Inlämningsuppgift

Basic Cloud Computing

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Content

Virtual machine in Linux

1.Open the web browser and type the following URL, then click Enter

https://stordevsumj.blob.core.windows.net/easec/easec-linux1.ova

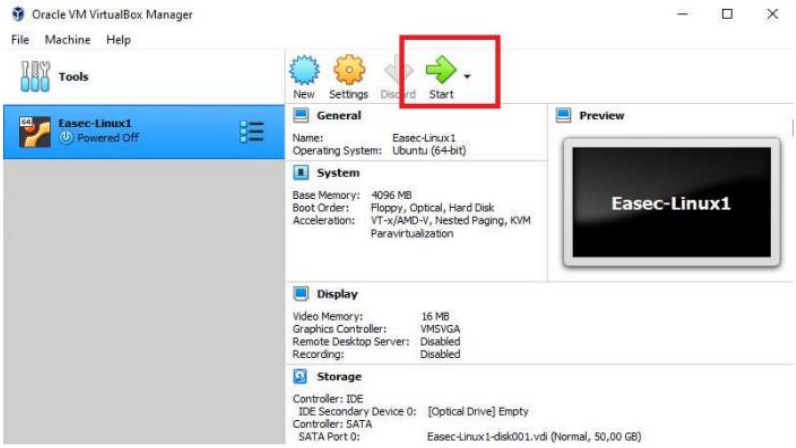
Create a directory c:/easec in order to store the virtual machine

2.In the computer, start virtual box which has been installed before. In that click on import

3.Then click on folder icon and browse to easec-linux1.ova from the directory and click next

4.In the Appliance to import window click on import button without making any changes,

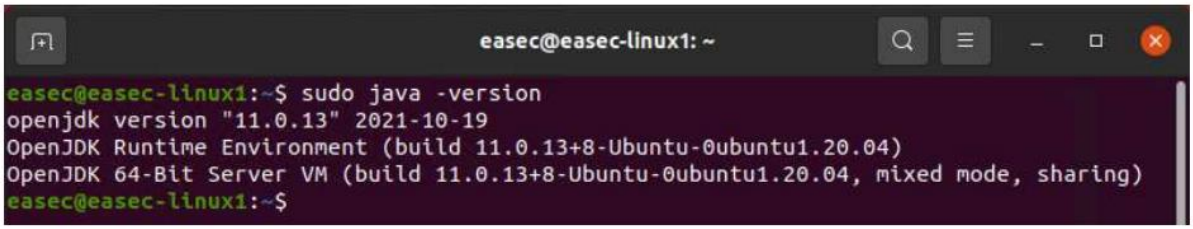
Once it gets imported click on the start button which is displaying in the virtual box



5.After this log in easec with password.

Install Java in the Ubuntu terminal

1. Open virtual machine and login with password. Then click Alt+Ctrl+T to open the Ubuntu terminal.Type **sudo apt-get update** command in the terminal.
2. Type the password for sudo.
3. Write the following command to install java in linux
4. sudo apt-get install openjdk-11-jdk
5. Type ‘ y ’ in order to confirm installation.Do you want to continue? and click enter.
6. Write following command to confirm the installation
7. Sudo java –version



Visual studio code

1.open the webbrowser and type the following url and click on enter
https://code.visualstudio.com/docs/languages/java
2.click on Install extension pack for java then click on choose Application to open the Visual studio code link.click on open link.
3.Visual studio code open with Extension pack for java,click on install .
4.Click on terminal and type the command ,click enter
Code .

5.Click on yes,I trust the authors.Visual studio code opens where we can select file menu,New file.Select the link and choose java.

Install Mysql 8.0 in linux

1. Open virtual machine and login with password.Then click Alt+Ctrl+T to open the Ubuntu terminal.Type **sudo apt-get update** command in the terminal.
2. Type the password for sudo.
3. Type the following command
4. sudo apt-get install mysql-server
5. write 'y' in order to install mysql and click enter.
6. Type the following command to configure Mysql 8.0 and click enter
7. sudo mysql_secure_installation
8. write 'y' in order to continue with configuration of mysql and type 0.
9. Enter the password and re-enter the password and write 'y' to continue with password
10. Again write 'y' to remove anonymous user and write 'y' for all other questions.
11. Type **sudo mysql to verify the sql prompt**

```
easec@easec-linux1:~$ sudo mysql
[sudo] password for easec:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.28-0ubuntu0.20.04.3 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```
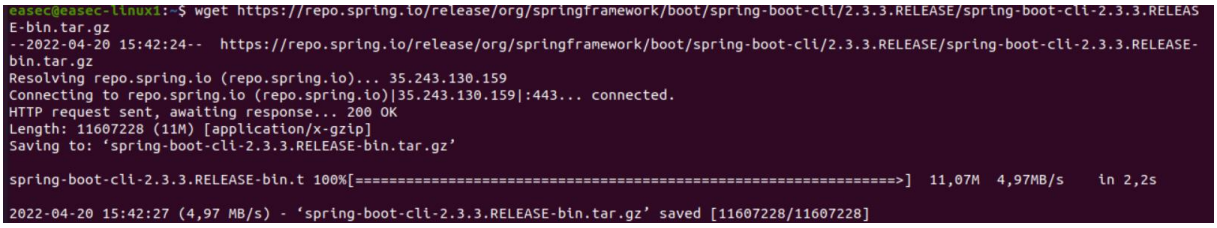
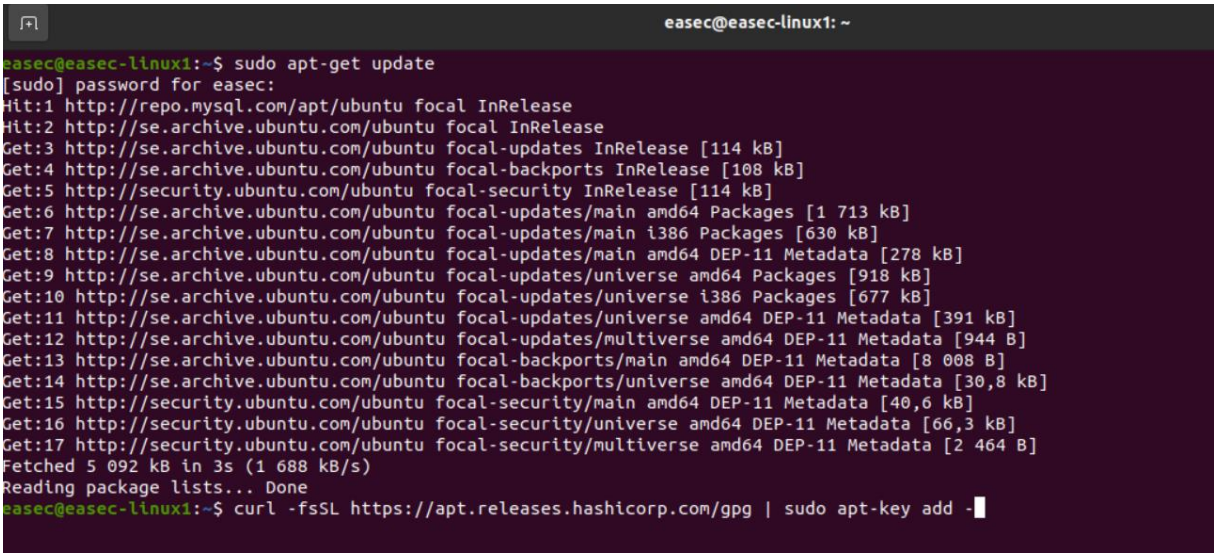

Install Spring Boot in linux

1. Open virtual machine and login with password.Then click Alt+Ctrl+T to open the Ubuntu terminal.Type **sudo apt-get update** command in the terminal.
2. Type the password for sudo.
3. Type the following command and click enter
4. wget https://repo.spring.io/release/org/springframework/boot/spring-boot-cli/2.3.3.RELEASE/spring-boot-cli-2.3.3.RELEASE-bin.tar.gz
5. Type the following command
6. tar -xzf spring-boot-cli-2.3.3.RELEASE-bin.tar.gz
7. Write the command in the terminal and click enter
8. sudo mv spring-boot-cli-2.3.3.RELEASE /opt
9. Write the command and click enter
10. sudo ln -s /opt/spring-2.3.3.RELEASE/bin/spring /usr/bin/spring
11. Then write the command ,press enter
12. sudo ln -s /opt/spring-boot-cli-2.3.3.RELEASE/shell-completion/bash/spring /etc/bash_completion.d/spring



Install Terraform in Ubuntu

1.Open virtual machine and login with password.Then click Alt+Ctrl+T to open the Ubuntu terminal.Type **sudo apt-get update** command in the terminal.



2.Then type the following command,which displays ok.

curl -fsSL https://apt.releases.hashicorp.com/gpg | sudo apt-key add -

```
easec@easec-linux1: ~
easec@easec-linux1:~$ sudo apt-get update
[sudo] password for easec:
Hit:1 http://repo.mysql.com/apt/ubuntu focal InRelease
Hit:2 http://se.archive.ubuntu.com/ubuntu focal InRelease
Get:3 http://se.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:4 http://se.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:6 http://se.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1 713 kB]
Get:7 http://se.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [630 kB]
Get:8 http://se.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [278 kB]
Get:9 http://se.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [918 kB]
Get:10 http://se.archive.ubuntu.com/ubuntu focal-updates/universe i386 Packages [677 kB]
Get:11 http://se.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [391 kB]
Get:12 http://se.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:13 http://se.archive.ubuntu.com/ubuntu focal-backports/main amd64 DEP-11 Metadata [8 008 B]
Get:14 http://se.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 Metadata [30,8 kB]
Get:15 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [40,6 kB]
Get:16 http://security.ubuntu.com/ubuntu focal-security/universe amd64 DEP-11 Metadata [66,3 kB]
Get:17 http://security.ubuntu.com/ubuntu focal-security/multiverse amd64 DEP-11 Metadata [2 464 B]
Fetched 5 092 kB in 3s (1 688 kB/s)
Reading package lists... Done
easec@easec-linux1:~$ curl -fsSL https://apt.releases.hashicorp.com/gpg | sudo apt-key add -
OK
easec@easec-linux1:~$ sudo apt-add-repository "deb [arch=amd64] https://apt.releases.hashicorp.com $(lsb_release -cs) main"
```

3.Then write the following command in order to add reference to terraform archive

sudo apt-add-repository "deb [arch=amd64] https://apt.releases.hashicorp.com $(lsb_release -cs) main"

```
easec@easec-linux1:~$ sudo apt-add-repository "deb [arch=amd64] https://apt.releases.hashicorp.com $(lsb_release -cs) main"
Hit:1 http://se.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://se.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://repo.mysql.com/apt/ubuntu focal InRelease
Hit:4 http://se.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:5 http://security.ubuntu.com/ubuntu focal-security InRelease
Get:6 https://apt.releases.hashicorp.com focal InRelease [16,3 kB]
Get:7 https://apt.releases.hashicorp.com focal/main amd64 Packages [51,1 kB]
Fetched 67,3 kB in 1s (46,8 kB/s)
Reading package lists... Done
easec@easec-linux1:~$
```

4.Then again write the sudo apt-get update command in the terminal to update the reference

```
easec@easec-linux1:~$ sudo apt-get update
Hit:1 http://repo.mysql.com/apt/ubuntu focal InRelease
Hit:2 http://se.archive.ubuntu.com/ubuntu focal InRelease
Hit:3 http://se.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 https://apt.releases.hashicorp.com focal InRelease
Hit:5 http://se.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:6 http://security.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
easec@easec-linux1:~$
```

5.To Install Terraform use the command **sudo apt-get install terraform**

```
easec@easec-linux1:~$ sudo apt-get install terraform
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  terraform
0 upgraded, 1 newly installed, 0 to remove and 62 not upgraded.
Need to get 18,8 MB of archives.
After this operation, 63,3 MB of additional disk space will be used.
Get:1 https://apt.releases.hashicorp.com focal/main amd64 terraform amd64 1.1.8 [18,8 MB]
Fetched 18,8 MB in 1s (13,0 MB/s)
Selecting previously unselected package terraform.
(Reading database ... 182547 files and directories currently installed.)
Preparing to unpack .../terraform_1.1.8_amd64.deb ...
Unpacking terraform (1.1.8) ...
Setting up terraform (1.1.8) ...
easec@easec-linux1:~$
```

6.To verify the installation of Terraform ,write the command and click enter

terraform -help

```
easec@easec-linux1:~$ terraform -help
Usage: terraform [global options] <subcommand> [args]

The available commands for execution are listed below.
The primary workflow commands are given first, followed by
less common or more advanced commands.

Main commands:
  init          Prepare your working directory for other commands
  validate      Check whether the configuration is valid
  plan          Show changes required by the current configuration
  apply         Create or update infrastructure
  destroy       Destroy previously-created infrastructure

All other commands:
  console       Try Terraform expressions at an interactive command prompt
  fmt           Reformat your configuration in the standard style
  force-unlock  Release a stuck lock on the current workspace
  get           Install or upgrade remote Terraform modules
  graph         Generate a Graphviz graph of the steps in an operation
  import        Associate existing infrastructure with a Terraform resource
  login         Obtain and save credentials for a remote host
  logout        Remove locally-stored credentials for a remote host
  output        Show output values from your root module
  providers     Show the providers required for this configuration
  refresh       Update the state to match remote systems
  show          Show the current state or a saved plan
  state         Advanced state management
  taint         Mark a resource instance as not fully functional
  test          Experimental support for module integration testing
  untaint       Remove the 'tainted' state from a resource instance
  version       Show the current Terraform version
  workspace     Workspace management

Global options (use these before the subcommand, if any):
  -chdir=DIR    Switch to a different working directory before executing the
                given subcommand.
  -help         Show this help output, or the help for a specified subcommand.
```

7.Write the following command in order to install Unzip package

Sudo apt-get install unzip

```
easec@easec-linux1:~$ sudo apt-get install unzip
Reading package lists... Done
Building dependency tree
Reading state information... Done
unzip is already the newest version (6.0-25ubuntu1).
unzip set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 62 not upgraded.
easec@easec-linux1:~$
```

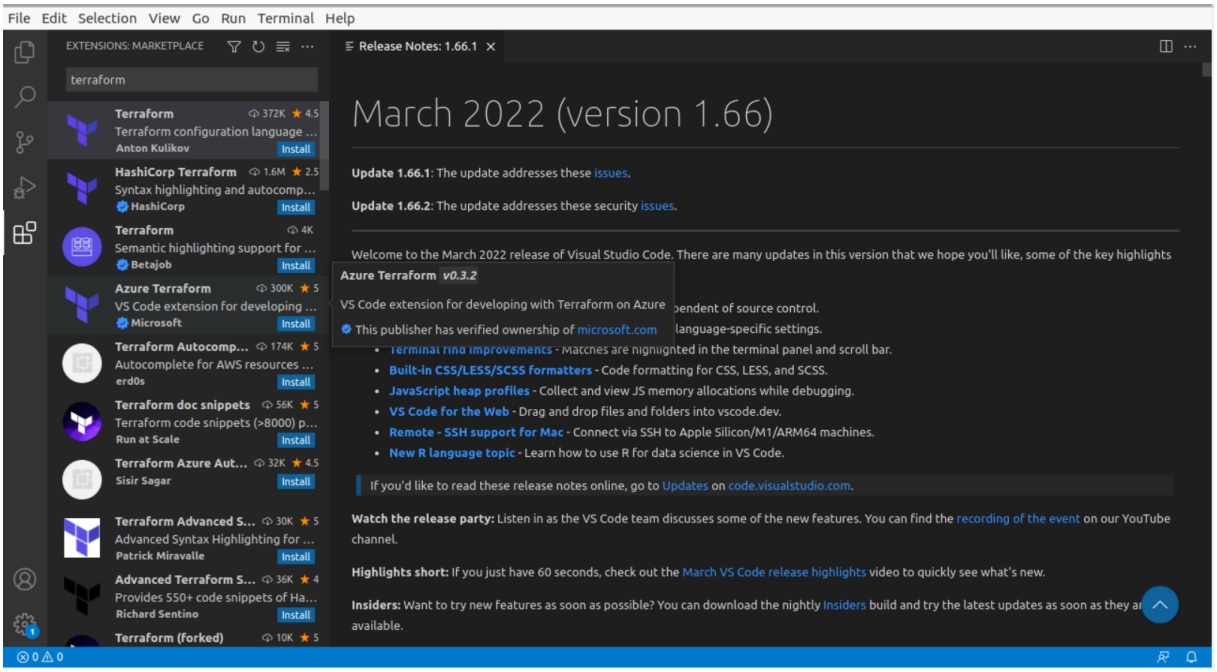
8.The command used to check the version of Terraform

terraform -v

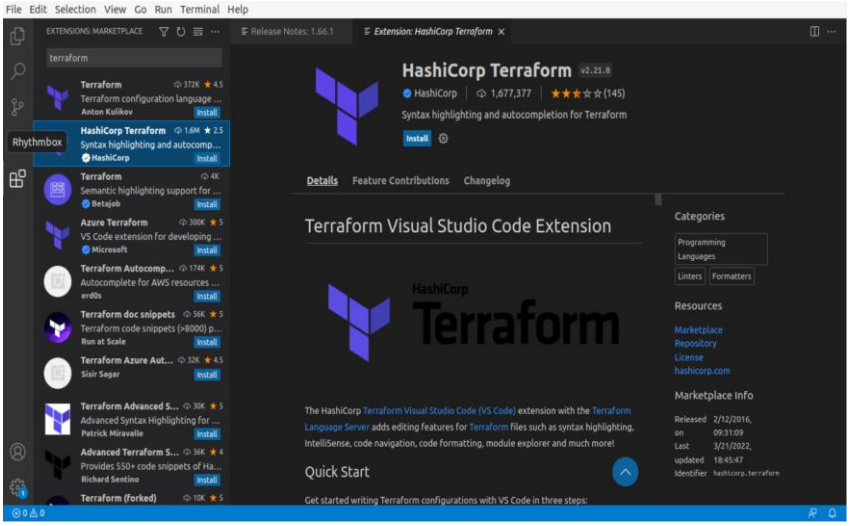
```
easec@easec-linux1:~$ terraform -v
Terraform v1.1.8
on linux_amd64
easec@easec-linux1:~$
```

Using IaC Framework(Terraform in visual studio code)

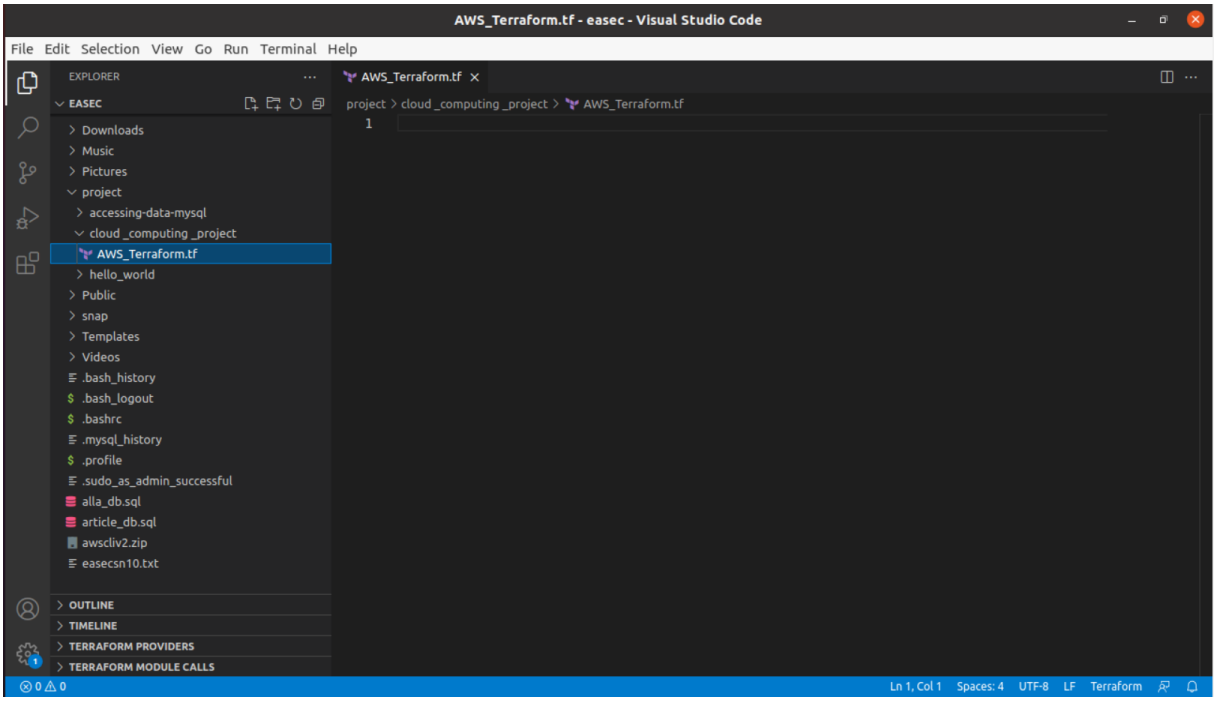
1.In Visual studio code click on extensions and type terraform ,then select Hashicorp Terraform



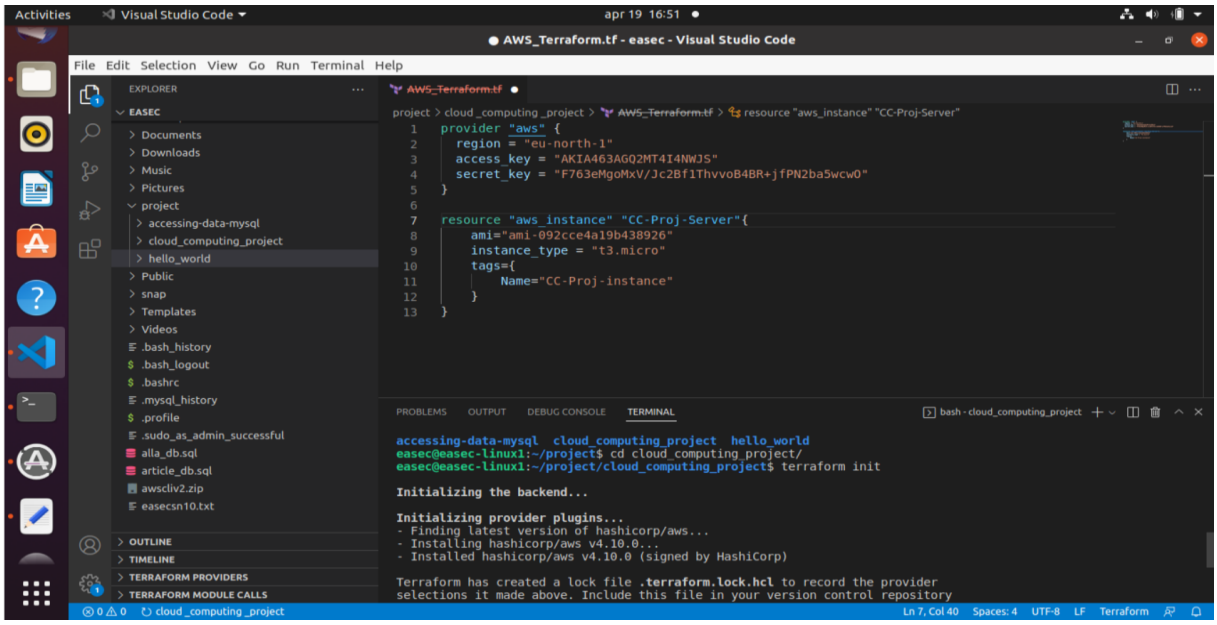
2.Click on Install button and then close extension:hashicorp terraform .



3.Then in virtual machine click on files and create new folder.I have created a folder inside home/easec/project/cloud_computing_project.



4.InVisual studio code Click on file –new file then save the file as AWS_Terraform.tf inside the folder cloud_computing_project.When you click on explorer you can able to see your folder with given filename.



5.In the terraform file type the following code

```
provider "aws" {
region = "eu-north-1"
access key = " "
secret key = " "
}
```

6.Write the aws instance resources with ami and instance type in the same terraform file

```
resource "aws_instance" "CC-Proj-Server"{
ami="ami-092cce4a19b438926"
instance_type = "t3.micro"
tags={
Name="CC-Proj-instance"
}
```

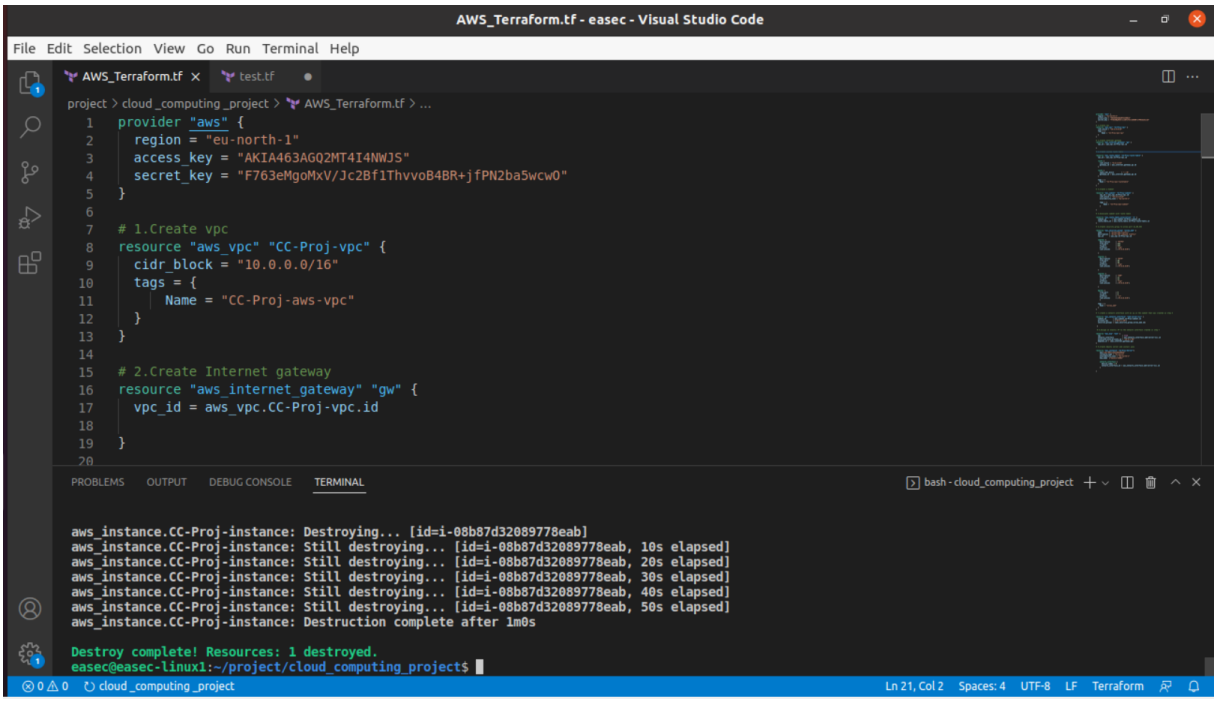
Remote Environment Setup-AWS

- Create VPC
- Create Internet Gateway
- Create custom route table
- Create subnet
- Create subnet with route table
- Create Security Group
- Create network interface
- Assign elastic IP to the network interface
- Create Ubuntu server and install Java, Spring boot, MySQL.

1. Created different resources in Terraform file

First created a resource vpc and then internet gateway. These resources can be created in any order.

We can refer these resources from AWS providers documentation



2.Then we created route table resource in this vpc_id is the name we created in vpc with .id should be added to it.Same way as gateway_id.

```
AWS_Terraform.tf ×   test.tf
project > cloud _computing _project > AWS_Terraform.tf > ...
# 3.Create custom route table

resource "aws_route_table" "CC-Proj-route-table" {
  vpc_id = aws_vpc.CC-Proj-vpc.id

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

  route {
    ipv6_cidr_block        = "::/0"
    gateway_id = aws_internet_gateway.gw.id
  }

  tags = {
    Name = "CC-Proj-aws-routetable"
  }
}
```

3.In this step we created subnet and subnet route table for our vpc with availability zone which one we selected in our console

```
AWS_Terraform.tf ×   test.tf
project > cloud _computing _project > AWS_Terraform.tf > ...

# 4.Create a Subnet

resource "aws_subnet" "CC-Proj-subnet" {
    vpc_id = aws_vpc.CC-Proj-vpc.id
    cidr_block = "10.0.0.0/16"
    availability_zone = "eu-north-1"

    tags = {
        Name = "CC-Proj-aws-subnet"
    }

}

# 5.Associate subnet with route table

resource "aws_route_table_association" "a" {
  subnet_id      = aws_subnet.CC-Proj-subnet.id
  route_table_id = aws_route_table.CC-Proj-route-table.id
}
```

4.Here we created a security group for different ports such as HTTPS,HTTP and SSH with port number.

```
AWS_Terraform.tf ×   test.tf
project > cloud _computing _project > AWS_Terraform.tf > ...
# 6.Create security group to allow port 22,80,443

resource "aws_security_group" "allow_web" {
  name        = "allow_web_traffic"
  description = "Allow web inbound traffic"
  vpc_id      = aws_vpc.CC-Proj-vpc.id

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

  }

  ingress {
    description      = "HTTP"
    from_port        = 80
```

5.Create network interface and assign elastic IP to the network interface with subnet id.

```
AWS_Terraform.tf ●   test.tf
project > cloud _computing _project > AWS_Terraform.tf > ...
}

# 7.create a network interface with an ip in the subnet that was created in step 4

resource "aws_network_interface" "web-server-nic" {
  subnet_id       = aws_subnet.CC-Proj-subnet.id
  private_ips     = ["10.0.1.50"]
  security_groups = [aws_security_group.allow_web.id]

 }

 # 8.Assign an elastic IP to the network interface created in step 7

resource "aws_eip" "one" {
  vpc                       = true
  network_interface         = aws_network_interface.web-server-nic.id
  associate_with_private_ip = "10.0.1.50"
  depends_on = [aws_internet_gateway.gw]
}
```

6.In this final step we created Ubuntu server and installed Java,Springboot and Mysql with different commands and finally run the terraform command

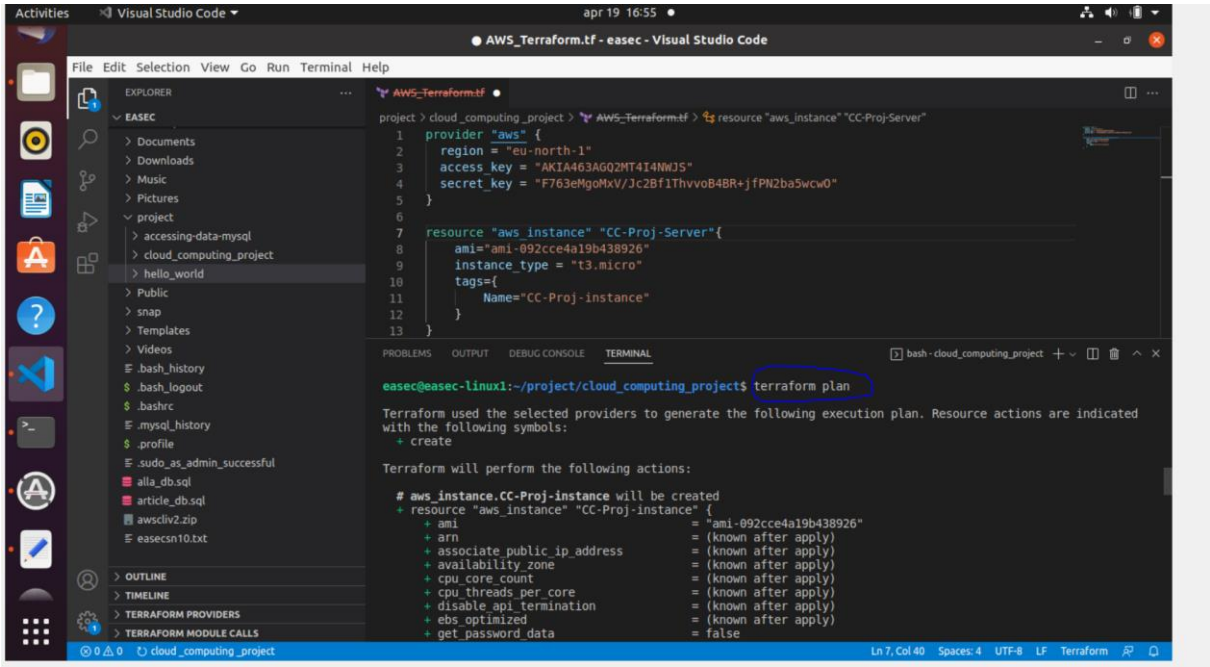
```
# 9.Create Ubuntu server and install java,springboot,mysql

resource "aws_instance" "CC-Proj-Server"{
    ami="ami-092cce4a19b438926"
    instance_type = "t3.micro"
    availability_zone = "eu-north-1"
    key_name  ="easecsrl0401"

    network_interface {
      device_index = 0
      network_interface_id = aws_network_interface.web-server-nic.id
    }

    user_data = <<-EOF
    #!/bin/bash
    sudo apt update -y
    sudo apt-get  install openjdk-11-jdk -y

    wget https://repo.spring.io/release/org/springframework/boot/spring-boot-cli/2.3.3.RELEASE/spring-boot-cli-2.3.3.RELEAS
    tar -xzf spring-boot-cli-2.3.3.RELEASE-bin.tar.gz
```

```
    wget https://repo.spring.io/release/org/springframework/boot/spring-boot-cli/2.3.3.RELEASE/spring-boot-cli-2.3.3.RELEAS
    tar -xzf spring-boot-cli-2.3.3.RELEASE-bin.tar.gz
    sudo mv spring-boot-cli-2.3.3.RELEASE /opt/
    sudo ln -s /opt/spring-2.3.3.RELEASE/bin/spring /usr/bin/spring
    sudo ln -s /opt/spring-boot-cli-2.3.3.RELEASE/shell-completion/bash/spring
    /etc/bash_completion.d/spring

    sudo apt update -y
    sudo apt-get install mysql-server
    sudo dpkg --configure -a
    sudo mysql_secure_installation -y
    EOF

 tags={
        Name="CC-Proj-instance"
    }
}
```

```
File  Edit  Selection  View  Go  Run  Terminal  Help
AW5_Terraform.tf 1   test.tf
project > test.tf
    sudo apt update -y
    sudo apt-get  install openjdk-11-jdk -y

    wget https://repo.spring.io/release/org/springframework/boot/spring-boot-cli/2.3.3.RELEASE/spring-boot-cli-2.3.3.RELEAS
    tar -xzf spring-boot-cli-2.3.3.RELEASE-bin.tar.gz
    sudo mv spring-boot-cli-2.3.3.RELEASE /opt/
    sudo ln -s /opt/spring-2.3.3.RELEASE/bin/spring /usr/bin/spring
    sudo ln -s /opt/spring-boot-cli-2.3.3.RELEASE/shell-completion/bash/spring
    /etc/bash_completion.d/spring

    sudo apt update -y
    sudo apt-get install mysql-server
    sudo dpkg --configure -a
    sudo mysql_secure_installation -y
    EOF
}

PROBLEMS 1   OUTPUT   DEBUG CONSOLE   TERMINAL                    bash - project

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.CC-Proj-Server: Creating...
aws_instance.CC-Proj-Server: Still creating... [10s elapsed]
aws_instance.CC-Proj-Server: Creation complete after 13s [id=i-07100883ceb9b45e7]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
easec@easec-linux1:~/project$
⊗ 1 ⚠ 0   project                    Ln 29, Col 38   Spaces: 4   UTF-8   LF   Terraform
```

7.Click on Terminal menu,select New Terminal which will get displayed at the bottom of visual studio code.Then type command cd project,click enter.

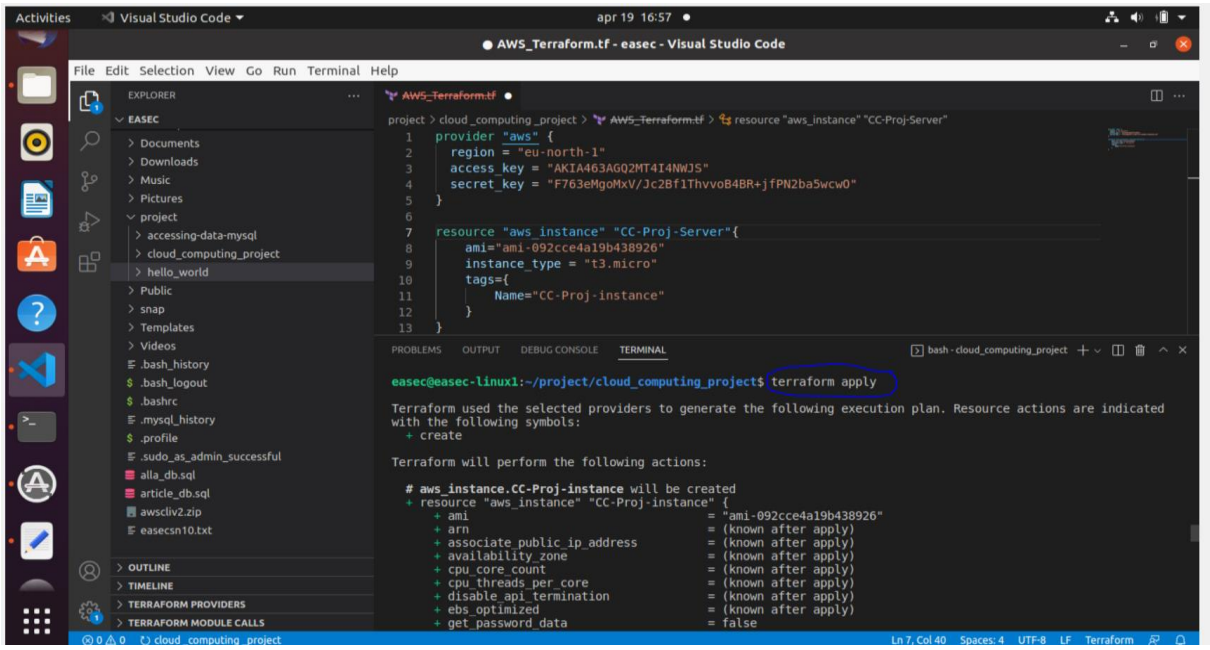
Then type cd cloud_computing_project in order to move to our directory where we stored our Terraform file,AWS_Terraform.tf



8.Then write the following command and click enter in order to initialize terraform

terraform init

9.Type the command **terraform apply** then click enter.Enter your value:yes type yes to perform actions.



10.Open the browser and type the following URL, then login with IAM user ,AccountId and Password.

https://console.aws.amazon.com

11.Type EC2 in the search box and click on instances(running) and it shows the running instances in AWS