DevOps Project to automate infrastructure on AWS using Terraform and GitLab CICD

Before commencing the project, make sure you have a basic understanding of the following topics, as they will simplify the implementation process.

Basic Terraform Knowledge (resource)
Understanding of CICD (resource)
GitLab CI Knowledge (resource)

PREREQUISITES:

1) Aws account creation

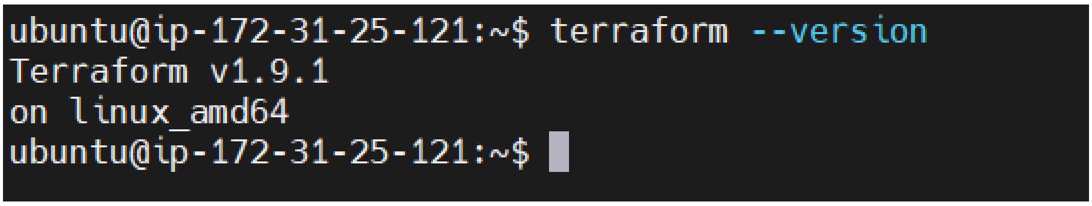
Check out the official site to create aws account Here

2) GitLab account

- ✓ Login to https://gitlab.com
- ✓ You can sign in via GitHub/Gmail
- ✓ Verify email and phone
- ✓ fill up the questionaries
- ✓ provide group name & project name as per your choice

3) Terraform Installed

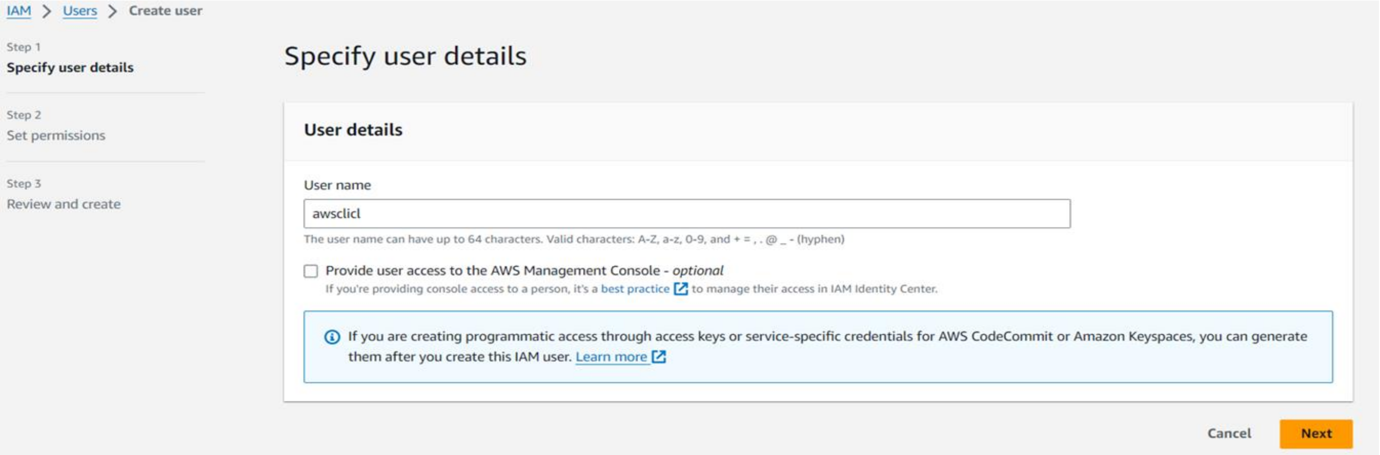
Check out the official website to install terraform Here



```
ubuntu@ip-172-31-25-121:~$ terraform --version
Terraform v1.9.1
on linux_amd64
ubuntu@ip-172-31-25-121:~$
```

4) AWS CLI Installed

Navigate to the IAM dashboard on AWS, then select "Users." Enter the username and proceed to the next step



Step 1
Specify user details

Step 2
Set permissions

Step 3
Review and create

Specify user details

User details

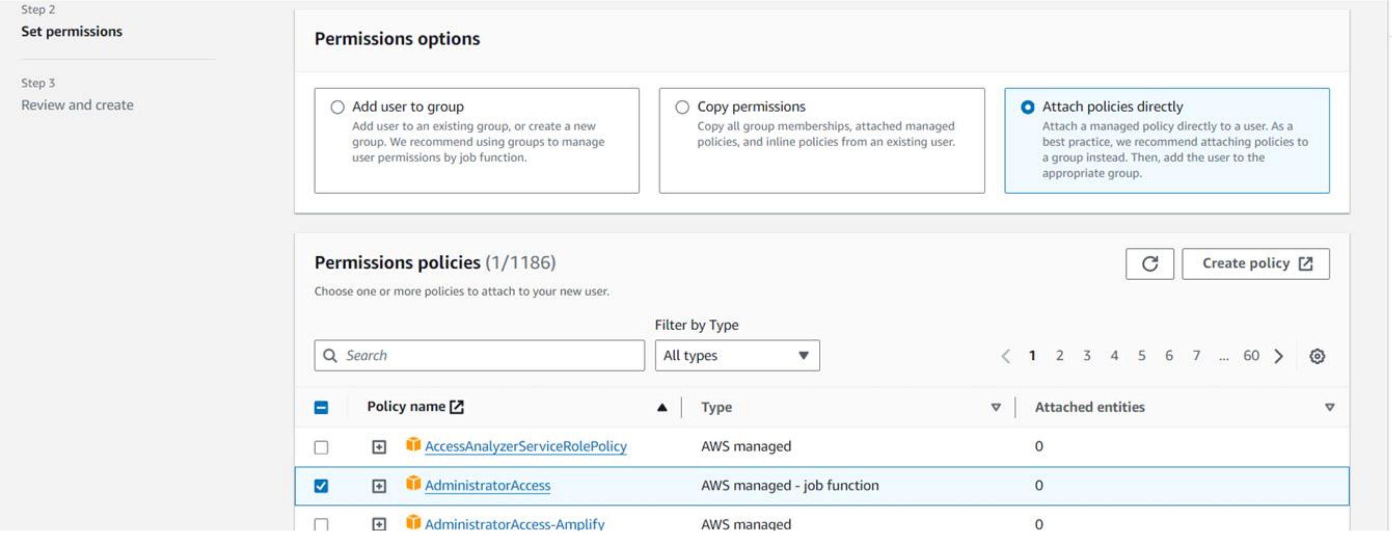
User name: awsclicl

The user name can have up to 64 characters. Valid characters: A-Z, a-z, 0-9, and + = , . @ _ - (hyphen)

□ Provide user access to the AWS Management Console - *optional*
If you're providing console access to a person, it's a best practice to manage their access in IAM Identity Center.

ⓘ If you are creating programmatic access through access keys or service-specific credentials for AWS CodeCommit or Amazon Keyspaces, you can generate them after you create this IAM user. Learn more

Assign permissions by attaching policies directly, opting for "Administrator access," and then create the user.



Step 2
Set permissions

Step 3
Review and create

Permissions options

○ Add user to group
Add user to an existing group, or create a new group. We recommend using groups to manage user permissions by job function.

○ Copy permissions
Copy all group memberships, attached managed policies, and inline policies from an existing user.

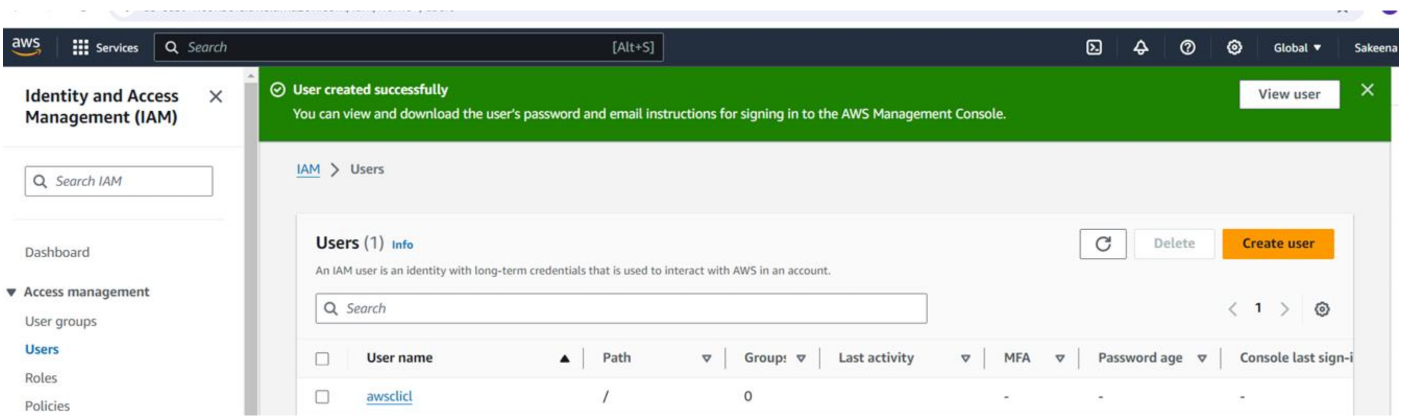
● Attach policies directly
Attach a managed policy directly to a user. As a best practice, we recommend attaching policies to a group instead. Then, add the user to the appropriate group.

Permissions policies (1/1186)

Choose one or more policies to attach to your new user.

Filter by Type: All types

		Policy name	Type	Attached entities
□	⊞	AccessAnalyzerServiceRolePolicy	AWS managed	0
☑	⊞	AdministratorAccess	AWS managed - job function	0
□	⊞	AdministratorAccess-Amplify	AWS managed	0



User created successfully
You can view and download the user's password and email instructions for signing in to the AWS Management Console.

Identity and Access Management (IAM)

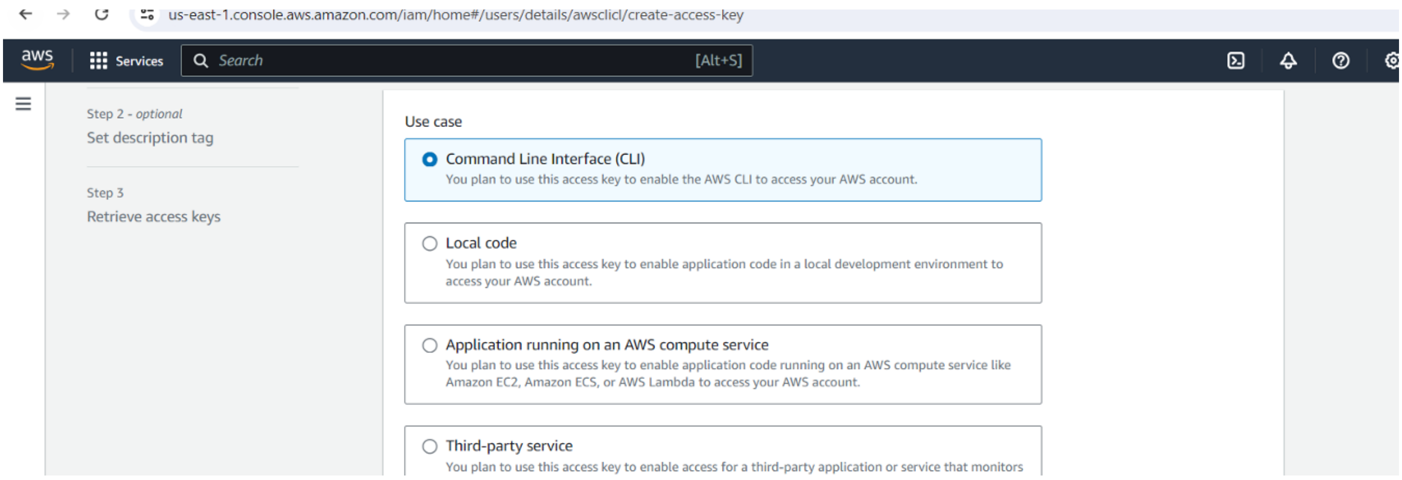
IAM > Users

Users (1) Info

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

	User name	Path	Groups	Last activity	MFA	Password age	Console last sign-i
□	awsclicl	/	0		-	-	-

Within the user settings, locate "Create access key," and choose the command line interface (CLI) option to generate an access key.



us-east-1.console.aws.amazon.com/iam/home#/users/details/awsclicl/create-access-key

Step 2 - *optional*
Set description tag

Step 3
Retrieve access keys

Use case

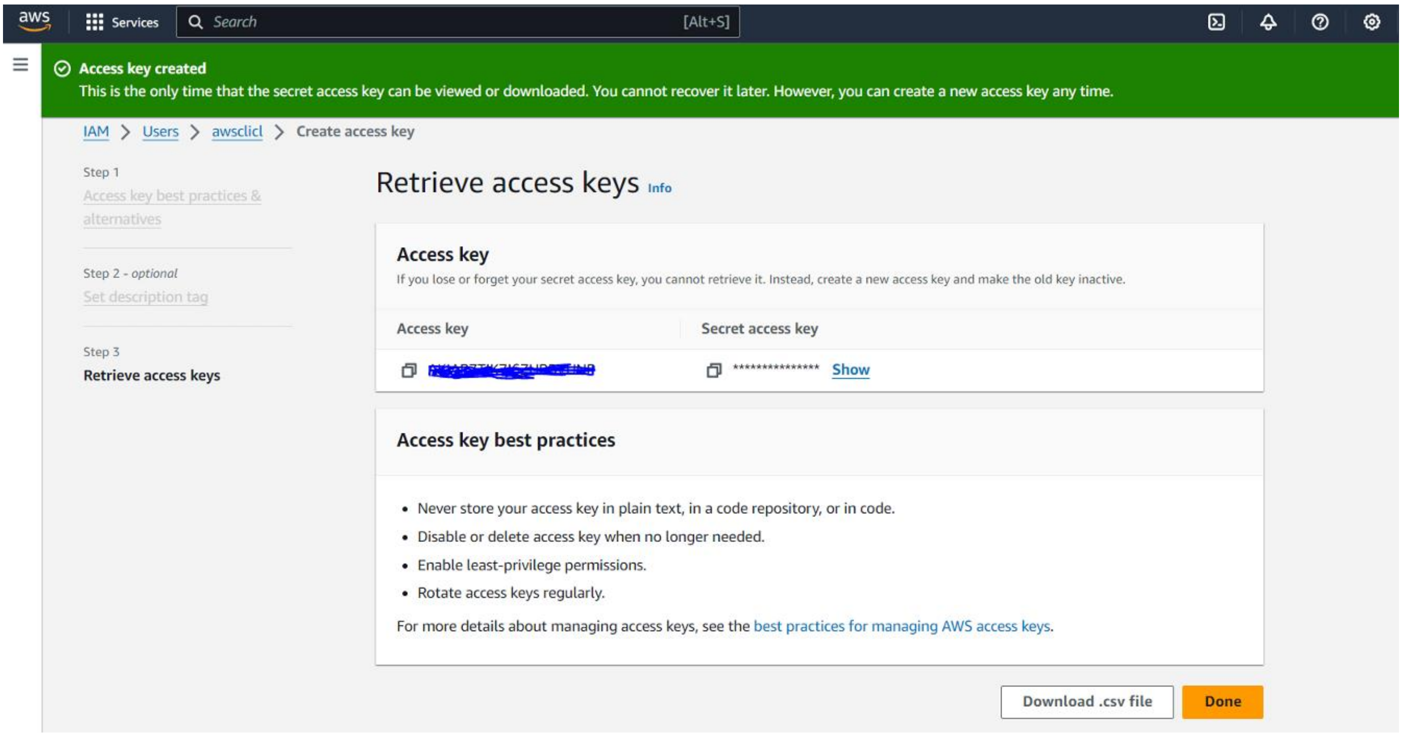
● Command Line Interface (CLI)
You plan to use this access key to enable the AWS CLI to access your AWS account.

○ Local code
You plan to use this access key to enable application code in a local development environment to access your AWS account.

○ Application running on an AWS compute service
You plan to use this access key to enable application code running on an AWS compute service like Amazon EC2, Amazon ECS, or AWS Lambda to access your AWS account.

○ Third-party service
You plan to use this access key to enable access for a third-party application or service that monitors

Upon creation, you can view or download the access key and secret access key either from the console or via CSV download.



Access key created

This is the only time that the secret access key can be viewed or downloaded. You cannot recover it later. However, you can create a new access key any time.

IAM > Users > awsclicl > Create access key

Step 1
Access key best practices & alternatives

Step 2 - *optional*
Set description tag

Step 3
Retrieve access keys

Retrieve access keys Info

Access key

If you lose or forget your secret access key, you cannot retrieve it. Instead, create a new access key and make the old key inactive.

Access key	Secret access key
[redacted]	*************** Show

Access key best practices

- Never store your access key in plain text, in a code repository, or in code.
- Disable or delete access key when no longer needed.
- Enable least-privilege permissions.
- Rotate access keys regularly.

For more details about managing access keys, see the best practices for managing AWS access keys.

Download .csv file   Done

Now go to your terminal and follow below steps:

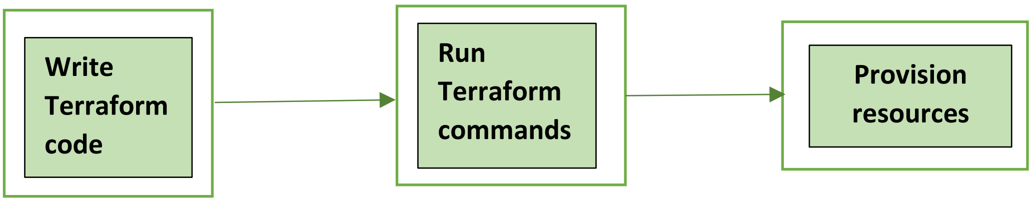
```
sudo apt install unzip
curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"
unzip awscliv2.zip
sudo ./aws/install
aws configure (input created accesskeyid and secret access key)
cat ~/.aws/config
cat ~/.aws/credentials
aws iam list-users (to list all IAM users in an AWS account)
```

5) Code editor (Vscode)

Download it from Here

Let’s begin with the project. This project is divided in to two parts.

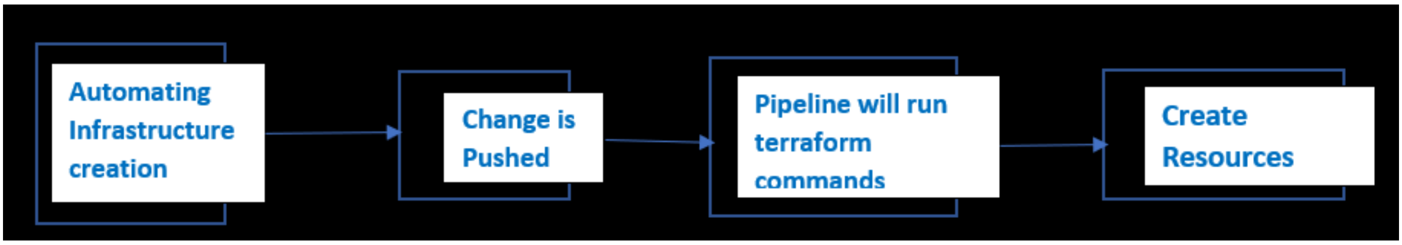
Part1:



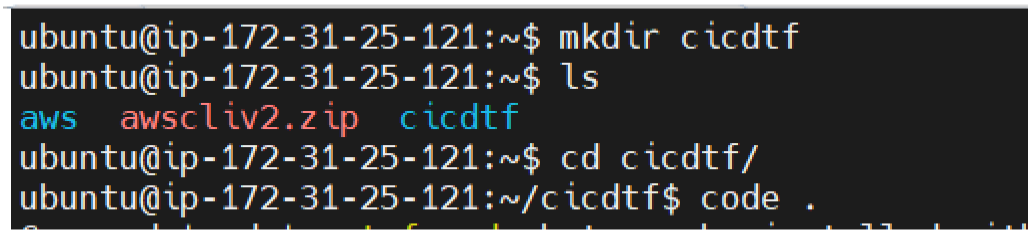
Here, we write terraform code, run terraform commands and create infrastructure manually to ensure everything works fine before automating

Part2:

Create CICD pipeline script on Gitlab to automate terraform resource creation

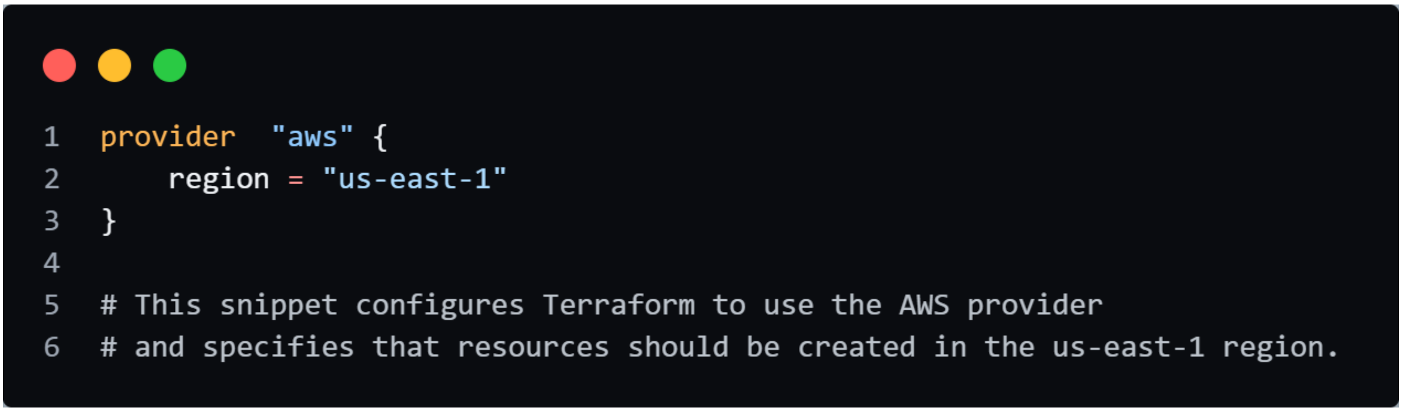

Automating Infrastructure creation
Change is Pushed
Pipeline will run terraform commands
Create Resources

Step1: Create a new folder named “cicdtf” and open it in vscode to start writing the code.



```
ubuntu@ip-172-31-25-121:~$ mkdir cicdtf
ubuntu@ip-172-31-25-121:~$ ls
aws  awscliv2.zip  cicdtf
ubuntu@ip-172-31-25-121:~$ cd cicdtf/
ubuntu@ip-172-31-25-121:~/cicdtf$ code .
```

Step2: We will start writing our Terraform code in the “cicdtf” folder. The first step in writing Terraform code is to define a provider. To do this, we will create a file called provider.tf with the following content:



```
provider  "aws" {
    region = "us-east-1"
}

# This snippet configures Terraform to use the AWS provider
# and specifies that resources should be created in the us-east-1 region.
```

We will be deploying a VPC, a security group, a subnet and an EC2 instance as part of the initial phase.

The folder structure is as follows:

1. VPC Module (vpc folder):

Files:

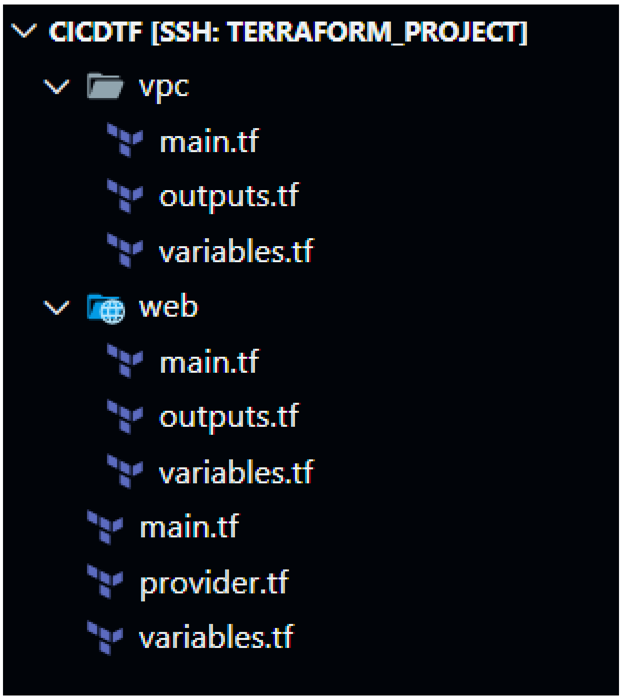
main.tf: Defines resources like VPC, subnets, and security groups.
variables.tf: Declares input variables for customization.
outputs.tf: Specifies outputs like VPC ID, subnet IDs, etc.

2.EC2 Module (web folder):

Files:

main.tf: Configures EC2 instance details, including AMI, instance type, and security groups.
variables.tf: Defines variables needed for EC2 instance customization.
outputs.tf: Outputs instance details like public IP, instance ID, etc.

Snap of folder structure:



```
CICDTF [SSH: TERRAFORM_PROJECT]
  vpc
    main.tf
    outputs.tf
    variables.tf
  web
    main.tf
    outputs.tf
    variables.tf
  main.tf
  provider.tf
  variables.tf
```

Let’s start with defining vpc,

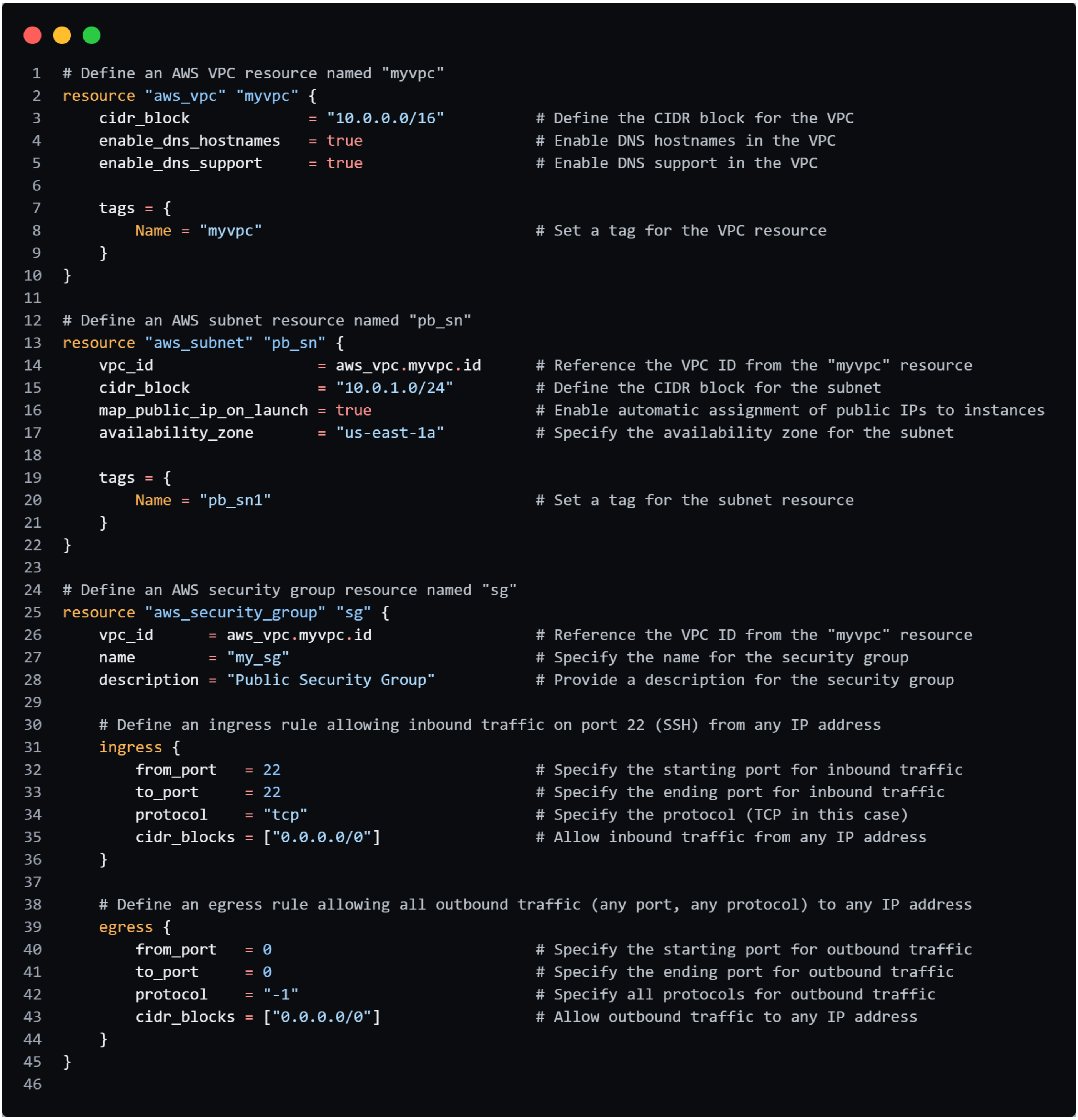
The below Terraform script (main.tf) sets up an AWS Virtual Private Cloud (VPC) with a CIDR block of 10.0.0.0/16, enabling DNS support and hostnames. It creates a subnet (10.0.1.0/24) in us-east-1a with public IP mapping. Additionally, it establishes a security group allowing inbound SSH (port 22) traffic from any IP address and permitting all outbound traffic from the instances within the VPC.

To know more about modules and different parameters being used in this project, check out the official documentation of Terraform Here

Make use of below repositories to check out the code.

https://gitlab.com/N4si/cicdtf

https://gitlab.com/Sakeena19/cicdtf



```
# Define an AWS VPC resource named "myvpc"
resource "aws_vpc" "myvpc" {
    cidr_block           = "10.0.0.0/16"          # Define the CIDR block for the VPC
    enable_dns_hostnames = true                   # Enable DNS hostnames in the VPC
    enable_dns_support   = true                   # Enable DNS support in the VPC

    tags = {
        Name = "myvpc"                            # Set a tag for the VPC resource
    }
}

# Define an AWS subnet resource named "pb_sn"
resource "aws_subnet" "pb_sn" {
    vpc_id                  = aws_vpc.myvpc.id    # Reference the VPC ID from the "myvpc" resource
    cidr_block              = "10.0.1.0/24"       # Define the CIDR block for the subnet
    map_public_ip_on_launch = true                # Enable automatic assignment of public IPs to instances
    availability_zone       = "us-east-1a"        # Specify the availability zone for the subnet

    tags = {
        Name = "pb_sn1"                           # Set a tag for the subnet resource
    }
}

# Define an AWS security group resource named "sg"
resource "aws_security_group" "sg" {
    vpc_id      = aws_vpc.myvpc.id                # Reference the VPC ID from the "myvpc" resource
    name        = "my_sg"                         # Specify the name for the security group
    description = "Public Security Group"         # Provide a description for the security group

    # Define an ingress rule allowing inbound traffic on port 22 (SSH) from any IP address
    ingress {
        from_port   = 22                          # Specify the starting port for inbound traffic
        to_port     = 22                          # Specify the ending port for inbound traffic
        protocol    = "tcp"                       # Specify the protocol (TCP in this case)
        cidr_blocks = ["0.0.0.0/0"]               # Allow inbound traffic from any IP address
    }

    # Define an egress rule allowing all outbound traffic (any port, any protocol) to any IP address
    egress {
        from_port   = 0                           # Specify the starting port for outbound traffic
        to_port     = 0                           # Specify the ending port for outbound traffic
        protocol    = "-1"                        # Specify all protocols for outbound traffic
        cidr_blocks = ["0.0.0.0/0"]               # Allow outbound traffic to any IP address
    }
}

```

Step3:

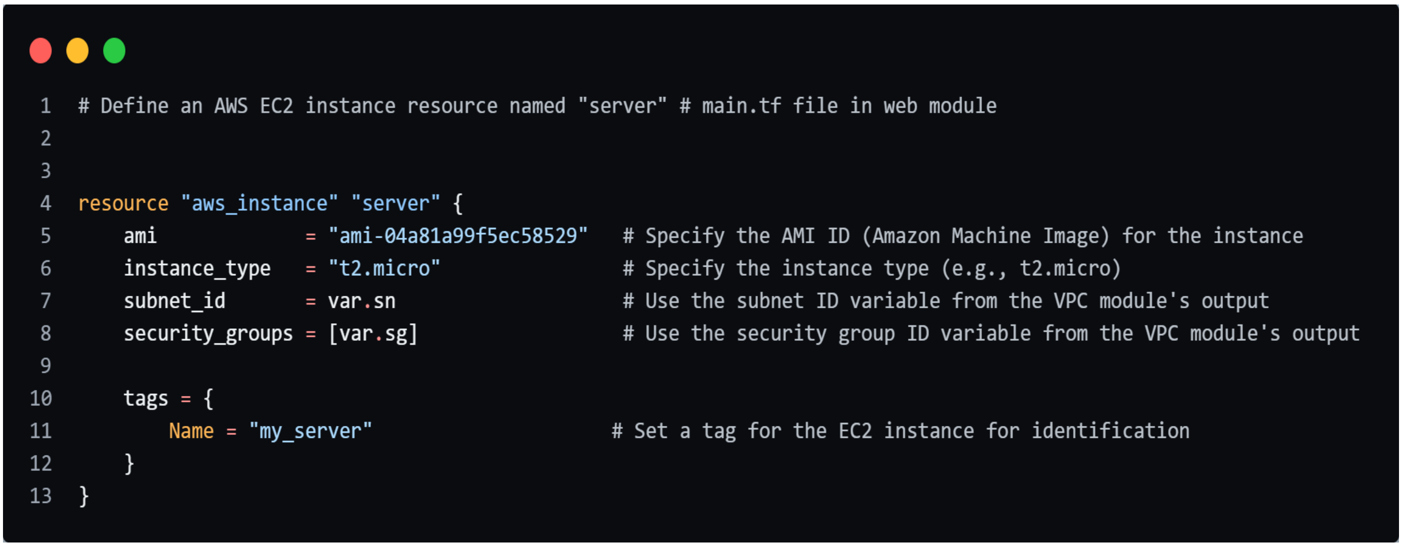
we will create an EC2 instance in the web module and use the security group and subnet defined in the VPC module. This demonstrates how to share values between different modules in Terraform.

Main Module (Root Module): The main.tf file acts as the parent module
Child Modules: The VPC and web modules are child modules.

To share values from one child module to another, we follow these steps:

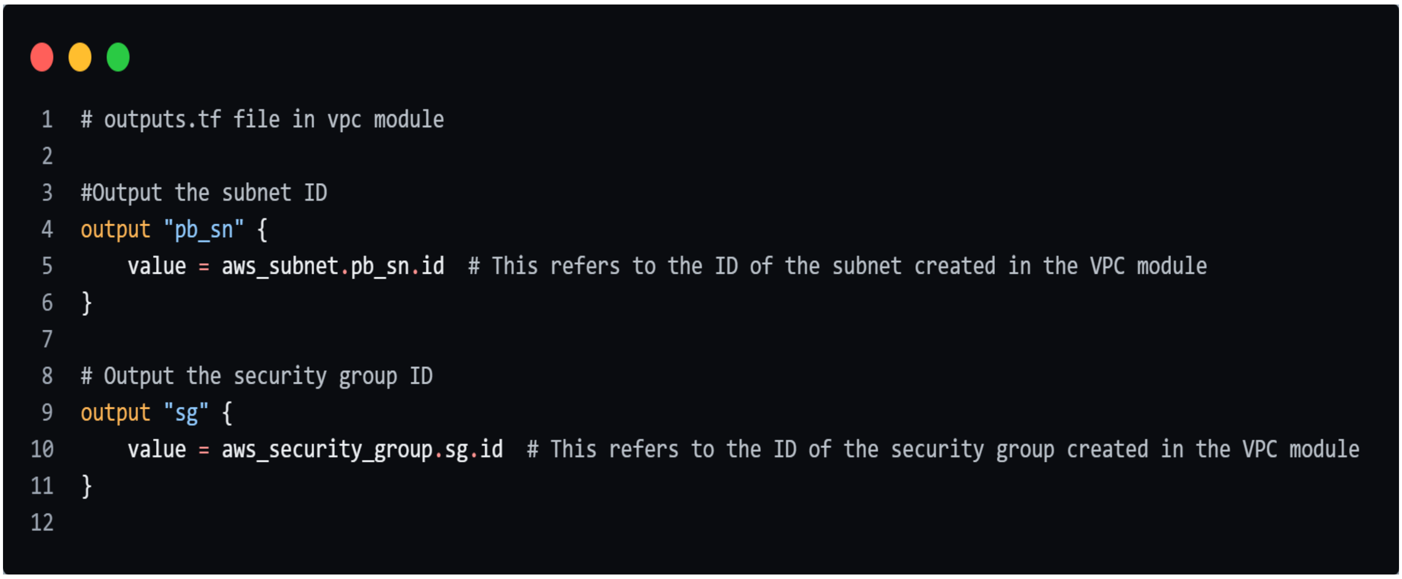
Define Outputs: Specify the values (e.g., subnet ID, security group ID) as outputs in the VPC module.
Use Variables: Reference these outputs as variables in the web module.

The script in main.tf file in web module is as follows:



```
# Define an AWS EC2 instance resource named "server" # main.tf file in web module


resource "aws_instance" "server" {
    ami             = "ami-04a81a99f5ec58529"   # Specify the AMI ID (Amazon Machine Image) for the instance
    instance_type   = "t2.micro"                # Specify the instance type (e.g., t2.micro)
    subnet_id       = var.sn                    # Use the subnet ID variable from the VPC module's output
    security_groups = [var.sg]                  # Use the security group ID variable from the VPC module's output

    tags = {
        Name = "my_server"                     # Set a tag for the EC2 instance for identification
    }
}
```

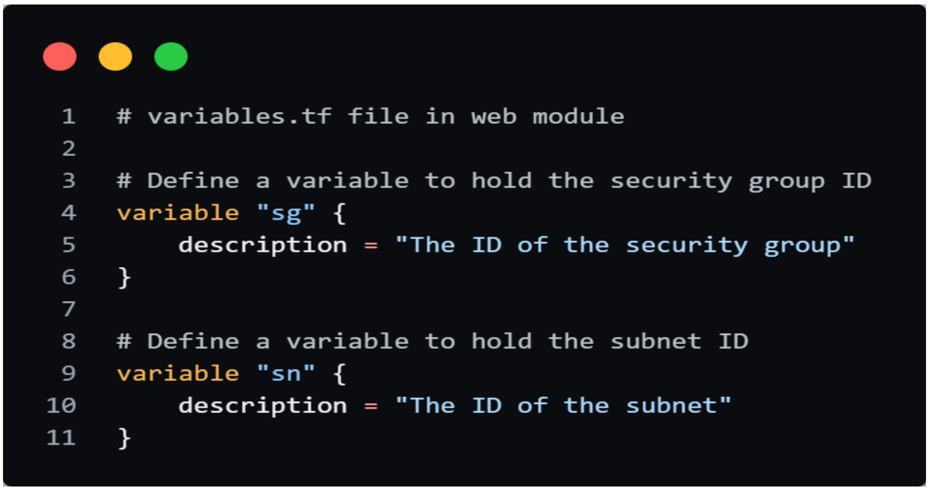
Step4: define outputs.tf file in vpc module.



```
# outputs.tf file in vpc module

#Output the subnet ID
output "pb_sn" {
    value = aws_subnet.pb_sn.id  # This refers to the ID of the subnet created in the VPC module
}

# Output the security group ID
output "sg" {
    value = aws_security_group.sg.id  # This refers to the ID of the security group created in the VPC module
}

```

output "pb_sn": Defines an output variable named pb_sn.
value = aws_subnet.pb_sn.id: This line assigns the ID of the subnet resource (aws_subnet.pb_sn) to the output variable. This allows other modules to access the subnet ID. Similar for security group as well.

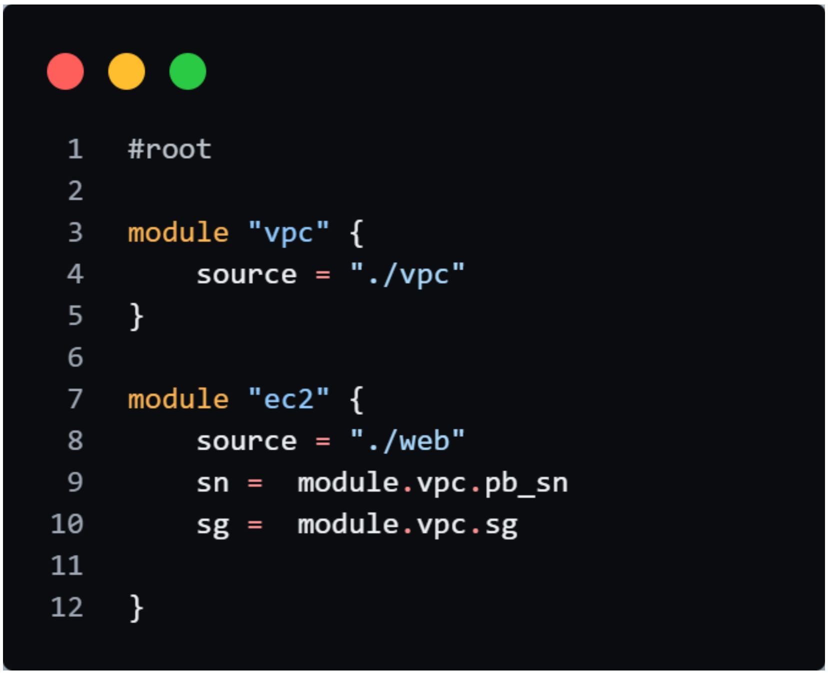
Step5: Define variables.tf file in web module.



```
# variables.tf file in web module

# Define a variable to hold the security group ID
variable "sg" {
    description = "The ID of the security group"
}

# Define a variable to hold the subnet ID
variable "sn" {
    description = "The ID of the subnet"
}
```

These variables are used to pass the security group ID and subnet ID from the VPC module to the web module.

Step6: Now to start using these modules, we have to define both vpc and web in the root module(main.tf) as shown below.



```
#root

module "vpc" {
    source = "./vpc"
}

module "ec2" {
    source = "./web"
    sn =  module.vpc.pb_sn
    sg =  module.vpc.sg

}
```

source = "./vpc": Specifies the path to the VPC module directory. This imports the VPC module defined in the ./vpc folder.
source = "./web": Specifies the path to the web module directory. This imports the EC2 module defined in the ./web folder.
sn = module.vpc.pb_sn: Passes the subnet ID output (pb_sn) from the VPC module to the EC2 module, assigning it to the variable sn.
sg = module.vpc.sg: Passes the security group ID output (sg) from the VPC module to the EC2 module, assigning it to the variable sg.

Step7:

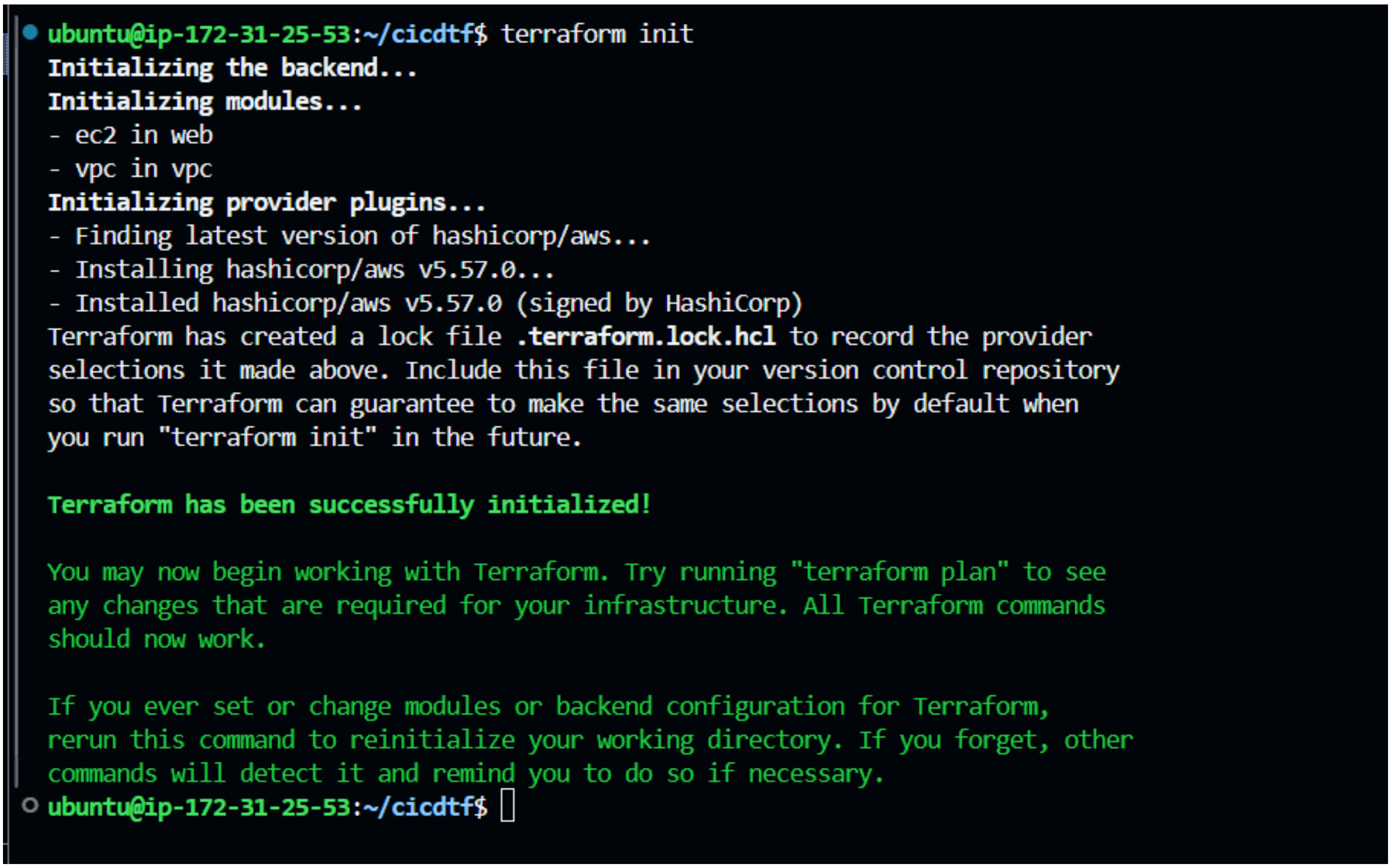
Now to check whether the code is working fine, lets run terraform commands. Make sure to connect aws with terraform (using aws configure) before running and save all the files if not done already.

To initialize terraform, use "terraform init" command which setups everything necessary for terraform to manage your infrastructure such as modules, plugins, backend config etc., as defined in your configuration files.

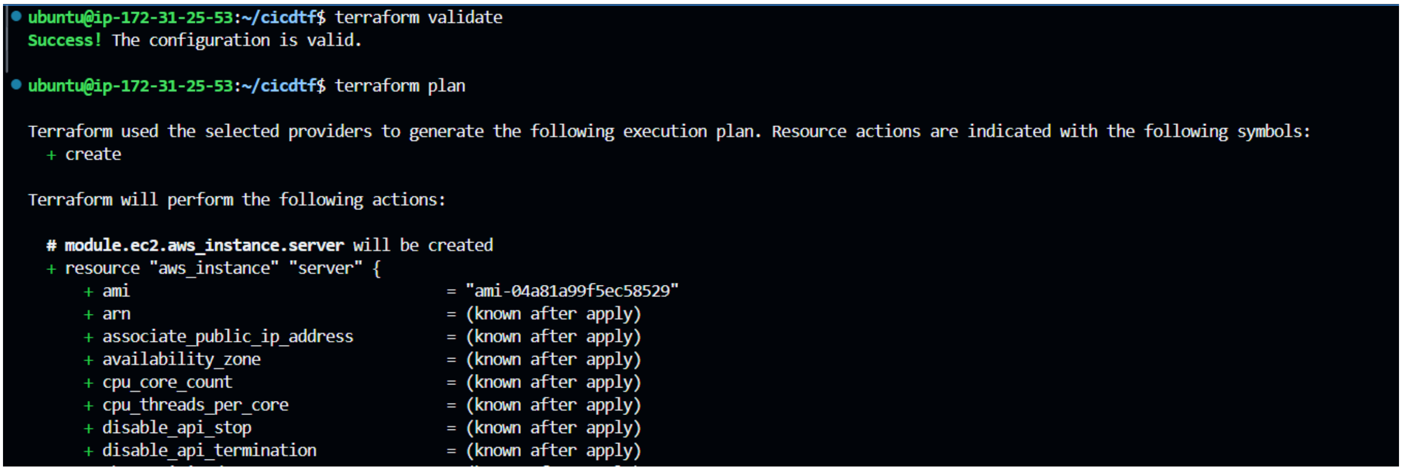
To check if our code is valid, use "terraform validate" command.

Run "terraform plan" command is used to create an execution plan to see what changes terraform will make to your infrastructure without actually applying those changes.

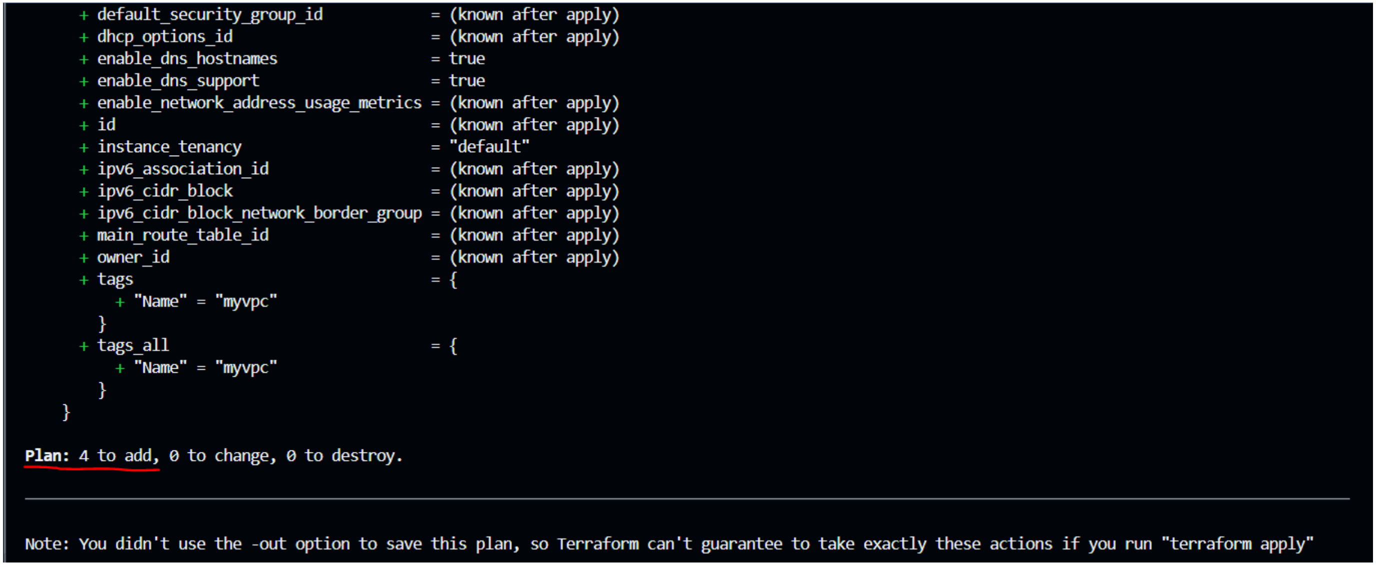
In below snap shown, it's going to create 4 components: vpc, ec2 instance , subnet and security group will be created.



```
ubuntu@ip-172-31-25-53:~/cicdtf$ terraform init
Initializing the backend...
Initializing modules...
- ec2 in web
- vpc in vpc
Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v5.57.0...
- Installed hashicorp/aws v5.57.0 (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.
ubuntu@ip-172-31-25-53:~/cicdtf$
```

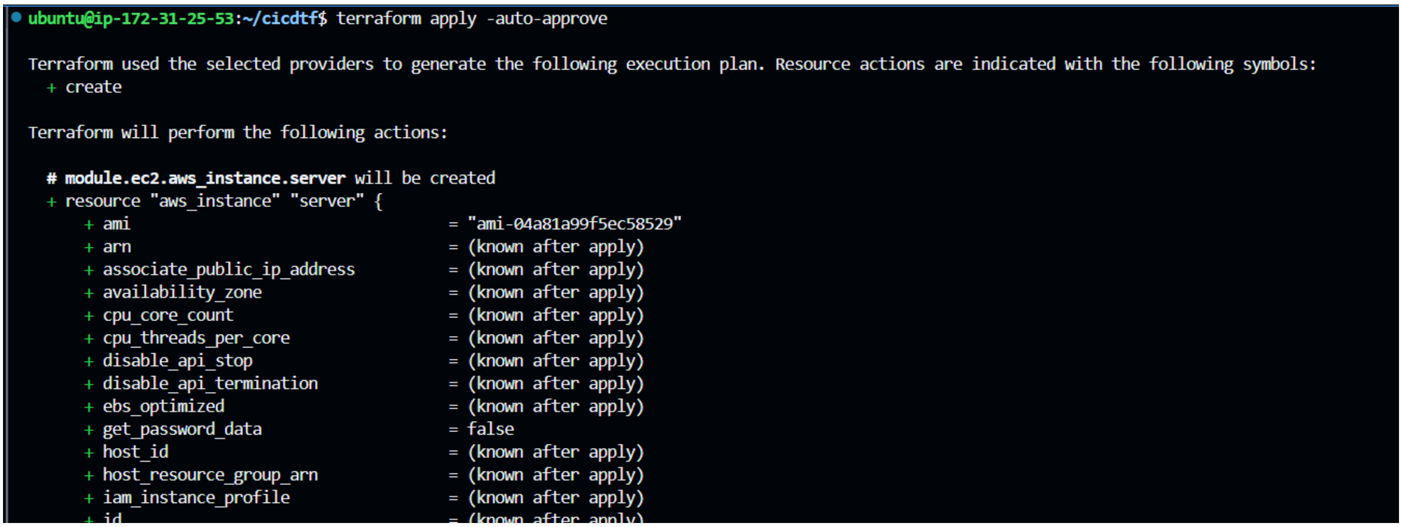


```
ubuntu@ip-172-31-25-53:~/cicdtf$ terraform validate
Success! The configuration is valid.

ubuntu@ip-172-31-25-53:~/cicdtf$ 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:

  # module.ec2.aws_instance.server will be created
  + resource "aws_instance" "server" {
      + ami                                  = "ami-04a81a99f5ec58529"
      + 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)
```

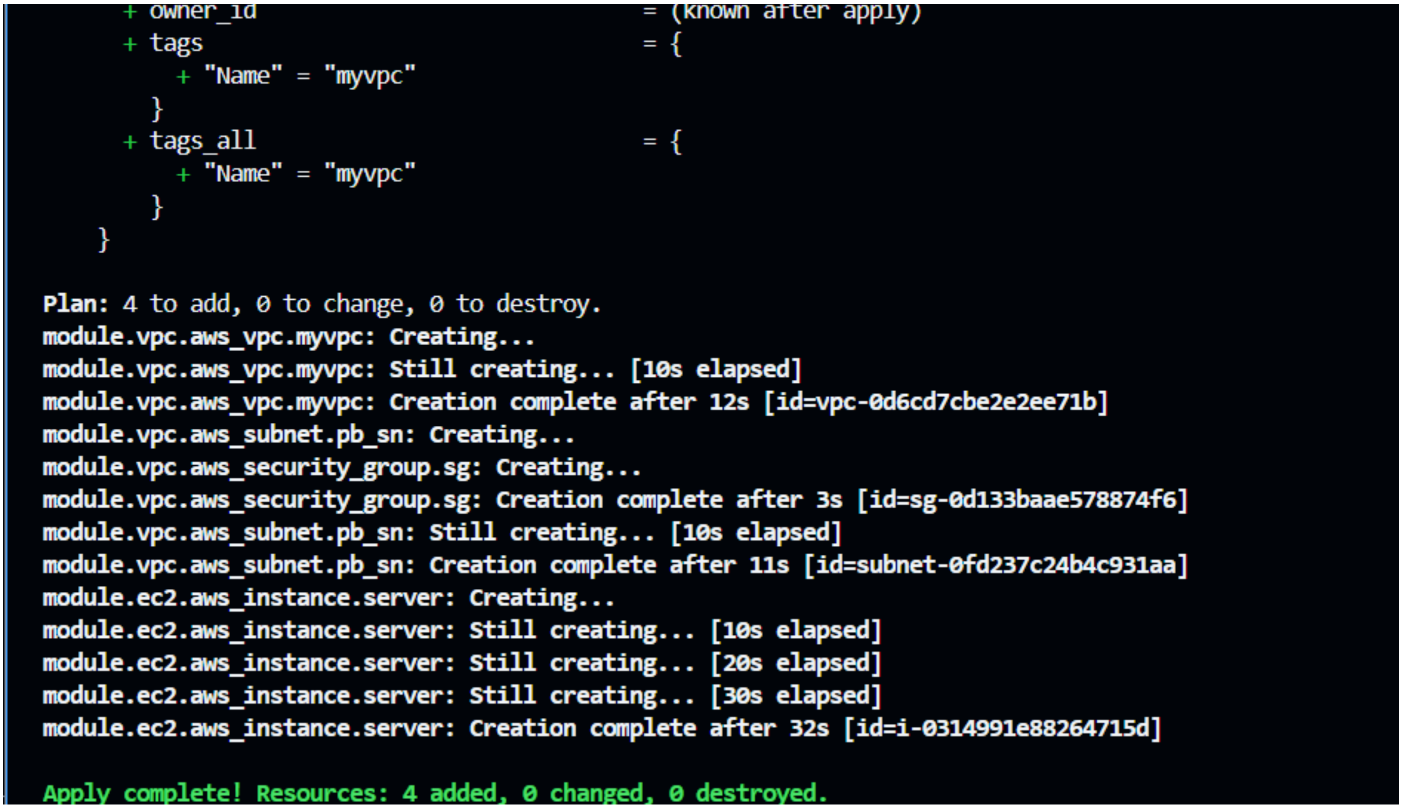


```
      + default_security_group_id            = (known after apply)
      + dhcp_options_id                      = (known after apply)
      + enable_dns_hostnames                 = true
      + enable_dns_support                   = true
      + enable_network_address_usage_metrics = (known after apply)
      + id                                   = (known after apply)
      + instance_tenancy                     = "default"
      + ipv6_association_id                  = (known after apply)
      + ipv6_cidr_block                      = (known after apply)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "myvpc"
        }
      + tags_all                             = {
          + "Name" = "myvpc"
        }
    }

Plan: 4 to add, 0 to change, 0 to destroy.

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

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"
```

You can also run by checking "terraform apply -auto-approve" command which executes the terraform plan without requiring interactive communication and proceeds with deployment.



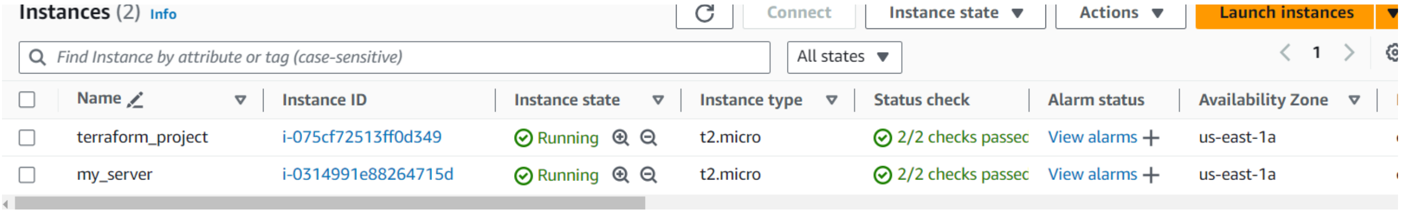
```
ubuntu@ip-172-31-25-53:~/cicdtf$ terraform apply -auto-approve

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:

  # module.ec2.aws_instance.server will be created
  + resource "aws_instance" "server" {
      + ami                                  = "ami-04a81a99f5ec58529"
      + 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)
      + host_resource_group_arn              = (known after apply)
      + iam_instance_profile                 = (known after apply)
      + id                                   = (known after apply)
```



```
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "myvpc"
        }
      + tags_all                             = {
          + "Name" = "myvpc"
        }
    }

Plan: 4 to add, 0 to change, 0 to destroy.
module.vpc.aws_vpc.myvpc: Creating...
module.vpc.aws_vpc.myvpc: Still creating... [10s elapsed]
module.vpc.aws_vpc.myvpc: Creation complete after 12s [id=vpc-0d6cd7cbe2e2ee71b]
module.vpc.aws_subnet.pb_sn: Creating...
module.vpc.aws_security_group.sg: Creating...
module.vpc.aws_security_group.sg: Creation complete after 3s [id=sg-0d133baae578874f6]
module.vpc.aws_subnet.pb_sn: Still creating... [10s elapsed]
module.vpc.aws_subnet.pb_sn: Creation complete after 11s [id=subnet-0fd237c24b4c931aa]
module.ec2.aws_instance.server: Creating...
module.ec2.aws_instance.server: Still creating... [10s elapsed]
module.ec2.aws_instance.server: Still creating... [20s elapsed]
module.ec2.aws_instance.server: Still creating... [30s elapsed]
module.ec2.aws_instance.server: Creation complete after 32s [id=i-0314991e88264715d]

Apply complete! Resources: 4 added, 0 changed, 0 destroyed.
```

When we run apply, terraform. tfstate file will be created which is not a good practise to have it in local machine, we will setup backend in later steps to store on S3 using DynamoDB.

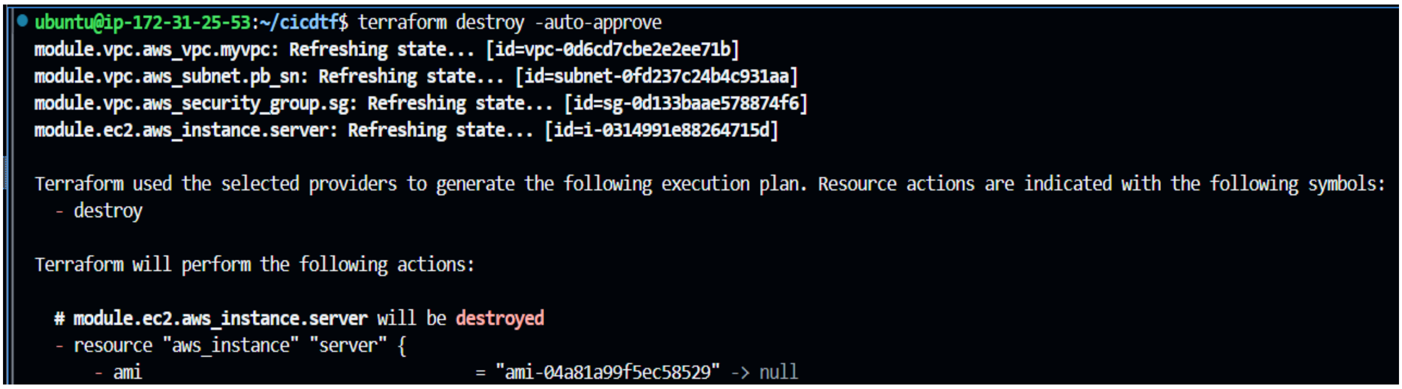
Also it will create vpc, subnet and ec2 instance as well which can be verified in your aws console.



□	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
□	terraform_project	i-075cf72513ff0d349	✓ Running	t2.micro	✓ 2/2 checks passec	View alarms +	us-east-1a
□	my_server	i-0314991e88264715d	✓ Running	t2.micro	✓ 2/2 checks passec	View alarms +	us-east-1a

Now that the code is working fine locally, we'll configure a backend on S3, push the code to GitLab, and proceed with the second part of the project: setting up a CI/CD pipeline to automate the infrastructure deployment tasks we previously performed manually.

before this, delete everything using “terraform destroy -auto-approve” to proceed with automation.



```
ubuntu@ip-172-31-25-53:~/cicdtf$ terraform destroy -auto-approve
module.vpc.aws_vpc.myvpc: Refreshing state... [id=vpc-0d6cd7cbe2e2ee71b]
module.vpc.aws_subnet.pb_sn: Refreshing state... [id=subnet-0fd237c24b4c931aa]
module.vpc.aws_security_group.sg: Refreshing state... [id=sg-0d133baae578874f6]
module.ec2.aws_instance.server: Refreshing state... [id=i-0314991e88264715d]

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:

  # module.ec2.aws_instance.server will be destroyed
  - resource "aws_instance" "server" {
      - ami                                  = "ami-04a81a99f5ec58529" -> null
```

Step8: Set up a backend using S3 and Dynamo DB.

Follow below video or documentation mentioned which has a complete process on how to setup S3 bucket and DynamoDB in detail.

https://developer.hashicorp.com/terraform/language/settings/backends/s3

https://registry.terraform.io/providers/hashicorp/aws/latest/docs/resources/s3_bucket

https://youtu.be/o04xfWEouKM?si=OGNj1c9R2iqe9TOM

The code for creating s3 and DynamoDB is as follows:

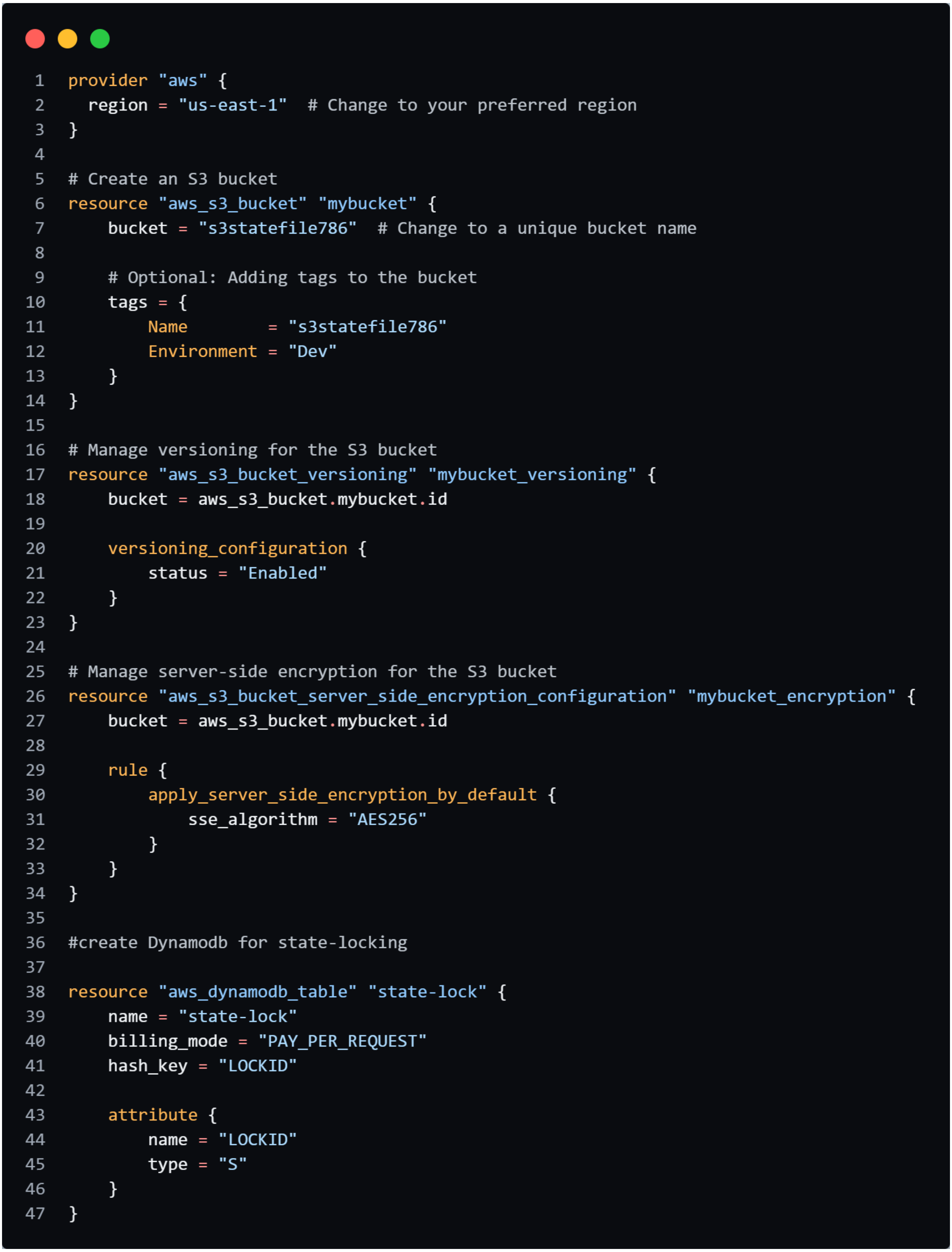
Once the code has been written in a file, run below terraform commands to create s3 and DynamoDB table.

🔶terraform init (initialize your working directory)

🔶terraform plan (plan the changes)

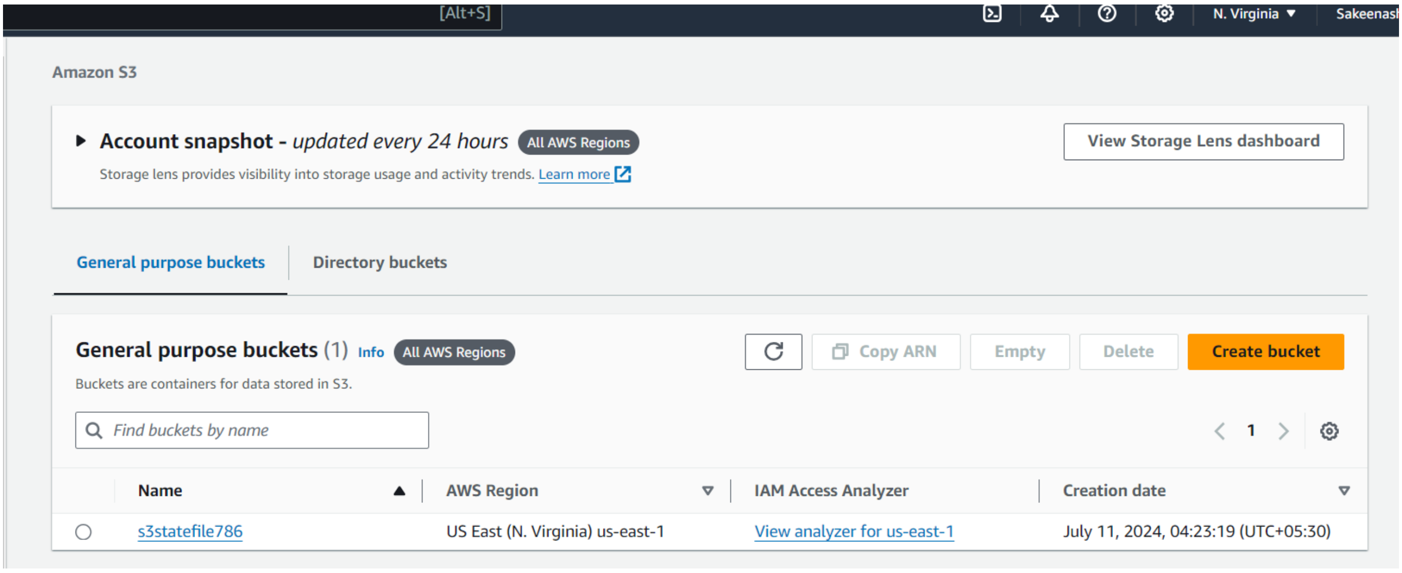
🔶terraform apply (apply the changes)

This configuration will create an S3 bucket with versioning and server-side encryption enabled, as well as a DynamoDB table named state-lock with on-demand billing and a string primary key LOCKID.



```
provider "aws" {
  region = "us-east-1"  # Change to your preferred region
}

# Create an S3 bucket
resource "aws_s3_bucket" "mybucket" {
    bucket = "s3statefile786"  # Change to a unique bucket name

    # Optional: Adding tags to the bucket
    tags = {
        Name        = "s3statefile786"
        Environment = "Dev"
    }
}

# Manage versioning for the S3 bucket
resource "aws_s3_bucket_versioning" "mybucket_versioning" {
    bucket = aws_s3_bucket.mybucket.id

    versioning_configuration {
        status = "Enabled"
    }
}

# Manage server-side encryption for the S3 bucket
resource "aws_s3_bucket_server_side_encryption_configuration" "mybucket_encryption" {
    bucket = aws_s3_bucket.mybucket.id

    rule {
        apply_server_side_encryption_by_default {
            sse_algorithm = "AES256"
        }
    }
}

#create Dynamodb for state-locking

resource "aws_dynamodb_table" "state-lock" {
    name = "state-lock"
    billing_mode = "PAY_PER_REQUEST"
    hash_key = "LOCKID"

    attribute {
        name = "LOCKID"
        type = "S"
    }
}
```

After applying the changes, you can verify whether the s3 bucket and DynamoDB table created in your aws console.



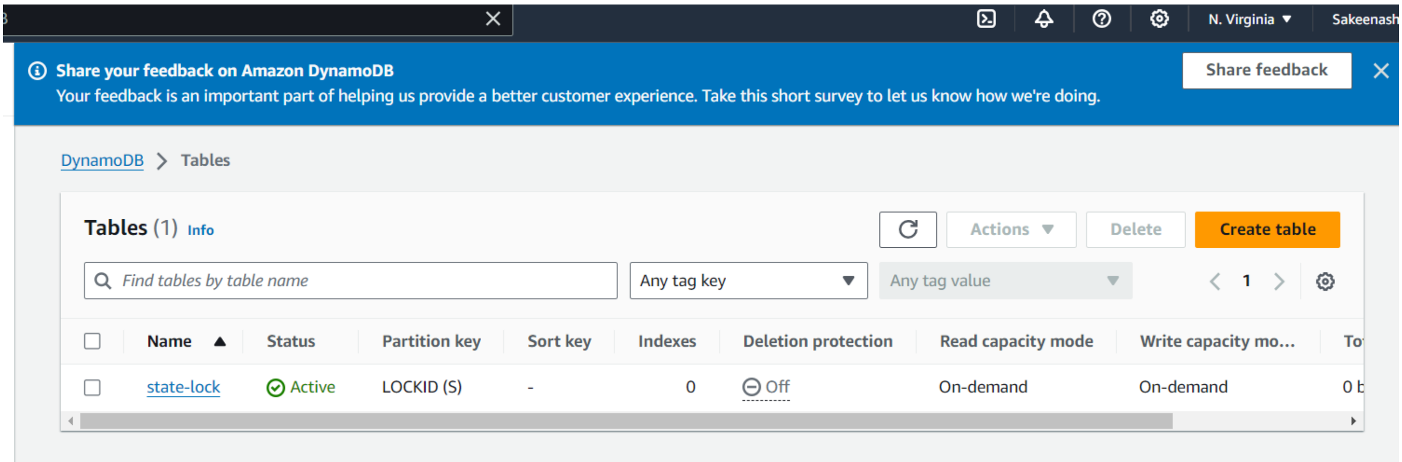
Account snapshot - *updated every 24 hours* All AWS Regions

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

General purpose buckets (1) Info All AWS Regions

Buckets are containers for data stored in S3.

	Name	AWS Region	IAM Access Analyzer	Creation date
○	s3statefile786	US East (N. Virginia) us-east-1	View analyzer for us-east-1	July 11, 2024, 04:23:19 (UTC+05:30)

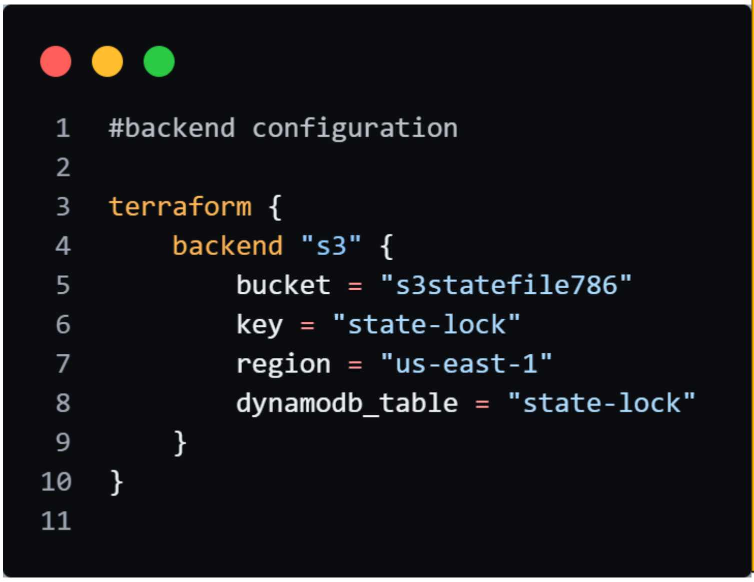


Share your feedback on Amazon DynamoDB
Your feedback is an important part of helping us provide a better customer experience. Take this short survey to let us know how we're doing.

Tables (1) Info

□	Name	Status	Partition key	Sort key	Indexes	Deletion protection	Read capacity mode	Write capacity mo...	To
□	state-lock	✓ Active	LOCKID (S)	-	0	⊖ Off	On-demand	On-demand	0 b

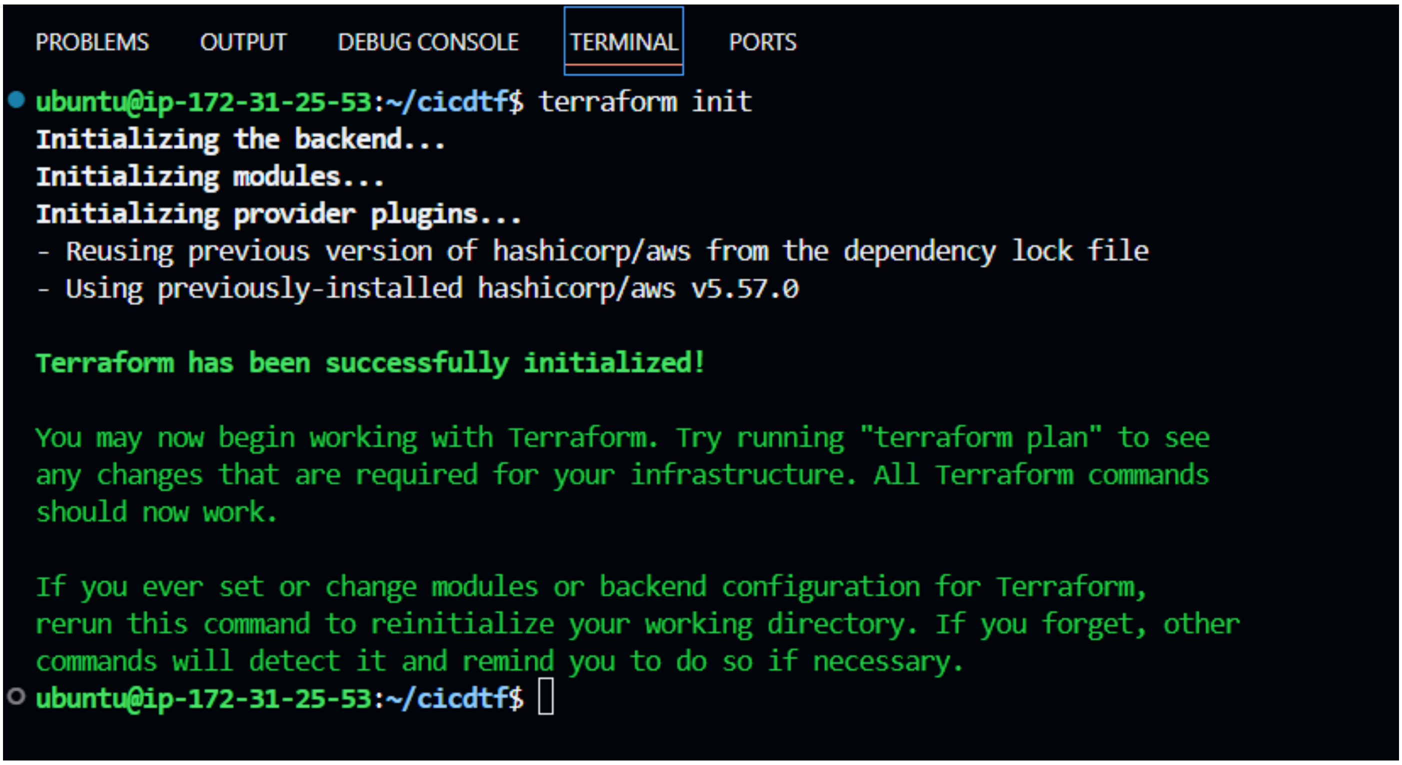
Now create an backend.tf file which will have your bucket details and dynamo dB table.



```
#backend configuration

terraform {
    backend "s3" {
        bucket = "s3statefile786"
        key = "state-lock"
        region = "us-east-1"
        dynamodb_table = "state-lock"
    }
}

```

- **backend "s3"**: Specifies that the Terraform state will be stored in an S3 bucket.
- **bucket = "s3statefile786"**: Sets the name of the S3 bucket where the state file will be stored.
- **key = "state-lock"**: Defines the path within the S3 bucket where the state file will be stored. This can be thought of as the "file name" for the state file within the bucket.
- **region = "us-east-1"**: Indicates the AWS region where the S3 bucket is located.
- **dynamodb_table = "state-lock"**: Specifies the DynamoDB table used for state locking to prevent concurrent modifications to the state file. This helps ensure that only one Terraform process can modify the state at a time, preventing conflicts.

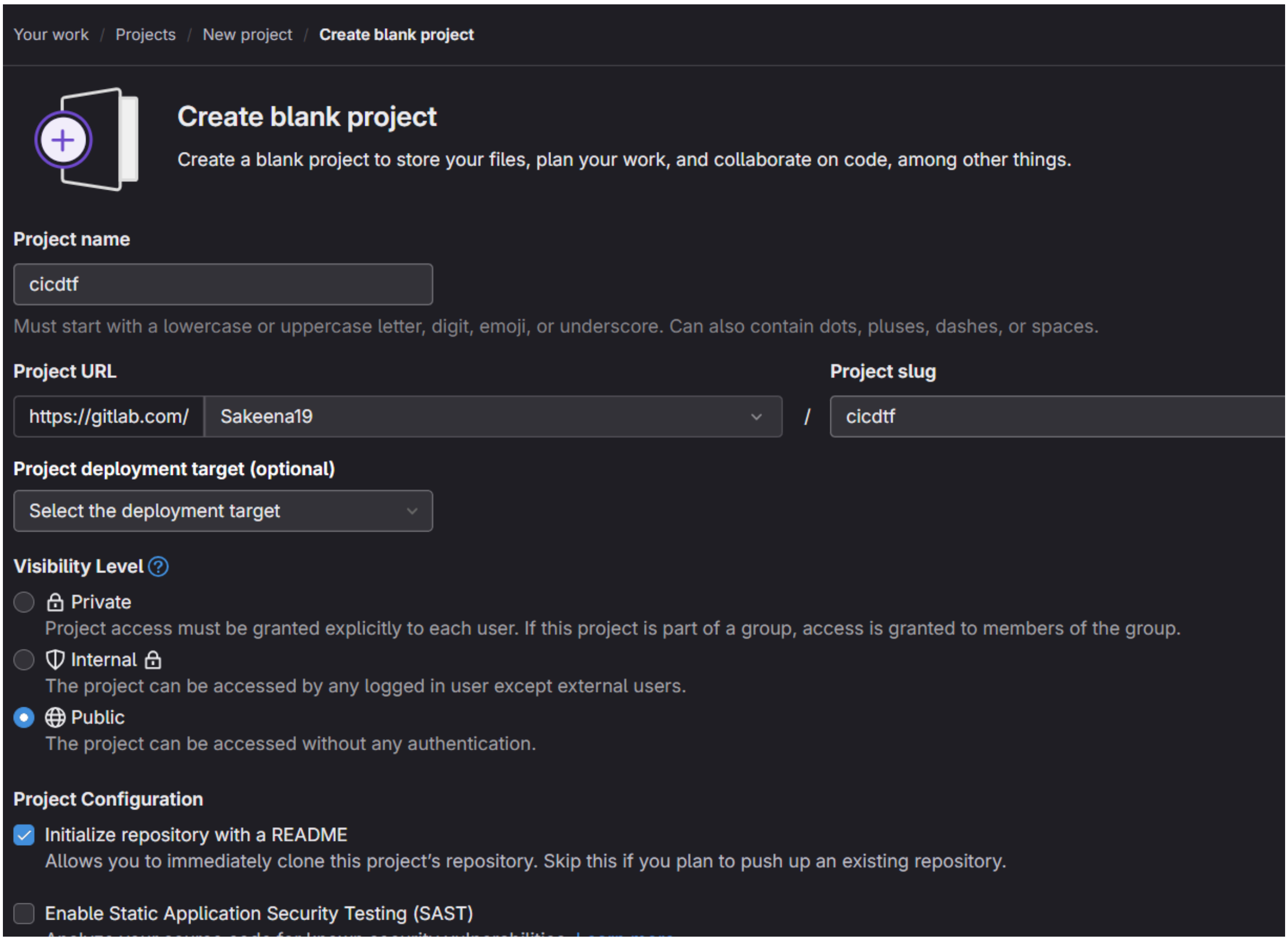
Run “terraform init” to initialize the backend.



```
● ubuntu@ip-172-31-25-53:~/cicdtf$ terraform init
  Initializing the backend...
  Initializing modules...
  Initializing provider plugins...
  - Reusing previous version of hashicorp/aws from the dependency lock file
  - Using previously-installed hashicorp/aws v5.57.0

  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.
○ ubuntu@ip-172-31-25-53:~/cicdtf$ 
```

To automate all the above actions, let’s move to part2, i.e., create GitLab repo, push code to repo and setup cicd pipeline.

Go to GitLab and create a new repository:
Click on new project -> create a blank project -> provide project name, visibility, enable readme -> create project.



Create blank project

Create a blank project to store your files, plan your work, and collaborate on code, among other things.

Project name: cicdtf

Must start with a lowercase or uppercase letter, digit, emoji, or underscore. Can also contain dots, pluses, dashes, or spaces.

Project URL: https://gitlab.com/ Sakeena19 / Project slug: cicdtf

Project deployment target (optional): Select the deployment target

Visibility Level

○ Private
Project access must be granted explicitly to each user. If this project is part of a group, access is granted to members of the group.

○ Internal
The project can be accessed by any logged in user except external users.

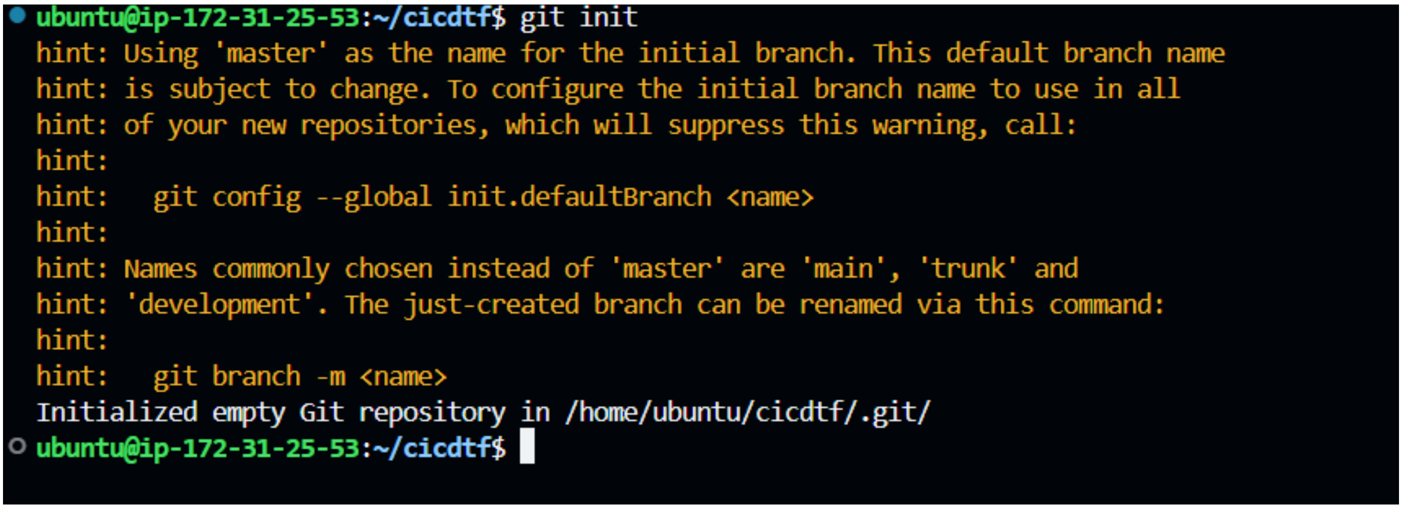
● Public
The project can be accessed without any authentication.

Project Configuration

☑ Initialize repository with a README
Allows you to immediately clone this project’s repository. Skip this if you plan to push up an existing repository.

□ Enable Static Application Security Testing (SAST)

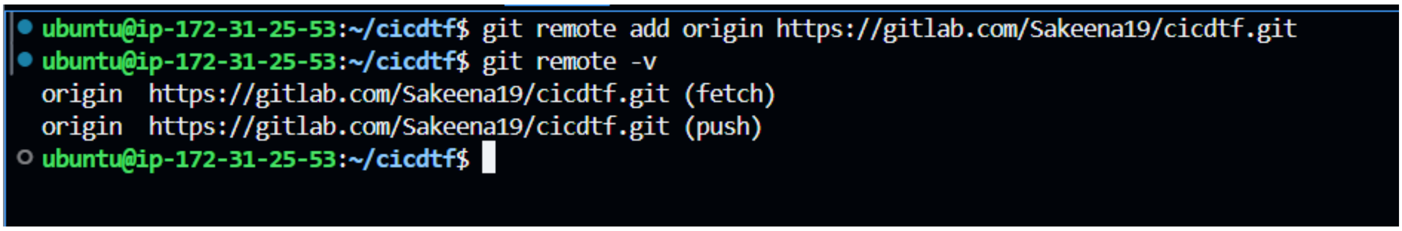
To push the code, first step is to initialize the repository.



```
ubuntu@ip-172-31-25-53:~/cicdtf$ git init
hint: Using 'master' as the name for the initial branch. This default branch name
hint: is subject to change. To configure the initial branch name to use in all
hint: of your new repositories, which will suppress this warning, call:
hint:
hint:   git config --global init.defaultBranch <name>
hint:
hint: Names commonly chosen instead of 'master' are 'main', 'trunk' and
hint: 'development'. The just-created branch can be renamed via this command:
hint:
hint:   git branch -m <name>
Initialized empty Git repository in /home/ubuntu/cicdtf/.git/
ubuntu@ip-172-31-25-53:~/cicdtf$
```

To use only necessary files and ignore other files, create .gitignore file which can be found Here

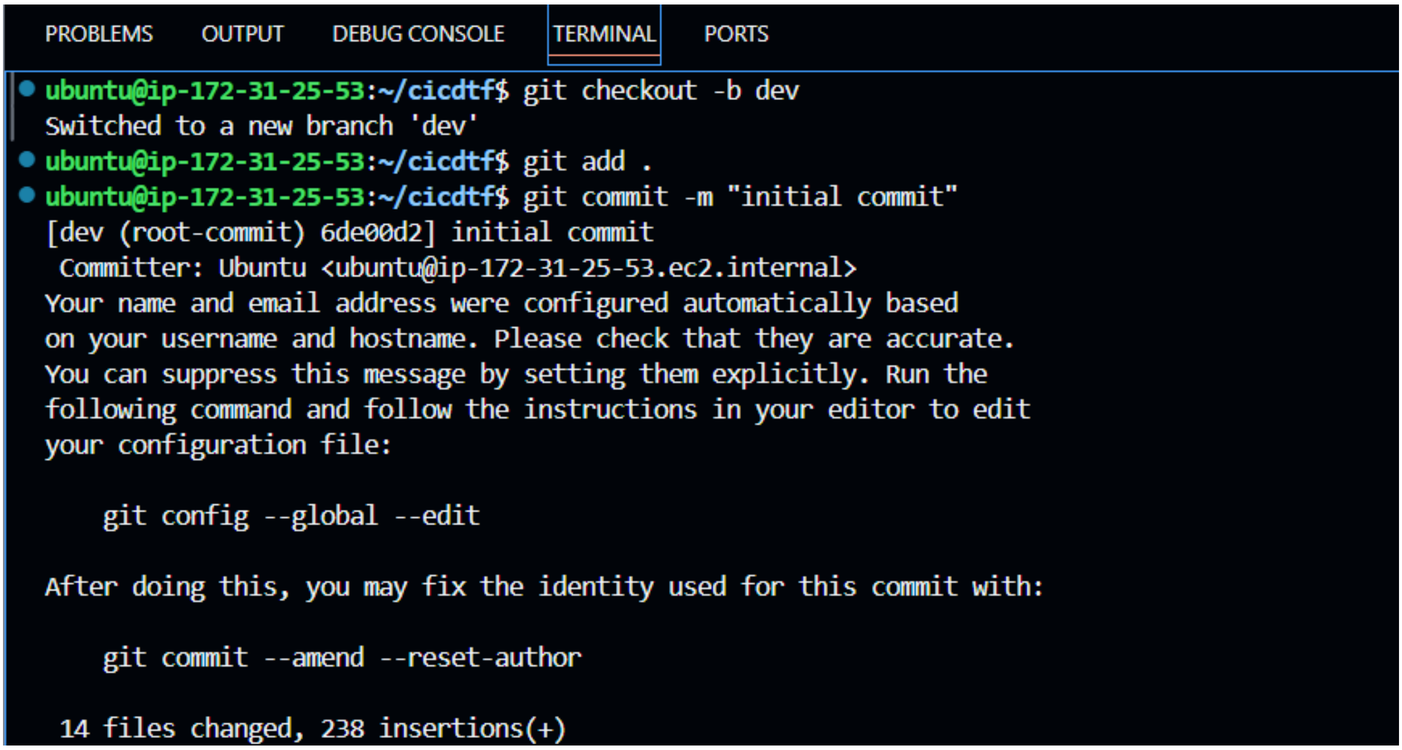
To connect with your GitLab repo, use
git remote add origin https://gitlab.com/Sakeena19/cicdtf.git



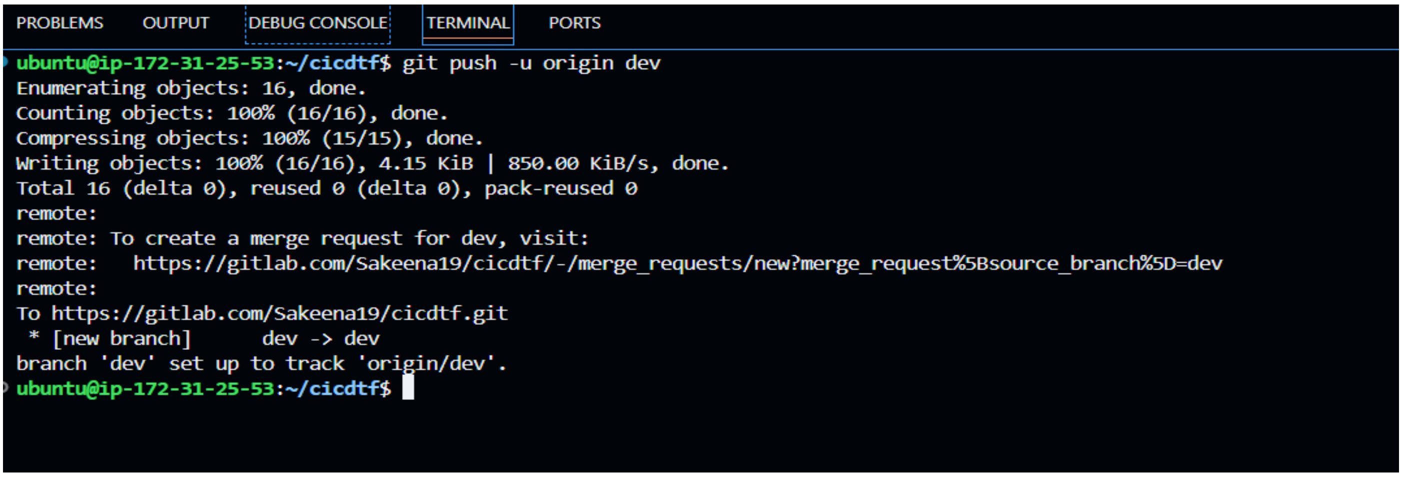
```
ubuntu@ip-172-31-25-53:~/cicdtf$ git remote add origin https://gitlab.com/Sakeena19/cicdtf.git
ubuntu@ip-172-31-25-53:~/cicdtf$ git remote -v
origin  https://gitlab.com/Sakeena19/cicdtf.git (fetch)
origin  https://gitlab.com/Sakeena19/cicdtf.git (push)
ubuntu@ip-172-31-25-53:~/cicdtf$
```

The next step is to create a branch called "dev" because we cannot directly push our code to the main branch. This allows us to make changes and test them safely before merging into the main branch which is the best practice.

To create a branch, use “git checkout -b dev” which will create a branch and switch at a time.



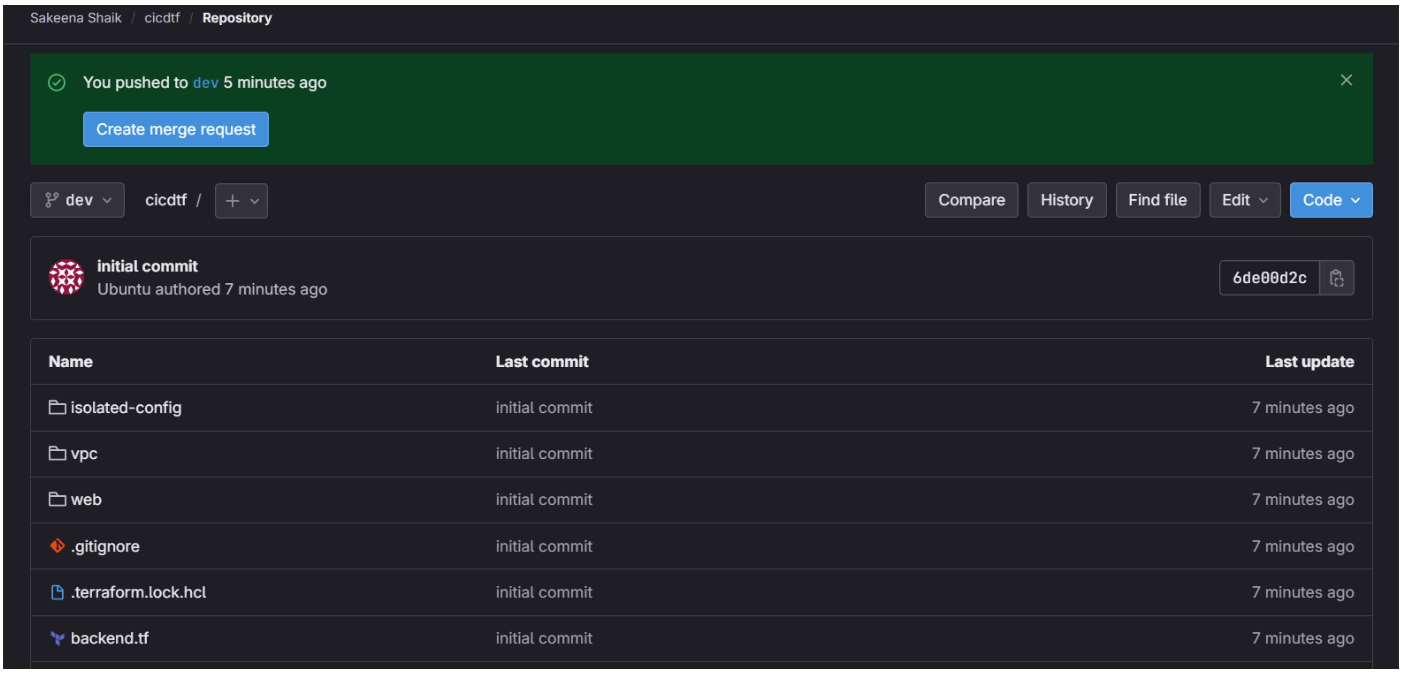
```
ubuntu@ip-172-31-25-53:~/cicdtf$ git checkout -b dev
Switched to a new branch 'dev'
ubuntu@ip-172-31-25-53:~/cicdtf$ git add .
ubuntu@ip-172-31-25-53:~/cicdtf$ git commit -m "initial commit"
[dev (root-commit) 6de00d2] initial commit
 Committer: Ubuntu <ubuntu@ip-172-31-25-53.ec2.internal>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

 14 files changed, 238 insertions(+)
```



```
ubuntu@ip-172-31-25-53:~/cicdtf$ git push -u origin dev
Enumerating objects: 16, done.
Counting objects: 100% (16/16), done.
Compressing objects: 100% (15/15), done.
Writing objects: 100% (16/16), 4.15 KiB | 850.00 KiB/s, done.
Total 16 (delta 0), reused 0 (delta 0), pack-reused 0
remote:
remote: To create a merge request for dev, visit:
remote:   https://gitlab.com/Sakeena19/cicdtf/-/merge_requests/new?merge_request%5Bsource_branch%5D=dev
remote:
To https://gitlab.com/Sakeena19/cicdtf.git
 * [new branch]      dev -> dev
branch 'dev' set up to track 'origin/dev'.
ubuntu@ip-172-31-25-53:~/cicdtf$
```

- 🔷git add . (Adds all changes from current working Dir to staging area)
- 🔷git commit -m “initial commit” (commits the staged changes to local repo)
- 🔷git push -u origin dev (pushes code from local to remote repo i.e., GitLab in the branch named dev)

The dev branch should be created in your GitLab repo from which you can create merge request to merge from dev to main.

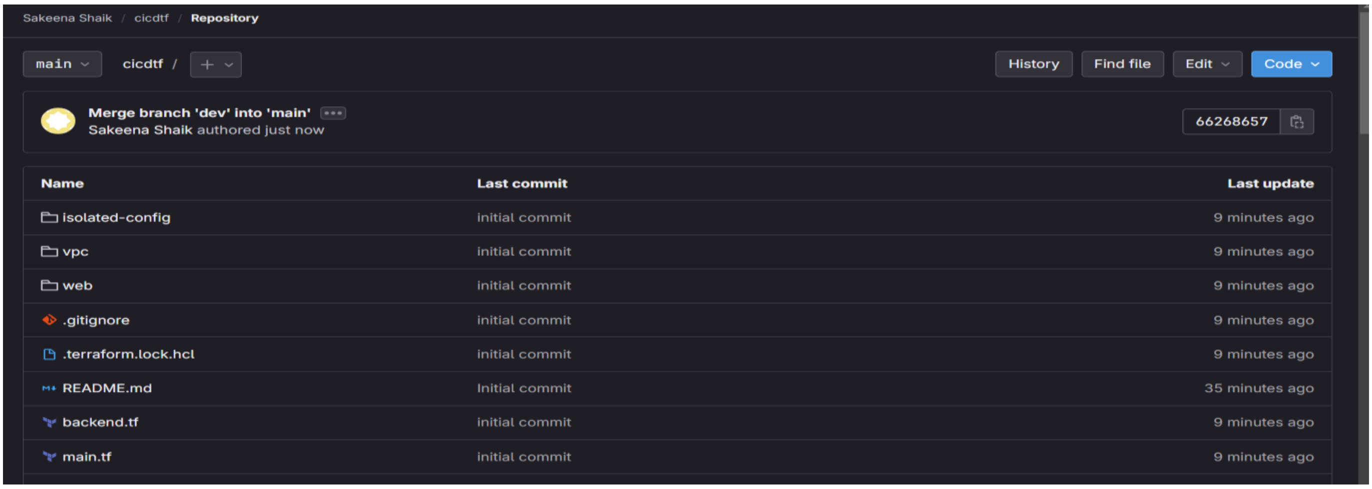


You pushed to dev 5 minutes ago

initial commit
Ubuntu authored 7 minutes ago

Name	Last commit	Last update
isolated-config	initial commit	7 minutes ago
vpc	initial commit	7 minutes ago
web	initial commit	7 minutes ago
.gitignore	initial commit	7 minutes ago
.terraform.lock.hcl	initial commit	7 minutes ago
backend.tf	initial commit	7 minutes ago

After merging you can view your code available in main branch.



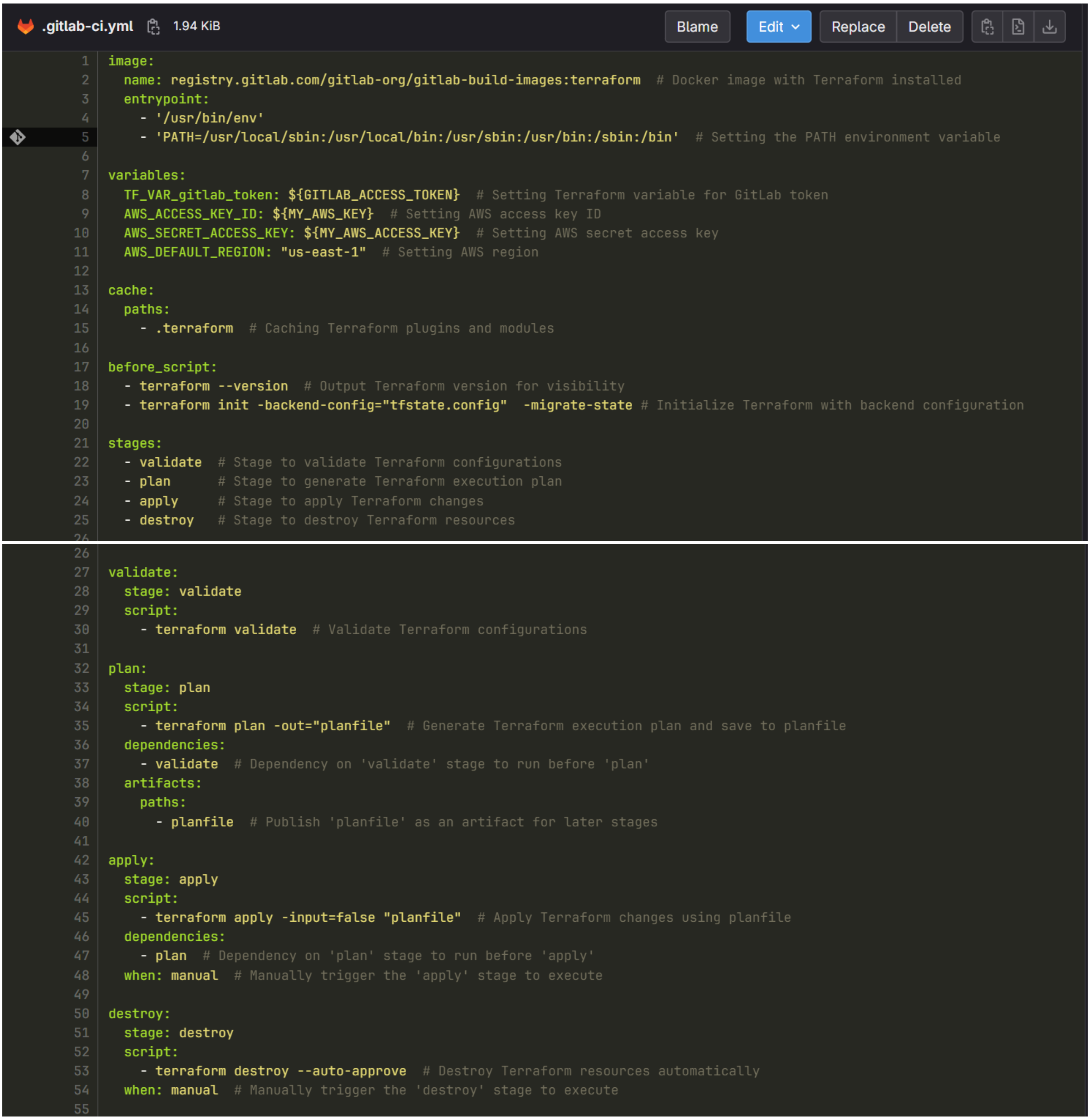
Merge branch 'dev' into 'main'
Sakeena Shaik authored just now

Name	Last commit	Last update
isolated-config	initial commit	9 minutes ago
vpc	initial commit	9 minutes ago
web	initial commit	9 minutes ago
.gitignore	initial commit	9 minutes ago
.terraform.lock.hcl	initial commit	9 minutes ago
README.md	Initial commit	35 minutes ago
backend.tf	initial commit	9 minutes ago
main.tf	initial commit	9 minutes ago

Now as the code is ready, lets write a CICD pipeline script in Gitlab.

The pipeline configuration file must be named "gitlab-ci.yml" for GitLab to recognize it as the CI/CD configuration file. This naming convention ensures that GitLab understands and processes the configuration defined within.

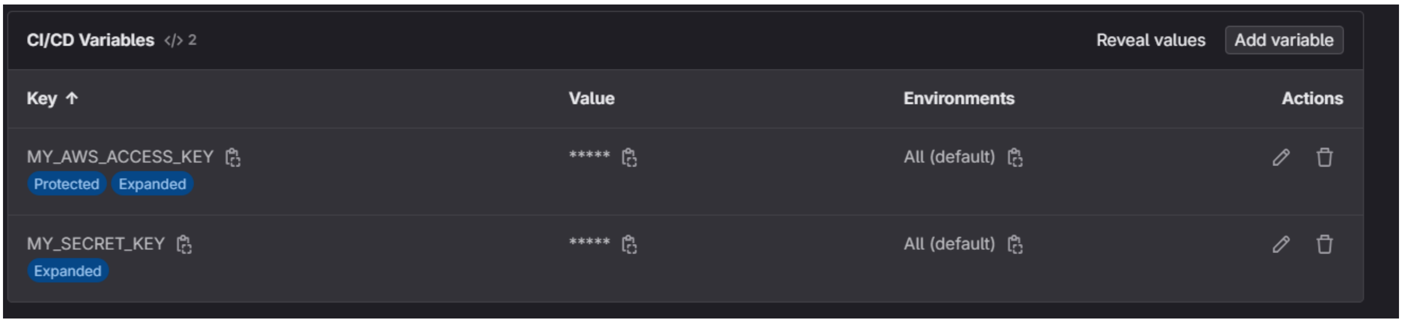
The main purpose of defining this file is to automate the terraform commands so that whenever a person makes any change in infrastructure the pipeline will trigger automatically.



```yaml
image:
  name: registry.gitlab.com/gitlab-org/gitlab-build-images:terraform  # Docker image with Terraform installed
  entrypoint:
    - '/usr/bin/env'
    - 'PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin'  # Setting the PATH environment variable

variables:
  TF_VAR_gitlab_token: ${GITLAB_ACCESS_TOKEN}  # Setting Terraform variable for GitLab token
  AWS_ACCESS_KEY_ID: ${MY_AWS_KEY}  # Setting AWS access key ID
  AWS_SECRET_ACCESS_KEY: ${MY_AWS_ACCESS_KEY}  # Setting AWS secret access key
  AWS_DEFAULT_REGION: "us-east-1"  # Setting AWS region

cache:
  paths:
    - .terraform  # Caching Terraform plugins and modules

before_script:
  - terraform --version  # Output Terraform version for visibility
  - terraform init -backend-config="tfstate.config"  -migrate-state # Initialize Terraform with backend configuration

stages:
  - validate  # Stage to validate Terraform configurations
  - plan      # Stage to generate Terraform execution plan
  - apply     # Stage to apply Terraform changes
  - destroy   # Stage to destroy Terraform resources

validate:
  stage: validate
  script:
    - terraform validate  # Validate Terraform configurations

plan:
  stage: plan
  script:
    - terraform plan -out="planfile"  # Generate Terraform execution plan and save to planfile
  dependencies:
    - validate  # Dependency on 'validate' stage to run before 'plan'
  artifacts:
    paths:
      - planfile  # Publish 'planfile' as an artifact for later stages

apply:
  stage: apply
  script:
    - terraform apply -input=false "planfile"  # Apply Terraform changes using planfile
  dependencies:
    - plan  # Dependency on 'plan' stage to run before 'apply'
  when: manual  # Manually trigger the 'apply' stage to execute

destroy:
  stage: destroy
  script:
    - terraform destroy --auto-approve  # Destroy Terraform resources automatically
  when: manual  # Manually trigger the 'destroy' stage to execute

```

As it’s not a best practise to hardcode the aws secret and access key in code, variables can be created for storing access keys and secret access keys in your GitLab repository.

Navigate to your project repo -> settings -> CICD ->Variables -> Add variables -> Add variables for your access key and secret access key.



CI/CD Variables </> 2 Reveal values Add variable

Key ↑	Value	Environments	Actions
MY_AWS_ACCESS_KEY Protected Expanded	*****	All (default)	
MY_SECRET_KEY Expanded	*****	All (default)	

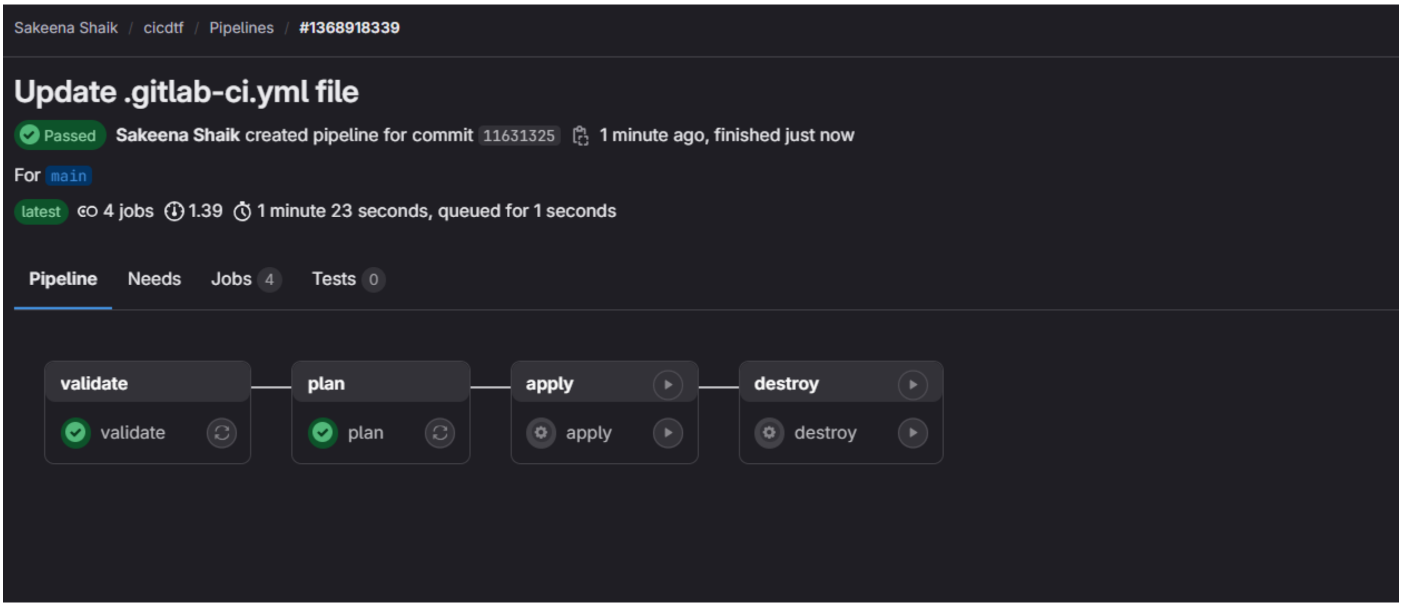
Once the above changes done, the pipeline will start triggering automatically executing all the steps we scripted in .gitlab-ci.yml file.

cicd pipeline script explanation (.gitlab-ci.yml file):

This GitLab CI/CD pipeline script is designed to automate the deployment and management of infrastructure using Terraform. The script uses a Docker image that has Terraform installed and sets environment variables for AWS credentials and a GitLab token. It also caches Terraform plugins and modules to improve efficiency. The pipeline is divided into four stages: validate, plan, apply, and destroy.

In the validate stage, the script checks if the Terraform configuration files are correct. The plan stage then generates a Terraform execution plan and saves it as an artifact called planfile. The apply stage uses this plan to create or update the infrastructure, but this stage must be triggered manually to execute. Similarly, the destroy stage, which is also manually triggered, destroys the Terraform-managed resources automatically.

Before running these stages, the script outputs the Terraform version and initializes Terraform with a backend configuration specified in a tfstate.config file. By organizing the pipeline in this way, the script ensures that infrastructure changes are validated, planned, and applied in a controlled and orderly manner, with the option to manually control the application and destruction of infrastructure changes.



Sakeena Shaik / cicdtf / Pipelines / #1368918339

Update .gitlab-ci.yml file

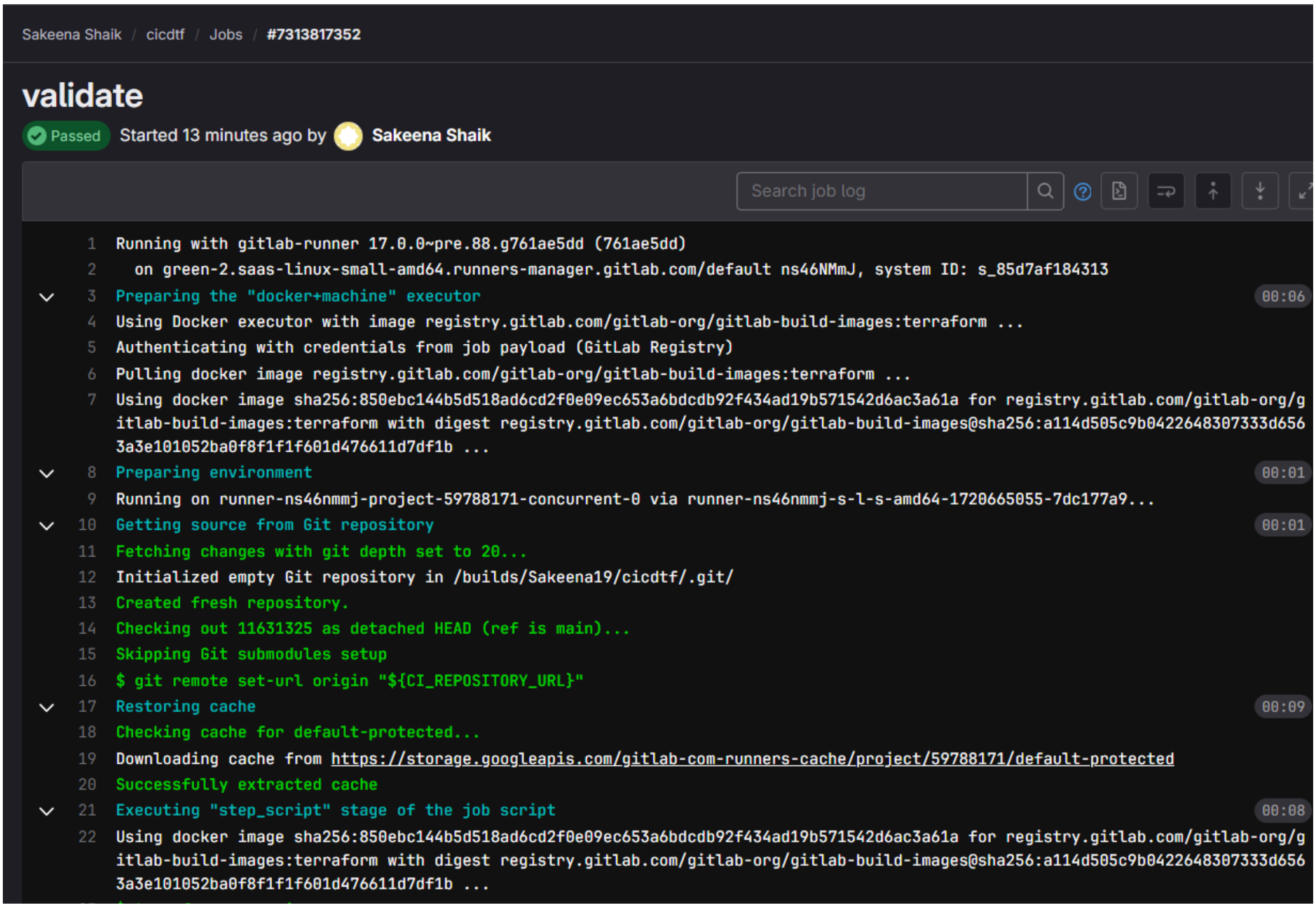
✓ Passed Sakeena Shaik created pipeline for commit 11631325 1 minute ago, finished just now

For main

latest 4 jobs 1.39 1 minute 23 seconds, queued for 1 seconds

Whenever the pipeline executes, the validate and plan stages run automatically, while the apply and destroy stages require manual execution, as defined in the script. This approach follows industry best practices, allowing verification of changes and manual approval before they are applied or destroyed.

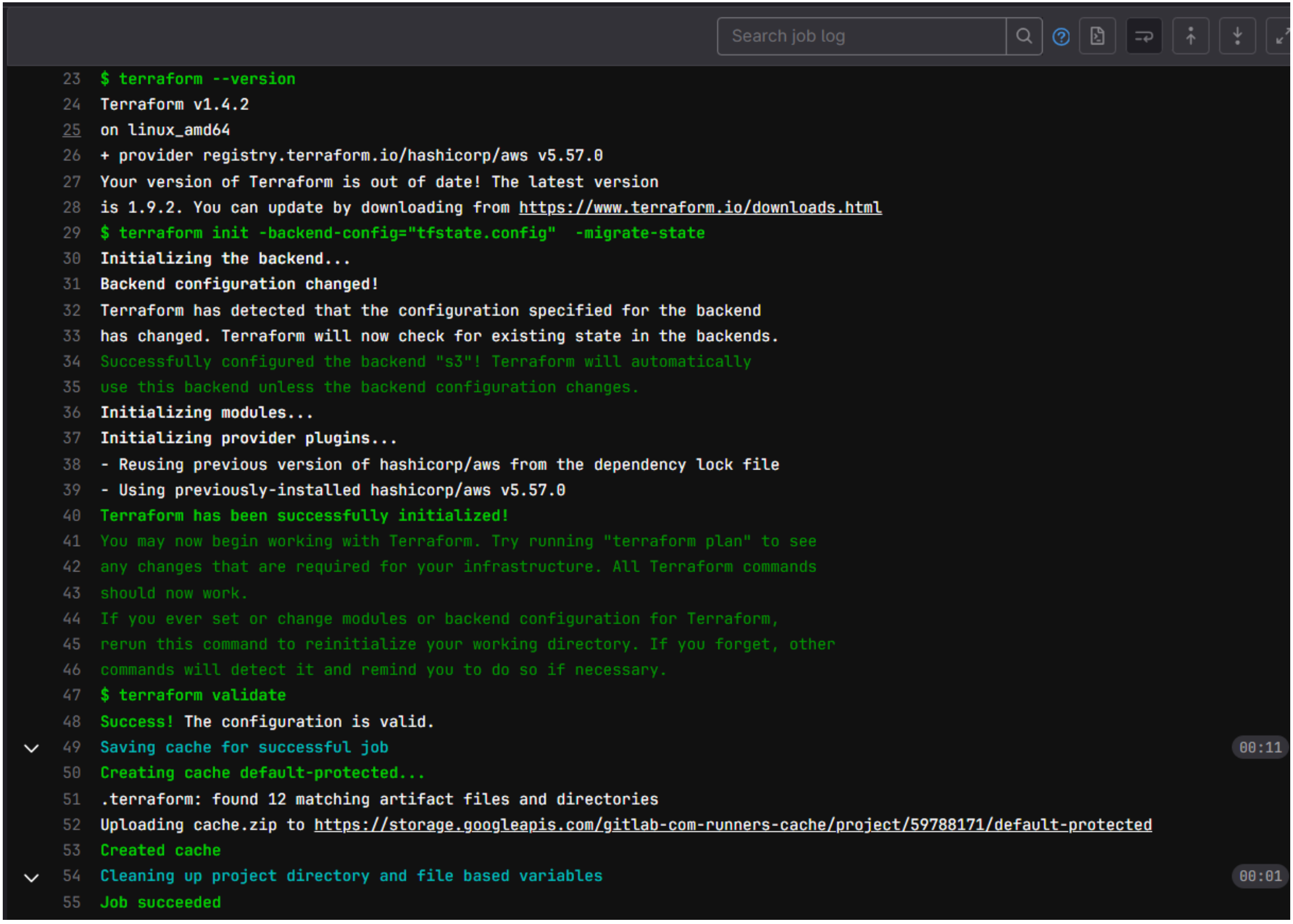
1) Logs from validate stage:



validate

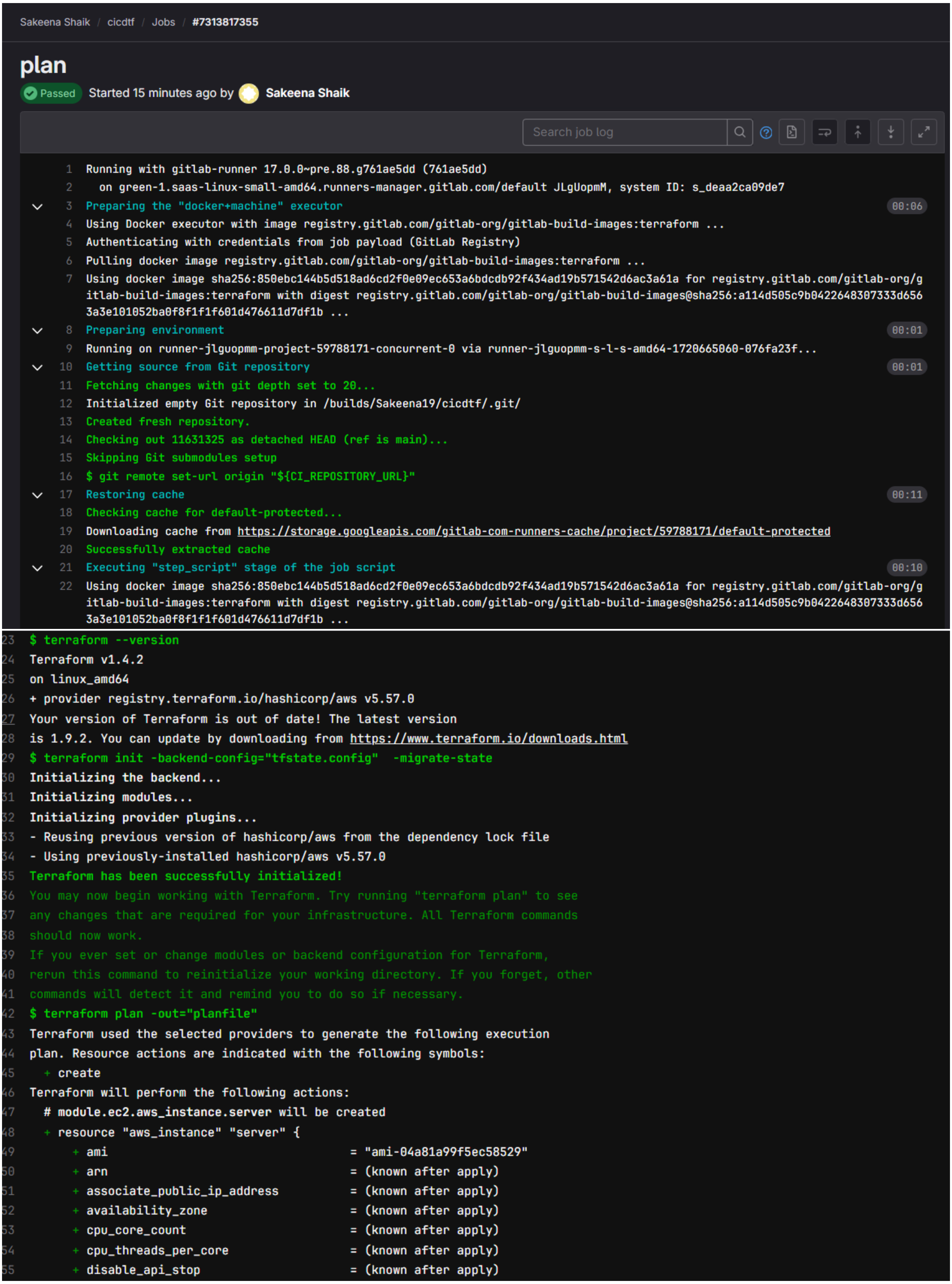
Started 13 minutes ago by Sakeena Shaik

```
Running with gitlab-runner 17.0.0~pre.88.g761ae5dd (761ae5dd)
  on green-2.saas-linux-small-amd64.runners-manager.gitlab.com/default ns46NMmJ, system ID: s_85d7af184313
Preparing the "docker+machine" executor                                                          00:06
Using Docker executor with image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Authenticating with credentials from job payload (GitLab Registry)
Pulling docker image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Using docker image sha256:850ebc144b5d518ad6cd2f0e09ec653a6bdcdb92f434ad19b571542d6ac3a61a for registry.gitlab.com/gitlab-org/g
itlab-build-images:terraform with digest registry.gitlab.com/gitlab-org/gitlab-build-images@sha256:a114d505c9b0422648307333d656
3a3e101052ba0f8f1f1f601d476611d7df1b ...
Preparing environment                                                                            00:01
Running on runner-ns46nmmj-project-59788171-concurrent-0 via runner-ns46nmmj-s-l-s-amd64-1720665055-7dc177a9...
Getting source from Git repository                                                               00:01
Fetching changes with git depth set to 20...
Initialized empty Git repository in /builds/Sakeena19/cicdtf/.git/
Created fresh repository.
Checking out 11631325 as detached HEAD (ref is main)...
Skipping Git submodules setup
$ git remote set-url origin "${CI_REPOSITORY_URL}"
Restoring cache                                                                                  00:09
Checking cache for default-protected...
Downloading cache from https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Successfully extracted cache
Executing "step_script" stage of the job script                                                  00:08
Using docker image sha256:850ebc144b5d518ad6cd2f0e09ec653a6bdcdb92f434ad19b571542d6ac3a61a for registry.gitlab.com/gitlab-org/g
itlab-build-images:terraform with digest registry.gitlab.com/gitlab-org/gitlab-build-images@sha256:a114d505c9b0422648307333d656
3a3e101052ba0f8f1f1f601d476611d7df1b ...
```



```
$ terraform --version
Terraform v1.4.2
on linux_amd64
+ provider registry.terraform.io/hashicorp/aws v5.57.0
Your version of Terraform is out of date! The latest version
is 1.9.2. You can update by downloading from https://www.terraform.io/downloads.html
$ terraform init -backend-config="tfstate.config"  -migrate-state
Initializing the backend...
Backend configuration changed!
Terraform has detected that the configuration specified for the backend
has changed. Terraform will now check for existing state in the backends.
Successfully configured the backend "s3"! Terraform will automatically
use this backend unless the backend configuration changes.
Initializing modules...
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/aws v5.57.0
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.
$ terraform validate
Success! The configuration is valid.
Saving cache for successful job                                                                  00:11
Creating cache default-protected...
.terraform: found 12 matching artifact files and directories
Uploading cache.zip to https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Created cache
Cleaning up project directory and file based variables                                           00:01
Job succeeded
```

2) Logs from plan stage:

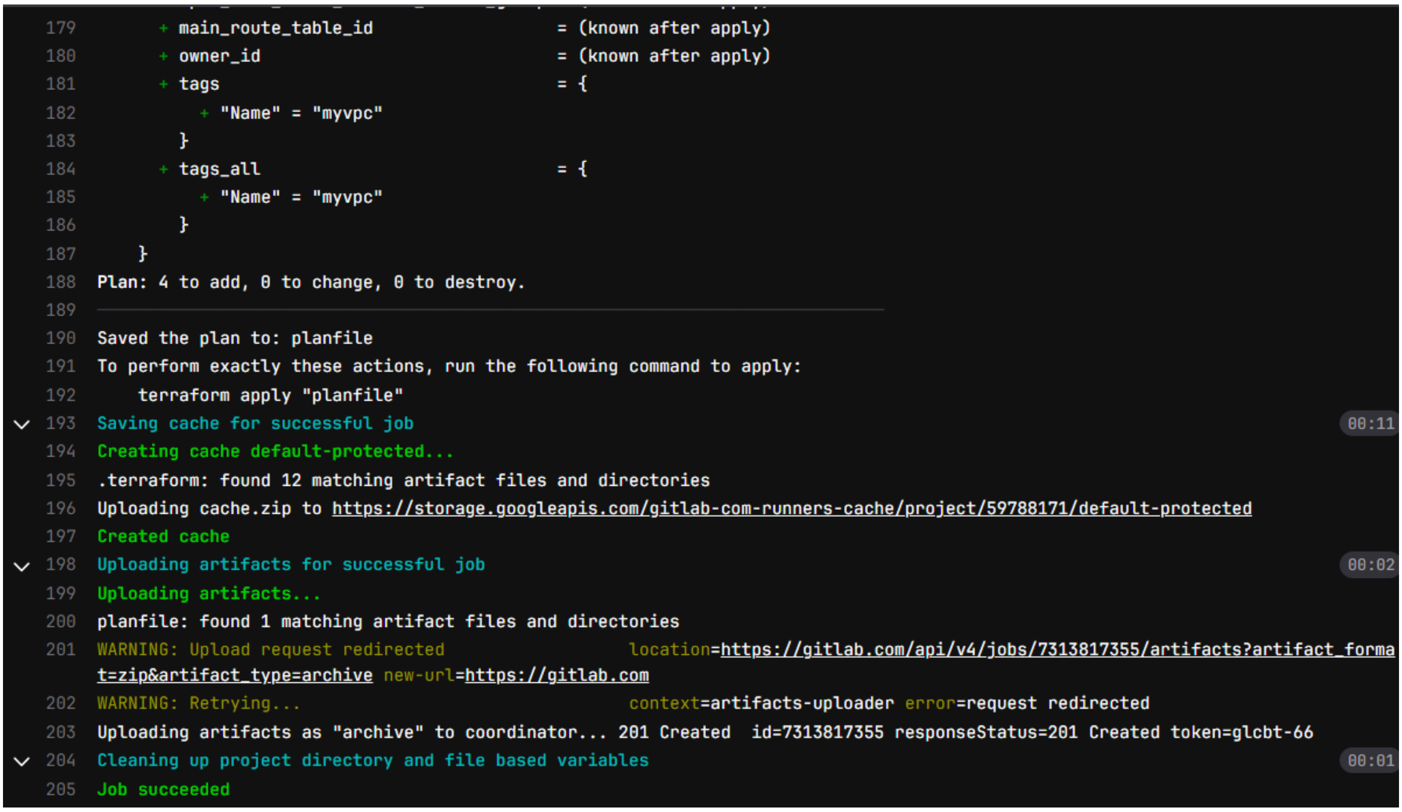


Sakeena Shaik / cicdtf / Jobs / #7313817355

plan

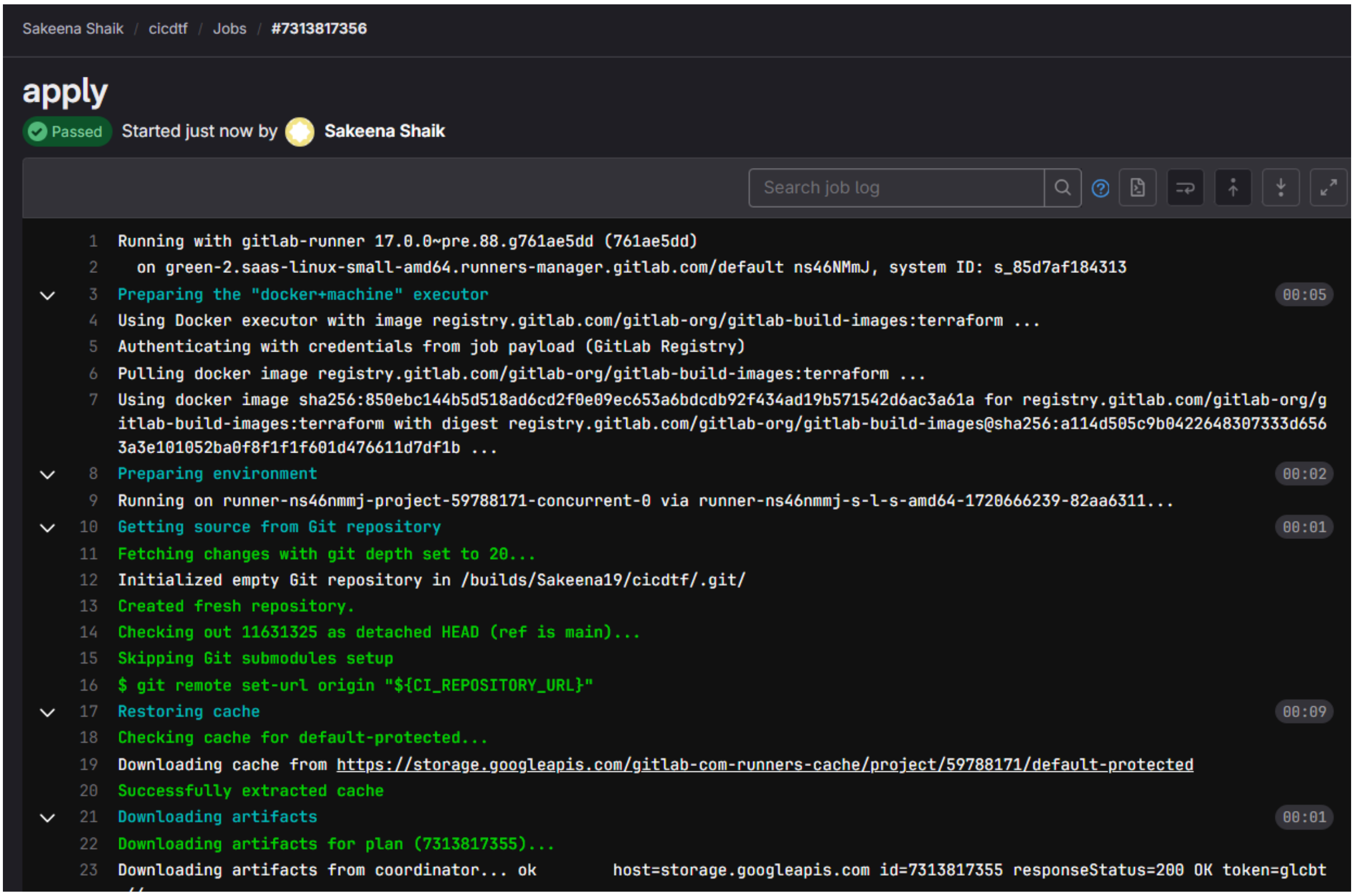
Passed Started 15 minutes ago by Sakeena Shaik

```
Running with gitlab-runner 17.0.0~pre.88.g761ae5dd (761ae5dd)
  on green-1.saas-linux-small-amd64.runners-manager.gitlab.com/default JLgUopmM, system ID: s_deaa2ca09de7
Preparing the "docker+machine" executor                                                              00:06
Using Docker executor with image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Authenticating with credentials from job payload (GitLab Registry)
Pulling docker image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Using docker image sha256:850ebc144b5d518ad6cd2f0e09ec653a6bdcdb92f434ad19b571542d6ac3a61a for registry.gitlab.com/gitlab-org/g
itlab-build-images:terraform with digest registry.gitlab.com/gitlab-org/gitlab-build-images@sha256:a114d505c9b0422648307333d656
3a3e101052ba0f8f1f1f601d476611d7df1b ...
Preparing environment                                                                                00:01
Running on runner-jlguopmm-project-59788171-concurrent-0 via runner-jlguopmm-s-l-s-amd64-1720665060-076fa23f...
Getting source from Git repository                                                                   00:01
Fetching changes with git depth set to 20...
Initialized empty Git repository in /builds/Sakeena19/cicdtf/.git/
Created fresh repository.
Checking out 11631325 as detached HEAD (ref is main)...
Skipping Git submodules setup
$ git remote set-url origin "${CI_REPOSITORY_URL}"
Restoring cache                                                                                      00:11
Checking cache for default-protected...
Downloading cache from https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Successfully extracted cache
Executing "step_script" stage of the job script                                                      00:10
Using docker image sha256:850ebc144b5d518ad6cd2f0e09ec653a6bdcdb92f434ad19b571542d6ac3a61a for registry.gitlab.com/gitlab-org/g
itlab-build-images:terraform with digest registry.gitlab.com/gitlab-org/gitlab-build-images@sha256:a114d505c9b0422648307333d656
3a3e101052ba0f8f1f1f601d476611d7df1b ...
$ terraform --version
Terraform v1.4.2
on linux_amd64
+ provider registry.terraform.io/hashicorp/aws v5.57.0
Your version of Terraform is out of date! The latest version
is 1.9.2. You can update by downloading from https://www.terraform.io/downloads.html
$ terraform init -backend-config="tfstate.config"  -migrate-state
Initializing the backend...
Initializing modules...
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/aws v5.57.0
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.
$ terraform plan -out="planfile"
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:
  # module.ec2.aws_instance.server will be created
  + resource "aws_instance" "server" {
      + ami                                  = "ami-04a81a99f5ec58529"
      + 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)
```



```
          + main_route_table_id                = (known after apply)
          + owner_id                           = (known after apply)
          + tags                               = {
              + "Name" = "myvpc"
            }
          + tags_all                           = {
              + "Name" = "myvpc"
            }
        }
Plan: 4 to add, 0 to change, 0 to destroy.

Saved the plan to: planfile
To perform exactly these actions, run the following command to apply:
    terraform apply "planfile"
Saving cache for successful job                                                                00:11
Creating cache default-protected...
.terraform: found 12 matching artifact files and directories
Uploading cache.zip to https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Created cache
Uploading artifacts for successful job                                                         00:02
Uploading artifacts...
planfile: found 1 matching artifact files and directories
WARNING: Upload request redirected                  location=https://gitlab.com/api/v4/jobs/7313817355/artifacts?artifact_forma
t=zip&artifact_type=archive new-url=https://gitlab.com
WARNING: Retrying...                                context=artifacts-uploader error=request redirected
Uploading artifacts as "archive" to coordinator... 201 Created  id=7313817355 responseStatus=201 Created token=glcbt-66
Cleaning up project directory and file based variables                                         00:01
Job succeeded
```

3) Logs from apply:

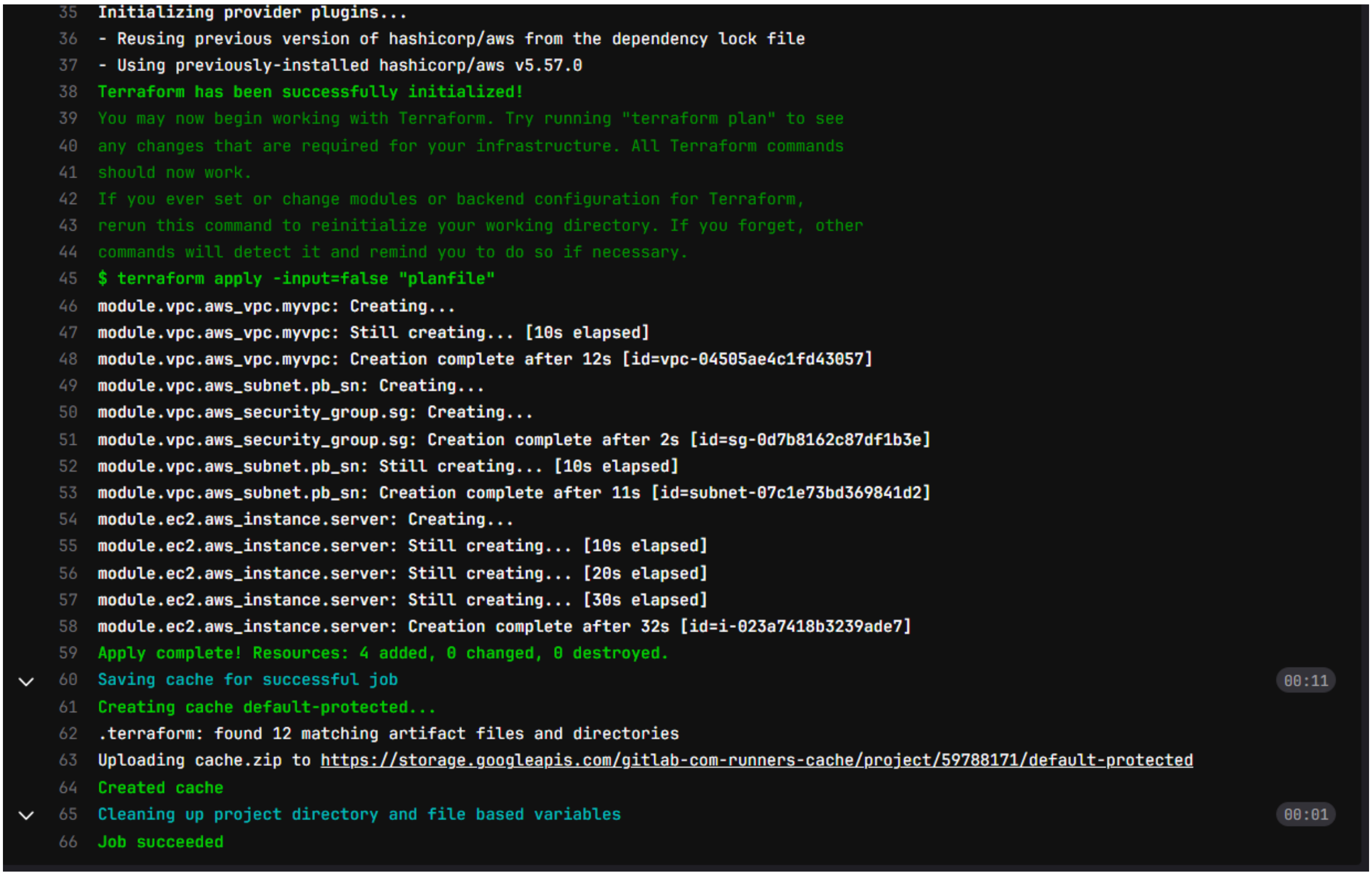


Sakeena Shaik / cicdtf / Jobs / **#7313817356**

apply

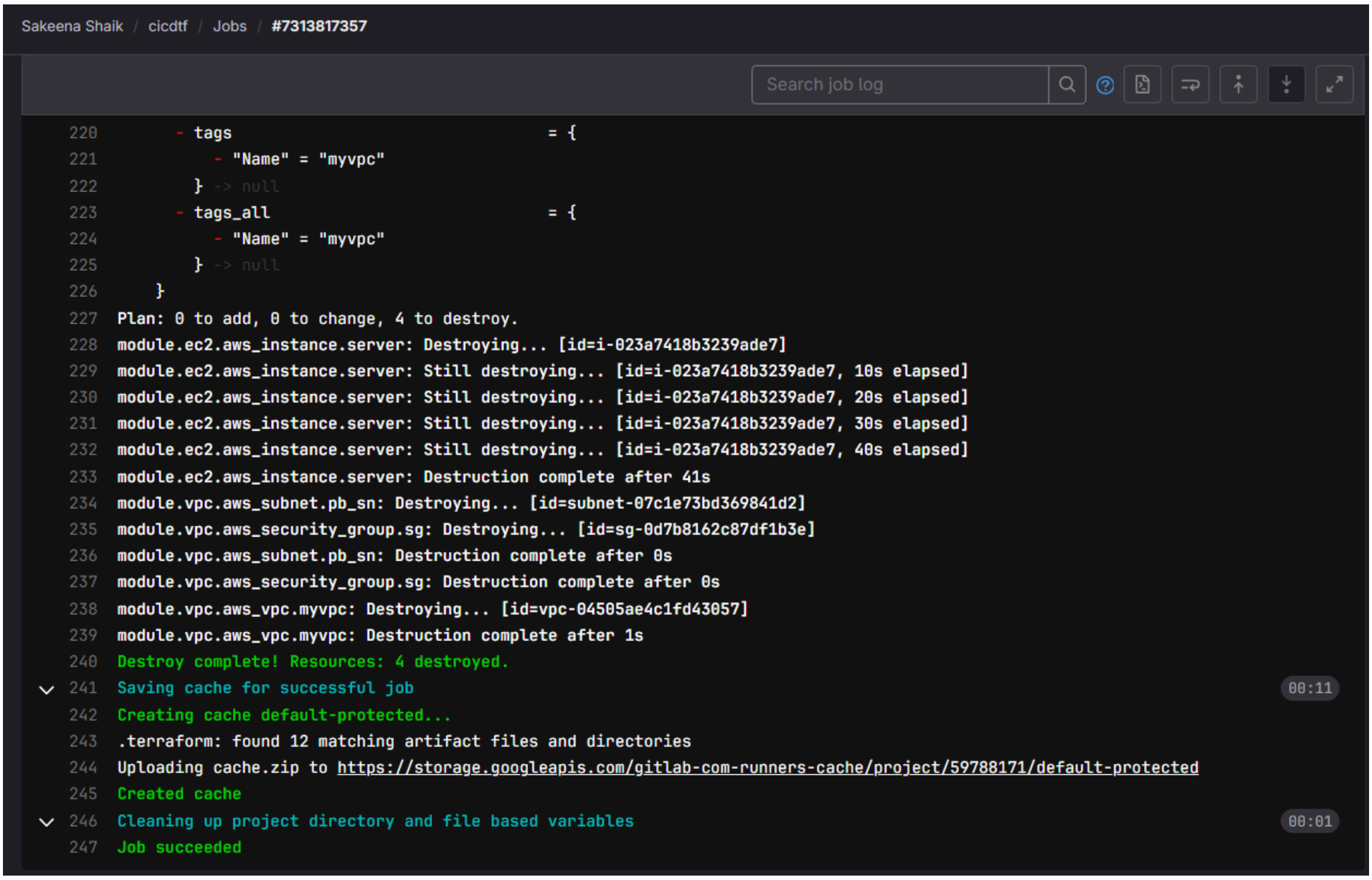
Passed Started just now by **Sakeena Shaik**

```
Running with gitlab-runner 17.0.0~pre.88.g761ae5dd (761ae5dd)
  on green-2.saas-linux-small-amd64.runners-manager.gitlab.com/default ns46NMmJ, system ID: s_85d7af184313
Preparing the "docker+machine" executor                                                        00:05
Using Docker executor with image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Authenticating with credentials from job payload (GitLab Registry)
Pulling docker image registry.gitlab.com/gitlab-org/gitlab-build-images:terraform ...
Using docker image sha256:850ebc144b5d518ad6cd2f0e09ec653a6bdcdb92f434ad19b571542d6ac3a61a for registry.gitlab.com/gitlab-org/g
itlab-build-images:terraform with digest registry.gitlab.com/gitlab-org/gitlab-build-images@sha256:a114d505c9b0422648307333d656
3a3e101052ba0f8f1f1f601d476611d7df1b ...
Preparing environment                                                                          00:02
Running on runner-ns46nmmj-project-59788171-concurrent-0 via runner-ns46nmmj-s-l-s-amd64-1720666239-82aa6311...
Getting source from Git repository                                                             00:01
Fetching changes with git depth set to 20...
Initialized empty Git repository in /builds/Sakeena19/cicdtf/.git/
Created fresh repository.
Checking out 11631325 as detached HEAD (ref is main)...
Skipping Git submodules setup
$ git remote set-url origin "${CI_REPOSITORY_URL}"
Restoring cache                                                                                00:09
Checking cache for default-protected...
Downloading cache from https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Successfully extracted cache
Downloading artifacts                                                                          00:01
Downloading artifacts for plan (7313817355)...
Downloading artifacts from coordinator... ok        host=storage.googleapis.com id=7313817355 responseStatus=200 OK token=glcbt
```



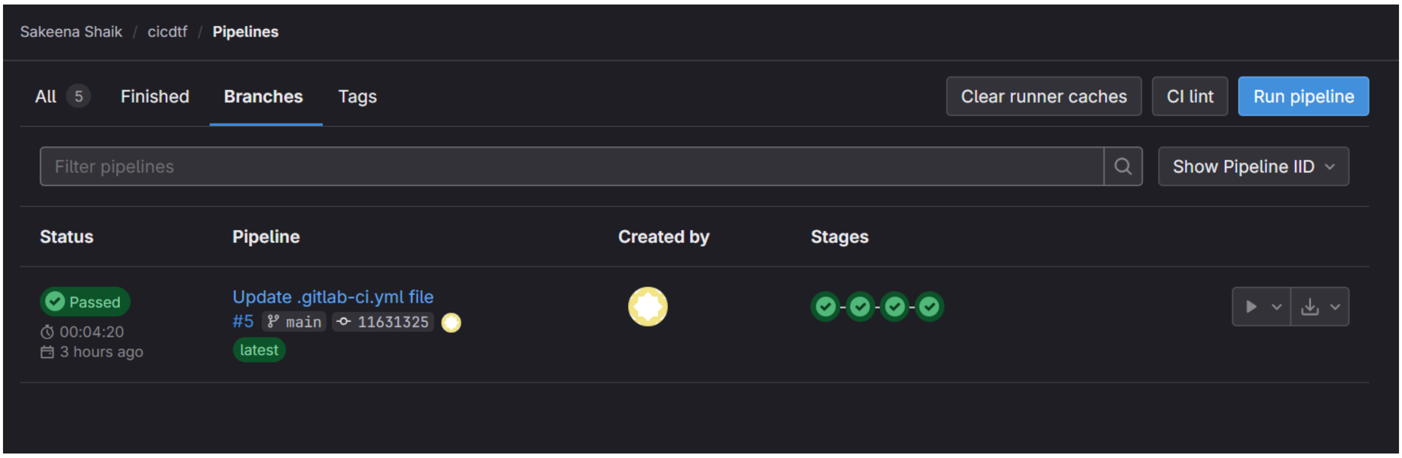
```
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/aws v5.57.0
Terraform has been successfully initialized!
You may now begin working with Terraform. Try running "terraform plan" to see
any changes that 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.
$ terraform apply -input=false "planfile"
module.vpc.aws_vpc.myvpc: Creating...
module.vpc.aws_vpc.myvpc: Still creating... [10s elapsed]
module.vpc.aws_vpc.myvpc: Creation complete after 12s [id=vpc-04505ae4c1fd43057]
module.vpc.aws_subnet.pb_sn: Creating...
module.vpc.aws_security_group.sg: Creating...
module.vpc.aws_security_group.sg: Creation complete after 2s [id=sg-0d7b8162c87df1b3e]
module.vpc.aws_subnet.pb_sn: Still creating... [10s elapsed]
module.vpc.aws_subnet.pb_sn: Creation complete after 11s [id=subnet-07c1e73bd369841d2]
module.ec2.aws_instance.server: Creating...
module.ec2.aws_instance.server: Still creating... [10s elapsed]
module.ec2.aws_instance.server: Still creating... [20s elapsed]
module.ec2.aws_instance.server: Still creating... [30s elapsed]
module.ec2.aws_instance.server: Creation complete after 32s [id=i-023a7418b3239ade7]
Apply complete! Resources: 4 added, 0 changed, 0 destroyed.
Saving cache for successful job                                                   00:11
Creating cache default-protected...
.terraform: found 12 matching artifact files and directories
Uploading cache.zip to https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Created cache
Cleaning up project directory and file based variables                            00:01
Job succeeded
```

4) Logs from destroy:



```
      - tags                          = {
          - "Name" = "myvpc"
        } -> null
      - tags_all                      = {
          - "Name" = "myvpc"
        } -> null
    }
Plan: 0 to add, 0 to change, 4 to destroy.
module.ec2.aws_instance.server: Destroying... [id=i-023a7418b3239ade7]
module.ec2.aws_instance.server: Still destroying... [id=i-023a7418b3239ade7, 10s elapsed]
module.ec2.aws_instance.server: Still destroying... [id=i-023a7418b3239ade7, 20s elapsed]
module.ec2.aws_instance.server: Still destroying... [id=i-023a7418b3239ade7, 30s elapsed]
module.ec2.aws_instance.server: Still destroying... [id=i-023a7418b3239ade7, 40s elapsed]
module.ec2.aws_instance.server: Destruction complete after 41s
module.vpc.aws_subnet.pb_sn: Destroying... [id=subnet-07c1e73bd369841d2]
module.vpc.aws_security_group.sg: Destroying... [id=sg-0d7b8162c87df1b3e]
module.vpc.aws_subnet.pb_sn: Destruction complete after 0s
module.vpc.aws_security_group.sg: Destruction complete after 0s
module.vpc.aws_vpc.myvpc: Destroying... [id=vpc-04505ae4c1fd43057]
module.vpc.aws_vpc.myvpc: Destruction complete after 1s
Destroy complete! Resources: 4 destroyed.
Saving cache for successful job                                                   00:11
Creating cache default-protected...
.terraform: found 12 matching artifact files and directories
Uploading cache.zip to https://storage.googleapis.com/gitlab-com-runners-cache/project/59788171/default-protected
Created cache
Cleaning up project directory and file based variables                            00:01
Job succeeded
```

All 4 states have been executed.



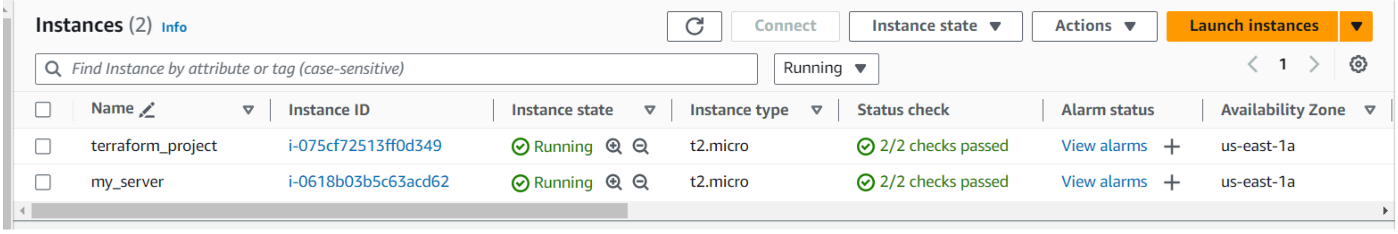
Sakeena Shaik / cicdtf / **Pipelines**

All 5 | Finished | **Branches** | Tags

Clear runner caches | CI lint | Run pipeline

Filter pipelines | Show Pipeline IID

Status	Pipeline	Created by	Stages
Passed 00:04:20 3 hours ago	Update .gitlab-ci.yml file #5 main 11631325 latest		✓-✓-✓-✓

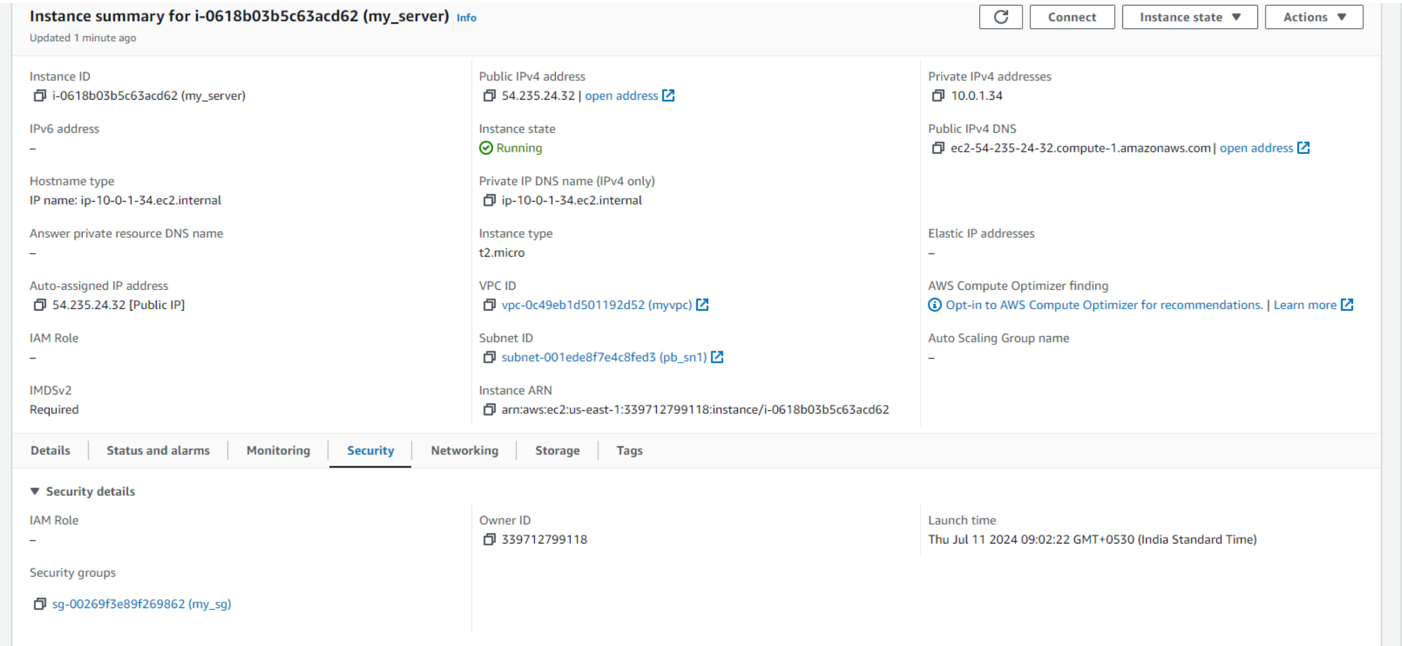


Instances (2) Info

Connect | Instance state ▼ | Actions ▼ | Launch instances ▼

Find Instance by attribute or tag (case-sensitive) | Running ▼ | 1

□	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
□	terraform_project	i-075cf72513ff0d349	✓ Running	t2.micro	✓ 2/2 checks passed	View alarms +	us-east-1a
□	my_server	i-0618b03b5c63acd62	✓ Running	t2.micro	✓ 2/2 checks passed	View alarms +	us-east-1a



Instance summary for i-0618b03b5c63acd62 (my_server) Info

Updated 1 minute ago

Connect | Instance state ▼ | Actions ▼

Instance ID
i-0618b03b5c63acd62 (my_server)

Public IPv4 address
54.235.24.32 | open address

Private IPv4 addresses
10.0.1.34

IPv6 address
–

Instance state
✓ Running

Public IPv4 DNS
ec2-54-235-24-32.compute-1.amazonaws.com | open address

Hostname type
IP name: ip-10-0-1-34.ec2.internal

Private IP DNS name (IPv4 only)
ip-10-0-1-34.ec2.internal

Answer private resource DNS name
–

Instance type
t2.micro

Elastic IP addresses
–

Auto-assigned IP address
54.235.24.32 [Public IP]

VPC ID
vpc-0c49eb1d501192d52 (myvpc)

AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations. | Learn more

IAM Role
–

Subnet ID
subnet-001ede8f7e4c8fed3 (pb_sn1)

Auto Scaling Group name
–

IMDSv2
Required

Instance ARN
arn:aws:ec2:us-east-1:339712799118:instance/i-0618b03b5c63acd62

Details | Status and alarms | Monitoring | **Security** | Networking | Storage | Tags

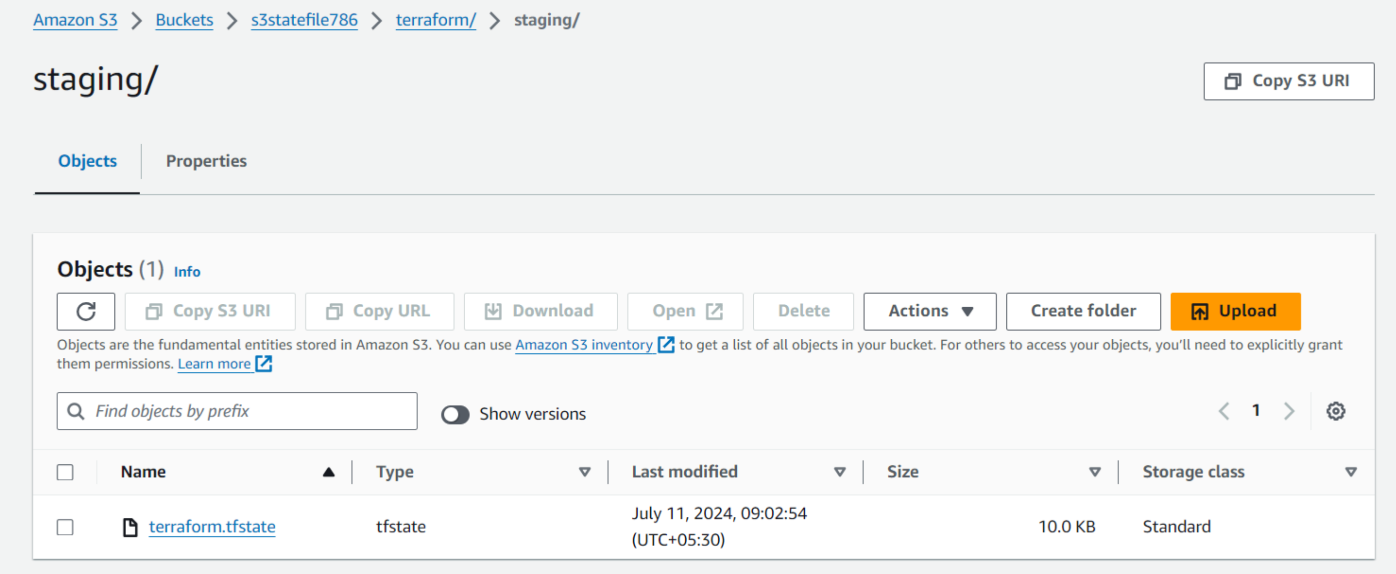
▼ Security details

IAM Role
–

Owner ID
339712799118

Launch time
Thu Jul 11 2024 09:02:22 GMT+0530 (India Standard Time)

Security groups
sg-00269f3e89f269862 (my_sg)



Amazon S3 > Buckets > s3statefile786 > terraform/ > staging/

staging/

Copy S3 URI

Objects | Properties

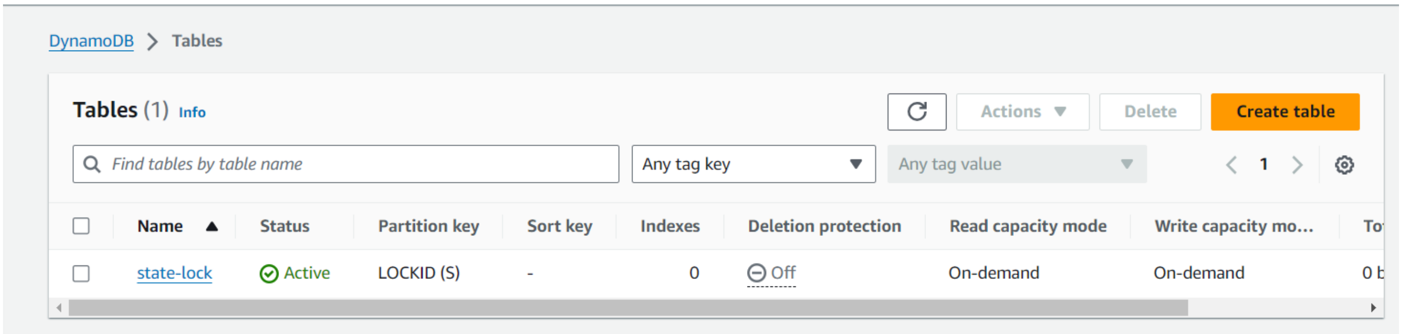
Objects (1) Info

Copy S3 URI | Copy URL | Download | Open | Delete | Actions ▼ | Create folder | Upload

Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Find objects by prefix | Show versions | 1

□	Name ▲	Type	Last modified	Size	Storage class
□	terraform.tfstate	tfstate	July 11, 2024, 09:02:54 (UTC+05:30)	10.0 KB	Standard



□	Name ▲	Status	Partition key	Sort key	Indexes	Deletion protection	Read capacity mode	Write capacity mo…	To
□	state-lock	✓ Active	LOCKID (S)	-	0	⊖ Off	On-demand	On-demand	0 b

Verify full logs in below text file:

Logs.txt

The pipeline performs the following steps:

- Initializes Terraform with the specified backend configuration.
- Applies the Terraform plan to create infrastructure resources (VPC, Subnet, Security Group, and EC2 instance).
- Saves .terraform directory to cache for future use.
- Cleans up the environment after the job is completed.