Hello readers,

In this article, I am eager to talk about how to provision and manage cloud resources using code. There are various tools which support "infrastructure-as-code", such as Chef, Puppet, Ansible, CloudFormation, SaltStack etc, but , in this blog I want to talk about Terraform. . Terraform is an open-source IaC software tool created by Hashicorp that provides a consistent CLI to manage various cloud resources. Indeed, we will be using it, to create AWS services (VPC, Subnets, Security group , Ec2 with user-data to launch Apache server with a sample website on it , internet gateway etc..). We will go through GitHub by creating a local environment which will hold our code. We will then, create a new GitHub repository to access our code remotely.

We will learn how to:

- Create a directory in your local environment and initialize a new git repository
- Create a new repository in GitHub and push our code in it.
- Use Terraform to automate a fully managed code template which have working sample website running on Apache.

I will drop my public repository which have all the codes at the end of this article.

Before we get started, make sure you have these resources ready.

First download Terraform, use google or this link https://www.terraform.io/downloads, download visual studio code https://code.visualstudio.com/downloaill d and GitHub https://git-scm.com/downloads

Let start with GitHub

I- On your Desktop make right click to open gitbash .You will see something similar to this

`

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$
```

2- Run mkdir keita-terraform-project

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$ mkdir keita-terraform-project

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$
```

3 – Run cd cd keita-terraform-project in order to navigate the folder we just created.

`

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop (main)
$ cd keita-terraform-project/

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project (m
ain)
$
```

4 Run mkdir  project-p01 to  create another folder inside our main project.

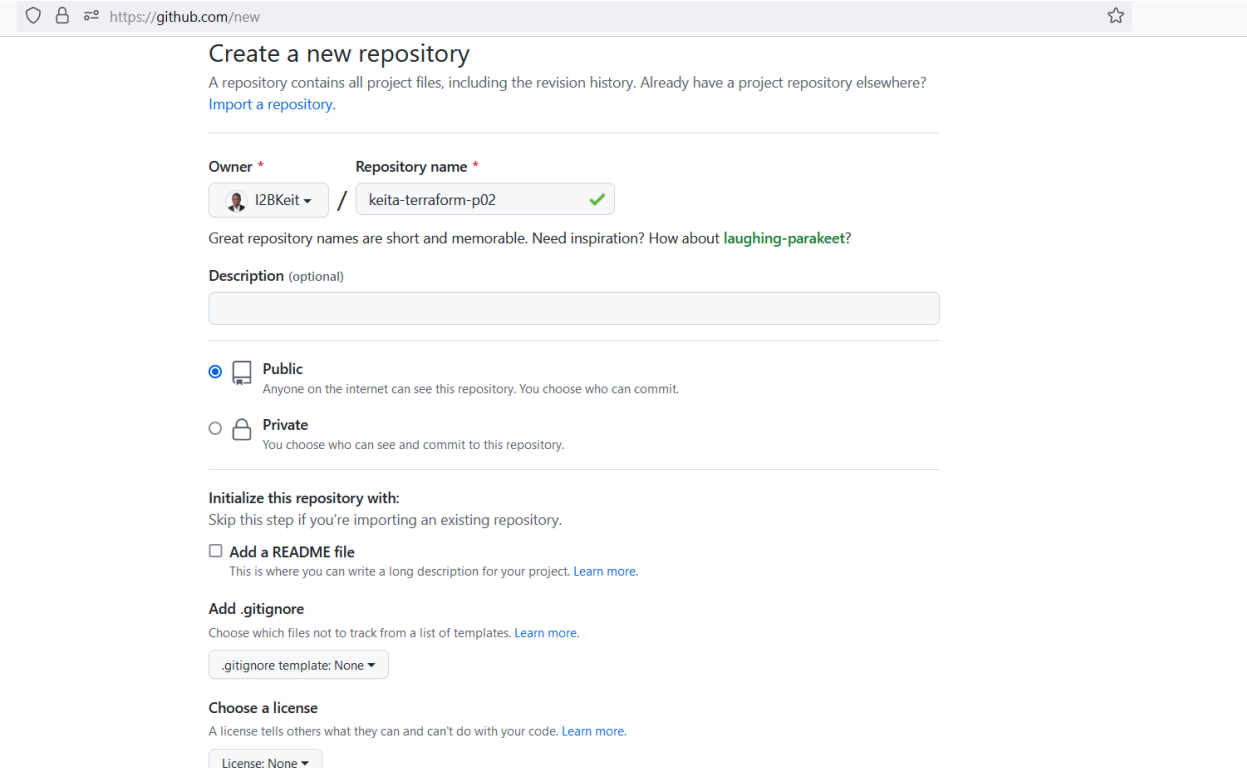
```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project (m
ain)
$ cd project-p01/

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$
```

As you could see, we created two folders which hold our project locally, we then have to have a remote control to access and host them on GitHub. Let then create an empty github repository.

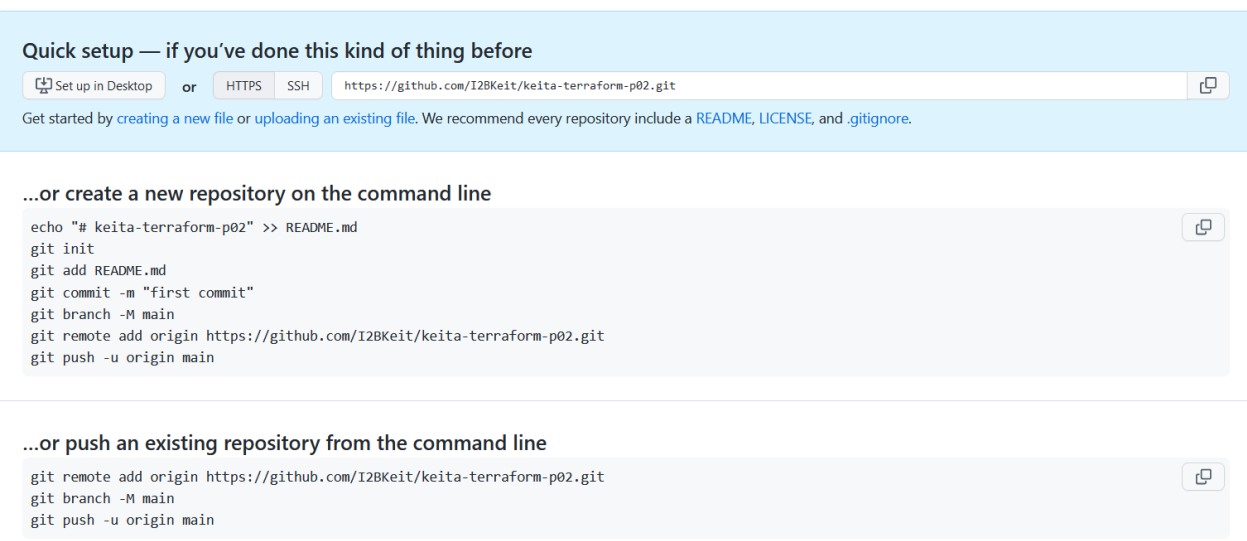
If you don't have a github account , you could have one via this link https://github.com/

After creating your github account, crame it eate a new repository , yourname-terraform-p02

`




Voila! We created an empty repository which look like this :




So far, we do have our project in our local environment(you laptop), now let configure it , to be accessible via a remote control. Let go back to gitbah within our project directory and run these commands.

- `echo "# keita-terraform-p02" >> README.md`
- `git init`
- `git add README.md`
- `git commit -m"github repository has been configured and we could access our project remotly"`

`

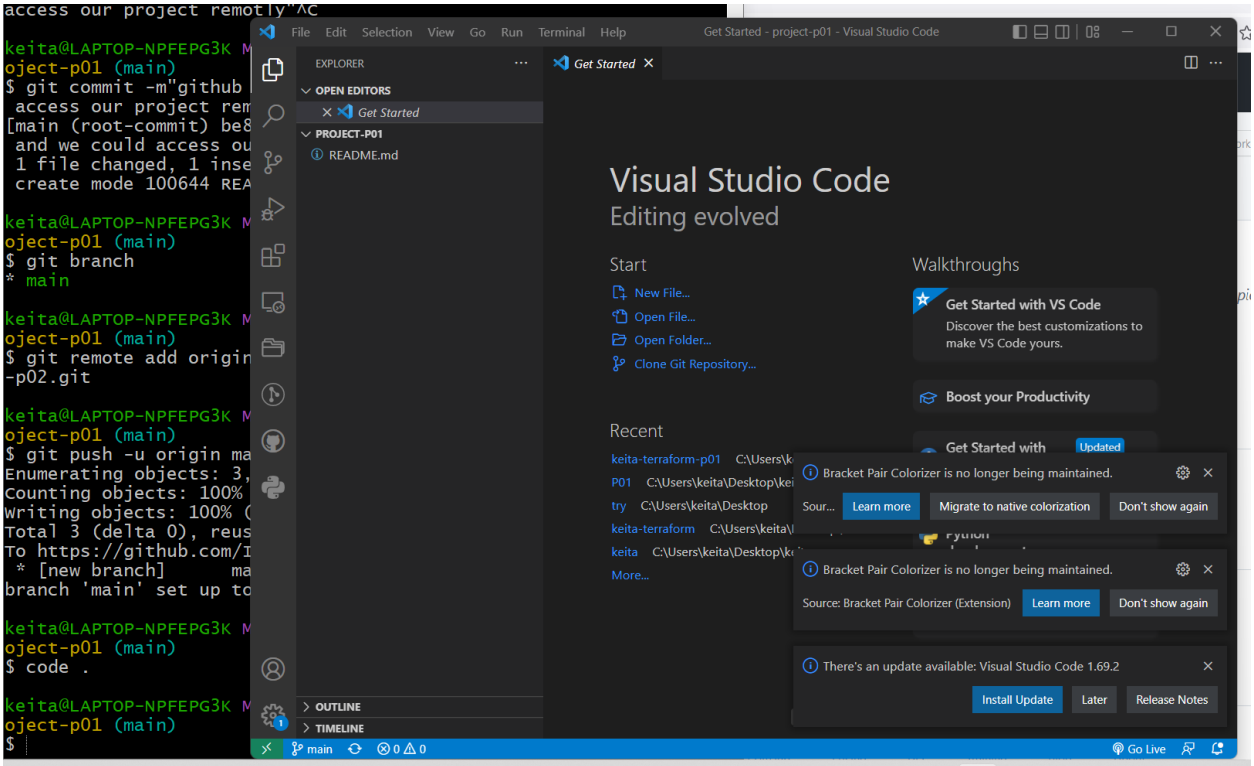
- `git branch -M main`
- `git remote add origin https://github.com/I2BKeit/keita-terraform-p02.git`
- `git push -u origin main`

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ git commit -m"github rpository has been configured and we could
access our project remotly"^C

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ git commit -m"github repository has been configured and we could
 access our project remotly"
[main (root-commit) be8ef2e] github repository has been configured
 and we could access our project remotly
 1 file changed, 1 insertion(+)
 create mode 100644 README.md

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ git branch
* main

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ git remote add origin https://github.com/I2BKeit/keita-terraform
-p02.git

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ git push -u origin main
Enumerating objects: 3, done.
Counting objects: 100% (3/3), done.
Writing objects: 100% (3/3), 277 bytes | 277.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To https://github.com/I2BKeit/keita-terraform-p02.git
 * [new branch]      main -> main
branch 'main' set up to track 'origin/main'.

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$
```

We now have our project pushed to github and it is a public repository anyone could access it anytime, anywhere.

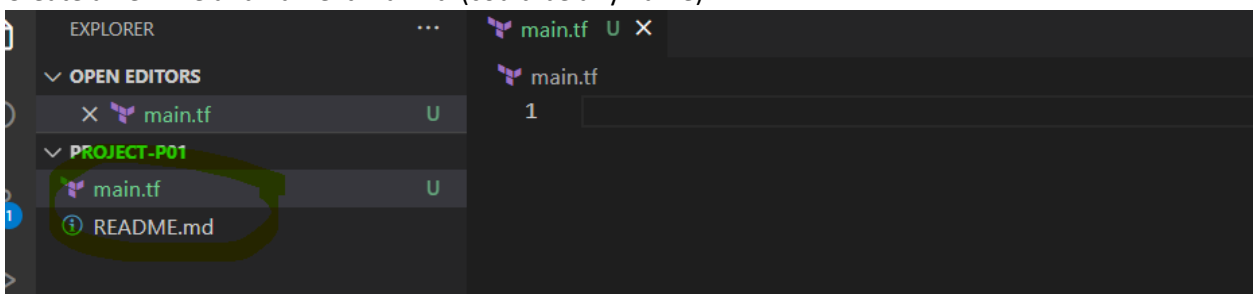
We learnt how to create folders locally and access it remotely via github. Let now start working on our main subject: Terraform . Go back to gitbash and with our project directory run code . , which will open the project with visual code.

`

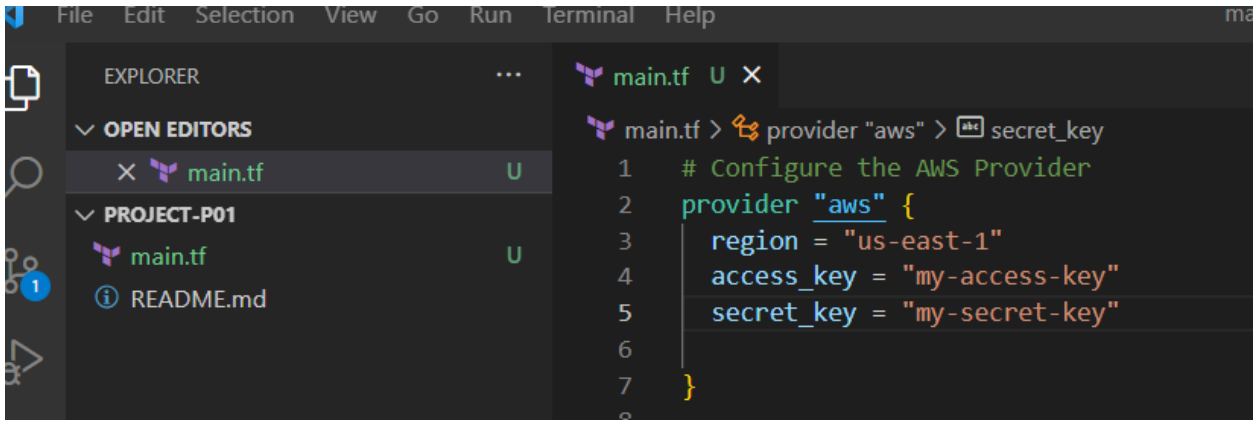



## II Configure terraform main file.

1- Create a new file and name it main .tf (could be any name):




2- Enable communication between Terraform and AWS:




_Grab you access and secret key from IAM service under your security credentials.

`

Run terraform inti to initialize our project.

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$ terraform init

Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v4.22.0...
- Installed hashicorp/aws v4.22.0 (signed by HashiCorp)

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

Terraform has been successfully initialized!

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

If you ever set or change modules or backend configuration for Ter
raform,
rerun this command to reinitialize your working directory. If you
forget, other
commands will detect it and remind you to do so if necessary.

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$
```

Voila !! our project passed initialization let then implement our main.tf to create services

3- Automate AWS service via code as service.

a- Automate a VPC , name it keita-demo-VPC:

```
main.tf                U
README.md

}
resource "aws_vpc" "keita-demo-vpc" {
  cidr_block = "10.0.0.0/16"
  tags = {
    "Name" = "keita-demo-vpc"
  }
}
```

`

Run terraform plan to determine the desired state of above resource we just created. If everything works perfectly you will see something similar like this:

```
$ terraform plan

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

Terraform will perform the following actions:

  # aws_vpc.keita-demo-vpc will be created
  + resource "aws_vpc" "keita-demo-vpc" {
      + arn                                  = (known after apply)
      + 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)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "keita-demo-vpc"
        }
      + tags_all                             = {
          + "Name" = "keita-demo-vpc"
        }
    }

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

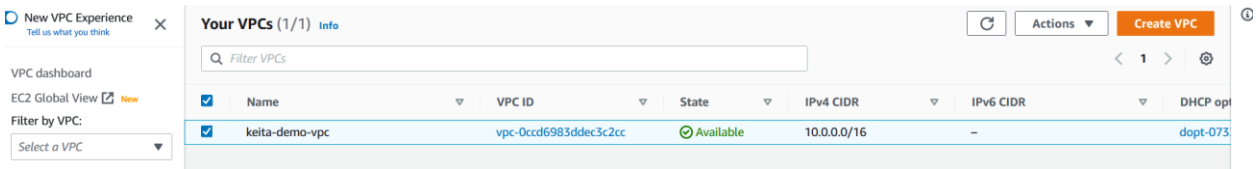
Go ahead and launch terraform apply to automatically create our VPC. It will prompt your yes or No. Enter yes as value to launch. After running terraform apply , you should see something

`

similar like this:

```
      + 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)
      + ipv6_cidr_block_network_border_group = (known after apply)
      + main_route_table_id                  = (known after apply)
      + owner_id                             = (known after apply)
      + tags                                 = {
          + "Name" = "keita-demo-vpc"
        }
      + tags_all                             = {
          + "Name" = "keita-demo-vpc"
        }
    }

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_vpc.keita-demo-vpc: Creating...
aws_vpc.keita-demo-vpc: Creation complete after 2s [id=vpc-0ccd698
3ddec3c2cc]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
```

If you check your AWS console, you will see a new VPC created via terraform.




b- Create an Internet Gateway:

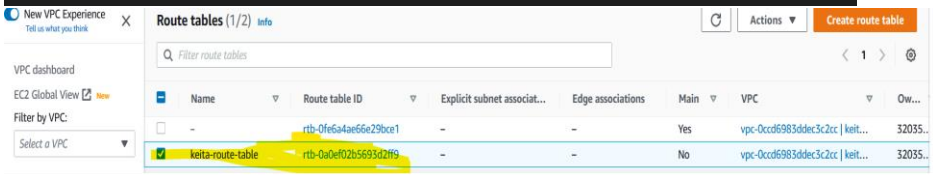
`

```
resource "aws_internet_gateway" "keita-gw" {
  vpc_id = aws_vpc.keita-demo-vpc.id

  tags = {
    Name = "keita-gw"
  }
}
```

c- Create Route Table

```
resource "aws_route_table" "keita-route-table" {
  vpc_id = aws_vpc.keita-demo-vpc.id

  route{
    cidr_block = "0.0.0.0/0"
    gateway_id = aws_internet_gateway.keita-gw.id
  }

  tags = {
    Name = "keita-route-table"
  }
}
```

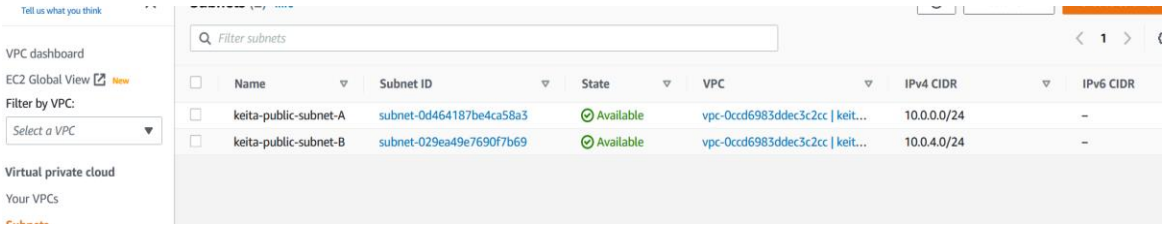
d-




e- Create two public Subnet:

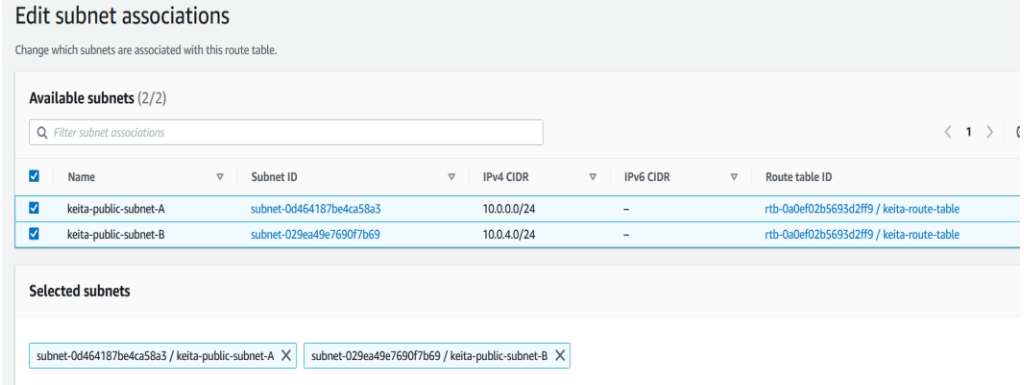
```
resource "aws_subnet" "keita-public-subnet-A" {
  vpc_id = aws_vpc.keita-demo-vpc.id
  cidr_block = "10.0.0.0/24"
  availability_zone = "us-east-1a"
  tags = {
    "Name" = "keita-public-subnet-A"
  }

}
resource "aws_subnet" "keita-public-subnet-B" {
  vpc_id = aws_vpc.keita-demo-vpc.id
  cidr_block = "10.0.4.0/24"
  availability_zone = "us-east-1a"
  tags = {
    "Name" = "keita-public-subnet-B"
  }

}
```

`




f- Associate subnet with route table

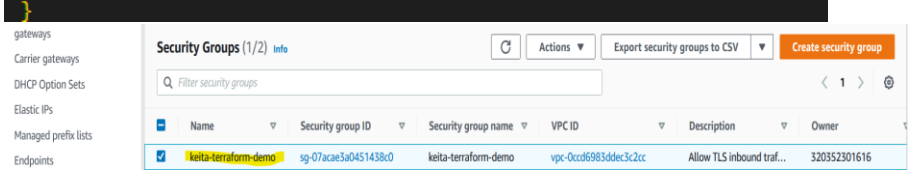
```
# 5-    Associate route to the public subnet
resource "aws_route_table_association" "Keita-public-RT-A" {
  subnet_id      = aws_subnet.keita-public-subnet-A.id
  route_table_id = aws_route_table.keita-route-table.id


}
resource "aws_route_table_association" "Keita-public-RT-B" {
  subnet_id      = aws_subnet.keita-public-subnet-B.id
  route_table_id = aws_route_table.keita-route-table.id


}
```




g- Create security group

`

```
# 6-    Security group which allows pport: 22, 80, 443
resource "aws_security_group" "keita-terraform-demo" {
  name        = "keita-terraform-demo"
  description = "Allow TLS inbound traffic"
  vpc_id      = aws_vpc.keita-demo-vpc.id

  ingress {
    description      = "HTTPS"
    from_port        = 443
    to_port          = 443
    protocol         = "tcp"
    cidr_blocks      =["0.0.0.0/0"] // Anyone can acces this

  }
   ingress {
    description      = "HTTP"
    from_port        = 80
    to_port          = 80
    protocol         = "tcp"
    cidr_blocks      =["0.0.0.0/0"] // Anyone can acces this

  }
   ingress {
    description      = "SSH"
    from_port        = 22
    to_port          = 22
    protocol         = "tcp"
    cidr_blocks      =["0.0.0.0/0"] // Anyone can acces this

  }

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

  }

  tags = {
    Name = "keita-terraform-demo"
  }
}
```




h- Create a network interface

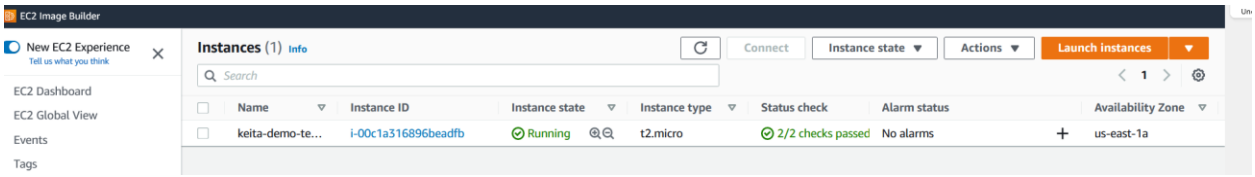
`

```
# 7-    Network interface
resource "aws_network_interface" "test" {
  subnet_id       = aws_subnet.keita-public-subnet-A
  private_ips     = ["10.0.0.50"]
  security_groups = aws-security_group.keita-terraform-demo


}
```

i- Assign an elastic IP in the subnet that was created

```
resource "aws_eip" "keita-eip" {
  vpc                       = true
  network_interface         = aws_network_interface.keita.id
  associate_with_private_ip = "10.0.0.50"
  depends_on = [
    aws_internet_gateway.keita-gw
  ]

}
```

j- Create an ec2 instance and install Apache :




README.md
terraform.tfstate U
terraform.tfstate.backup U

```
resource "aws_instance" "keita-demo-terraform-ec2" {
    ami ="ami-0cff7528ff583bf9a"
    instance_type ="t2.micro"
    availability_zone = "us-east-1a"
    tags = {
      "Name" = "keita-demo-terraform-ec2"
        }
      key_name="done"
  network_interface {
    device_index = 0
    network_interface_id = aws_network_interface.keita.id

  }
 user_data = <<-EOF
 #!/bin/bash
yum update -y
yum -y install httpd
systemctl enable httpd
systemctl start httpd
```

`

```
main.tf                    U
ROJECT-P01
.terraform
.terraform.lock.hcl        U
main.tf                    U
README.md
terraform.tfstate          U
terraform.tfstate.backup   U
UTLINE
MELINE
ERRAFORM PROVIDERS
```

```
echo '<html>
<body>

<h2>Thank you dear readers </h2>
<details>
   <summary>Terraform commands used </summary>
     <li>
      <ul>Terraform init</ul>
       <ul>Terraform plan</ul>
        <ul>Terraform apply</ul>
         <ul>Terraform destroy</ul>
     </li>
   </details>
<details>
   <summary>Git commands used:</summary>
    <li>
     <ul>git init </ul>
      <ul>git push </ul>
      <ul>git add .</ul>
       <ul>git commit -m"your messages" </ul>
        <ul>git remote add origin url </ul>

    </li>
    </details>
<p>Ibrehima keita </p>
</body>
</html>' > /var/www/html/index.html
EOF
}
```

```
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.keita-demo-terraform-ec2: Creating...
aws_instance.keita-demo-terraform-ec2: Still creating... [10s elap
sed]
aws_instance.keita-demo-terraform-ec2: Still creating... [20s elap
sed]
aws_instance.keita-demo-terraform-ec2: Still creating... [30s elap
sed]
aws_instance.keita-demo-terraform-ec2: Creation complete after 33s
 [id=i-00c1a316896beadfb]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project/pr
oject-p01 (main)
$
```

`

| Name | Instance ID | Instance state | Instance type | Status check | Alarm status | Availability Zone | Publi |
|---|---|---|---|---|---|---|---|
| keita-demo-terraform-ec2 | i-0d3572eeac8b7cb99 | Running | t2.micro | 2/2 checks passed | No alarms | us-east-1a | – |

50.17.236.28

# Thank you dear readers

▼ Terraform commands used

- 

  Terraform init

  Terraform plan

  Terraform apply

  Terraform destroy

▼ Git commands used:

- 

  git init

  git push

  git add .

  git commit -m"your messages"

  git remote add origin url

Ibrehima keita

EXPLORER

OPEN EDITORS

main.tf M

PROJECT-P01

.terraform

.gitattributes

.terraform.lock.hcl

main.tf M

README.md

terraform.tfstate M

terraform.tfstate.backup M

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL GITLENS JUPYTER

```
aws_internet_gateway.keita-gw: Still destroying... [id=igw-0381469ccea4473c4, 10s elapsed]
aws_internet_gateway.keita-gw: Destruction complete after 13s
aws_instance.keita-demo-terraform-ec2: Still destroying... [id=i-0d3572eeac8b7cb99, 20s elapsed]
aws_instance.keita-demo-terraform-ec2: Still destroying... [id=i-0d3572eeac8b7cb99, 30s elapsed]
aws_instance.keita-demo-terraform-ec2: Destruction complete after 30s
aws_network_interface.keita: Destroying... [id=eni-0e6eabd5980605c12]
aws_network_interface.keita: Destruction complete after 1s
aws_subnet.keita-public-subnet-A: Destroying... [id=subnet-05267086fc47ed1e7]
aws_security_group.keita-terraform-demo: Destroying... [id=sg-0774334f8d4a66eaf]
aws_security_group.keita-terraform-demo: Destruction complete after 0s
aws_subnet.keita-public-subnet-A: Destruction complete after 0s
aws_vpc.keita-demo-vpc: Destroying... [id=vpc-044f927ac74ccc0c8]
aws_vpc.keita-demo-vpc: Destruction complete after 0s

Destroy complete! Resources: 11 destroyed.
PS C:\Users\keita\Desktop\keita-terraform-project\project-p01>
```

`

```
keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project (main)
$ date
Wed Jul 20 04:13:11 EDT 2022

keita@LAPTOP-NPFEPG3K MINGW32 ~/Desktop/keita-terraform-project (main)
$
```

`