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Advance DevOps - 6

Experiment - 6.

Aim-

To build, change and destroy AWS/GCP/Microsoft Azure infrastructure using Terraform.

Theory-

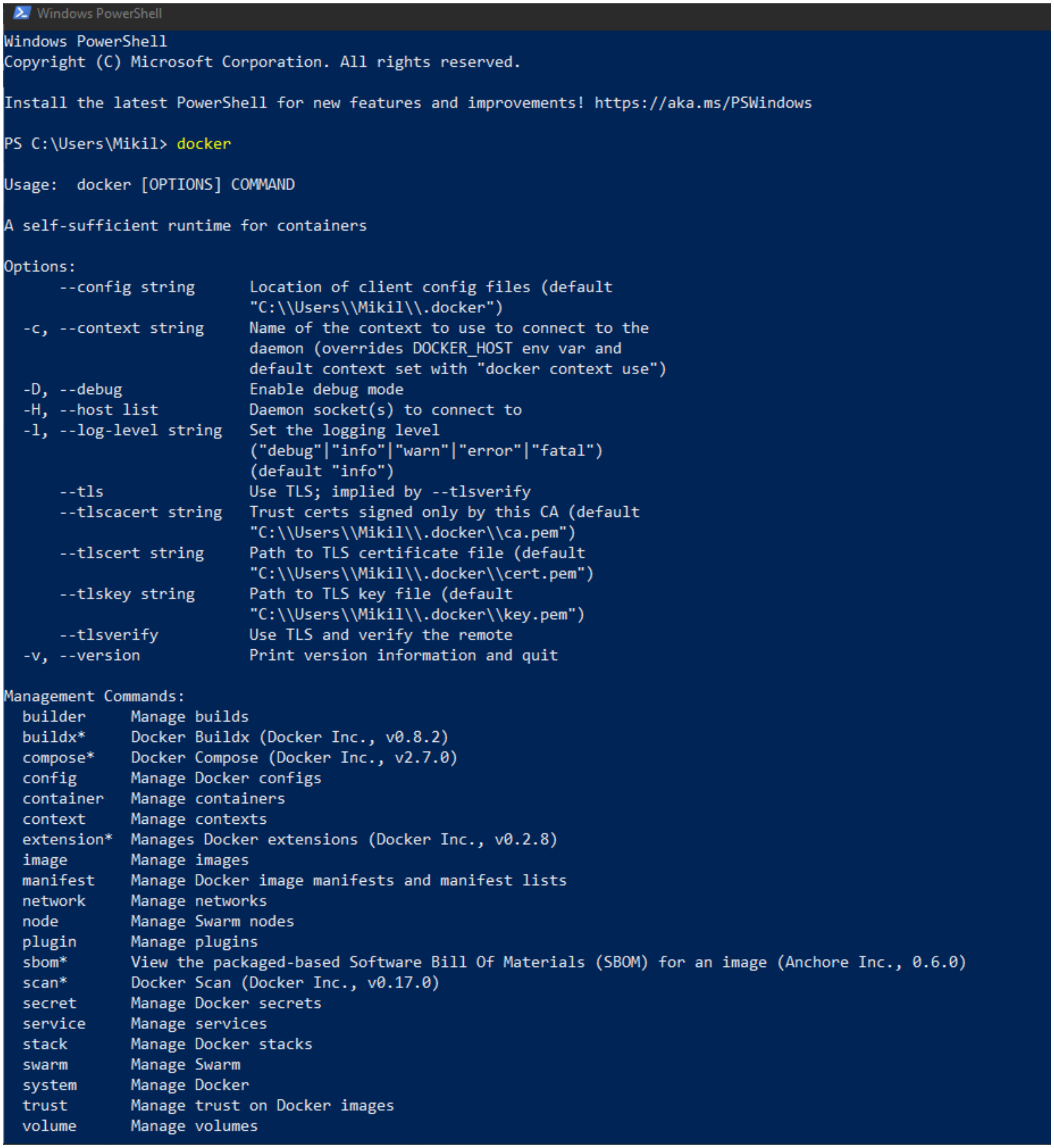
Teraform is an open source "Infrastructure as code" tool, created by HashiCorp. Terraform enables developers to use high-level configuration language called HCL to describe the desired "end state" cloud or on-premises infrastructure for running an application. It then generates a plan for reaching that end-states and executes the plan to provision the infrastru

AWS is designed to allow vendors, ISVs to quickl and securely host your applications, or a new SaaS-based application. You can use AWS Management Console or well doumented web services API's to access AWS's application hosting platform.

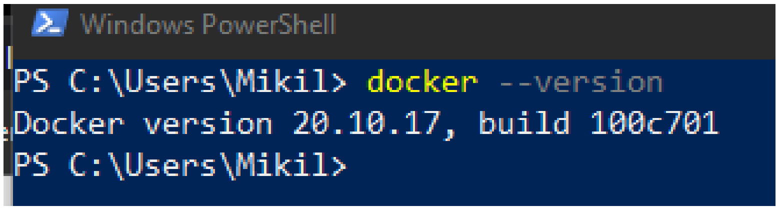
Steps-

Creating Docker container using terraform

Step 1: Check the docker functionality



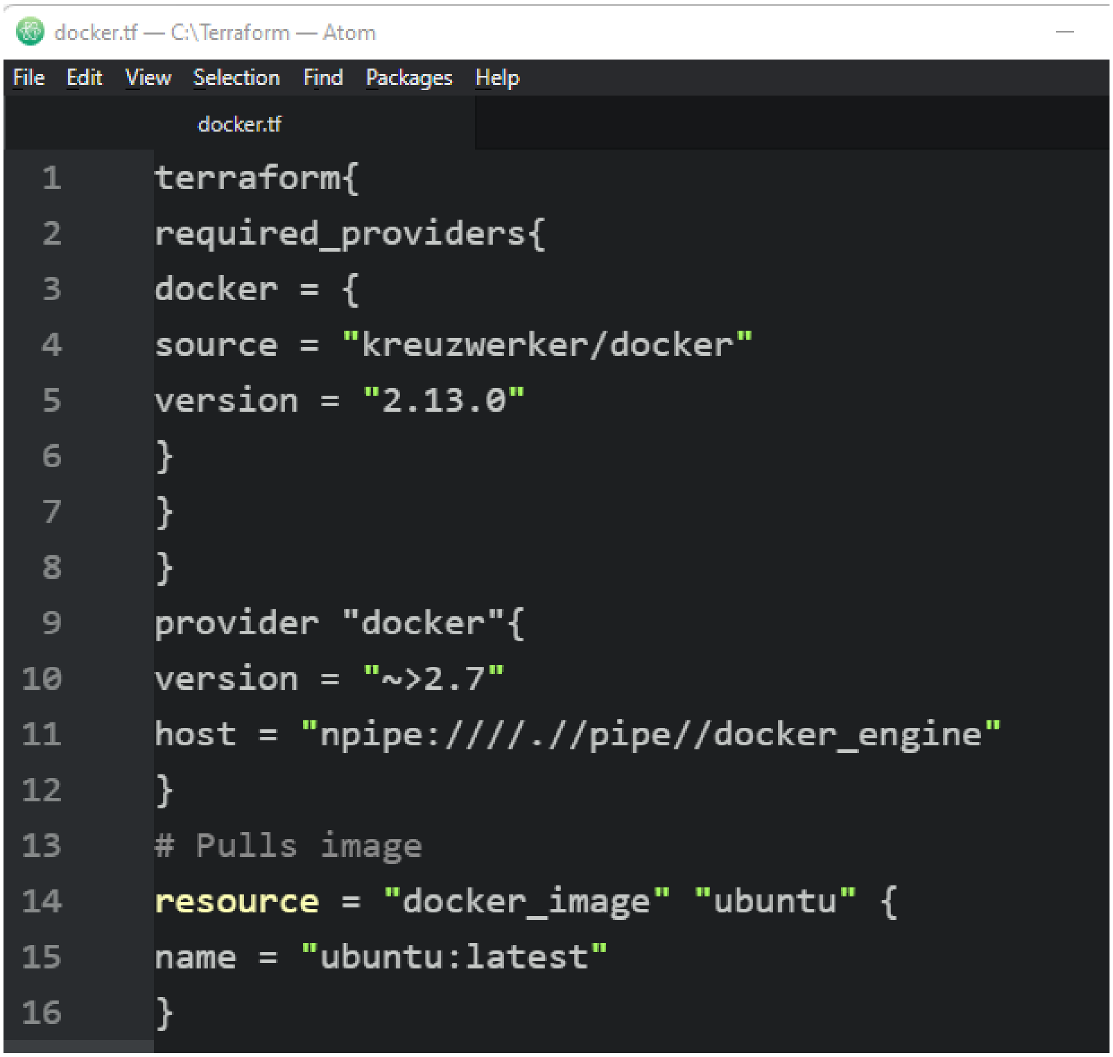
```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Mikil> docker

Usage:  docker [OPTIONS] COMMAND

A self-sufficient runtime for containers

Options:
      --config string      Location of client config files (default
                           "C:\\Users\\Mikil\\.docker")
  -c, --context string     Name of the context to use to connect to the
                           daemon (overrides DOCKER_HOST env var and
                           default context set with "docker context use")
  -D, --debug              Enable debug mode
  -H, --host list          Daemon socket(s) to connect to
  -l, --log-level string   Set the logging level
                           ("debug"|"info"|"warn"|"error"|"fatal")
                           (default "info")
      --tls                Use TLS; implied by --tlsverify
      --tlscacert string   Trust certs signed only by this CA (default
                           "C:\\Users\\Mikil\\.docker\\ca.pem")
      --tlscert string     Path to TLS certificate file (default
                           "C:\\Users\\Mikil\\.docker\\cert.pem")
      --tlskey string      Path to TLS key file (default
                           "C:\\Users\\Mikil\\.docker\\key.pem")
      --tlsverify          Use TLS and verify the remote
  -v, --version            Print version information and quit

Management Commands:
  builder     Manage builds
  buildx*     Docker Buildx (Docker Inc., v0.8.2)
  compose*    Docker Compose (Docker Inc., v2.7.0)
  config      Manage Docker configs
  container   Manage containers
  context     Manage contexts
  extension*  Manages Docker extensions (Docker Inc., v0.2.8)
  image       Manage images
  manifest    Manage Docker image manifests and manifest lists
  network     Manage networks
  node        Manage Swarm nodes
  plugin      Manage plugins
  sbom*       View the packaged-based Software Bill Of Materials (SBOM) for an image (Anchore Inc., 0.6.0)
  scan*       Docker Scan (Docker Inc., v0.17.0)
  secret      Manage Docker secrets
  service     Manage services
  stack       Manage Docker stacks
  swarm       Manage Swarm
  system      Manage Docker
  trust       Manage trust on Docker images
  volume      Manage volumes
```



```
PS C:\Users\Mikil> docker --version
Docker version 20.10.17, build 100c701
PS C:\Users\Mikil>
```

Step 2: Write a terraform script to create a Ubuntu Linux container

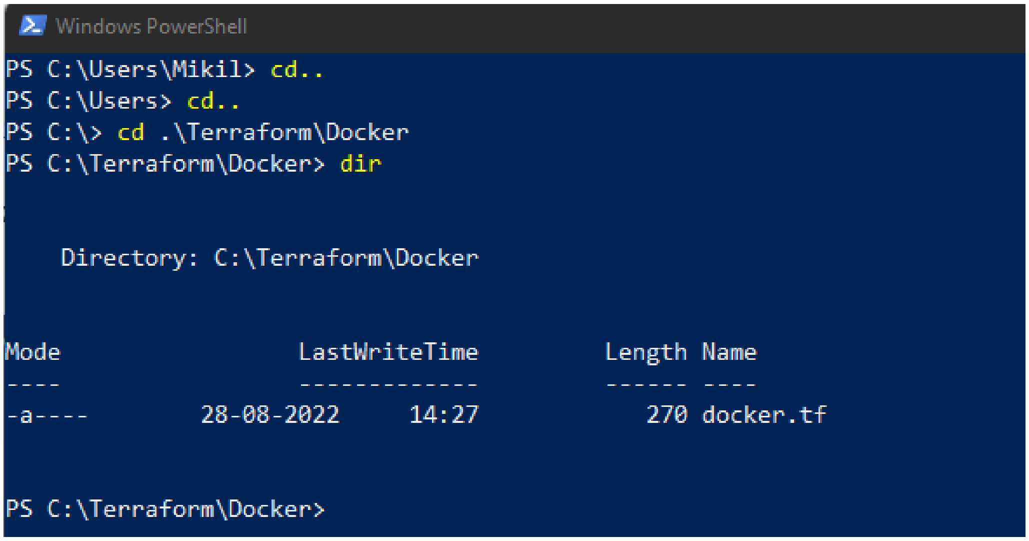
Create a new docker.tf file using Atom editor and write the following contents into it.



```
terraform{
required_providers{
docker = {
source = "kreuzwerker/docker"
version = "2.13.0"
}
}
}
provider "docker"{
version = "~>2.7"
host = "npipe:////.//pipe//docker_engine"
}
# Pulls image
resource = "docker_image" "ubuntu" {
name = "ubuntu:latest"
}
```

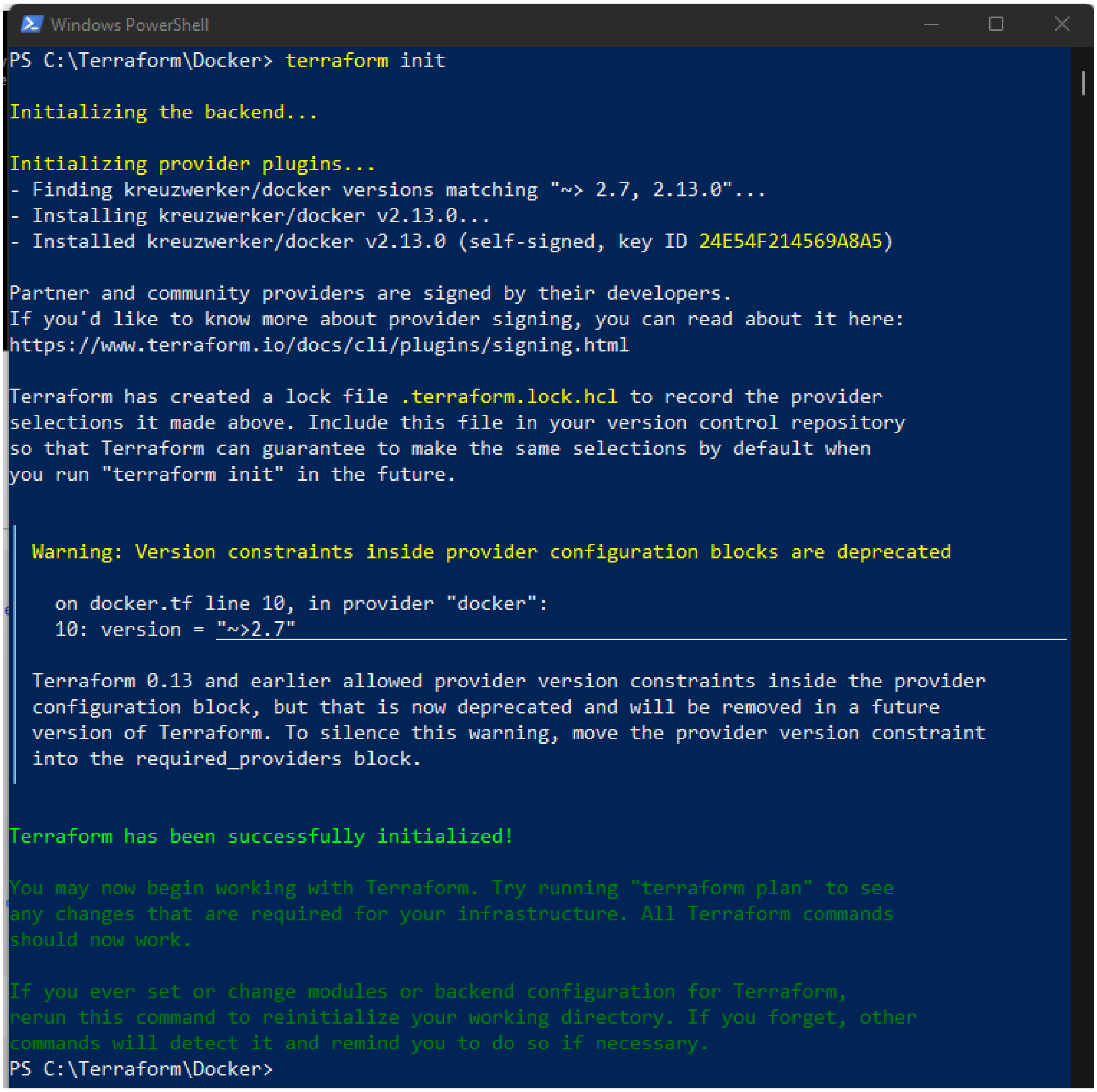
Save the file in a new directory called docker where rest of the terraform scripts are stored

Step 2: Open Command Prompt and go to Terraform_Script\docker directory where our .tf file is stored



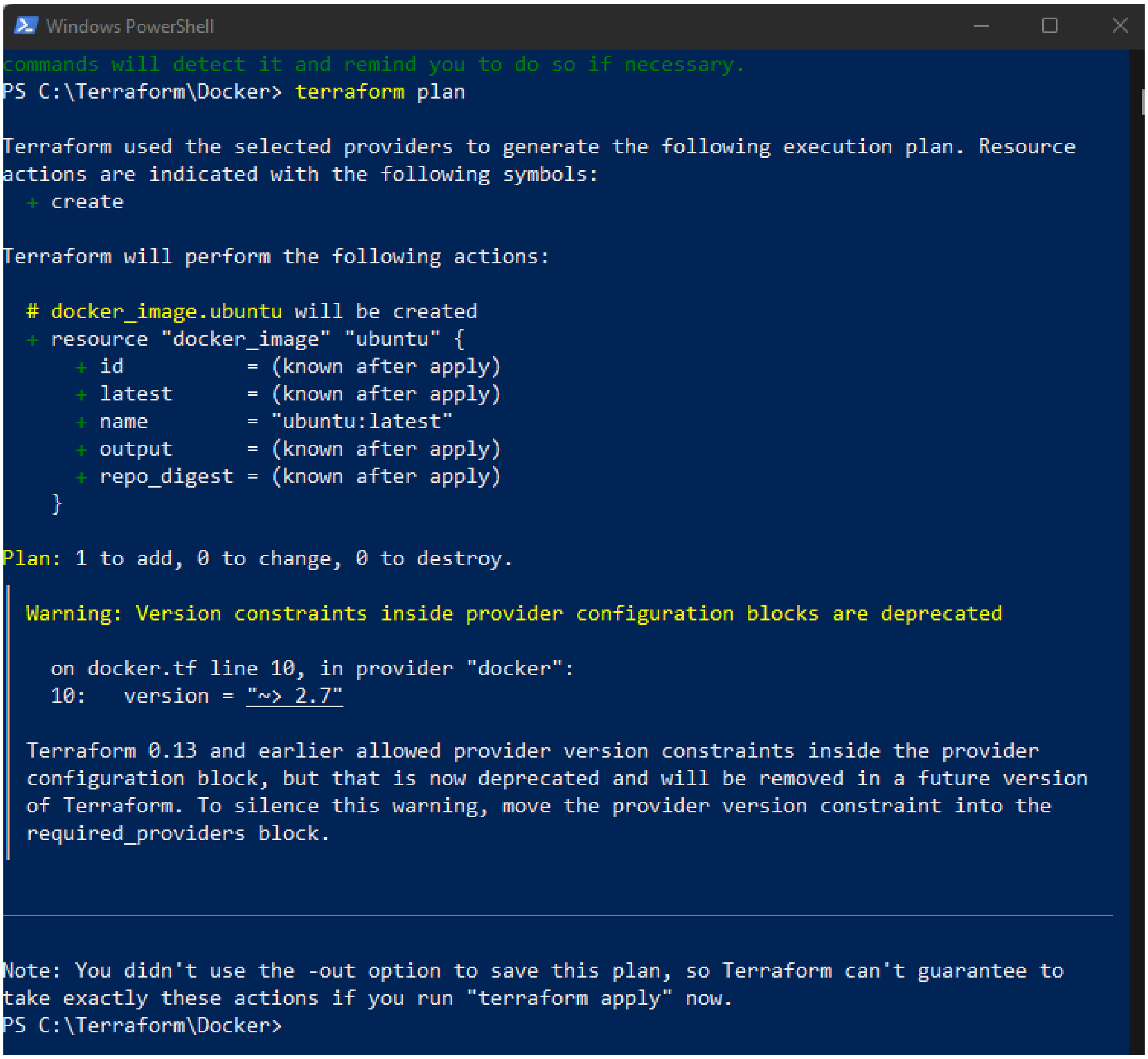
```
PS C:\Users\Mikil> cd..
PS C:\Users> cd..
PS C:\> cd .\Terraform\Docker
PS C:\Terraform\Docker> dir


    Directory: C:\Terraform\Docker


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        28-08-2022     14:27            270 docker.tf


PS C:\Terraform\Docker>
```

Step 3: Execute Terraform Init command to initialize the resources



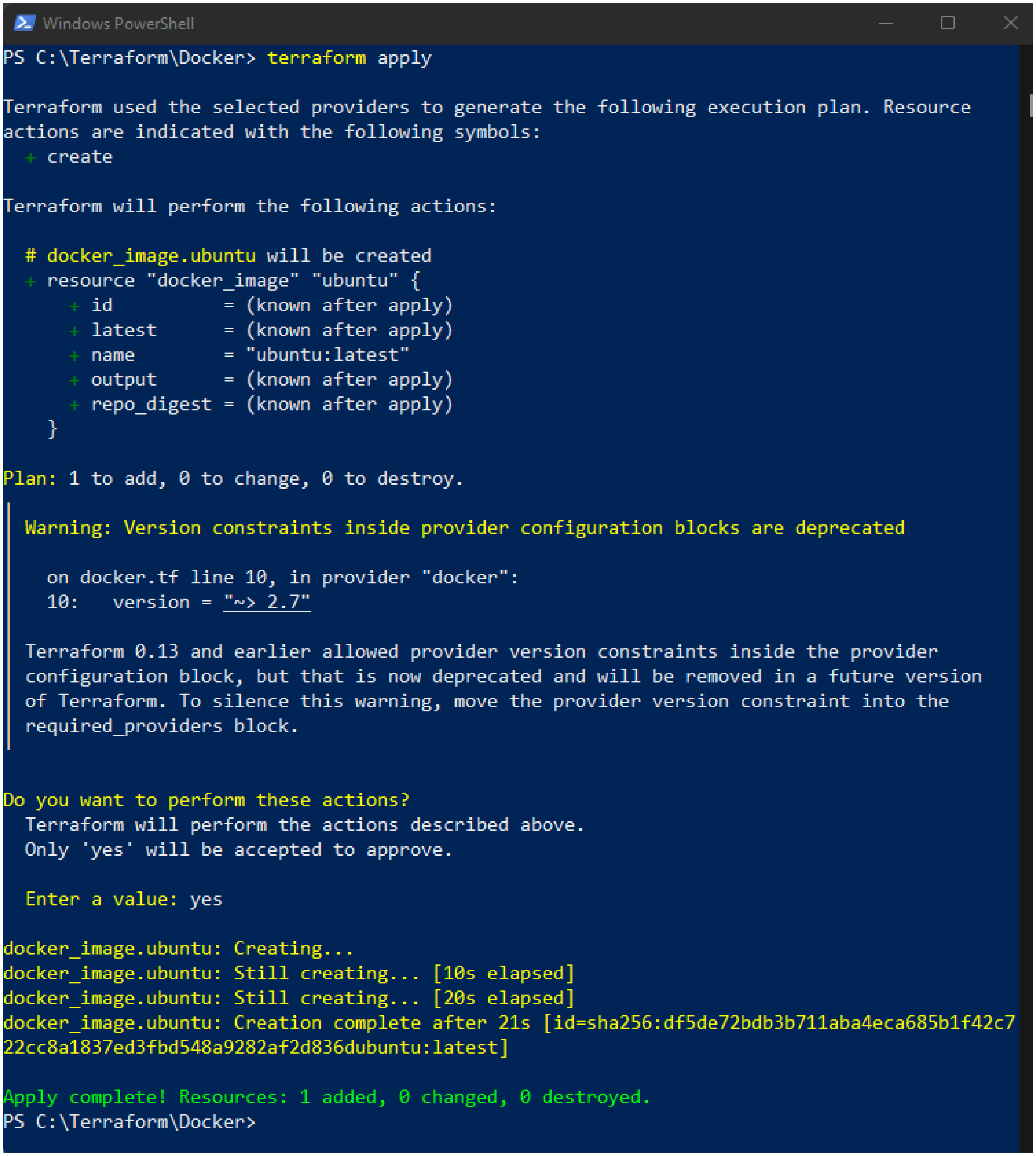
```
PS C:\Terraform\Docker> terraform init

Initializing the backend...

Initializing provider plugins...
- Finding kreuzwerker/docker versions matching "~> 2.7, 2.13.0"...
- Installing kreuzwerker/docker v2.13.0...
- Installed kreuzwerker/docker v2.13.0 (self-signed, key ID 24E54F214569A8A5)

Partner and community providers are signed by their developers.
If you'd like to know more about provider signing, you can read about it here:
https://www.terraform.io/docs/cli/plugins/signing.html

Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.


│ Warning: Version constraints inside provider configuration blocks are deprecated
│
│   on docker.tf line 10, in provider "docker":
│   10: version = "~>2.7"
│
│ Terraform 0.13 and earlier allowed provider version constraints inside the provider
│ configuration block, but that is now deprecated and will be removed in a future
│ version of Terraform. To silence this warning, move the provider version constraint
│ into the required_providers block.


Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
PS C:\Terraform\Docker>
```

Step 4: Execute Terraform plan to see the available resources



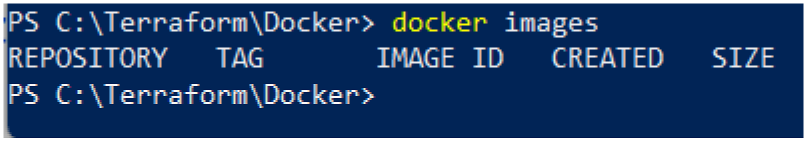
```
commands will detect it and remind you to do so if necessary.
PS C:\Terraform\Docker> terraform plan

Terraform used the selected providers to generate the following execution plan. Resource
actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # docker_image.ubuntu will be created
  + resource "docker_image" "ubuntu" {
      + id           = (known after apply)
      + latest       = (known after apply)
      + name         = "ubuntu:latest"
      + output       = (known after apply)
      + repo_digest = (known after apply)
    }

Plan: 1 to add, 0 to change, 0 to destroy.
│
│ Warning: Version constraints inside provider configuration blocks are deprecated
│
│   on docker.tf line 10, in provider "docker":
│   10:   version = "~> 2.7"
│
│ Terraform 0.13 and earlier allowed provider version constraints inside the provider
│ configuration block, but that is now deprecated and will be removed in a future version
│ of Terraform. To silence this warning, move the provider version constraint into the
│ required_providers block.
│


─────────────────────────────────────────────────────────────────────────────────────────

Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to
take exactly these actions if you run "terraform apply" now.
PS C:\Terraform\Docker>
```

Step 5: Execute Terraform apply to apply the configuration, which will automatically create and run the ubuntu Linux container based on our configuration.



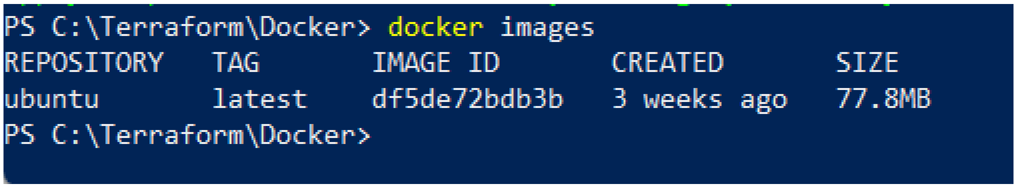
```
PS C:\Terraform\Docker> terraform apply

Terraform used the selected providers to generate the following execution plan. Resource
actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # docker_image.ubuntu will be created
  + resource "docker_image" "ubuntu" {
      + id          = (known after apply)
      + latest      = (known after apply)
      + name        = "ubuntu:latest"
      + output      = (known after apply)
      + repo_digest = (known after apply)
    }

Plan: 1 to add, 0 to change, 0 to destroy.

  Warning: Version constraints inside provider configuration blocks are deprecated

    on docker.tf line 10, in provider "docker":
    10:   version = "~> 2.7"

  Terraform 0.13 and earlier allowed provider version constraints inside the provider
  configuration block, but that is now deprecated and will be removed in a future version
  of Terraform. To silence this warning, move the provider version constraint into the
  required_providers block.


Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

docker_image.ubuntu: Creating...
docker_image.ubuntu: Still creating... [10s elapsed]
docker_image.ubuntu: Still creating... [20s elapsed]
docker_image.ubuntu: Creation complete after 21s [id=sha256:df5de72bdb3b711aba4eca685b1f42c7
22cc8a1837ed3fbd548a9282af2d836dubuntu:latest]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
PS C:\Terraform\Docker>
```

Docker images Before Executing Apply command:



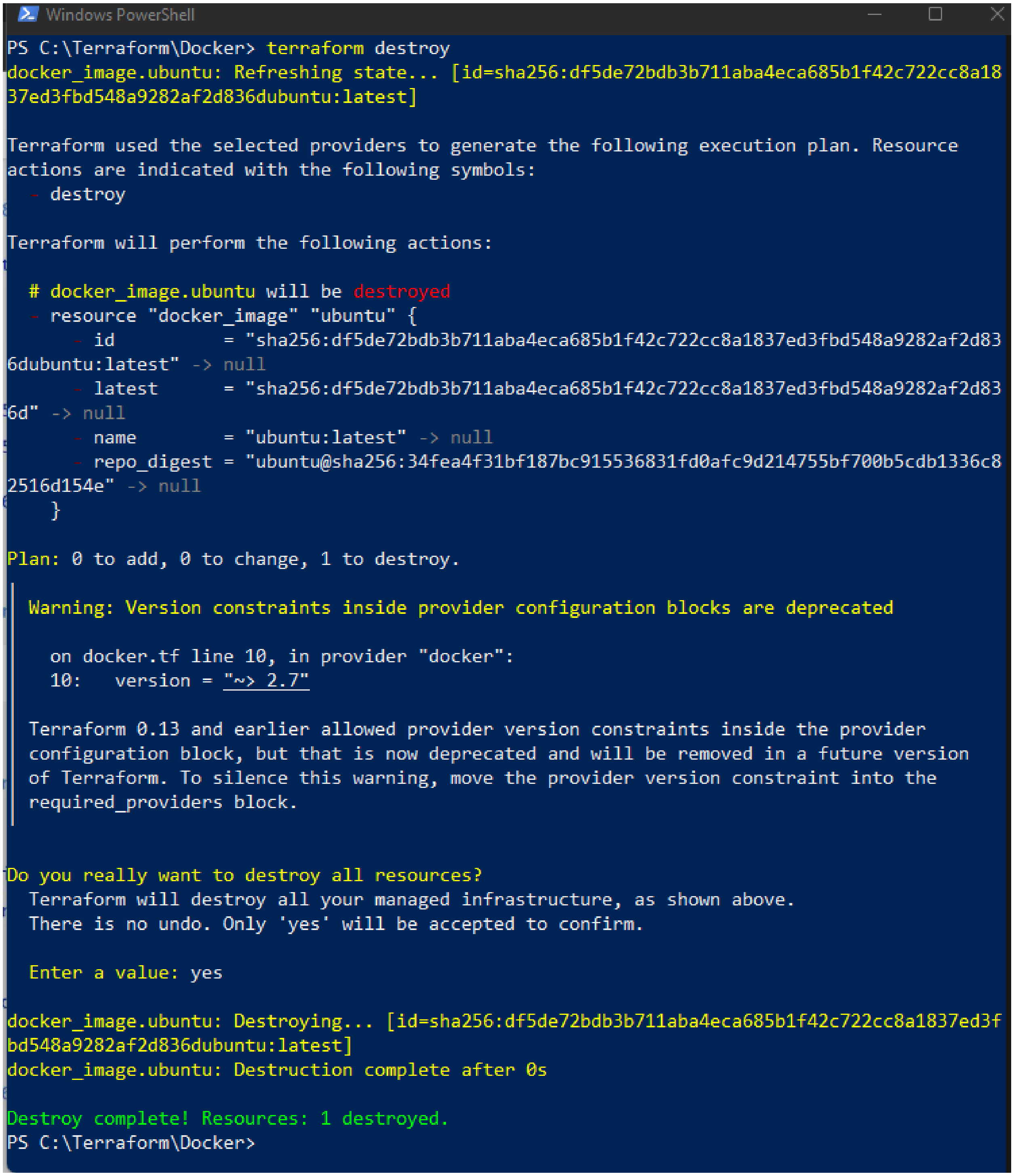
```
PS C:\Terraform\Docker> docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
PS C:\Terraform\Docker>
```

Docker images, After Executing Apply step:



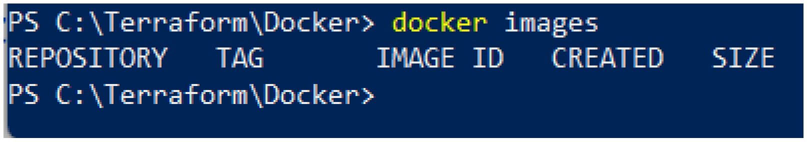
```
PS C:\Terraform\Docker> docker images
REPOSITORY    TAG       IMAGE ID       CREATED       SIZE
ubuntu        latest    df5de72bdb3b   3 weeks ago   77.8MB
PS C:\Terraform\Docker>
```

Step 6: Execute Terraform destroy to delete the configuration, which will automatically delete the Ubuntu Container



```
PS C:\Terraform\Docker> terraform destroy
docker_image.ubuntu: Refreshing state... [id=sha256:df5de72bdb3b711aba4eca685b1f42c722cc8a18
37ed3fbd548a9282af2d836dubuntu:latest]

Terraform used the selected providers to generate the following execution plan. Resource
actions are indicated with the following symbols:
  - destroy

Terraform will perform the following actions:

  # docker_image.ubuntu will be destroyed
  - resource "docker_image" "ubuntu" {
      - id          = "sha256:df5de72bdb3b711aba4eca685b1f42c722cc8a1837ed3fbd548a9282af2d83
6dubuntu:latest" -> null
      - latest      = "sha256:df5de72bdb3b711aba4eca685b1f42c722cc8a1837ed3fbd548a9282af2d83
6d" -> null
      - name        = "ubuntu:latest" -> null
      - repo_digest = "ubuntu@sha256:34fea4f31bf187bc915536831fd0afc9d214755bf700b5cdb1336c8
2516d154e" -> null
    }

Plan: 0 to add, 0 to change, 1 to destroy.
│
│ Warning: Version constraints inside provider configuration blocks are deprecated
│
│   on docker.tf line 10, in provider "docker":
│   10:   version = "~> 2.7"
│
│ Terraform 0.13 and earlier allowed provider version constraints inside the provider
│ configuration block, but that is now deprecated and will be removed in a future version
│ of Terraform. To silence this warning, move the provider version constraint into the
│ required_providers block.
│

Do you really want to destroy all resources?
  Terraform will destroy all your managed infrastructure, as shown above.
  There is no undo. Only 'yes' will be accepted to confirm.

  Enter a value: yes

docker_image.ubuntu: Destroying... [id=sha256:df5de72bdb3b711aba4eca685b1f42c722cc8a1837ed3f
bd548a9282af2d836dubuntu:latest]
docker_image.ubuntu: Destruction complete after 0s

Destroy complete! Resources: 1 destroyed.
PS C:\Terraform\Docker>
```

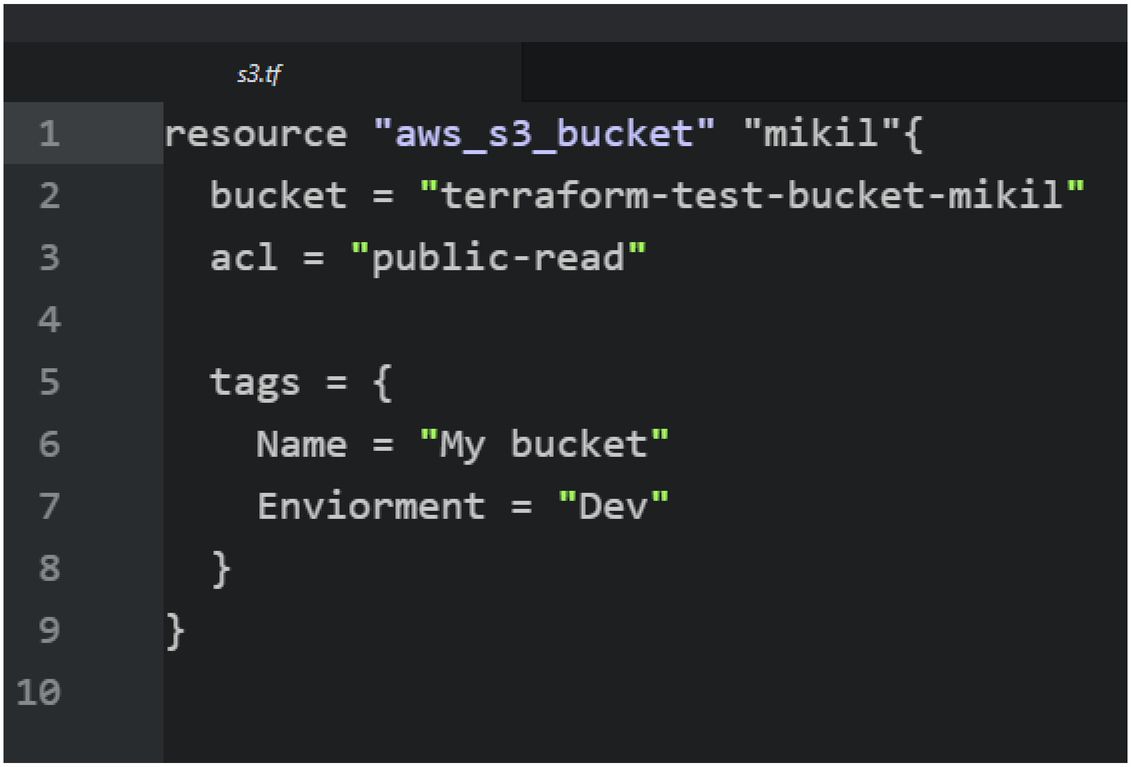
Docker images After Executing Destroy step:



```
PS C:\Terraform\Docker> docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
PS C:\Terraform\Docker>
```

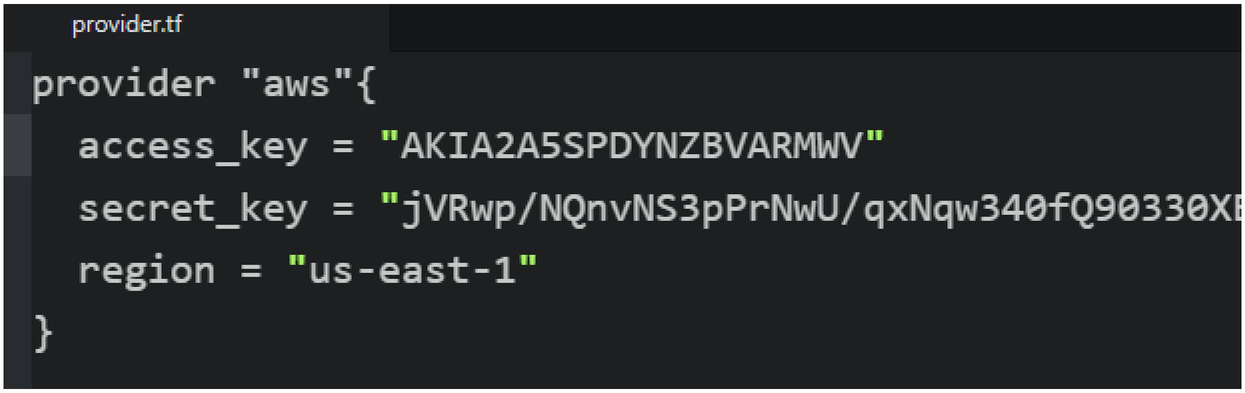
Creating S3 Bucket using terraform

Step 1: Write a Terraform Script in Atom for creating S3 Bucket on Amazon AWS



```
resource "aws_s3_bucket" "mikil"{
  bucket = "terraform-test-bucket-mikil"
  acl = "public-read"

  tags = {
    Name = "My bucket"
    Enviorment = "Dev"
  }
}
```

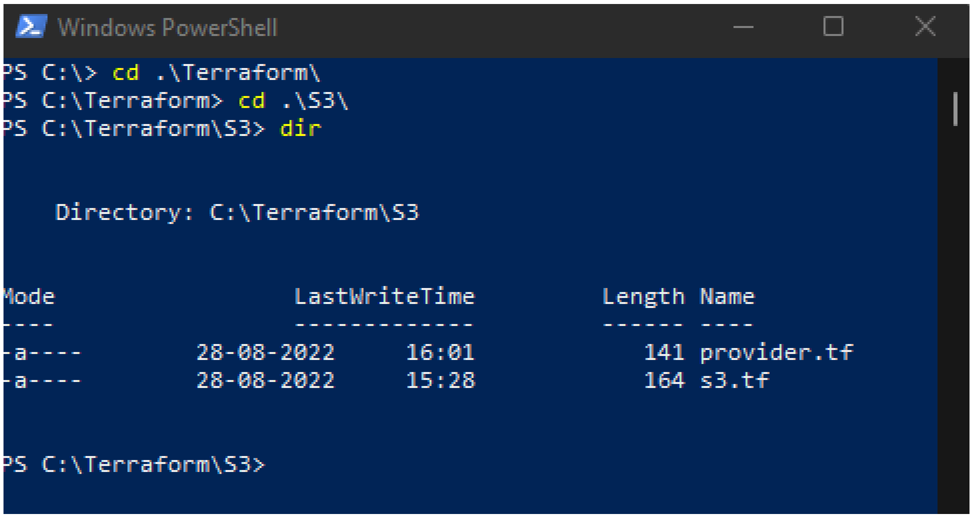
Create a new provider.tf file and write the following contents into it.



```
provider "aws"{
  access_key = "AKIA2A5SPDYNZBVARMWV"
  secret_key = "jVRwp/NQnvNS3pPrNwU/qxNqw340fQ90330X
  region = "us-east-1"
}
```

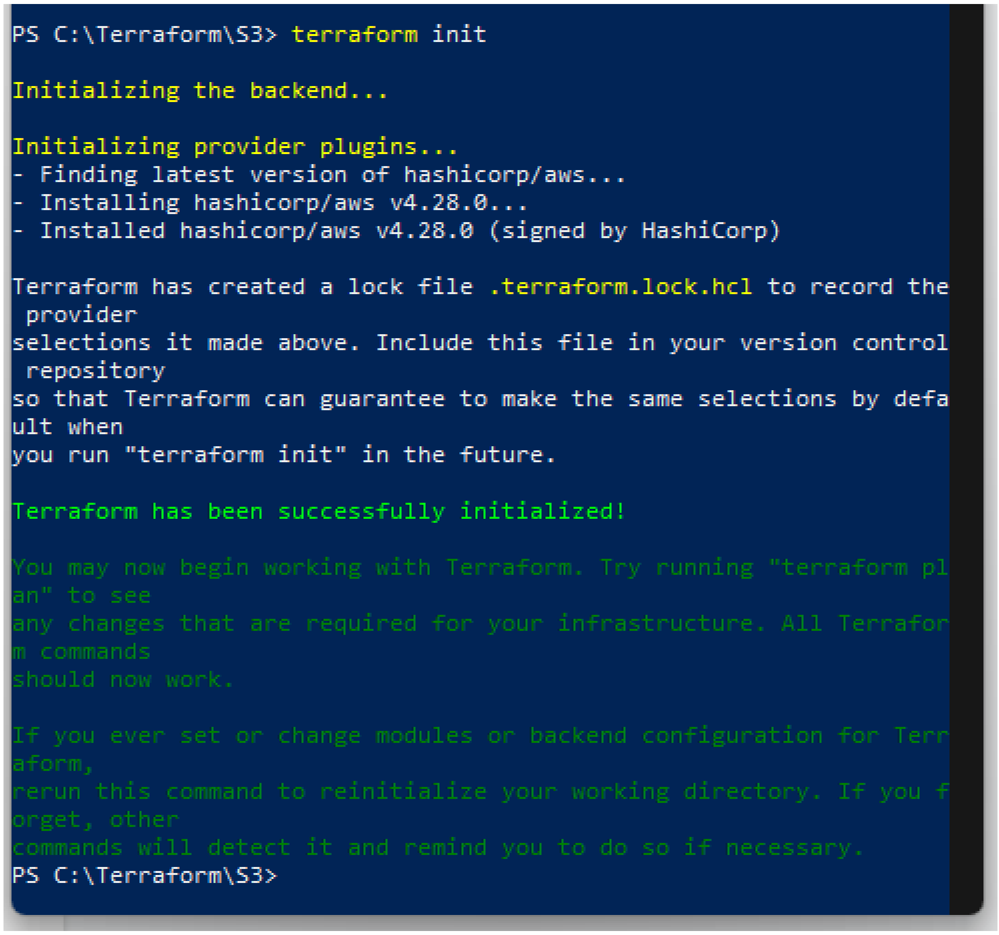
Save both the files in the same directory Terraform/S3

Step 2: Open Command Prompt and go to Terraform\S3 directory where our .tf files are stored



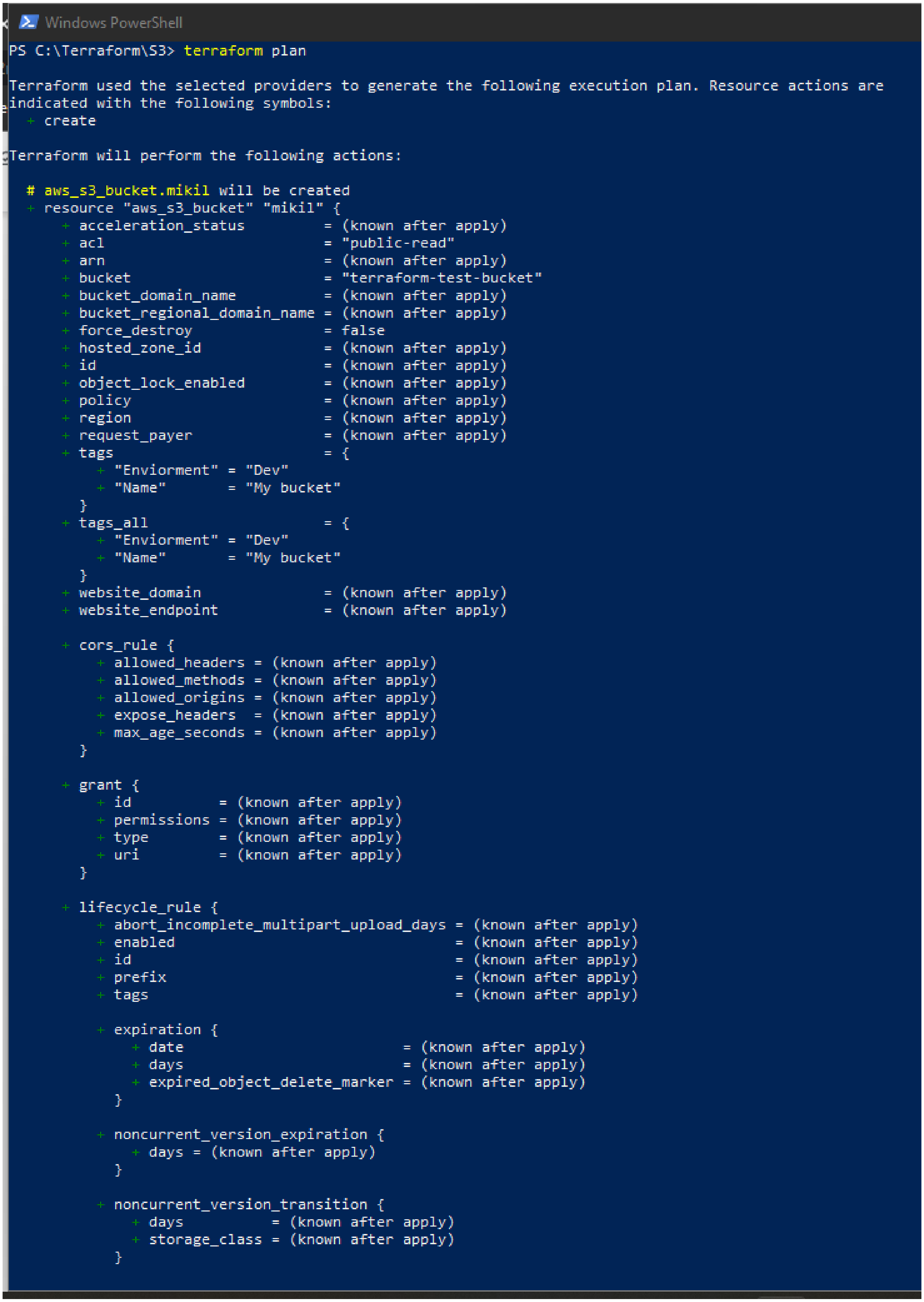
```
PS C:\> cd .\Terraform\
PS C:\Terraform> cd .\S3\
PS C:\Terraform\S3> dir


    Directory: C:\Terraform\S3


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        28-08-2022     16:01            141 provider.tf
-a----        28-08-2022     15:28            164 s3.tf


PS C:\Terraform\S3>
```

Step 3: Execute Terraform Init command to initialize the resources

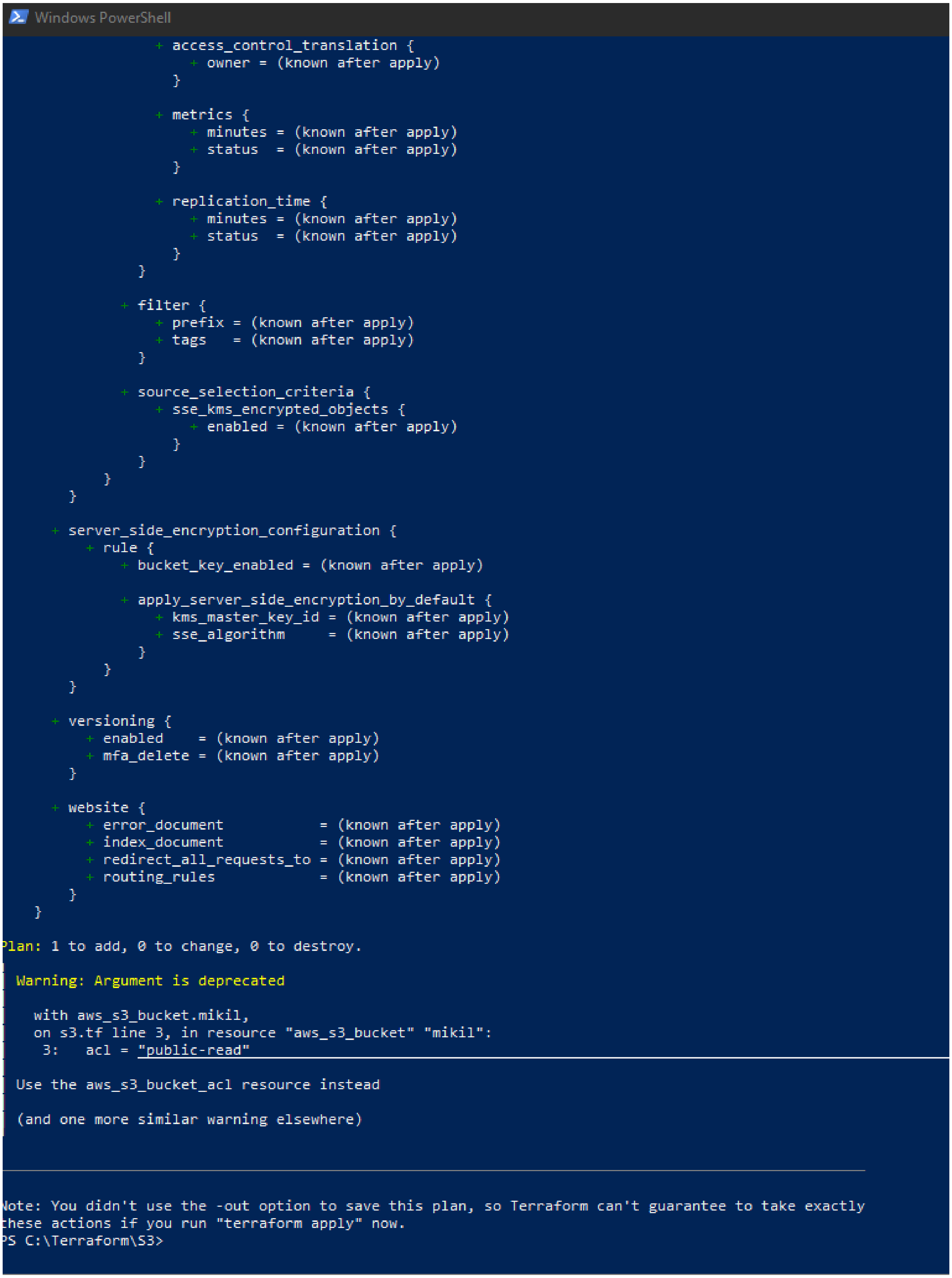


```
PS C:\Terraform\S3> terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v4.28.0...
- Installed hashicorp/aws v4.28.0 (signed by HashiCorp)

Terraform has created a lock file .terraform.lock.hcl to record the
 provider
selections it made above. Include this file in your version control
 repository
so that Terraform can guarantee to make the same selections by defa
ult when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform pl
an" to see
any changes that are required for your infrastructure. All Terrafor
m commands
should now work.

If you ever set or change modules or backend configuration for Terr
aform,
rerun this command to reinitialize your working directory. If you f
orget, other
commands will detect it and remind you to do so if necessary.
PS C:\Terraform\S3>
```

Step 4: Execute Terraform plan to see the available resources

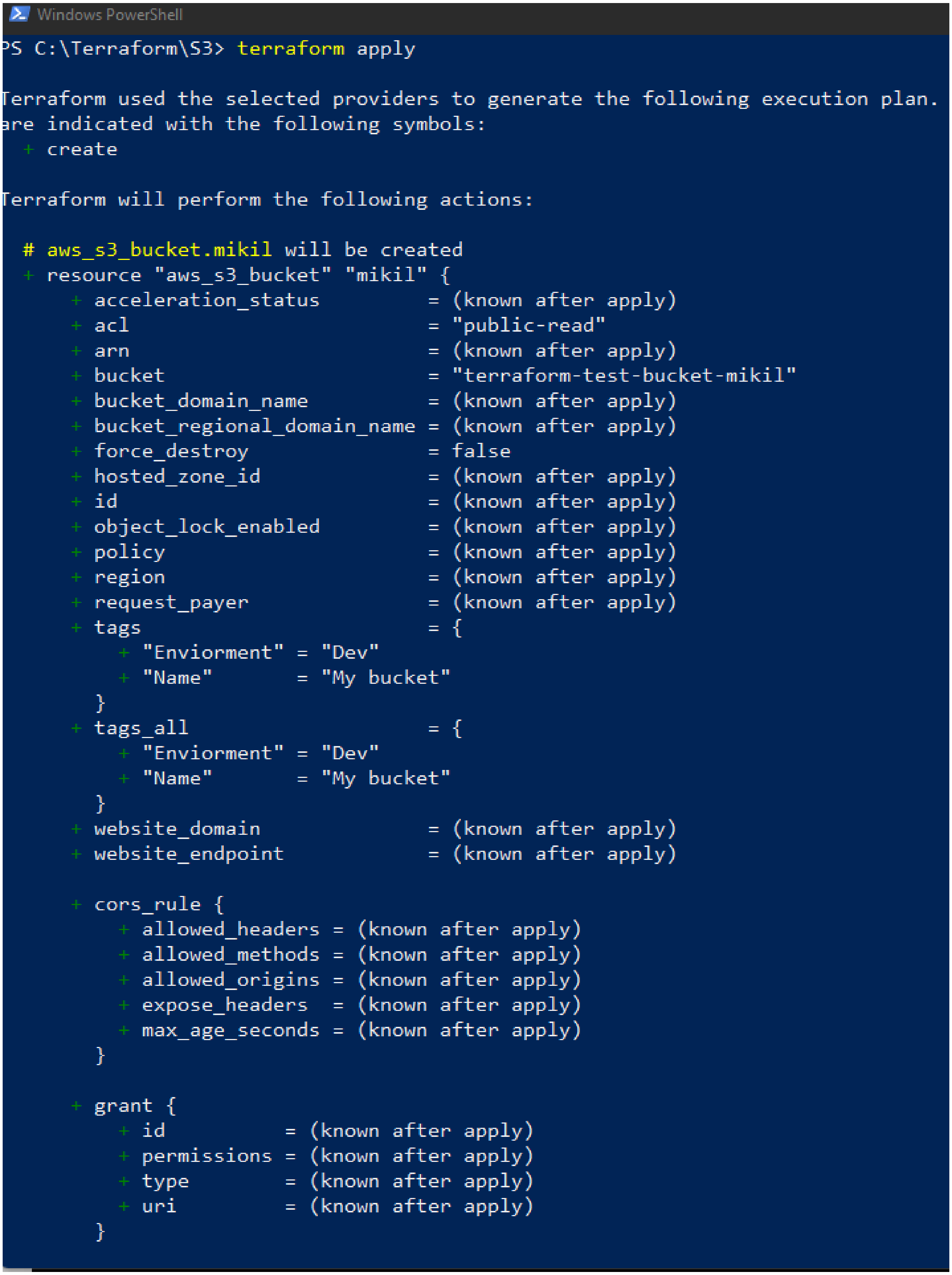


```
PS C:\Terraform\S3> terraform plan

Terraform used the selected providers to generate the following execution plan. Resource actions are
indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_s3_bucket.mikil will be created
  + resource "aws_s3_bucket" "mikil" {
      + acceleration_status         = (known after apply)
      + acl                         = "public-read"
      + arn                         = (known after apply)
      + bucket                      = "terraform-test-bucket"
      + bucket_domain_name          = (known after apply)
      + bucket_regional_domain_name = (known after apply)
      + force_destroy               = false
      + hosted_zone_id              = (known after apply)
      + id                          = (known after apply)
      + object_lock_enabled         = (known after apply)
      + policy                      = (known after apply)
      + region                      = (known after apply)
      + request_payer               = (known after apply)
      + tags                        = {
          + "Enviorment" = "Dev"
          + "Name"       = "My bucket"
        }
      + tags_all                    = {
          + "Enviorment" = "Dev"
          + "Name"       = "My bucket"
        }
      + website_domain              = (known after apply)
      + website_endpoint            = (known after apply)

      + cors_rule {
          + allowed_headers = (known after apply)
          + allowed_methods = (known after apply)
          + allowed_origins = (known after apply)
          + expose_headers  = (known after apply)
          + max_age_seconds = (known after apply)
        }

      + grant {
          + id          = (known after apply)
          + permissions = (known after apply)
          + type        = (known after apply)
          + uri         = (known after apply)
        }

      + lifecycle_rule {
          + abort_incomplete_multipart_upload_days = (known after apply)
          + enabled                                = (known after apply)
          + id                                     = (known after apply)
          + prefix                                 = (known after apply)
          + tags                                   = (known after apply)

          + expiration {
              + date                         = (known after apply)
              + days                         = (known after apply)
              + expired_object_delete_marker = (known after apply)
            }

          + noncurrent_version_expiration {
              + days = (known after apply)
            }

          + noncurrent_version_transition {
              + days          = (known after apply)
              + storage_class = (known after apply)
            }
```

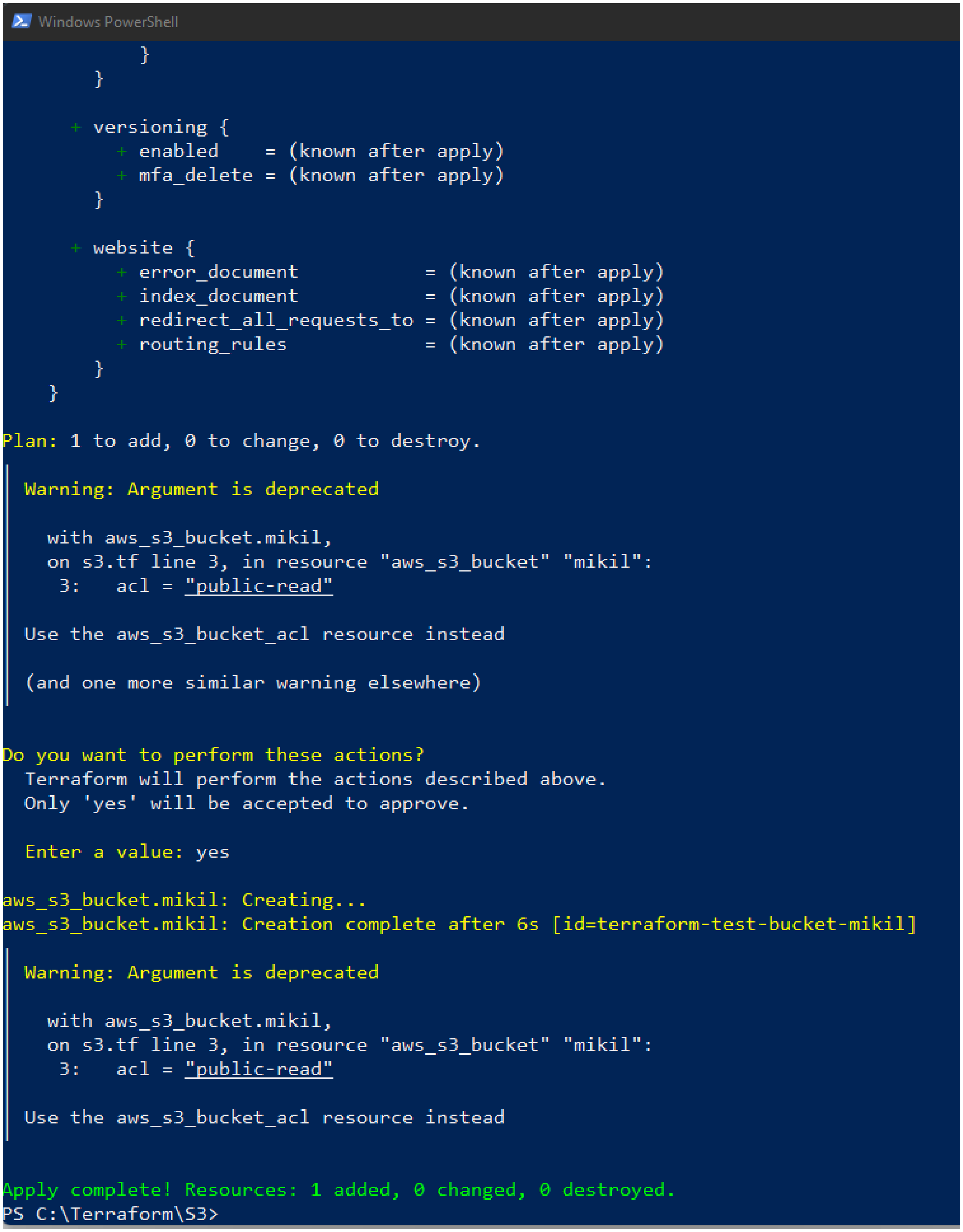


```
                  + access_control_translation {
                      + owner = (known after apply)
                    }

                  + metrics {
                      + minutes = (known after apply)
                      + status  = (known after apply)
                    }

                  + replication_time {
                      + minutes = (known after apply)
                      + status  = (known after apply)
                    }
                }

              + filter {
                  + prefix = (known after apply)
                  + tags   = (known after apply)
                }

              + source_selection_criteria {
                  + sse_kms_encrypted_objects {
                      + enabled = (known after apply)
                    }
                }
            }
        }

      + server_side_encryption_configuration {
          + rule {
              + bucket_key_enabled = (known after apply)

              + apply_server_side_encryption_by_default {
                  + kms_master_key_id = (known after apply)
                  + sse_algorithm     = (known after apply)
                }
            }
        }

      + versioning {
          + enabled    = (known after apply)
          + mfa_delete = (known after apply)
        }

      + website {
          + error_document           = (known after apply)
          + index_document           = (known after apply)
          + redirect_all_requests_to = (known after apply)
          + routing_rules            = (known after apply)
        }
    }

Plan: 1 to add, 0 to change, 0 to destroy.
│
│ Warning: Argument is deprecated
│
│   with aws_s3_bucket.mikil,
│   on s3.tf line 3, in resource "aws_s3_bucket" "mikil":
│    3:   acl = "public-read"
│
│ Use the aws_s3_bucket_acl resource instead
│
│ (and one more similar warning elsewhere)


Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly
these actions if you run "terraform apply" now.
PS C:\Terraform\S3>
```

Step 5: Execute Terraform apply to apply the configuration, which will automatically create an S3 bucket based on our configuration.

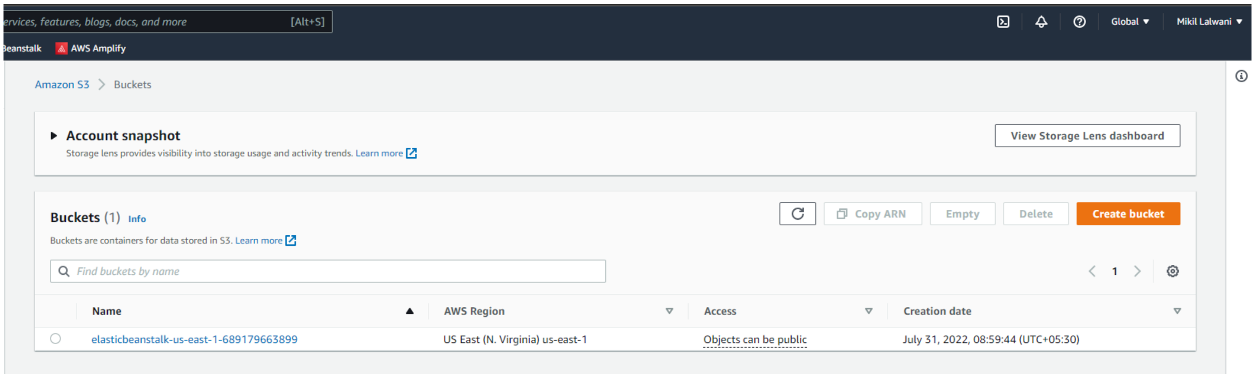


```
PS C:\Terraform\S3> terraform apply

Terraform used the selected providers to generate the following execution plan.
are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_s3_bucket.mikil will be created
  + resource "aws_s3_bucket" "mikil" {
      + acceleration_status         = (known after apply)
      + acl                         = "public-read"
      + arn                         = (known after apply)
      + bucket                      = "terraform-test-bucket-mikil"
      + bucket_domain_name          = (known after apply)
      + bucket_regional_domain_name = (known after apply)
      + force_destroy               = false
      + hosted_zone_id              = (known after apply)
      + id                          = (known after apply)
      + object_lock_enabled         = (known after apply)
      + policy                      = (known after apply)
      + region                      = (known after apply)
      + request_payer               = (known after apply)
      + tags                        = {
          + "Enviorment" = "Dev"
          + "Name"       = "My bucket"
        }
      + tags_all                    = {
          + "Enviorment" = "Dev"
          + "Name"       = "My bucket"
        }
      + website_domain              = (known after apply)
      + website_endpoint            = (known after apply)

      + cors_rule {
          + allowed_headers = (known after apply)
          + allowed_methods = (known after apply)
          + allowed_origins = (known after apply)
          + expose_headers  = (known after apply)
          + max_age_seconds = (known after apply)
        }

      + grant {
          + id          = (known after apply)
          + permissions = (known after apply)
          + type        = (known after apply)
          + uri         = (known after apply)
        }
```



```
            }
        }

      + versioning {
          + enabled    = (known after apply)
          + mfa_delete = (known after apply)
        }

      + website {
          + error_document           = (known after apply)
          + index_document           = (known after apply)
          + redirect_all_requests_to = (known after apply)
          + routing_rules            = (known after apply)
        }
    }

Plan: 1 to add, 0 to change, 0 to destroy.
│
│  Warning: Argument is deprecated
│
│    with aws_s3_bucket.mikil,
│    on s3.tf line 3, in resource "aws_s3_bucket" "mikil":
│     3:    acl = "public-read"
│
│  Use the aws_s3_bucket_acl resource instead
│
│  (and one more similar warning elsewhere)
│

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_s3_bucket.mikil: Creating...
aws_s3_bucket.mikil: Creation complete after 6s [id=terraform-test-bucket-mikil]
│
│  Warning: Argument is deprecated
│
│    with aws_s3_bucket.mikil,
│    on s3.tf line 3, in resource "aws_s3_bucket" "mikil":
│     3:    acl = "public-read"
│
│  Use the aws_s3_bucket_acl resource instead
│

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
PS C:\Terraform\S3>
```

AWS S3bucket dashboard, Before Executing Apply command:



▸ **Account snapshot**

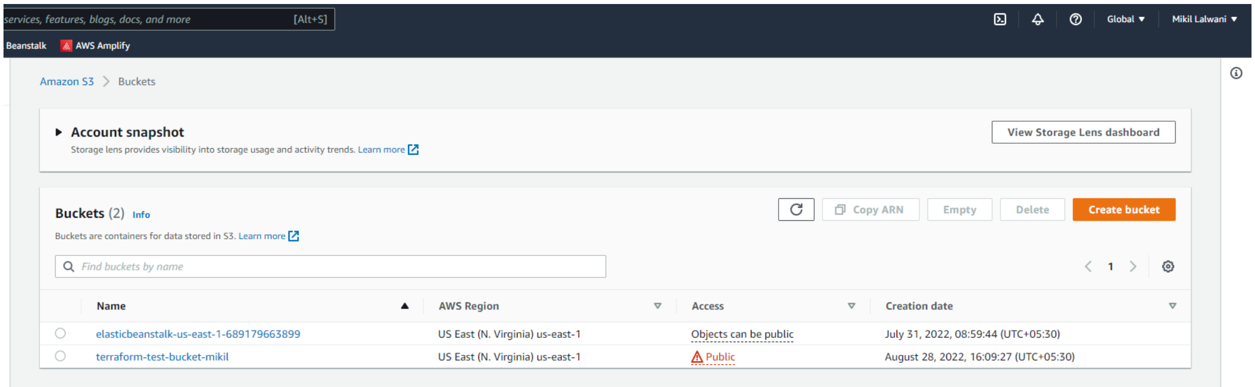
Storage lens provides visibility into storage usage and activity trends. Learn more

Buckets (1) Info

Buckets are containers for data stored in S3. Learn more

	Name	AWS Region	Access	Creation date
○	elasticbeanstalk-us-east-1-689179663899	US East (N. Virginia) us-east-1	Objects can be public	July 31, 2022, 08:59:44 (UTC+05:30)

AWS S3 Bucket dashboard, After Executing Apply step:



▸ **Account snapshot**

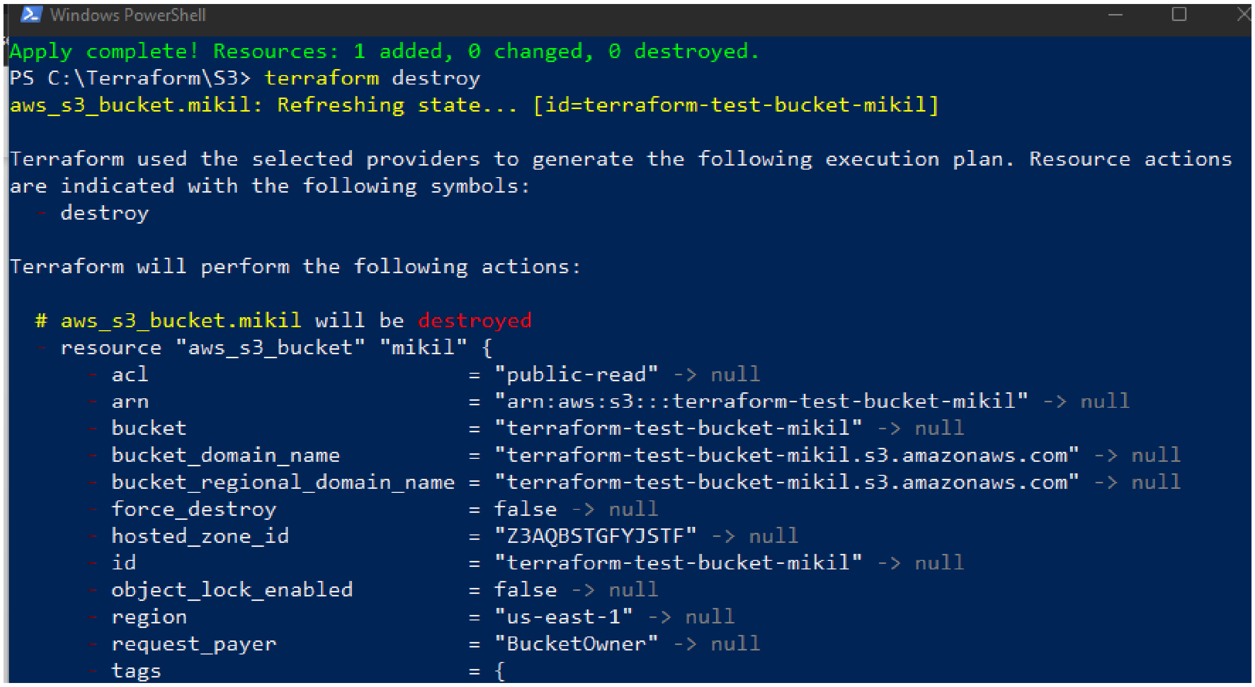
Storage lens provides visibility into storage usage and activity trends. Learn more

Buckets (2) Info

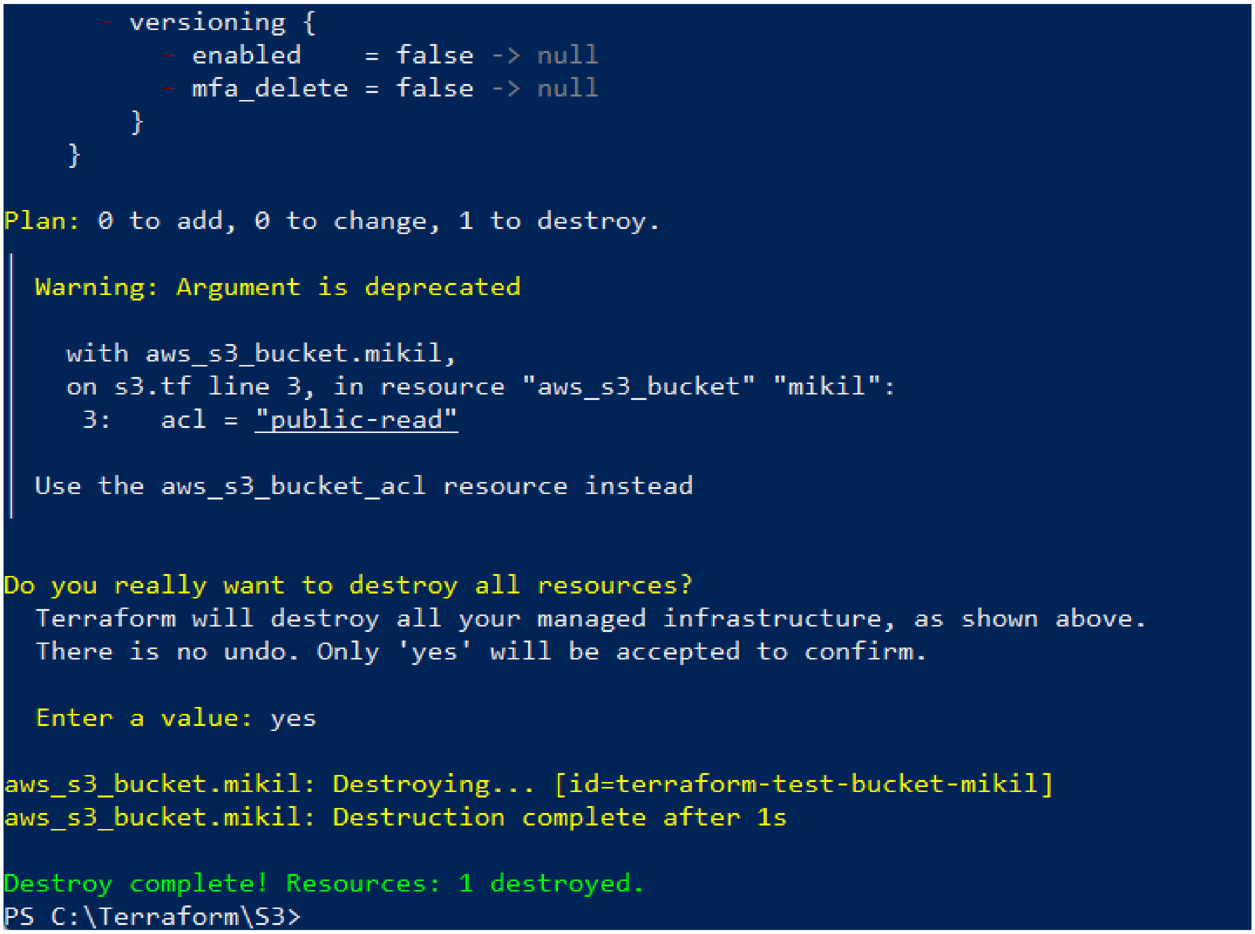
Buckets are containers for data stored in S3. Learn more

	Name	AWS Region	Access	Creation date
○	elasticbeanstalk-us-east-1-689179663899	US East (N. Virginia) us-east-1	Objects can be public	July 31, 2022, 08:59:44 (UTC+05:30)
○	terraform-test-bucket-mikil	US East (N. Virginia) us-east-1	⚠ Public	August 28, 2022, 16:09:27 (UTC+05:30)

Step 6: Execute Terraform destroy to delete the configuration, which will automatically delete an EC2 instance

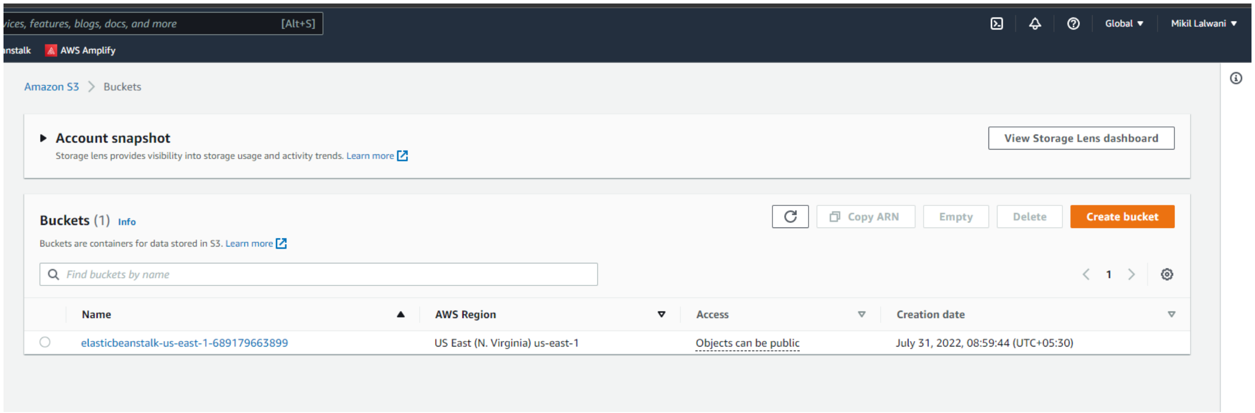


```
Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
PS C:\Terraform\S3> terraform destroy
aws_s3_bucket.mikil: Refreshing state... [id=terraform-test-bucket-mikil]

Terraform used the selected providers to generate the following execution plan. Resource actions
are indicated with the following symbols:
  - destroy

Terraform will perform the following actions:

  # aws_s3_bucket.mikil will be destroyed
  - resource "aws_s3_bucket" "mikil" {
      - acl                         = "public-read" -> null
      - arn                         = "arn:aws:s3:::terraform-test-bucket-mikil" -> null
      - bucket                      = "terraform-test-bucket-mikil" -> null
      - bucket_domain_name          = "terraform-test-bucket-mikil.s3.amazonaws.com" -> null
      - bucket_regional_domain_name = "terraform-test-bucket-mikil.s3.amazonaws.com" -> null
      - force_destroy               = false -> null
      - hosted_zone_id              = "Z3AQBSTGFYJSTF" -> null
      - id                          = "terraform-test-bucket-mikil" -> null
      - object_lock_enabled         = false -> null
      - region                      = "us-east-1" -> null
      - request_payer               = "BucketOwner" -> null
      - tags                        = {
```



```
      - versioning {
          - enabled    = false -> null
          - mfa_delete = false -> null
        }
    }

Plan: 0 to add, 0 to change, 1 to destroy.
│
│ Warning: Argument is deprecated
│
│   with aws_s3_bucket.mikil,
│   on s3.tf line 3, in resource "aws_s3_bucket" "mikil":
│    3:    acl = "public-read"
│
│ Use the aws_s3_bucket_acl resource instead
│

Do you really want to destroy all resources?
  Terraform will destroy all your managed infrastructure, as shown above.
  There is no undo. Only 'yes' will be accepted to confirm.

  Enter a value: yes

aws_s3_bucket.mikil: Destroying... [id=terraform-test-bucket-mikil]
aws_s3_bucket.mikil: Destruction complete after 1s

Destroy complete! Resources: 1 destroyed.
PS C:\Terraform\S3>
```

AWS EC2 dashboard, After Executing Destroy step:



▸ Account snapshot

Storage lens provides visibility into storage usage and activity trends. Learn more

Buckets (1) Info

Buckets are containers for data stored in S3. Learn more

	Name	AWS Region	Access	Creation date
○	elasticbeanstalk-us-east-1-689179663899	US East (N. Virginia) us-east-1	Objects can be public	July 31, 2022, 08:59:44 (UTC+05:30)

Creating EC2 instance using terraform

Step 1: Create a Working directory called “Terraform_Scripts” in C:\ drive for storing all the Terraform scripts

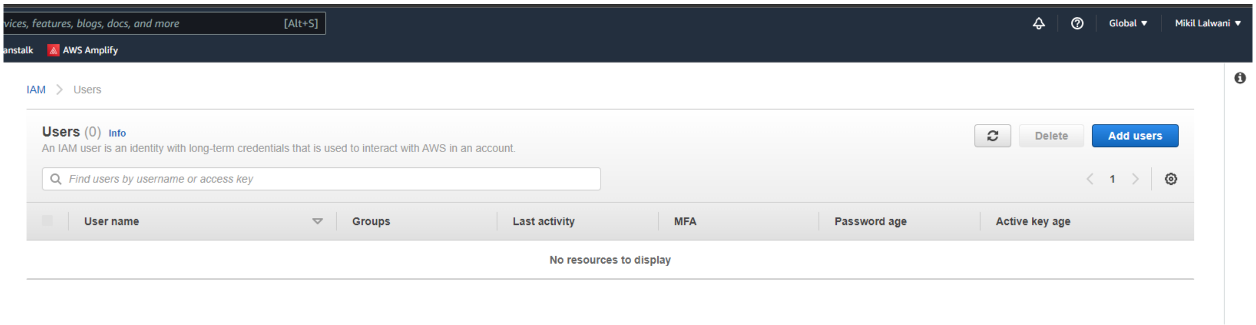
Step 2: Open Atom Editor and Open newly created folder “Terraform_Scripts” in it

Step 3: Create a new file called “EC2_on_Terraform” in it

Step 4: Open AWS Console and Search for IAM to get Access Key ID and Secrete Key

Open AWS Console: https://aws.amazon.com/console, Provide the credentials to Log in to Cloud Portal.

Now, search for IAM to get the Access Key ID and Secrete Key



vices, features, blogs, docs, and more [Alt+S]
anstalk
AWS Amplify
Global ▾
Mikil Lalwani ▾
IAM > Users

Users (0) Info

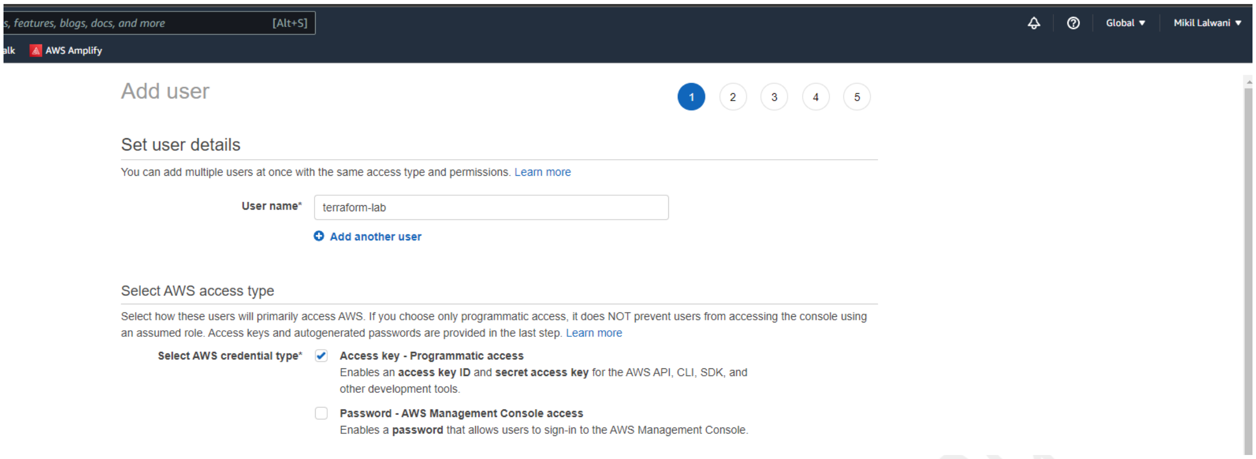
An IAM user is an identity with long-term credentials that is used to interact with AWS in an account.

Delete
Add users
Find users by username or access key
1

User name	Groups	Last activity	MFA	Password age	Active key age

No resources to display

Create a new user Terraform_user and select option Programmatic Access then click on next for “Permissions”



Set user details

You can add multiple users at once with the same access type and permissions. Learn more

User name* terraform-lab

Add another user

Select AWS access type

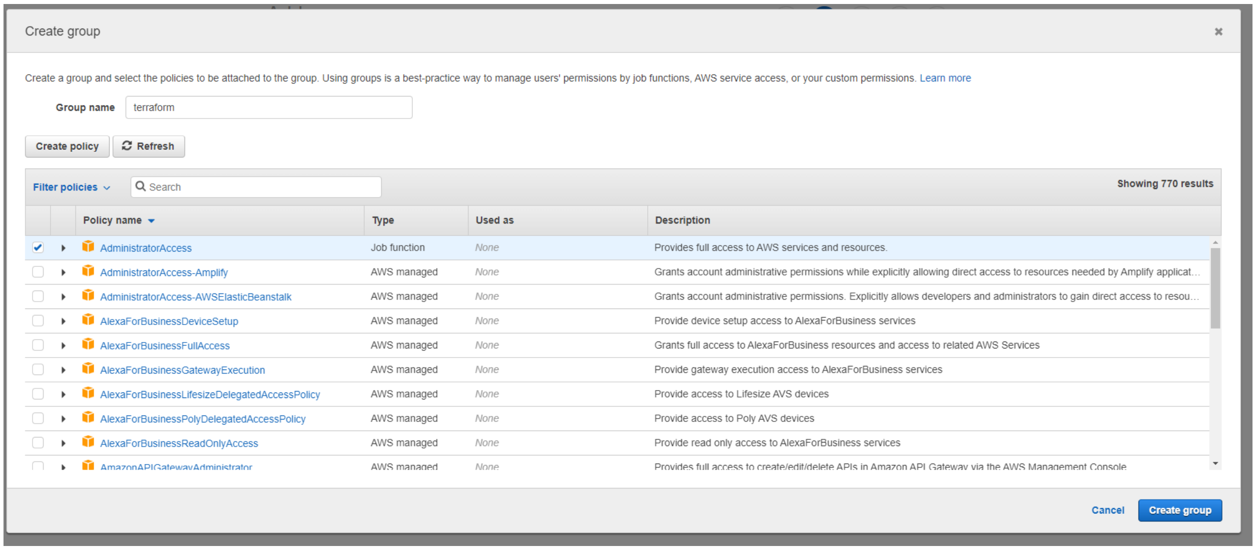
Select how these users will primarily access AWS. If you choose only programmatic access, it does NOT prevent users from accessing the console using an assumed role. Access keys and autogenerated passwords are provided in the last step. Learn more

Select AWS credential type* ☑ Access key - Programmatic access
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

□ Password - AWS Management Console access
Enables a **password** that allows users to sign-in to the AWS Management Console.

Now, Create a group “Terraform_Group” and assign permission as “Administrator Access”

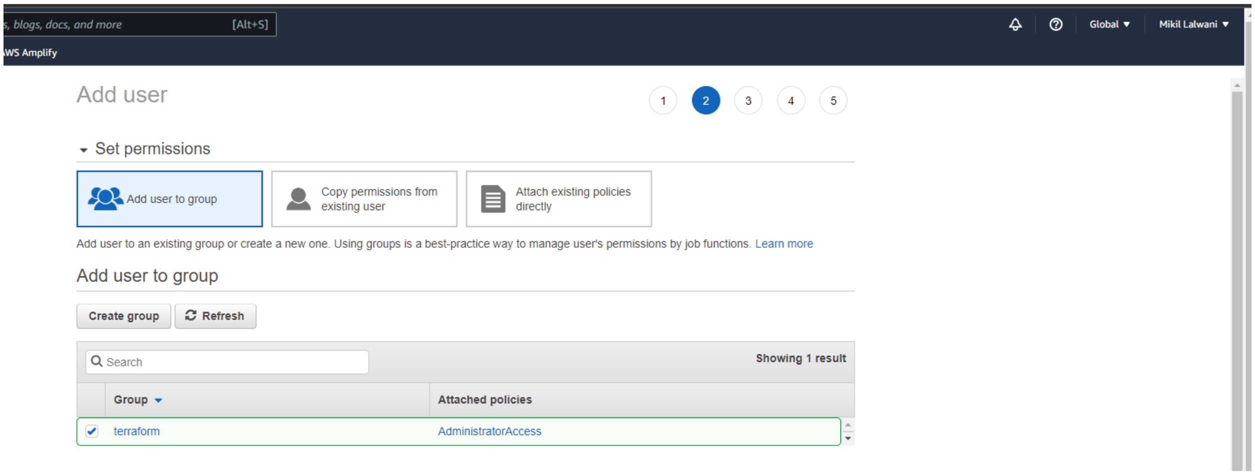
Now, Click on Create group followed by click on next for apecifying a Tag which is Optional



Create a group and select the policies to be attached to the group. Using groups is a best-practice way to manage users' permissions by job functions, AWS service access, or your custom permissions. Learn more

Group name: terraform

	Policy name	Type	Used as	Description
☑	AdministratorAccess	Job function	None	Provides full access to AWS services and resources.
□	AdministratorAccess-Amplify	AWS managed	None	Grants account administrative permissions while explicitly allowing direct access to resources needed by Amplify applicat...
□	AdministratorAccess-AWSElasticBeanstalk	AWS managed	None	Grants account administrative permissions. Explicitly allows developers and administrators to gain direct access to resou...
□	AlexaForBusinessDeviceSetup	AWS managed	None	Provide device setup access to AlexaForBusiness services
□	AlexaForBusinessFullAccess	AWS managed	None	Grants full access to AlexaForBusiness resources and access to related AWS Services
□	AlexaForBusinessGatewayExecution	AWS managed	None	Provide gateway execution access to AlexaForBusiness services
□	AlexaForBusinessLifesizeDelegatedAccessPolicy	AWS managed	None	Provide access to Lifesize AVS devices
□	AlexaForBusinessPolyDelegatedAccessPolicy	AWS managed	None	Provide access to Poly AVS devices
□	AlexaForBusinessReadOnlyAccess	AWS managed	None	Provide read only access to AlexaForBusiness services
□	AmazonAPIGatewayAdministrator	AWS managed	None	Provides full access to create/edit/delete APIs in Amazon API Gateway via the AWS Management Console



Add user

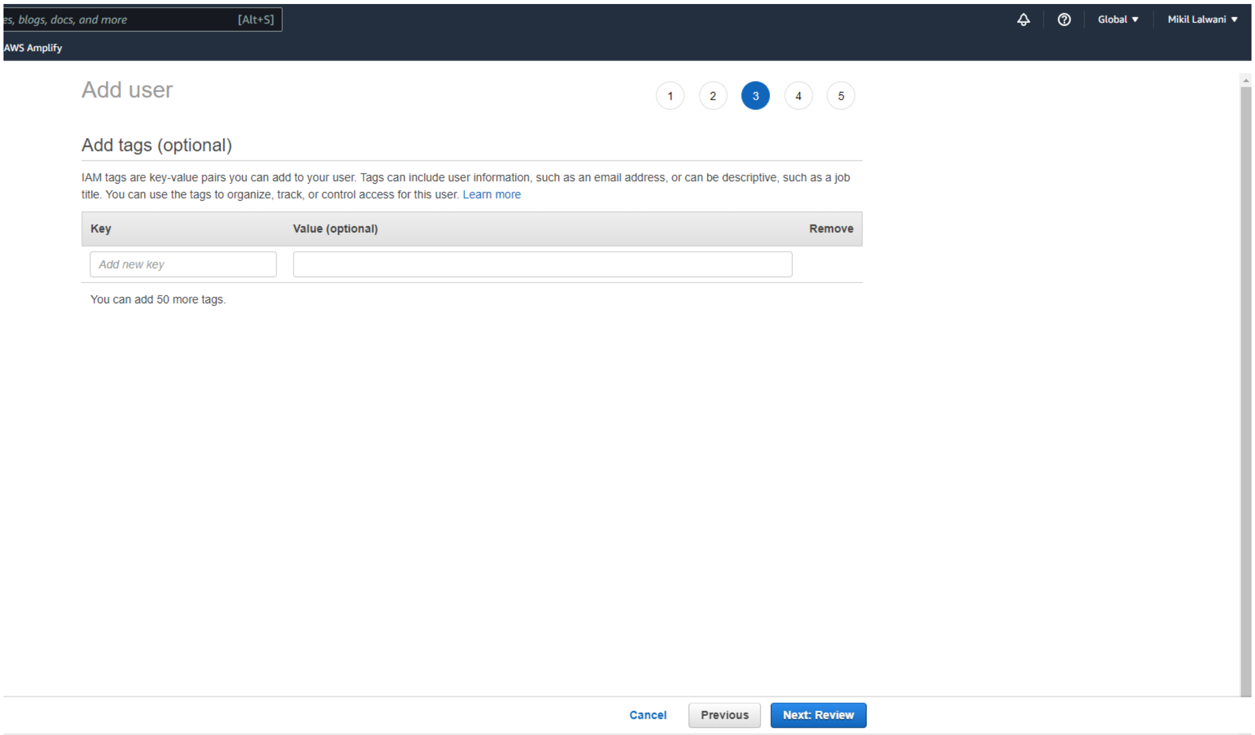
Set permissions

Add user to group
Copy permissions from existing user
Attach existing policies directly

Add user to an existing group or create a new one. Using groups is a best-practice way to manage user's permissions by job functions. Learn more

Add user to group

	Group	Attached policies
☑	terraform	AdministratorAccess



Add user

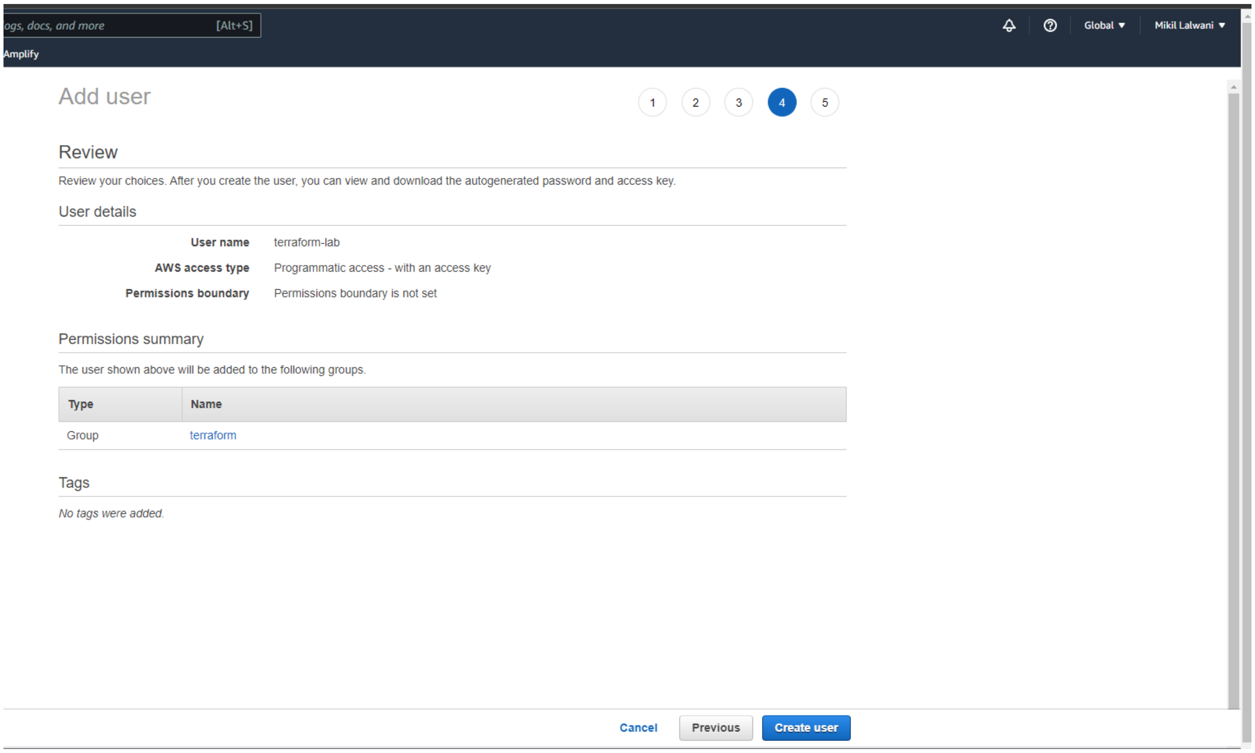
Add tags (optional)

IAM tags are key-value pairs you can add to your user. Tags can include user information, such as an email address, or can be descriptive, such as a job title. You can use the tags to organize, track, or control access for this user. Learn more

Key	Value (optional)	Remove
Add new key		

You can add 50 more tags.

Finally, Click on Next and Create user button to Create a New User.



Add user

Review

Review your choices. After you create the user, you can view and download the autogenerated password and access key.

User details

User name	terraform-lab
AWS access type	Programmatic access - with an access key
Permissions boundary	Permissions boundary is not set

Permissions summary

The user shown above will be added to the following groups.

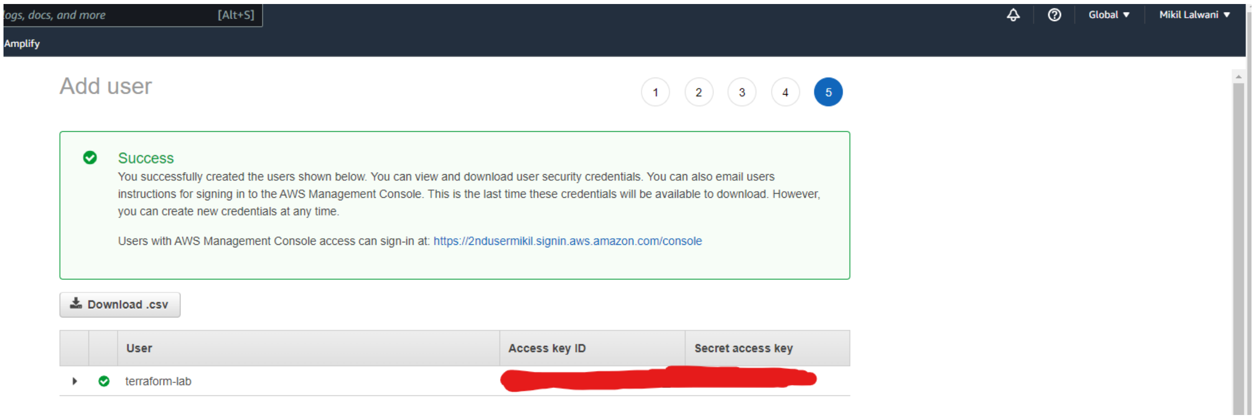
Type	Name
Group	terraform

Tags

No tags were added.

Now, Copy the Access Key ID and Secret Access Key for using it in Terraform Script,or Download .CSV file and save it for using Access Key ID and Secret Access in Key for

Terraform Script



Add user

Success

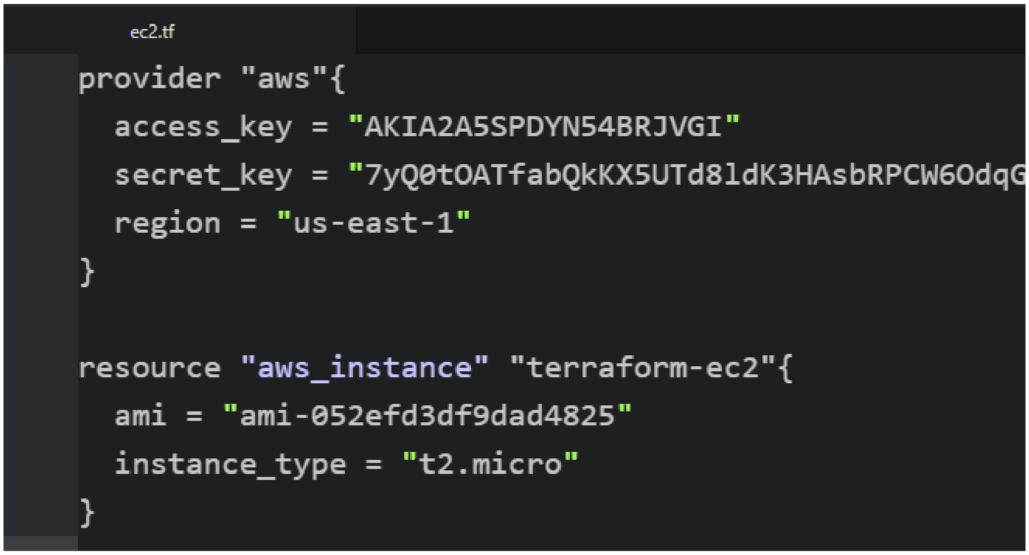
You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time.

Users with AWS Management Console access can sign-in at: https://2ndusermikil.signin.aws.amazon.com/console

Download .csv

		User	Access key ID	Secret access key
▸	✓	terraform-lab	[redacted]	[redacted]

Step 5: Write Terraform Script in Atom for creating a EC2 instance using an automated Script



```
provider "aws"{
  access_key = "AKIA2A5SPDYN54BRJVGI"
  secret_key = "7yQ0tOATfabQkKX5UTd8ldK3HAsbRPCW6OdqG
  region = "us-east-1"
}

resource "aws_instance" "terraform-ec2"{
  ami = "ami-052efd3df9dad4825"
  instance_type = "t2.micro"
}
```

In this Script, access_key = "________", secret_key = "________" and ami = "_______" needs to be specified as per Operating ststem and EC2 instance id.

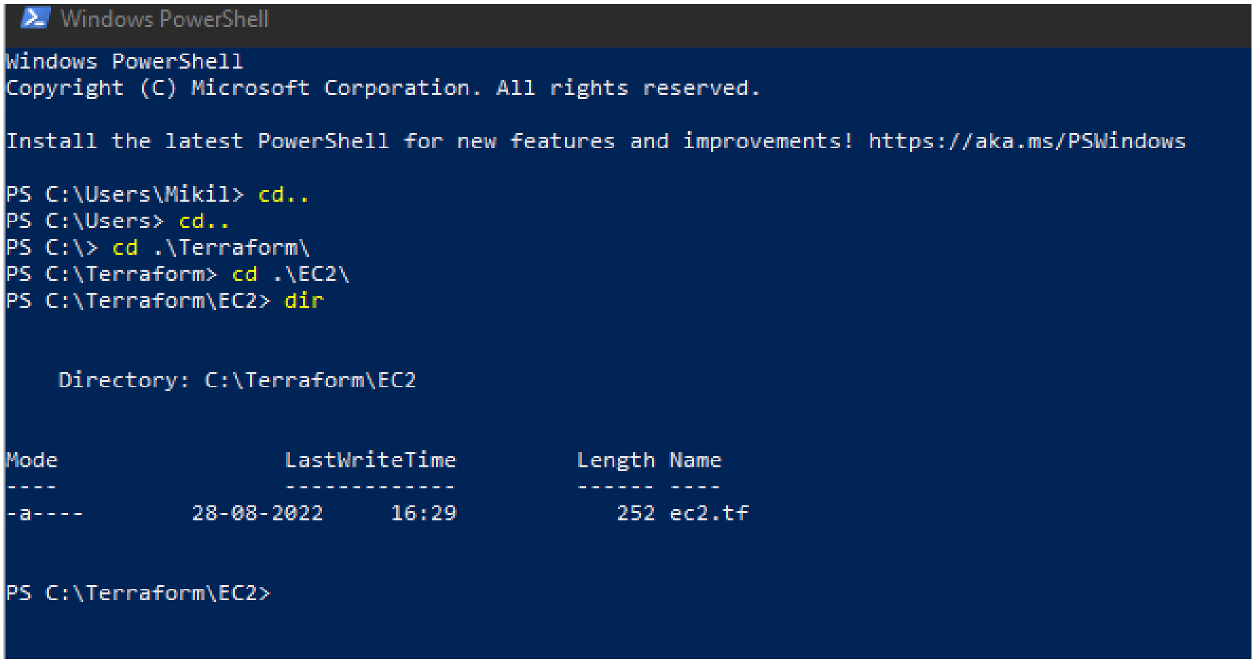
The access_key and secret_key can be used from previous step i.e. using CSV file or copied from user section of IAM service.

AMI stands for Amazon Machine Image which is the id of EC2 Virtual machine instance which can be copied from AWS EC2 service ami = "__"

To get AMI, First open AWS console and open EC2 service.
Click on Launch instance, which will show you list of Operating systems for which EC2 instance to be created. Copy the AMI id of an image for which instance to be created and

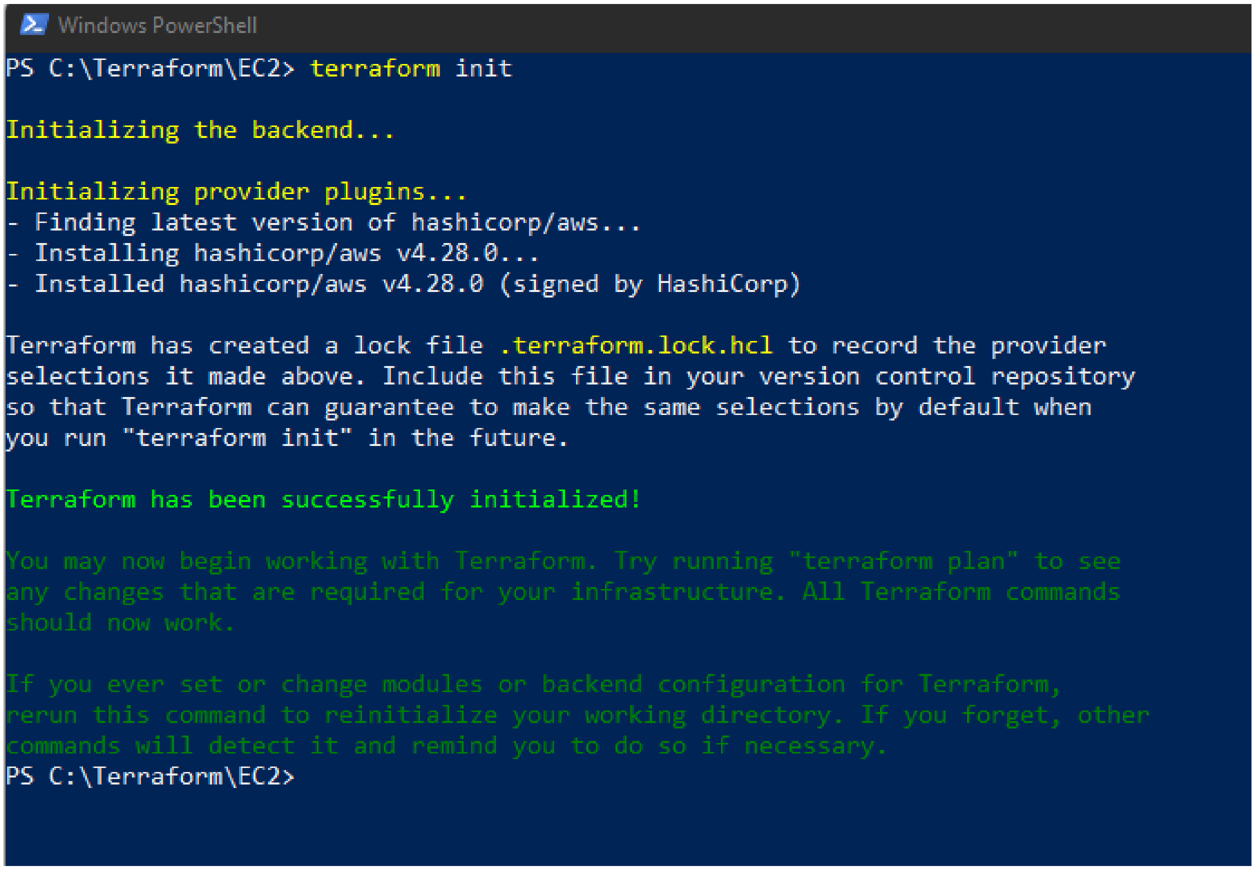
paste it into our terraform Script. [Note: Ami changes region to region, so see the region before copying AMI which is mentioned in the script, in our example it is us-east-1]

Step 7: Open Command Prompt and go to Terraform_Script directory where our .tf files are stored



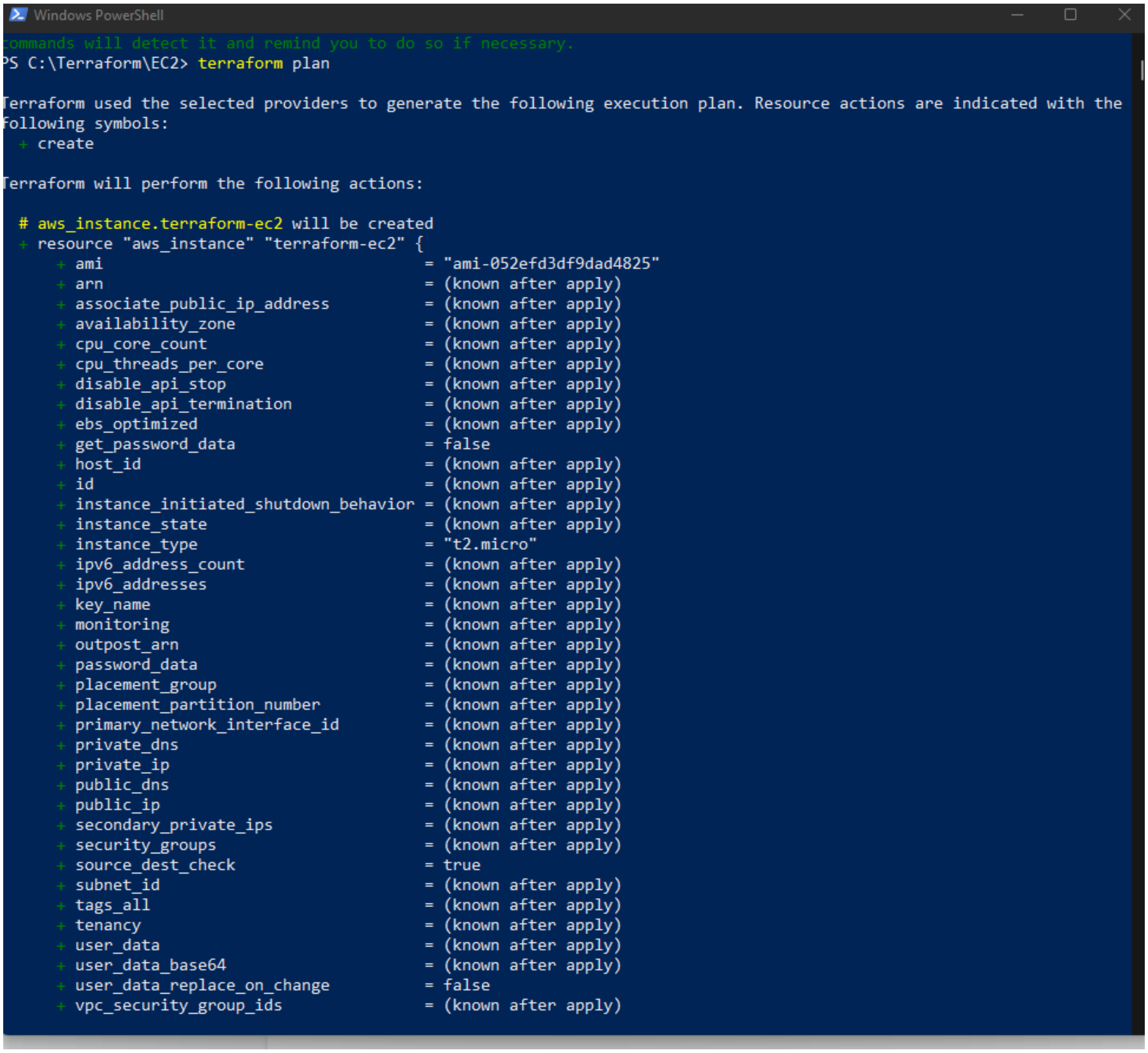
```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS C:\Users\Mikil> cd..
PS C:\Users> cd..
PS C:\> cd .\Terraform\
PS C:\Terraform> cd .\EC2\
PS C:\Terraform\EC2> dir


    Directory: C:\Terraform\EC2


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----        28-08-2022     16:29            252 ec2.tf


PS C:\Terraform\EC2>
```

Step 8: Execute Terraform Init command to initialize the resources

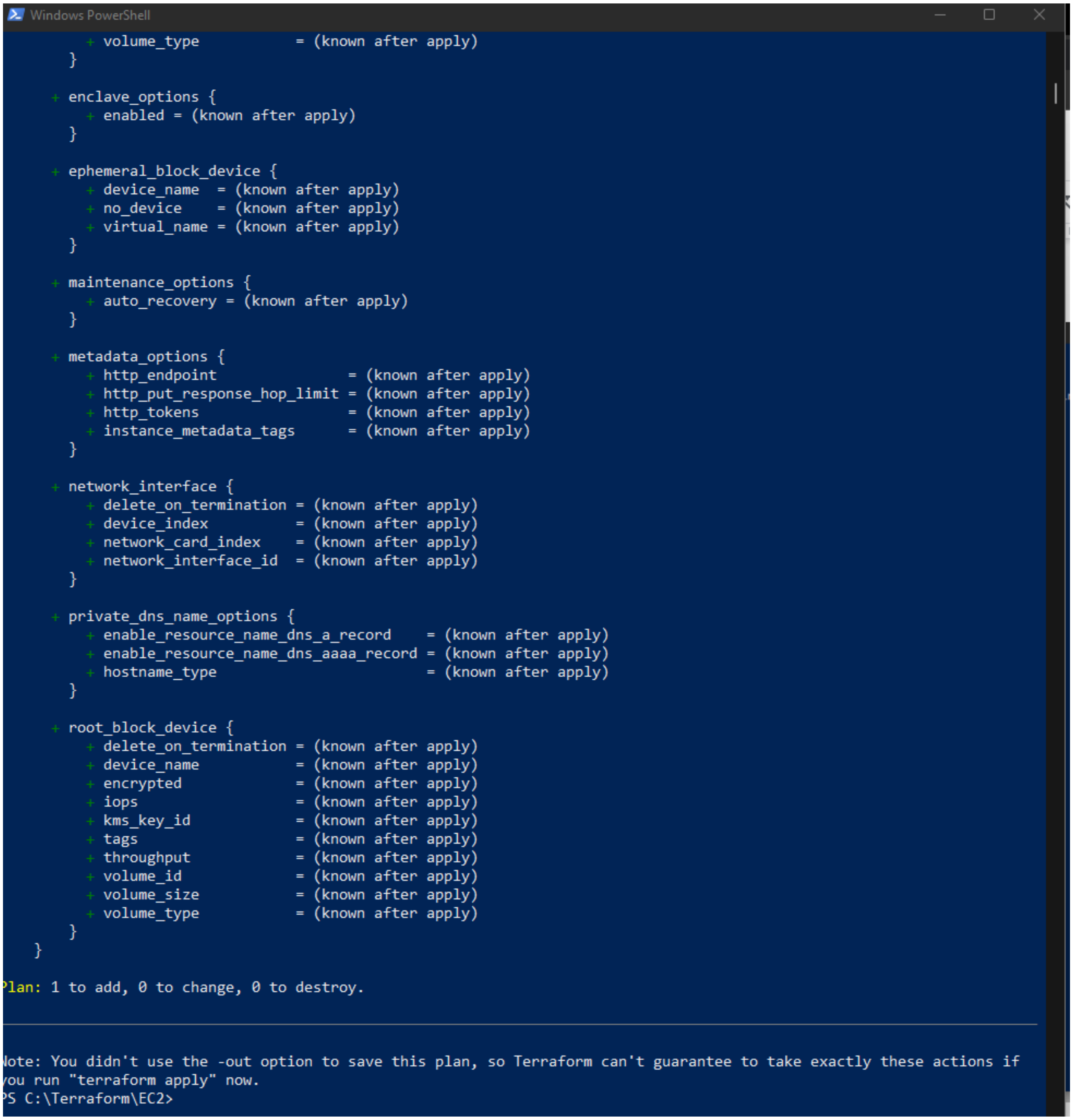


```
PS C:\Terraform\EC2> terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v4.28.0...
- Installed hashicorp/aws v4.28.0 (signed by HashiCorp)

Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

Terraform has been successfully initialized!

You may now begin working with Terraform. Try running "terraform plan" to see
any changes that are required for your infrastructure. All Terraform commands
should now work.

If you ever set or change modules or backend configuration for Terraform,
rerun this command to reinitialize your working directory. If you forget, other
commands will detect it and remind you to do so if necessary.
PS C:\Terraform\EC2>
```

Step 8: Execute Terraform plan to see the available resources

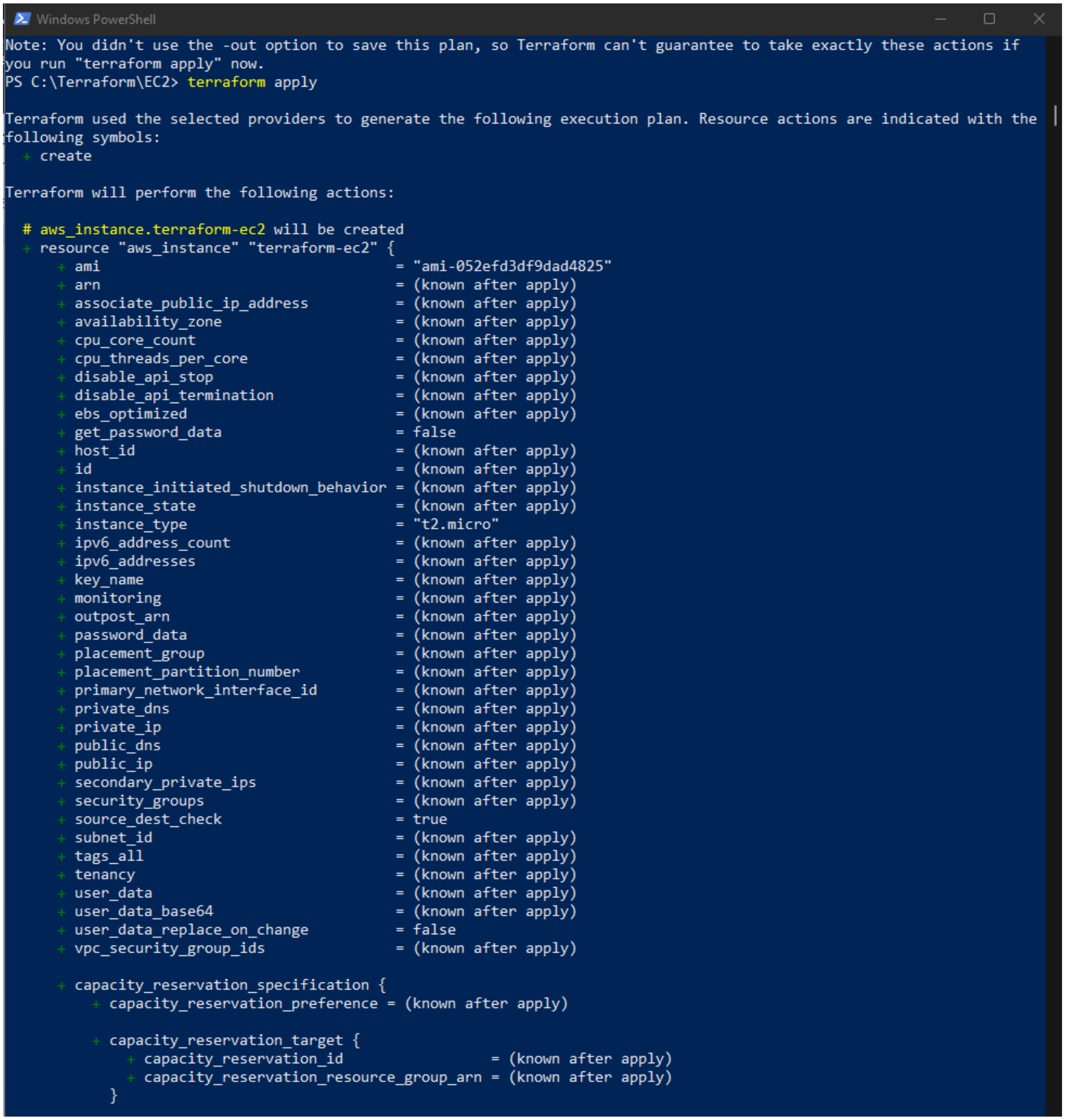


```
commands will detect it and remind you to do so if necessary.
PS C:\Terraform\EC2> terraform plan

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
  + create

Terraform will perform the following actions:

  # aws_instance.terraform-ec2 will be created
  + resource "aws_instance" "terraform-ec2" {
      + ami                                  = "ami-052efd3df9dad4825"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
      + ebs_optimized                        = (known after apply)
      + get_password_data                    = false
      + host_id                              = (known after apply)
      + id                                   = (known after apply)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
      + primary_network_interface_id         = (known after apply)
      + private_dns                          = (known after apply)
      + private_ip                           = (known after apply)
      + public_dns                           = (known after apply)
      + public_ip                            = (known after apply)
      + secondary_private_ips                = (known after apply)
      + security_groups                      = (known after apply)
      + source_dest_check                    = true
      + subnet_id                            = (known after apply)
      + tags_all                             = (known after apply)
      + tenancy                              = (known after apply)
      + user_data                            = (known after apply)
      + user_data_base64                     = (known after apply)
      + user_data_replace_on_change          = false
      + vpc_security_group_ids               = (known after apply)
```

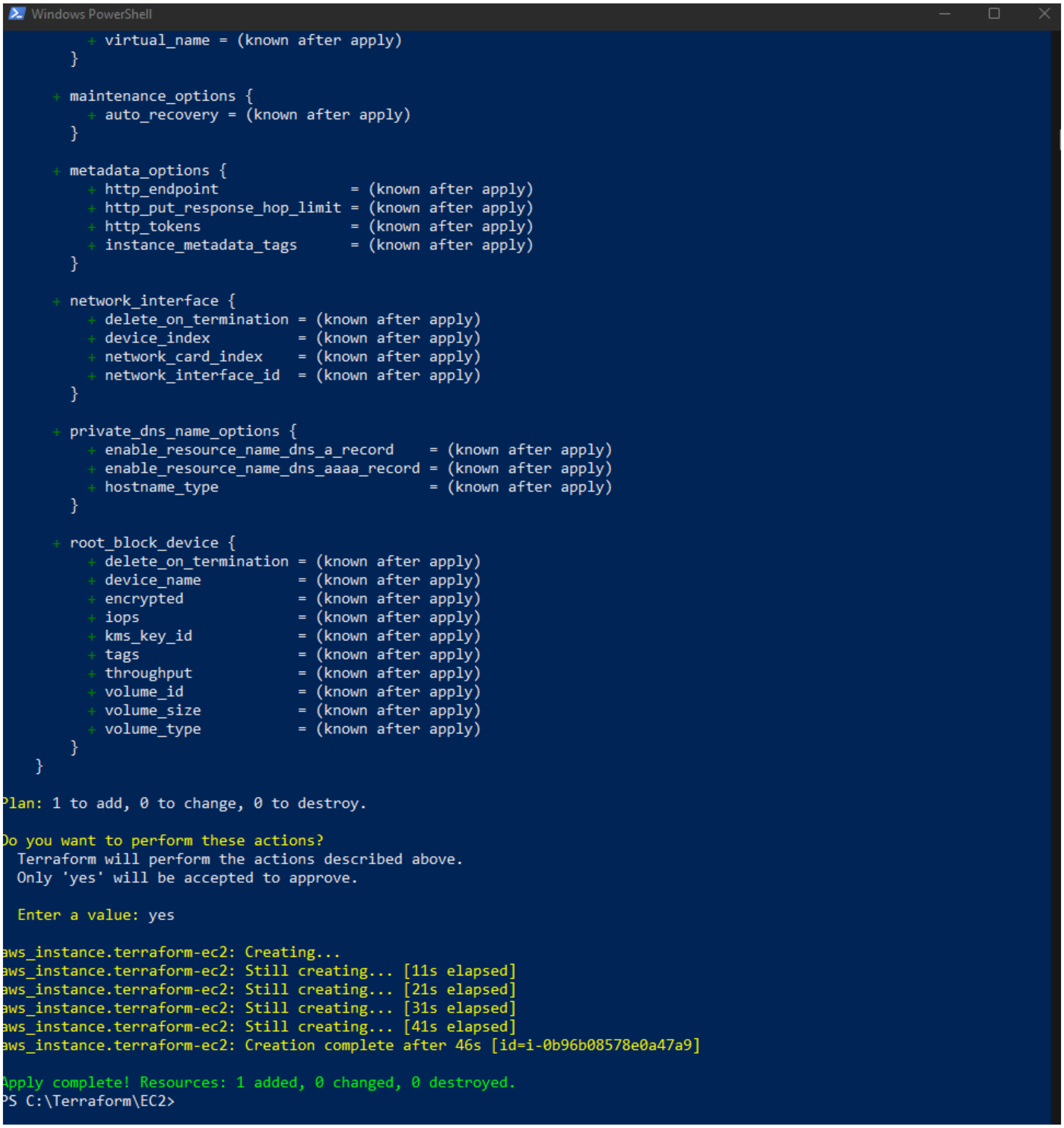


```
          + volume_type           = (known after apply)
        }

      + enclave_options {
          + enabled = (known after apply)
        }

      + ephemeral_block_device {
          + device_name  = (known after apply)
          + no_device    = (known after apply)
          + virtual_name = (known after apply)
        }

      + maintenance_options {
          + auto_recovery = (known after apply)
        }

      + metadata_options {
          + http_endpoint               = (known after apply)
          + http_put_response_hop_limit = (known after apply)
          + http_tokens                 = (known after apply)
          + instance_metadata_tags      = (known after apply)
        }

      + network_interface {
          + delete_on_termination = (known after apply)
          + device_index          = (known after apply)
          + network_card_index    = (known after apply)
          + network_interface_id  = (known after apply)
        }

      + private_dns_name_options {
          + enable_resource_name_dns_a_record    = (known after apply)
          + enable_resource_name_dns_aaaa_record = (known after apply)
          + hostname_type                        = (known after apply)
        }

      + root_block_device {
          + delete_on_termination = (known after apply)
          + device_name           = (known after apply)
          + encrypted             = (known after apply)
          + iops                  = (known after apply)
          + kms_key_id            = (known after apply)
          + tags                  = (known after apply)
          + throughput            = (known after apply)
          + volume_id             = (known after apply)
          + volume_size           = (known after apply)
          + volume_type           = (known after apply)
        }
    }

lan: 1 to add, 0 to change, 0 to destroy.

─────────────────────────────────────────────────────────────────────────────────────────────

ote: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these actions if
ou run "terraform apply" now.
S C:\Terraform\EC2>
```

Step 9: Execute Terraform apply to apply the configuration, which will automatically create an EC2 instance based on our configuration.

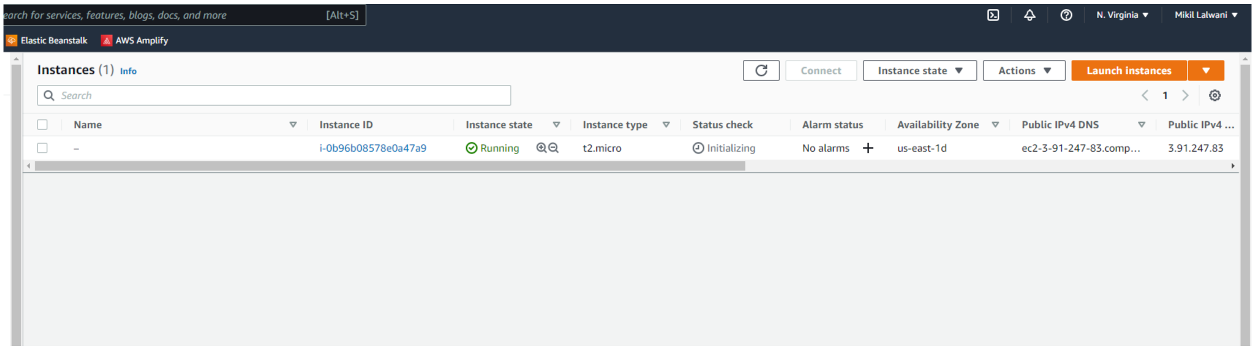


```
Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these actions if
you run "terraform apply" now.
PS C:\Terraform\EC2> terraform apply

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
  + create

Terraform will perform the following actions:

  # aws_instance.terraform-ec2 will be created
  + resource "aws_instance" "terraform-ec2" {
      + ami                                  = "ami-052efd3df9dad4825"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
      + ebs_optimized                        = (known after apply)
      + get_password_data                    = false
      + host_id                              = (known after apply)
      + id                                   = (known after apply)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
      + primary_network_interface_id         = (known after apply)
      + private_dns                          = (known after apply)
      + private_ip                           = (known after apply)
      + public_dns                           = (known after apply)
      + public_ip                            = (known after apply)
      + secondary_private_ips                = (known after apply)
      + security_groups                      = (known after apply)
      + source_dest_check                    = true
      + subnet_id                            = (known after apply)
      + tags_all                             = (known after apply)
      + tenancy                              = (known after apply)
      + user_data                            = (known after apply)
      + user_data_base64                     = (known after apply)
      + user_data_replace_on_change          = false
      + vpc_security_group_ids               = (known after apply)

      + capacity_reservation_specification {
          + capacity_reservation_preference = (known after apply)

          + capacity_reservation_target {
              + capacity_reservation_id                 = (known after apply)
              + capacity_reservation_resource_group_arn = (known after apply)
            }
```



```
          + virtual_name = (known after apply)
        }

      + maintenance_options {
          + auto_recovery = (known after apply)
        }

      + metadata_options {
          + http_endpoint               = (known after apply)
          + http_put_response_hop_limit = (known after apply)
          + http_tokens                 = (known after apply)
          + instance_metadata_tags      = (known after apply)
        }

      + network_interface {
          + delete_on_termination = (known after apply)
          + device_index          = (known after apply)
          + network_card_index    = (known after apply)
          + network_interface_id  = (known after apply)
        }

      + private_dns_name_options {
          + enable_resource_name_dns_a_record    = (known after apply)
          + enable_resource_name_dns_aaaa_record = (known after apply)
          + hostname_type                        = (known after apply)
        }

      + root_block_device {
          + delete_on_termination = (known after apply)
          + device_name           = (known after apply)
          + encrypted             = (known after apply)
          + iops                  = (known after apply)
          + kms_key_id            = (known after apply)
          + tags                  = (known after apply)
          + throughput            = (known after apply)
          + volume_id             = (known after apply)
          + volume_size           = (known after apply)
          + volume_type           = (known after apply)
        }
    }

Plan: 1 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_instance.terraform-ec2: Creating...
aws_instance.terraform-ec2: Still creating... [11s elapsed]
aws_instance.terraform-ec2: Still creating... [21s elapsed]
aws_instance.terraform-ec2: Still creating... [31s elapsed]
aws_instance.terraform-ec2: Still creating... [41s elapsed]
aws_instance.terraform-ec2: Creation complete after 46s [id=i-0b96b08578e0a47a9]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
PS C:\Terraform\EC2>
```

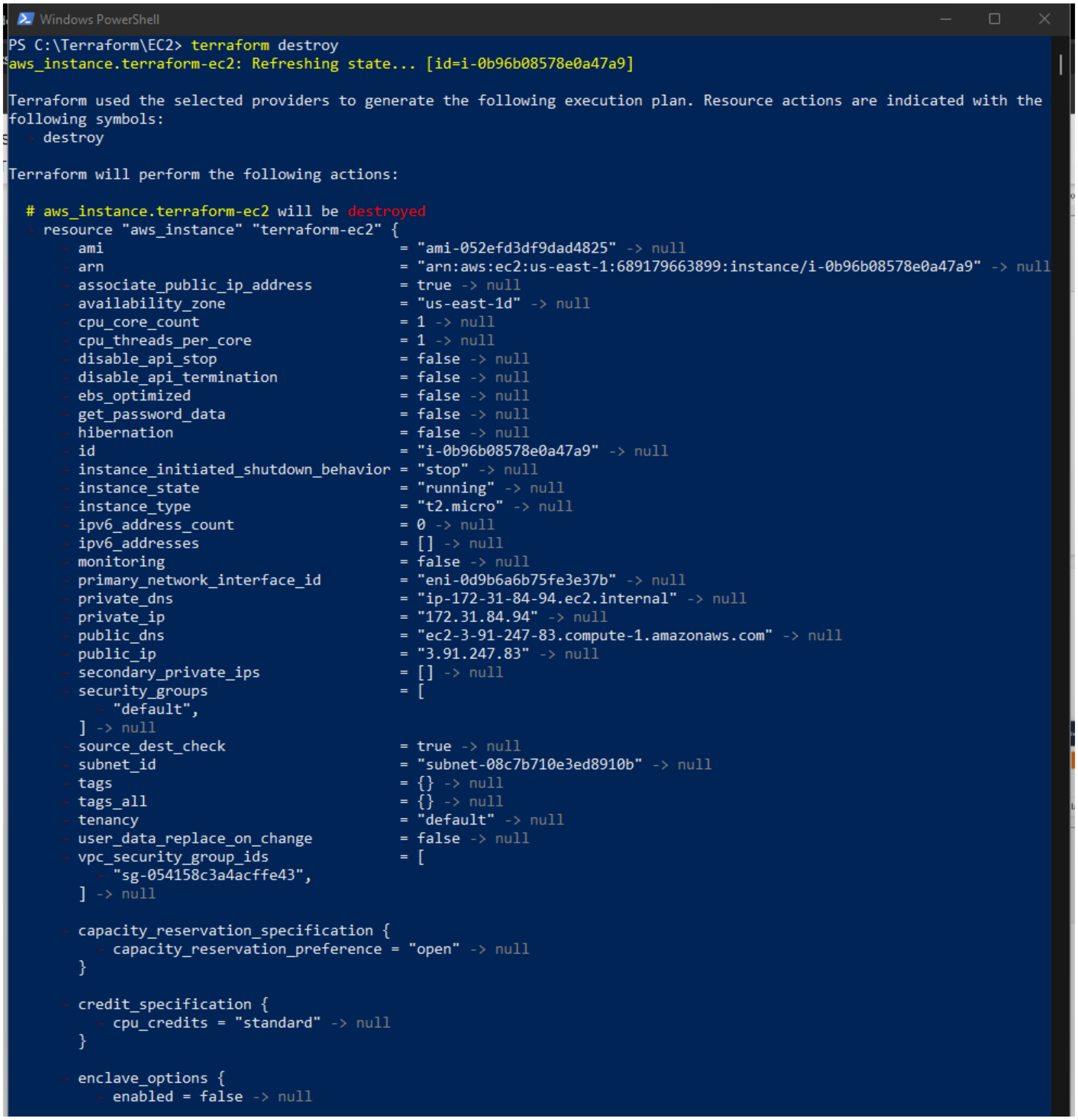
AWS EC2 dashboard, After Executing Apply step:



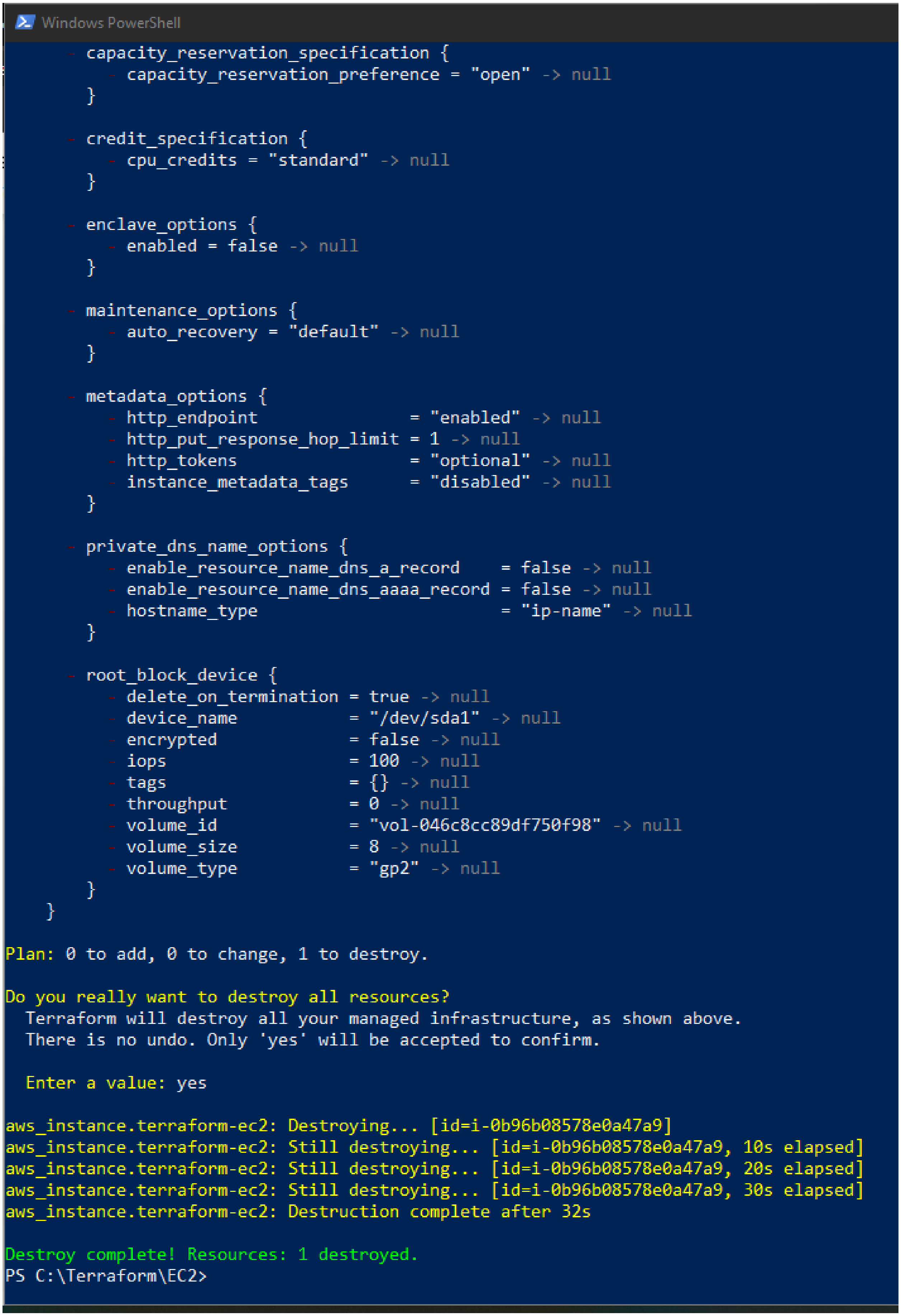
Instances (1) Info

	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...
□	–	i-0b96b08578e0a47a9	Running	t2.micro	Initializing	No alarms +	us-east-1d	ec2-3-91-247-83.comp...	3.91.247.83

Step 10: Execute Terraform destroy to delete the configuration, which will automatically delete an EC2 instance

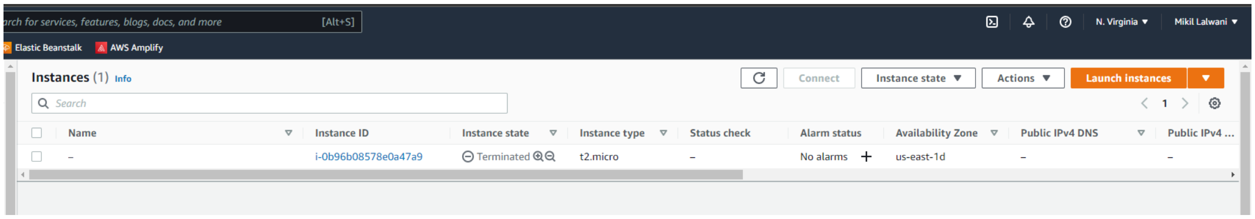


```
PS C:\Terraform\EC2> terraform destroy
aws_instance.terraform-ec2: Refreshing state... [id=i-0b96b08578e0a47a9]

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the
following symbols:
  - destroy

Terraform will perform the following actions:

  # aws_instance.terraform-ec2 will be destroyed
  - resource "aws_instance" "terraform-ec2" {
      - ami                                  = "ami-052efd3df9dad4825" -> null
      - arn                                  = "arn:aws:ec2:us-east-1:689179663899:instance/i-0b96b08578e0a47a9" -> null
      - associate_public_ip_address          = true -> null
      - availability_zone                    = "us-east-1d" -> null
      - cpu_core_count                       = 1 -> null
      - cpu_threads_per_core                 = 1 -> null
      - disable_api_stop                     = false -> null
      - disable_api_termination              = false -> null
      - ebs_optimized                        = false -> null
      - get_password_data                    = false -> null
      - hibernation                          = false -> null
      - id                                   = "i-0b96b08578e0a47a9" -> null
      - instance_initiated_shutdown_behavior = "stop" -> null
      - instance_state                       = "running" -> null
      - instance_type                        = "t2.micro" -> null
      - ipv6_address_count                   = 0 -> null
      - ipv6_addresses                       = [] -> null
      - monitoring                           = false -> null
      - primary_network_interface_id         = "eni-0d9b6a6b75fe3e37b" -> null
      - private_dns                          = "ip-172-31-84-94.ec2.internal" -> null
      - private_ip                           = "172.31.84.94" -> null
      - public_dns                           = "ec2-3-91-247-83.compute-1.amazonaws.com" -> null
      - public_ip                            = "3.91.247.83" -> null
      - secondary_private_ips                = [] -> null
      - security_groups                      = [
          - "default",
        ] -> null
      - source_dest_check                    = true -> null
      - subnet_id                            = "subnet-08c7b710e3ed8910b" -> null
      - tags                                 = {} -> null
      - tags_all                             = {} -> null
      - tenancy                              = "default" -> null
      - user_data_replace_on_change          = false -> null
      - vpc_security_group_ids               = [
          - "sg-054158c3a4acffe43",
        ] -> null

      - capacity_reservation_specification {
          - capacity_reservation_preference = "open" -> null
        }

      - credit_specification {
          - cpu_credits = "standard" -> null
        }

      - enclave_options {
          - enabled = false -> null
```



```
      - capacity_reservation_specification {
          - capacity_reservation_preference = "open" -> null
        }

      - credit_specification {
          - cpu_credits = "standard" -> null
        }

      - enclave_options {
          - enabled = false -> null
        }

      - maintenance_options {
          - auto_recovery = "default" -> null
        }

      - metadata_options {
          - http_endpoint               = "enabled" -> null
          - http_put_response_hop_limit = 1 -> null
          - http_tokens                 = "optional" -> null
          - instance_metadata_tags      = "disabled" -> null
        }

      - private_dns_name_options {
          - enable_resource_name_dns_a_record    = false -> null
          - enable_resource_name_dns_aaaa_record = false -> null
          - hostname_type                        = "ip-name" -> null
        }

      - root_block_device {
          - delete_on_termination = true -> null
          - device_name           = "/dev/sda1" -> null
          - encrypted             = false -> null
          - iops                  = 100 -> null
          - tags                  = {} -> null
          - throughput            = 0 -> null
          - volume_id             = "vol-046c8cc89df750f98" -> null
          - volume_size           = 8 -> null
          - volume_type           = "gp2" -> null
        }
    }

Plan: 0 to add, 0 to change, 1 to destroy.

Do you really want to destroy all resources?
  Terraform will destroy all your managed infrastructure, as shown above.
  There is no undo. Only 'yes' will be accepted to confirm.

  Enter a value: yes

aws_instance.terraform-ec2: Destroying... [id=i-0b96b08578e0a47a9]
aws_instance.terraform-ec2: Still destroying... [id=i-0b96b08578e0a47a9, 10s elapsed]
aws_instance.terraform-ec2: Still destroying... [id=i-0b96b08578e0a47a9, 20s elapsed]
aws_instance.terraform-ec2: Still destroying... [id=i-0b96b08578e0a47a9, 30s elapsed]
aws_instance.terraform-ec2: Destruction complete after 32s

Destroy complete! Resources: 1 destroyed.
PS C:\Terraform\EC2>
```

AWS EC2 dashboard, After Executing Destroy step:



Instances (1) Info

□	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 ...
□	–	i-0b96b08578e0a47a9	Terminated	t2.micro	–	No alarms	us-east-1d	–	–

Conclusion-

Thus, we have successfully build, changed and destroyed AWS infrastructure.