket harsh-padyal-43-static-site-bucket was created.

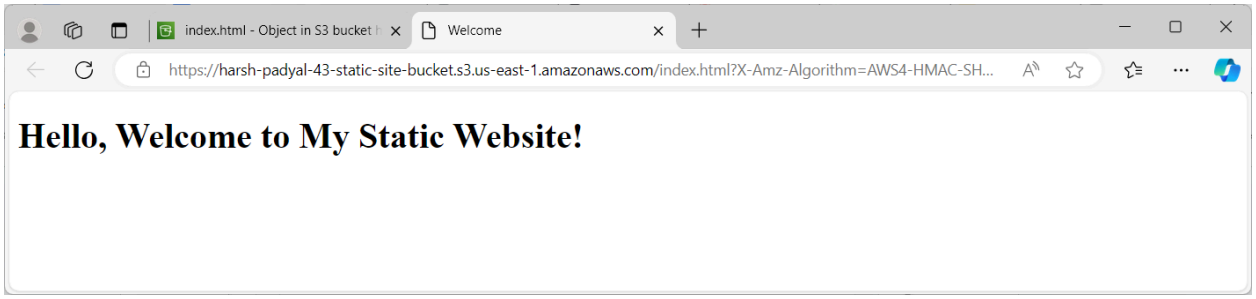


- Click on the bucket, then on index.html.



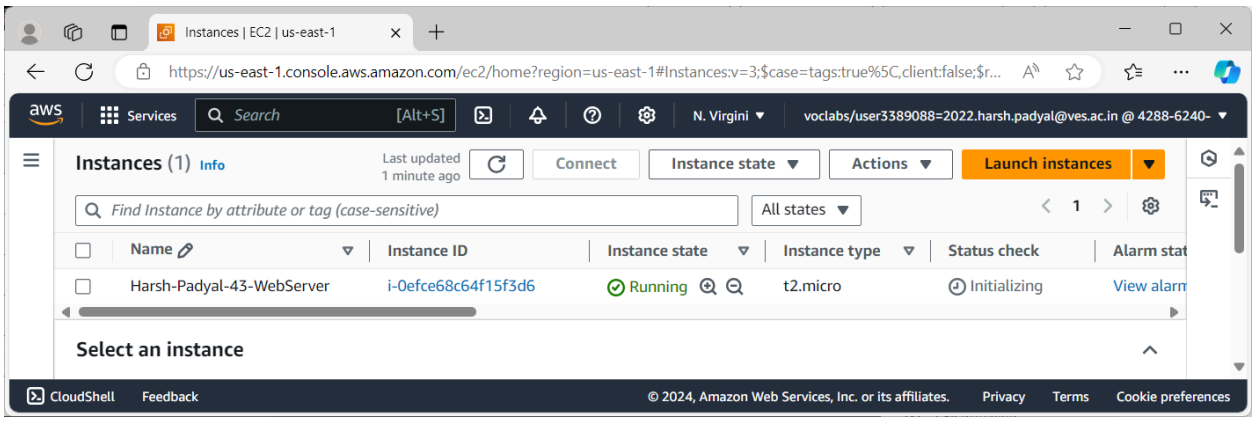
- Click Open to view the content of the index.html file hosted on the S3 website.



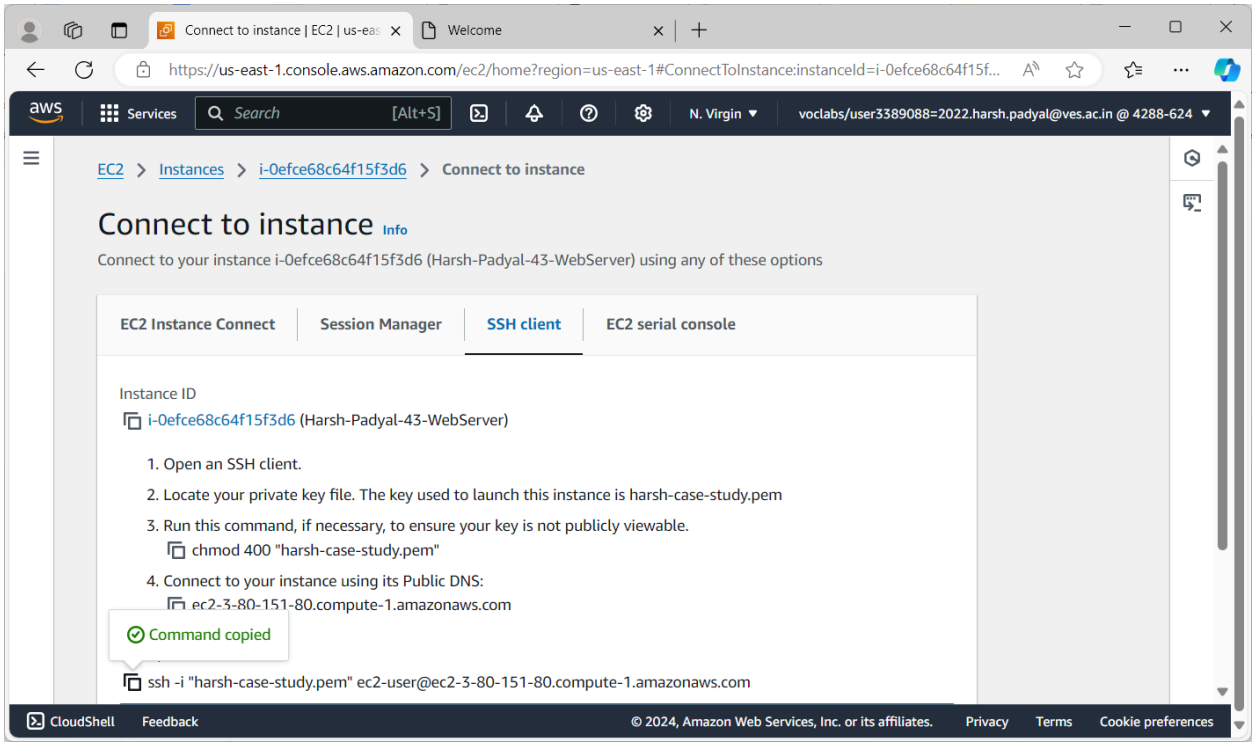


6. Connect to the EC2 instance:

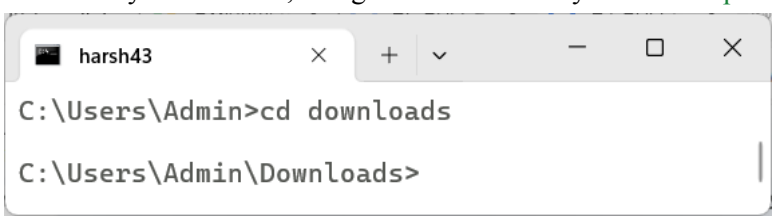
- In the EC2 console, locate your instance and click Connect.



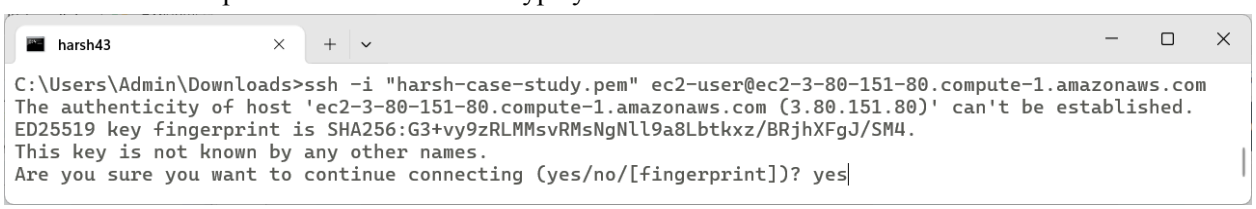
- Copy the provided SSH command to connect to the instance.

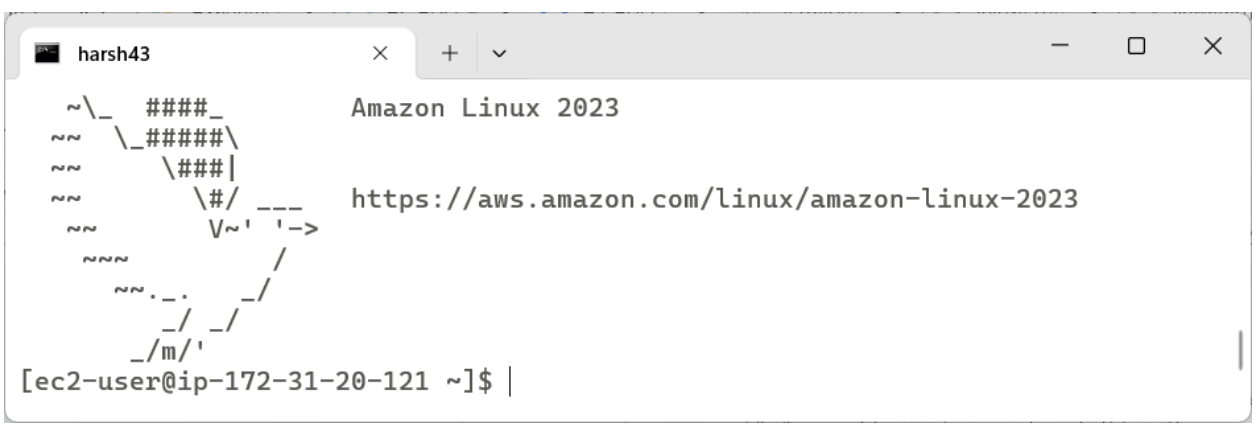


- In your terminal, navigate to the directory where the .pem file was stored.



- Run the copied SSH command and type yes to confirm the connection.





7. View logs on EC2 instance:

- After connecting to the instance, run the following command to view the interaction logs:

cat /var/log/s3_access.log

```
harsh43
[ec2-user@ip-172-31-20-121 ~]$ cat /var/log/s3_access.log
Starting setup...
Installing AWS CLI...
Amazon Linux 2023 repository                      35 MB/s |  28 MB     00:00
Amazon Linux 2023 Kernel Livepatch repository     44 kB/s |  11 kB     00:00

Package awscli-2-2.15.30-1.amzn2023.0.1.noarch is already installed.
Dependencies resolved.
Nothing to do.
Complete!
AWS CLI installation completed.
Configuring AWS CLI...
AWS CLI configuration completed.
Attempting to copy index.html from S3...
download: s3://harsh-padyal-43-static-site-bucket/index.html to home/ec2-user/index.html
Successfully copied index.html from S3.
S3 interaction complete.
[ec2-user@ip-172-31-20-121 ~]$ |
```

- The log will show the status of the AWS CLI installation, configuration, and S3 interaction.

8. Destroy resources:

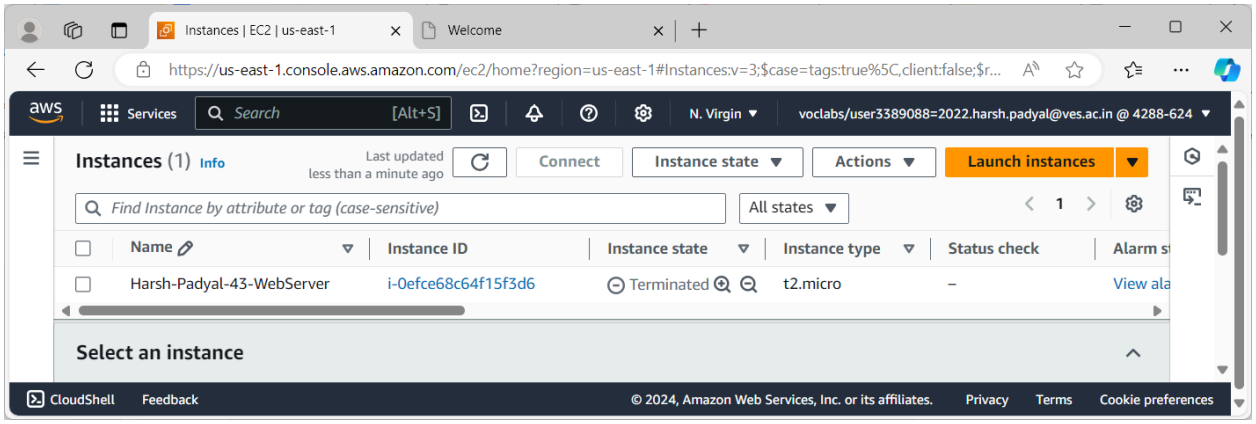
- Once your testing is complete, destroy the resources to avoid incurring costs by running:

terraform destroy

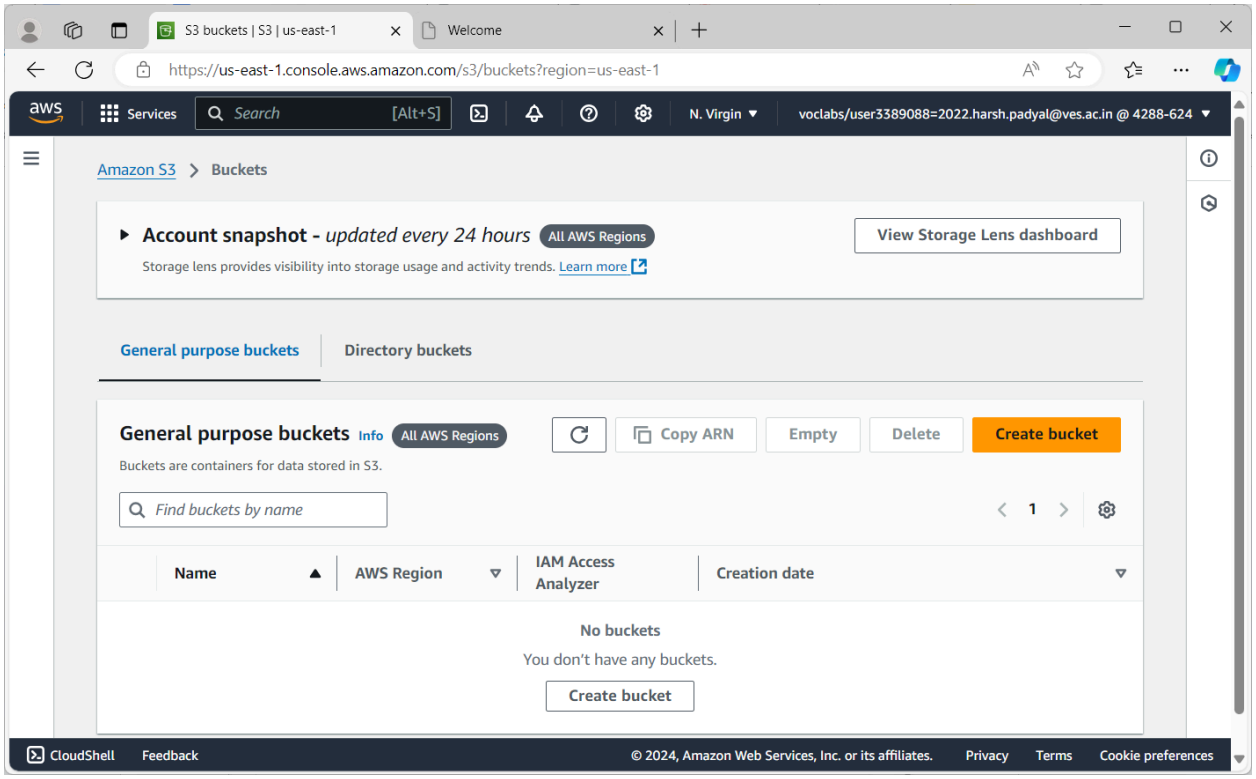
```
harsh-terraform-iac
PROBLEMS 3   OUTPUT   TERMINAL   DEBUG CONSOLE   powershell

  Enter a value: yes

aws_s3_bucket_public_access_block.example: Destroying... [id=harsh-padyal-43-static-site-bucket]
aws_s3_bucket_policy.public_access: Destroying... [id=harsh-padyal-43-static-site-bucket]
aws_s3_bucket_object.index: Destroying... [id=index.html]
aws_instance.web_server: Destroying... [id=i-0efce68c64f15f3d6]
aws_s3_bucket_object.index: Destruction complete after 0s
aws_s3_bucket_public_access_block.example: Destruction complete after 1s
aws_s3_bucket_policy.public_access: Destruction complete after 1s
aws_s3_bucket.static_site: Destroying... [id=harsh-padyal-43-static-site-bucket]
aws_s3_bucket.static_site: Destruction complete after 0s
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 10s elapsed]
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 20s elapsed]
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 30s elapsed]
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 40s elapsed]
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 50s elapsed]
aws_instance.web_server: Still destroying... [id=i-0efce68c64f15f3d6, 1m0s elapsed]
aws_instance.web_server: Destruction complete after 1m2s
aws_security_group.allow_ssh: Destroying... [id=sg-032bb5375e3c0516c]
aws_security_group.allow_ssh: Destruction complete after 2s

Destroy complete! Resources: 6 destroyed.
PS C:\Users\Admin\Documents\harsh-terraform-iac>
0 3   0   Ln 62, Col 50   Spaces: 2   UTF-8   CRLF   {} Terraform   Go Live   Prettier
```

- Confirm the destruction by typing yes

Ec2 instance terminated



S3 bucket deleted



Conclusion

In this exercise, Terraform was successfully used to provision an AWS EC2 instance and an S3 bucket, deploy a static website, and log interactions between the EC2 instance and the S3 bucket. The setup demonstrates the power of Infrastructure as Code to automate AWS provisioning and configuration.