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UNIVERSITY OF PETROLEUM & ENERGY STUDIES

School of Computer Science

Dehradun

ASSIGNMENT 1

Programme :	B. Tech in Computer Science and Engineering with Specialization in DevOps
Course :	System Provisioning and Configuration Management
Semester :	VII
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Step 1:

First create a directory project-terraform and initialise terraform which is installed on your system by following command:

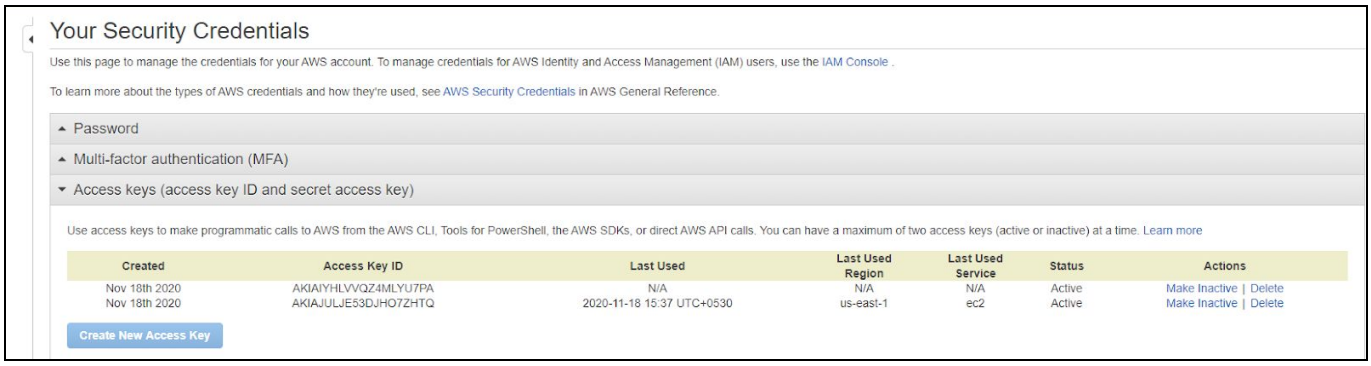
>>> Terraform init

```
Initializing the backend...

Initializing provider plugins...
- Checking for available provider plugins...
- Downloading plugin for provider "aws" (hashicorp/aws) 3.15.0...

The following providers do not have any version constraints in configuration,
so the latest version was installed.

To prevent automatic upgrades to new major versions that may contain breaking
changes, it is recommended to add version = "..." constraints to the
corresponding provider blocks in configuration, with the constraint strings
suggested below.

* provider.aws: version = "~> 3.15"

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.
```

Step 2:

Now, setup a connection to aws using the access key and secret key which you can create and download from your aws management console by clicking:

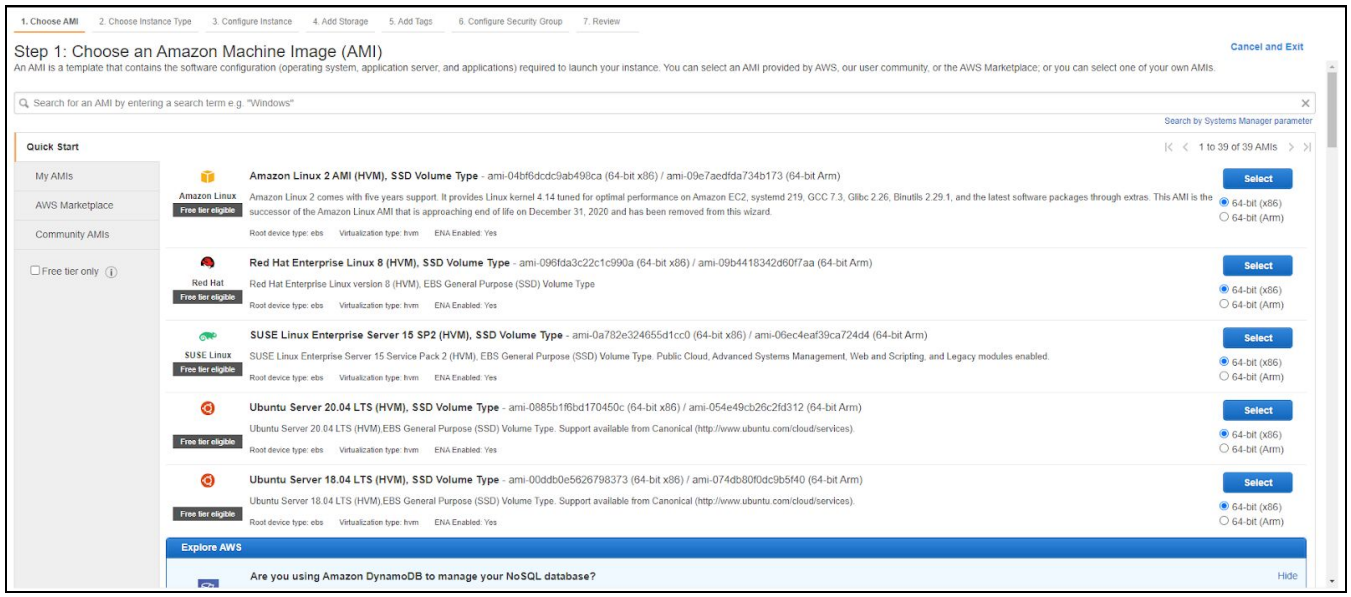
>>> your name -> security credentials -> access keys:

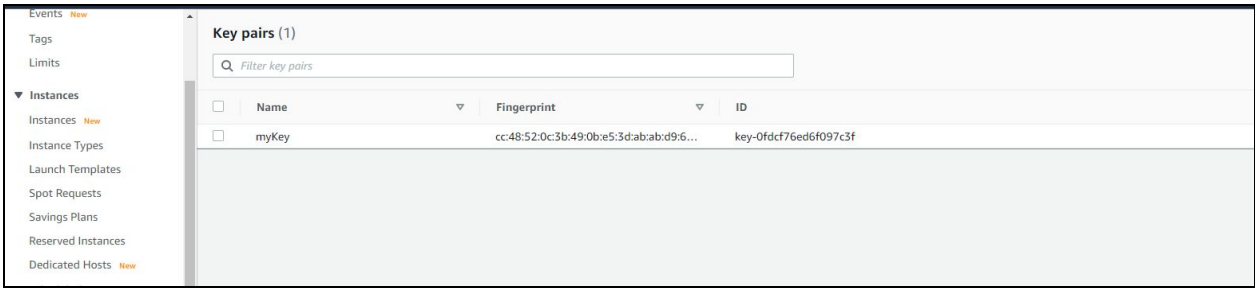


Now, create a file using ***vim*** which is will connect to aws and has the access and security key credentials which you have downloaded and enter your region:

```
provider "aws" {
  access_key = "AKIAJULJES3DJHO7ZHTQ"
  secret_key = "5ulCIurIPb/5Ov2GtKkPfgxpGJa613iAgFPTnD46"
  region     = "us-east-1"
}
```

Then, use ***vim*** to create a file in terraform with ***.tf*** extension and add below commands and set the ami from the screen as shown below and set the instance type as t2 micro and key_name as “mykey”:





create ec2 1.tf (~\project terraform) - VIM

```
resource "aws_instance" "myFirstInstance" {
  ami           = "ami-08c40ec9ead489470"
  count=2
  key_name = "myKey"
  instance_type = "t2.micro"
  security_groups= [ "security_jenkins_port"]
  tags = {
    Name = "jenkins_instance"
  }
}

resource  "aws_s3_bucket" "tf_course" {
  bucket = "sajalsood1995"
  acl    = "private"
}

resource "aws_vpc" "vpc" {
  cidr_block = "10.0.0.0/16"
}

resource "aws_vpn_gateway" "vpn_gateway" {
  vpc_id = aws_vpc.vpc.id
}

resource "aws_customer_gateway" "customer_gateway" {
  bgp_asn    = 65000
  ip_address = "172.0.0.1"
  type       = "ipsec.1"
}

resource "aws_vpn_connection" "main" {
  vpn_gateway_id      = aws_vpn_gateway.vpn_gateway.id
  customer_gateway_id = aws_customer_gateway.customer_gateway.id
  type                = "ipsec.1"
  static_routes_only  = true
}


resource "aws_security_group" "security_jenkins_port" {
  name        = "security_jenkins_port"
  description = "security group for jenkins"

  ingress {
    from_port   = 8080
    to_port     = 8080
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

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

 # outbound from jenkis server
  egress {
    from_port   = 0
    to_port     = 65535
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

  tags= {
    Name = "security_jenkins_port"
  }
}
```

In this file, we add resources like ***instance creation, vpn and S3 bucket***. All these steps to create these 3 added in this file.

Now, apply the following command which depicts all the plans that the file has to perform:

>>> terraform plan

```
Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.


------------------------------------------------------------------------

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_instance.myFirstInstance[0] will be created
  + resource "aws_instance" "myFirstInstance" {
      + ami                          = "ami-00ddb0e5626798373"
      + 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)
      + get_password_data            = false
      + host_id                      = (known after apply)
      + id                           = (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                     = "myKey"
      + outpost_arn                  = (known after apply)
      + password_data                = (known after apply)
      + placement_group              = (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              = [
          + "security_jenkins_port",
        ]
      + source_dest_check            = true
      + subnet_id                    = (known after apply)
      + tags                         = {
          + "Name" = "jenkins_instance"
        }
      + tenancy                      = (known after apply)
      + volume_tags                  = (known after apply)
      + vpc_security_group_ids       = (known after apply)

      + ebs_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)
          + snapshot_id           = (known after apply)
          + volume_id             = (known after apply)
          + volume_size           = (known after apply)
```

```
# aws_instance.myFirstInstance[1] will be created
+ resource "aws_instance" "myFirstInstance" {
    + ami                          = "ami-00ddb0e5626798373"
    + 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)
    + get_password_data            = false
    + host_id                      = (known after apply)
    + id                           = (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                     = "myKey"
    + outpost_arn                  = (known after apply)
    + password_data                = (known after apply)
    + placement_group              = (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              = [
        + "security_jenkins_port",
      ]
    + source_dest_check            = true
    + subnet_id                    = (known after apply)
    + tags                         = {
        + "Name" = "jenkins_instance"
      }
    + tenancy                      = (known after apply)
    + volume_tags                  = (known after apply)
    + vpc_security_group_ids       = (known after apply)

    + ebs_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)
        + snapshot_id           = (known after apply)
        + volume_id             = (known after apply)
        + volume_size           = (known after apply)
        + volume_type           = (known after apply)
      }

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

```
 # aws_security_group.security_jenkins_port will be created
 + resource "aws_security_group" "security_jenkins_port" {
     + arn                    = (known after apply)
     + description            = "security group for jenkins"
     + egress                 = [
         + {
             + cidr_blocks      = [
                 + "0.0.0.0/0",
               ]
             + description      = ""
             + from_port        = 0
             + ipv6_cidr_blocks = []
             + prefix_list_ids  = []
             + protocol         = "tcp"
             + security_groups  = []
             + self             = false
             + to_port          = 65535
           },
       ]
     + id                     = (known after apply)
     + ingress                = [
         + {
             + cidr_blocks      = [
                 + "0.0.0.0/0",
               ]
             + description      = ""
             + from_port        = 22
             + ipv6_cidr_blocks = []
             + prefix_list_ids  = []
             + protocol         = "tcp"
             + security_groups  = []
             + self             = false
             + to_port          = 22
           },
         + {
             + cidr_blocks      = [
                 + "0.0.0.0/0",
               ]
             + description      = ""
             + from_port        = 8080
             + ipv6_cidr_blocks = []
             + prefix_list_ids  = []
             + protocol         = "tcp"
             + security_groups  = []
             + self             = false
             + to_port          = 8080
           },
       ]
     + name                   = "security_jenkins_port"
     + owner_id               = (known after apply)
     + revoke_rules_on_delete = false
     + tags                   = {
         + "Name" = "security_jenkins_port"
       }
     + vpc_id                 = (known after apply)
   }

Plan: 3 to add, 0 to change, 0 to destroy.

------------------------------------------------------------------------
```

Run the following command to check whether the plans are added :

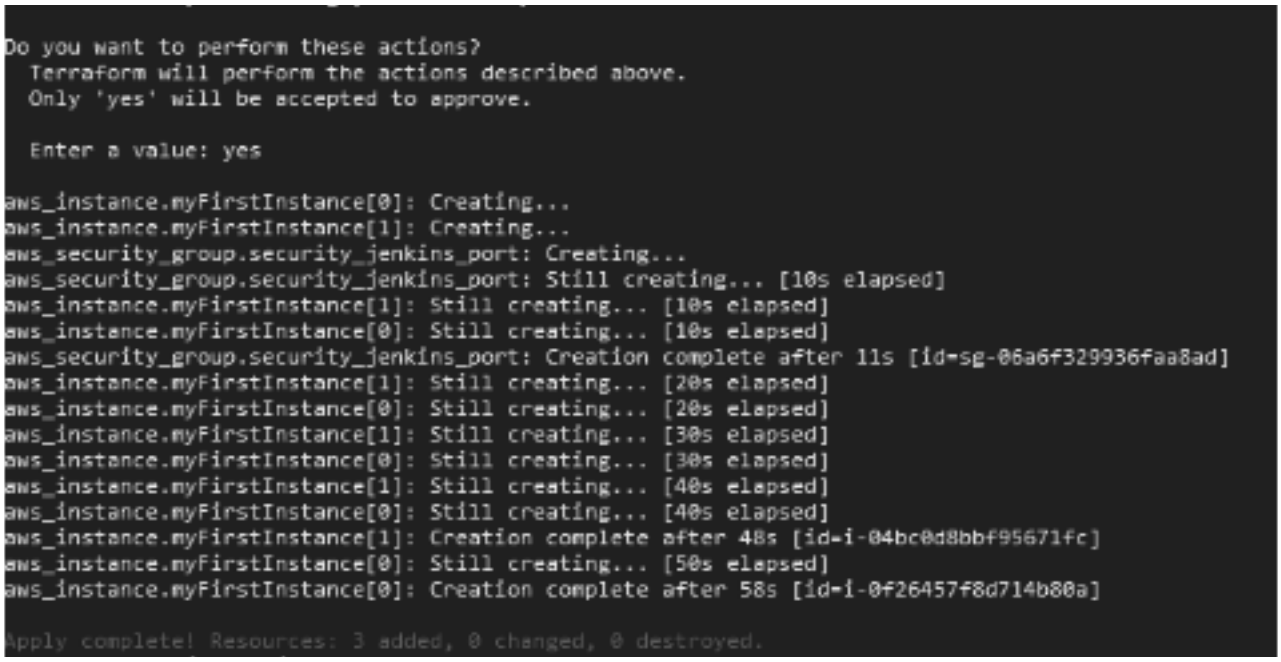
>>> terraform plan

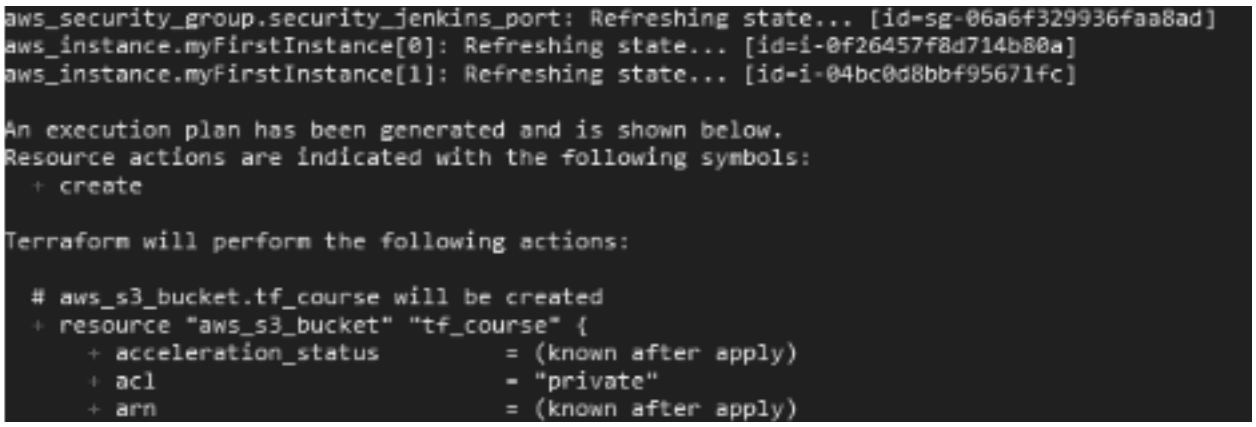
```
Refreshing Terraform state in-memory prior to plan...
The refreshed state will be used to calculate this plan, but will not be
persisted to local or remote state storage.

aws_security_group.security_jenkins_port: Refreshing state... [id=sg-06a6f329936faa8ad]
aws_instance.myFirstInstance[0]: Refreshing state... [id=i-0f26457f8d714b80a]
aws_instance.myFirstInstance[1]: Refreshing state... [id=i-04bc0d8bbf95671fc]

------------------------------------------------------------------------

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_s3_bucket.tf_course will be created
  + resource "aws_s3_bucket" "tf_course" {
      + acceleration_status         = (known after apply)
      + acl                         = "private"
      + arn                         = (known after apply)
```

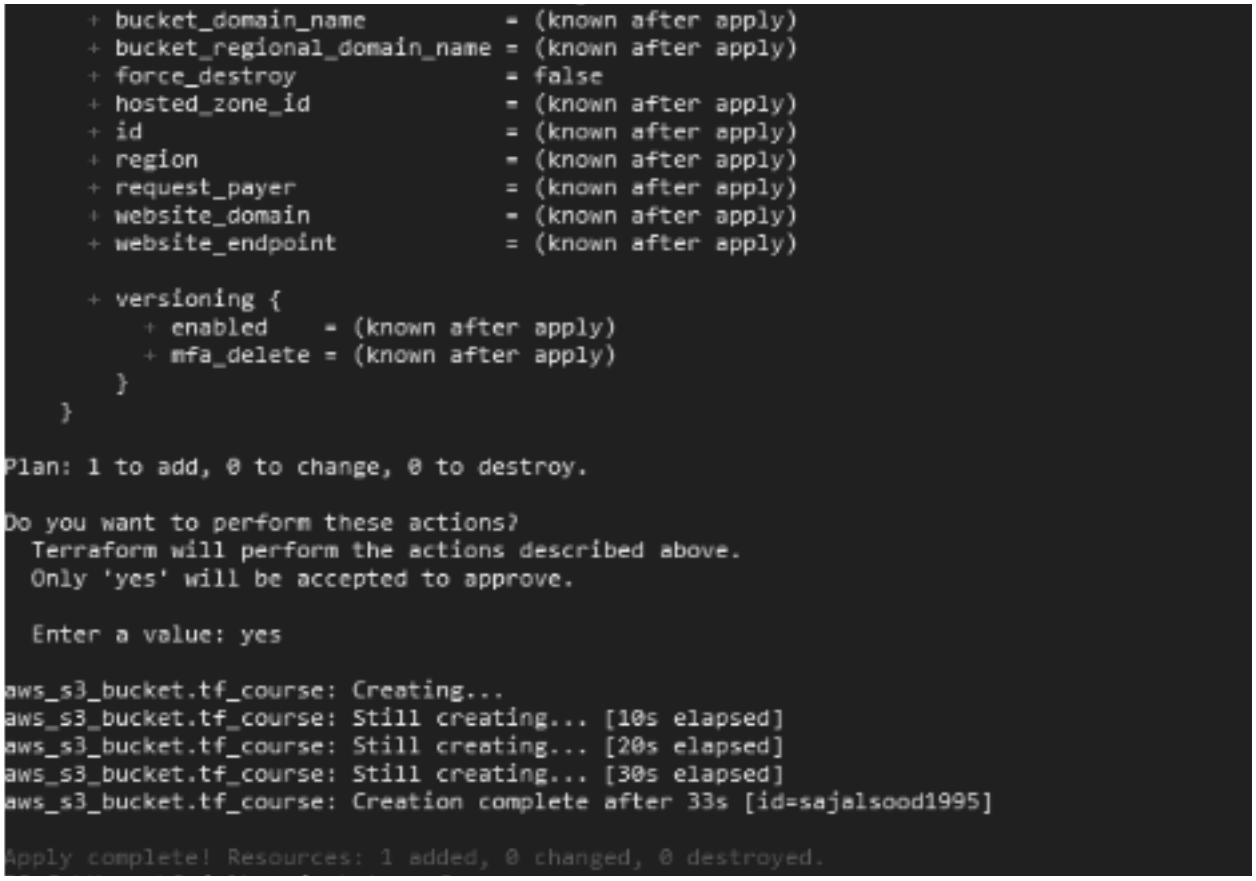
```
      + bucket_domain_name          = (known after apply)
      + bucket_regional_domain_name = (known after apply)
      + force_destroy               = false
      + hosted_zone_id              = (known after apply)
      + id                          = (known after apply)
      + region                      = (known after apply)
      + request_payer               = (known after apply)
      + website_domain              = (known after apply)
      + website_endpoint            = (known after apply)

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

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

------------------------------------------------------------------------

Note: You didn't specify an "-out" parameter to save this plan, so Terraform
can't guarantee that exactly these actions will be performed if
"terraform apply" is subsequently run.
```

Now Apply the following command through which the script will run:

>>> terraform apply






+ 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)
+ region = (known after apply)
+ request_payer = (known after apply)
+ website_domain = (known after apply)
+ website_endpoint = (known after apply)
+ versioning {
+ enabled = (known after apply)
+ mfa_delete = (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_s3_bucket.tf_course: Creating...
aws_s3_bucket.tf_course: Still creating... [10s elapsed]
aws_s3_bucket.tf_course: Still creating... [20s elapsed]
aws_s3_bucket.tf_course: Still creating... [30s elapsed]
aws_s3_bucket.tf_course: Creation complete after 33s [id=sajalsood1995]
Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Check through windows powershell as well:

```
aws_security_group.security_jenkins_port: Refreshing state... [id=sg-06a0f329930faa8ad]
aws_instance.myfirstinstance[0]: Refreshing state... [id=i-0f20457f8d714b80a]
aws_instance.myfirstinstance[1]: Refreshing state... [id=i-04bc0d8bbf95671fc]
aws_s3_bucket.tf_course: Refreshing state... [id=sajalsood1995]

An execution plan has been generated and is shown below.
Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_customer_gateway.customer_gateway will be created
  + resource "aws_customer_gateway" "customer_gateway" {
      + arn        = (known after apply)
      + bgp_asn    = "65000"
      + id         = (known after apply)
      + ip_address = "172.0.0.1"
      + type       = "ipsec.1"
    }

  # aws_vpc.vpc will be created
  + resource "aws_vpc" "vpc" {
      + arn                              = (known after apply)
      + assign_generated_ipv6_cidr_block = false
      + cidr_block                       = "10.0.0.0/16"
      + default_network_acl_id           = (known after apply)
      + default_route_table_id           = (known after apply)
      + default_security_group_id        = (known after apply)
      + dhcp_options_id                  = (known after apply)
      + enable_classiclink               = (known after apply)
      + enable_classiclink_dns_support   = (known after apply)
      + enable_dns_hostnames             = (known after apply)
      + enable_dns_support               = true
      + id                               = (known after apply)
      + instance_tenancy                 = "default"
      + ipv6_association_id              = (known after apply)
      + ipv6_cidr_block                  = (known after apply)
      + main_route_table_id              = (known after apply)
      + owner_id                         = (known after apply)
    }

  # aws_vpn_connection.main will be created
  + resource "aws_vpn_connection" "main" {
      + arn                           = (known after apply)
      + customer_gateway_configuration = (known after apply)
      + customer_gateway_id           = (known after apply)
      + id                            = (known after apply)
      + routes                        = (known after apply)
      + static_routes_only            = true
      + transit_gateway_attachment_id  = (known after apply)
      + tunnel1_address               = (known after apply)
      + tunnel1_bgp_asn               = (known after apply)
      + tunnel1_bgp_holdtime          = (known after apply)
      + tunnel1_cgw_inside_address    = (known after apply)
      + tunnel1_inside_cidr           = (known after apply)
      + tunnel1_preshared_key         = (sensitive value)
      + tunnel1_vgw_inside_address    = (known after apply)
      + tunnel2_address               = (known after apply)
      + tunnel2_bgp_asn               = (known after apply)
      + tunnel2_bgp_holdtime          = (known after apply)
      + tunnel2_cgw_inside_address    = (known after apply)
      + tunnel2_inside_cidr           = (known after apply)
      + tunnel2_preshared_key         = (sensitive value)
      + tunnel2_vgw_inside_address    = (known after apply)
      + type                          = "ipsec.1"
      + vgw_telemetry                 = (known after apply)
      + vpn_gateway_id                = (known after apply)
    }
```

```
      + type                            = "ipsec.1"
      + vgw_telemetry                   = (known after apply)
      + vpn_gateway_id                  = (known after apply)
    }

  # aws_vpn_gateway.vpn_gateway will be created
  + resource "aws_vpn_gateway" "vpn_gateway" {
      + amazon_side_asn = (known after apply)
      + arn             = (known after apply)
      + id              = (known after apply)
      + vpc_id          = (known after apply)
    }

Plan: 4 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_customer_gateway.customer_gateway: Creating...
aws_vpc.vpc: Creating...
aws_vpc.vpc: Still creating... [10s elapsed]
aws_customer_gateway.customer_gateway: Still creating... [10s elapsed]
aws_vpc.vpc: Creation complete after 14s [id=vpc-005dde8095a1ba862]
aws_vpn_gateway.vpn_gateway: Creating...
aws_customer_gateway.customer_gateway: Creation complete after 15s [id=cgw-0df41170dfde895f6]
aws_vpn_gateway.vpn_gateway: Still creating... [10s elapsed]
aws_vpn_gateway.vpn_gateway: Still creating... [20s elapsed]
aws_vpn_gateway.vpn_gateway: Creation complete after 25s [id=vgw-08a19b921c69b9b76]
aws_vpn_connection.main: Creating...
aws_vpn_connection.main: Still creating... [10s elapsed]
aws_vpn_connection.main: Still creating... [20s elapsed]
aws_vpn_connection.main: Still creating... [30s elapsed]
aws_vpn_connection.main: Still creating... [40s elapsed]
aws_vpn_connection.main: Still creating... [50s elapsed]
aws_vpn_connection.main: Still creating... [1m0s elapsed]
aws_vpn_connection.main: Still creating... [1m10s elapsed]
aws_vpn_connection.main: Still creating... [1m20s elapsed]
aws_vpn_connection.main: Still creating... [1m30s elapsed]
aws_vpn_connection.main: Still creating... [1m40s elapsed]
aws_vpn_connection.main: Still creating... [1m50s elapsed]
aws_vpn_connection.main: Still creating... [2m0s elapsed]
aws_vpn_connection.main: Still creating... [2m10s elapsed]
aws_vpn_connection.main: Still creating... [2m20s elapsed]
aws_vpn_connection.main: Still creating... [2m30s elapsed]
aws_vpn_connection.main: Still creating... [2m40s elapsed]
aws_vpn_connection.main: Still creating... [2m50s elapsed]
aws_vpn_connection.main: Still creating... [3m0s elapsed]
aws_vpn_connection.main: Still creating... [3m10s elapsed]
aws_vpn_connection.main: Still creating... [3m20s elapsed]
aws_vpn_connection.main: Still creating... [3m30s elapsed]
aws_vpn_connection.main: Still creating... [3m40s elapsed]
aws_vpn_connection.main: Still creating... [3m50s elapsed]
aws_vpn_connection.main: Still creating... [4m0s elapsed]
aws_vpn_connection.main: Still creating... [4m10s elapsed]
aws_vpn_connection.main: Still creating... [4m20s elapsed]
aws_vpn_connection.main: Still creating... [4m30s elapsed]
aws_vpn_connection.main: Still creating... [4m40s elapsed]
aws_vpn_connection.main: Still creating... [4m50s elapsed]
aws_vpn_connection.main: Still creating... [5m0s elapsed]
aws_vpn_connection.main: Creation complete after 5m8s [id=vpn-06042822b8697e55a]

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

Now, visit your aws management console and see:

- 2 EC2 instances have been created
- VPN is created
- S3 bucket is created: