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T22-82

Aim:

To understand terraform lifecycle, core concepts/terminologies and install it on a linux machine.

LO Mapping: LO1, LO5

Theory:

1. Introduction to Terraform: Terraform is an open-source Infrastructure as Code (IaC) tool created by HashiCorp. It allows you to define and manage your infrastructure using configuration files. Terraform supports a wide range of cloud providers, including AWS, Azure, GCP, and more.

2. Core Concepts and Terminologies:

- **Providers:** Providers are responsible for understanding API interactions with the services Terraform manages. Examples include AWS, Azure, Google Cloud, etc.
- **Resources:** Resources are the most important element in the Terraform language. Each resource block describes one or more infrastructure objects, such as virtual networks, compute instances, or higher-level components.
- **Modules:** Modules are containers for multiple resources that are used together. They are the basic unit of organization within Terraform configurations.
- **State:** Terraform maintains a state file to keep track of the infrastructure it manages. This file maps the configuration to the real-world resources.
- **Plans:** A plan in Terraform represents the actions that Terraform will take to reach the desired state described in the configuration files. It helps you understand the changes before they are applied.
- **Provisioners:** Provisioners are used to execute scripts or commands on a local or remote machine as part of the resource creation or destruction process.
- **Terraform Configuration Files:** These are the .tf files where you define your infrastructure using the HashiCorp Configuration Language (HCL) or JSON.

3. Terraform Lifecycle:

The typical Terraform workflow involves the following stages:

- **Write:** Define infrastructure as code in configuration files.
- **Initialize:** Run `terraform init` to initialize the working directory with configuration files.
- **Plan:** Run `terraform plan` to create an execution plan, which shows what actions Terraform will take to achieve the desired state.
- **Apply:** Run `terraform apply` to execute the actions proposed in the plan.
- **Destroy:** Run `terraform destroy` to remove the infrastructure managed by Terraform.

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Installing Terraform on a Linux Machine

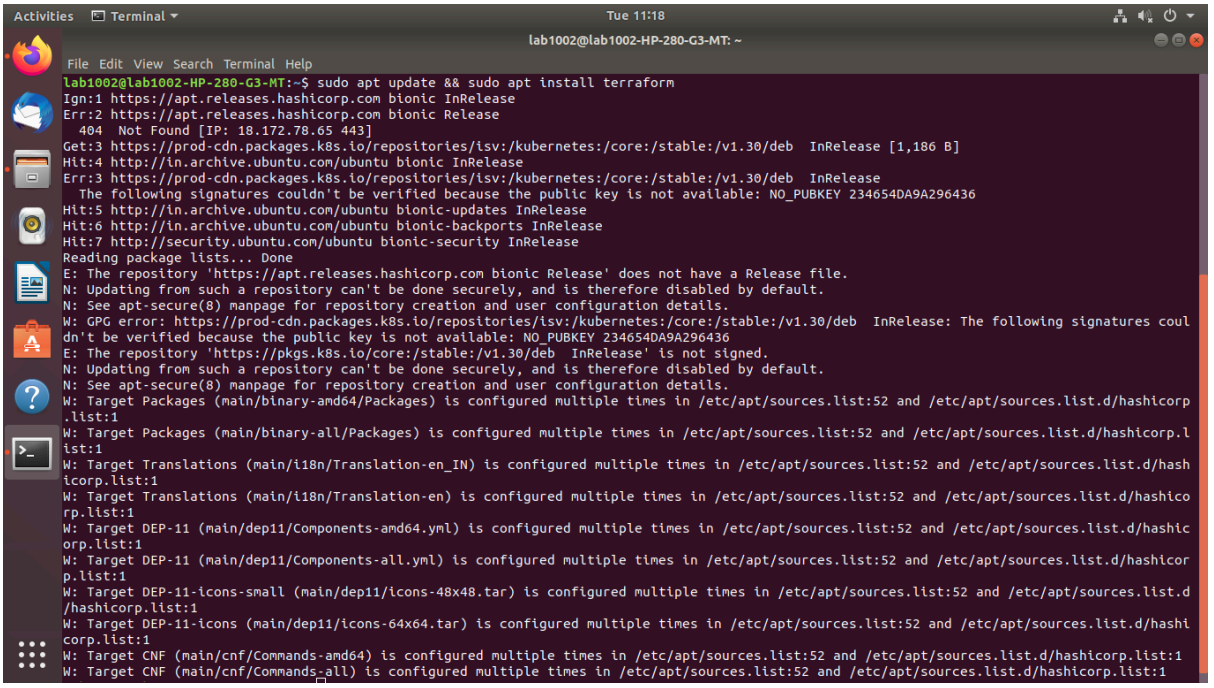
Run Commands

```
lab1002@lab1002-HP-280-G3-MT:~$ wget -O- https://apt.releases.hashicorp.com/gpg | sudo gpg --dearmor -o /usr/share/keyrings/hashicorp-archive-keyring.gpg
--2024-08-13 11:12:02--  https://apt.releases.hashicorp.com/gpg
Resolving apt.releases.hashicorp.com (apt.releases.hashicorp.com)... [sudo] password for lab1002: 18.172.78.129, 18.172.78.65, 18.172.78.12, ...
Connecting to apt.releases.hashicorp.com (apt.releases.hashicorp.com)|18.172.78.129|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3980 (3.9K) [binary/octet-stream]
Saving to: 'STDOUT'

-                   100%[===================>]   3.89K  --.-KB/s    in 0s

2024-08-13 11:12:02 (237 MB/s) - written to stdout [3980/3980]
```

```
lab1002@lab1002-HP-280-G3-MT:~$ echo "deb [signed-by=/usr/share/keyrings/hashicorp-archive-keyring.gpg] https://apt.releases.hashicorp.com $(lsb_release -cs) main" | sudo tee /etc/apt/sources.list.d/hashicorp.list
[sudo] password for lab1002:
deb [signed-by=/usr/share/keyrings/hashicorp-archive-keyring.gpg] https://apt.releases.hashicorp.com bionic main
```



Output:

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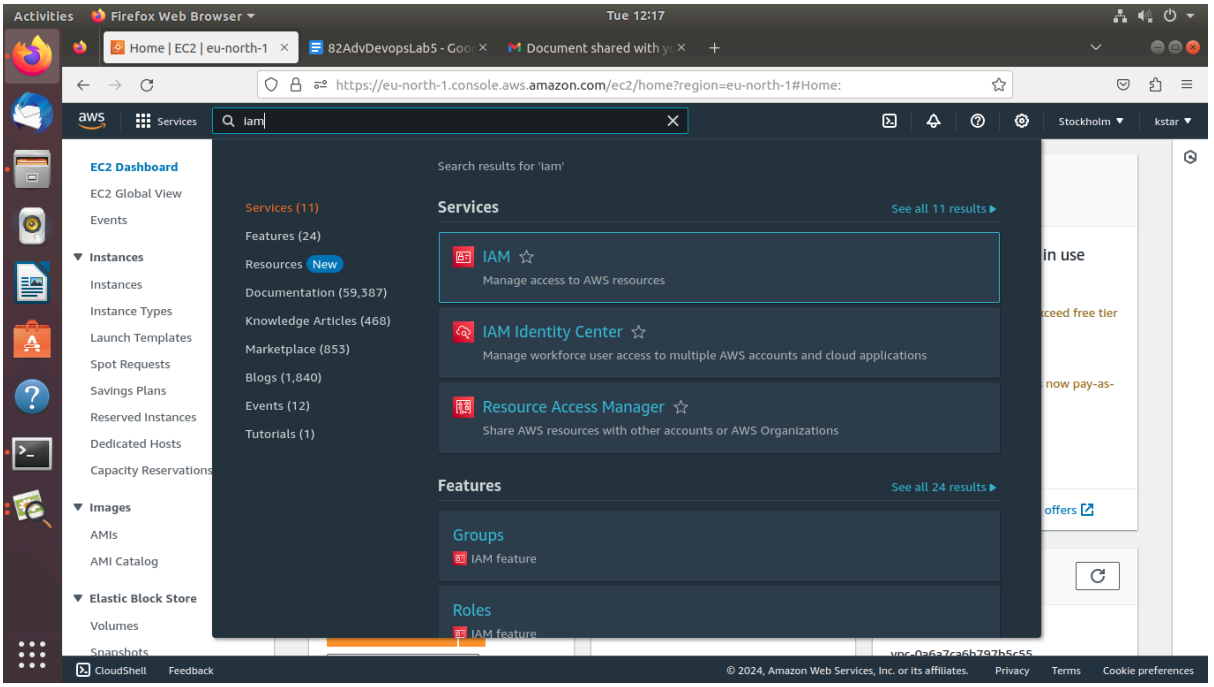
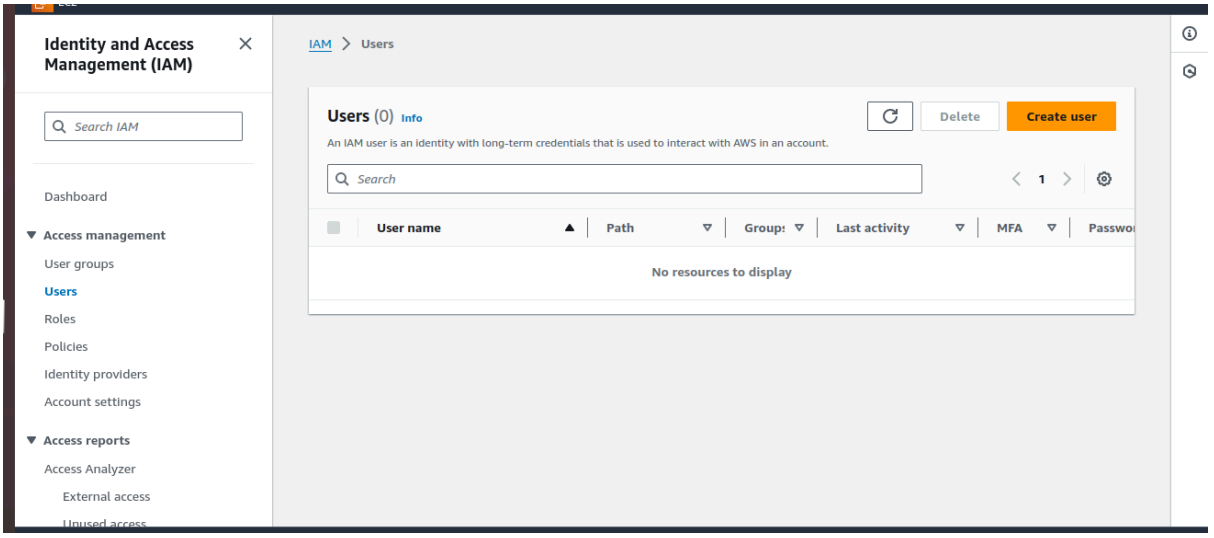
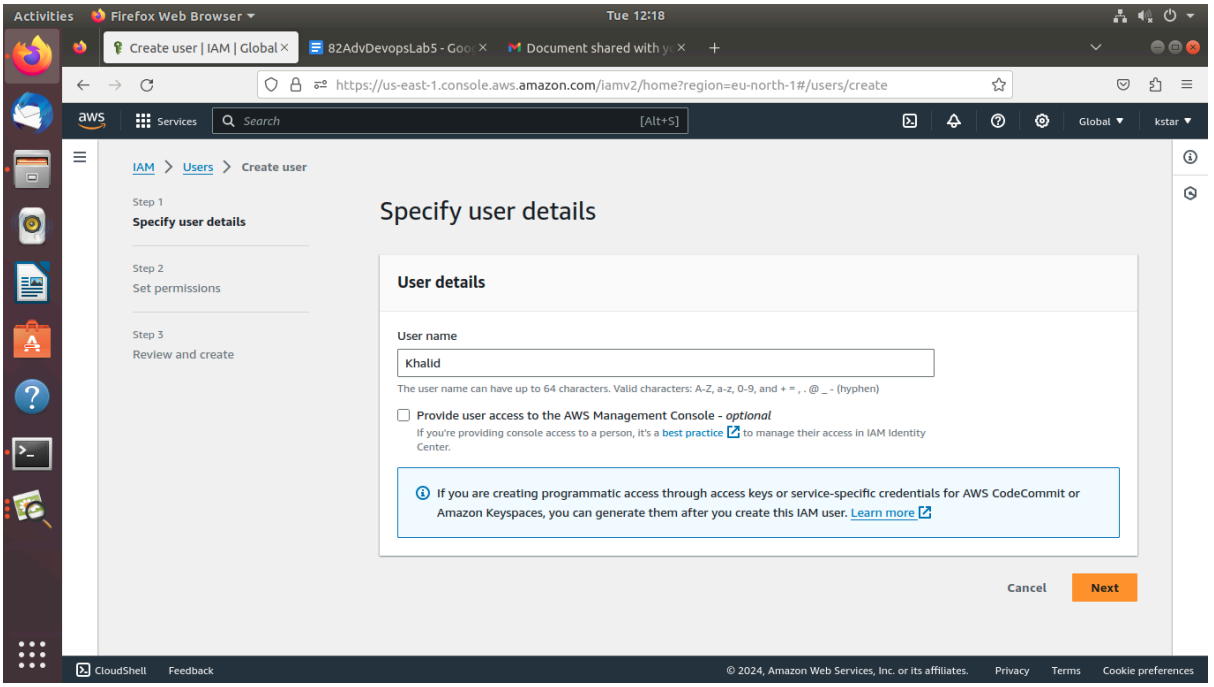
1. Search IAM



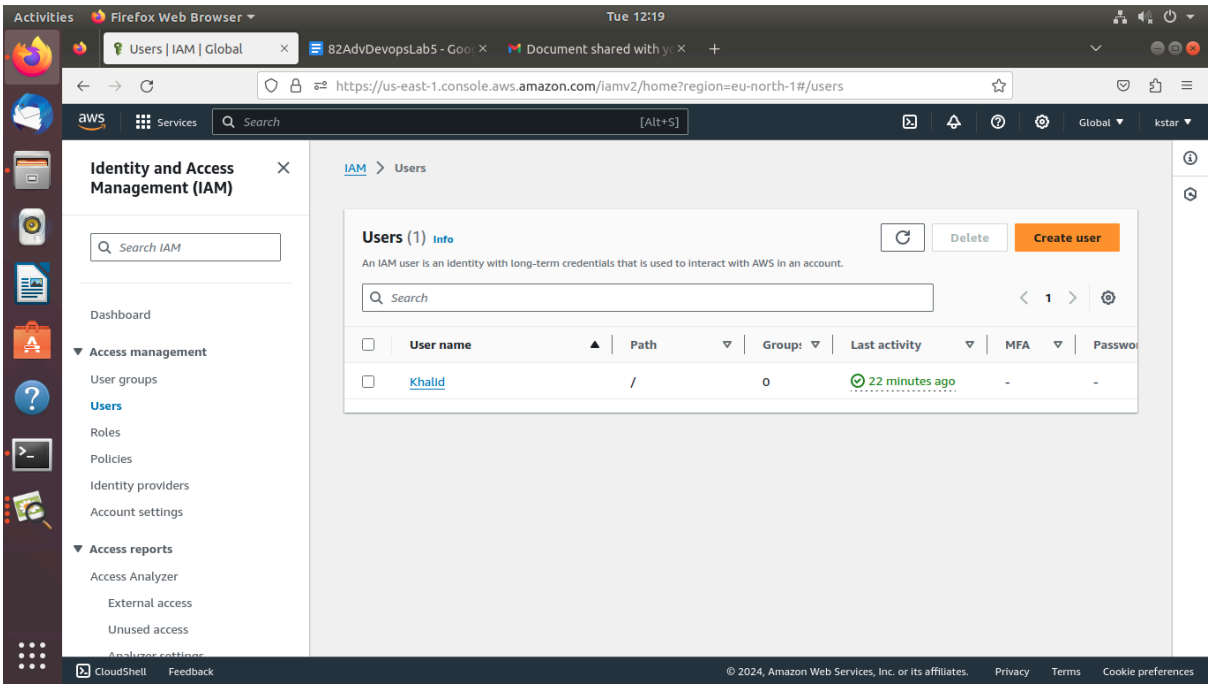
2. Go To Users and Click Yellow Create User Button



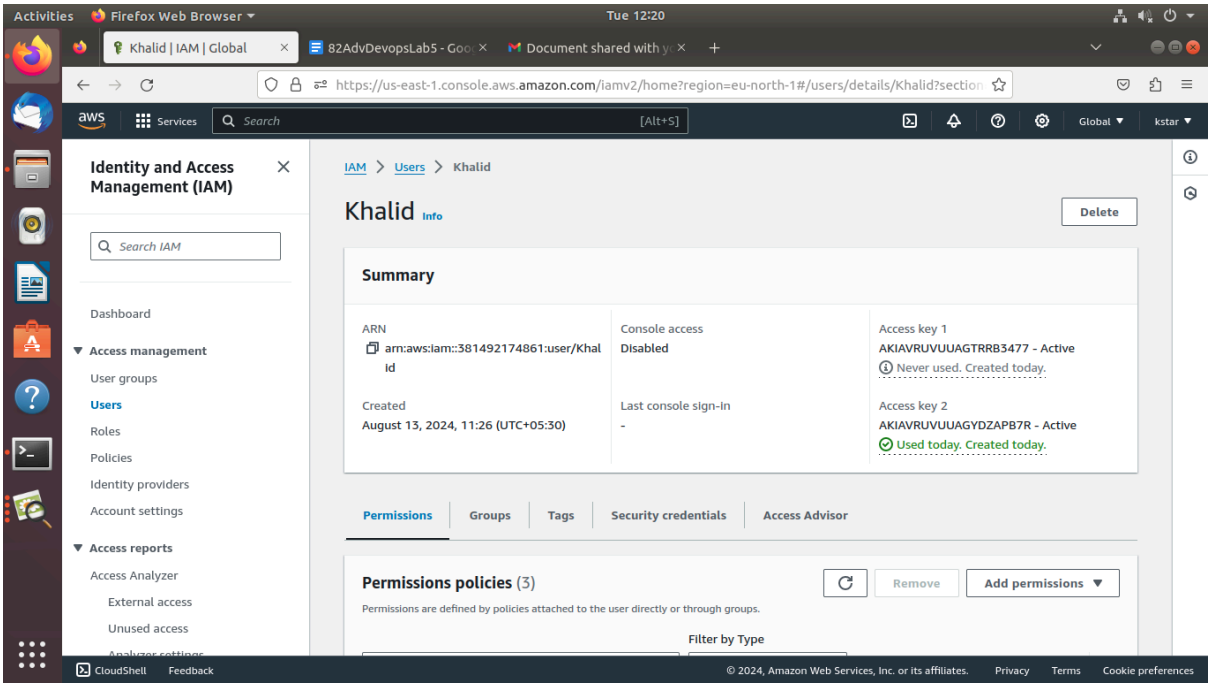
3. Click Next



4. User Successfully Created, Click on user and click Create Access Key.



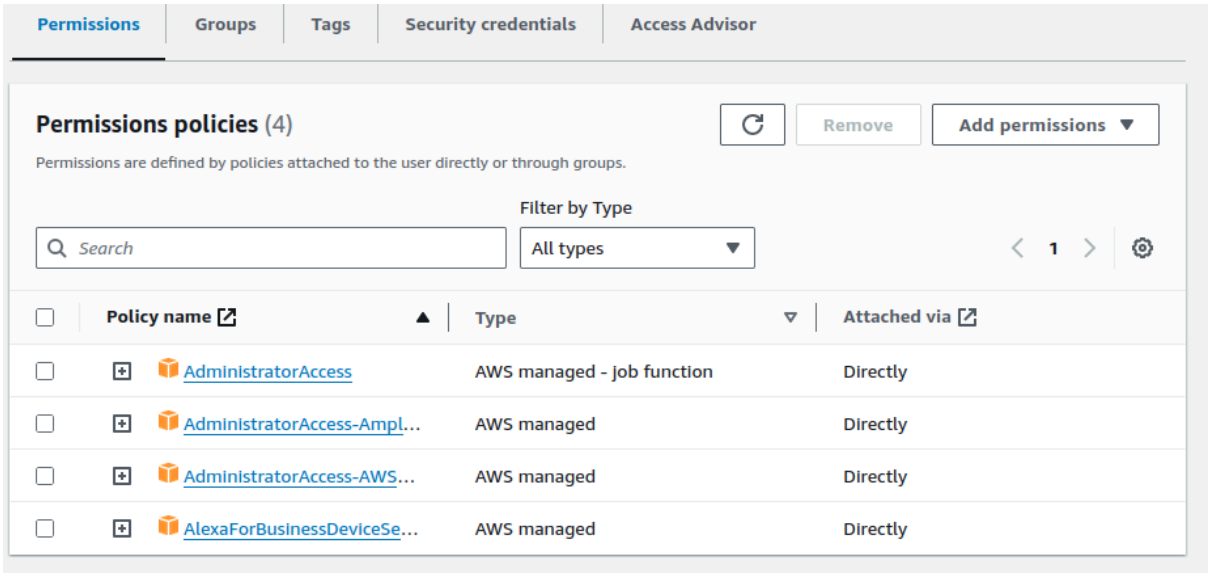
5. Keep the defaults and Complete creation of access keys.



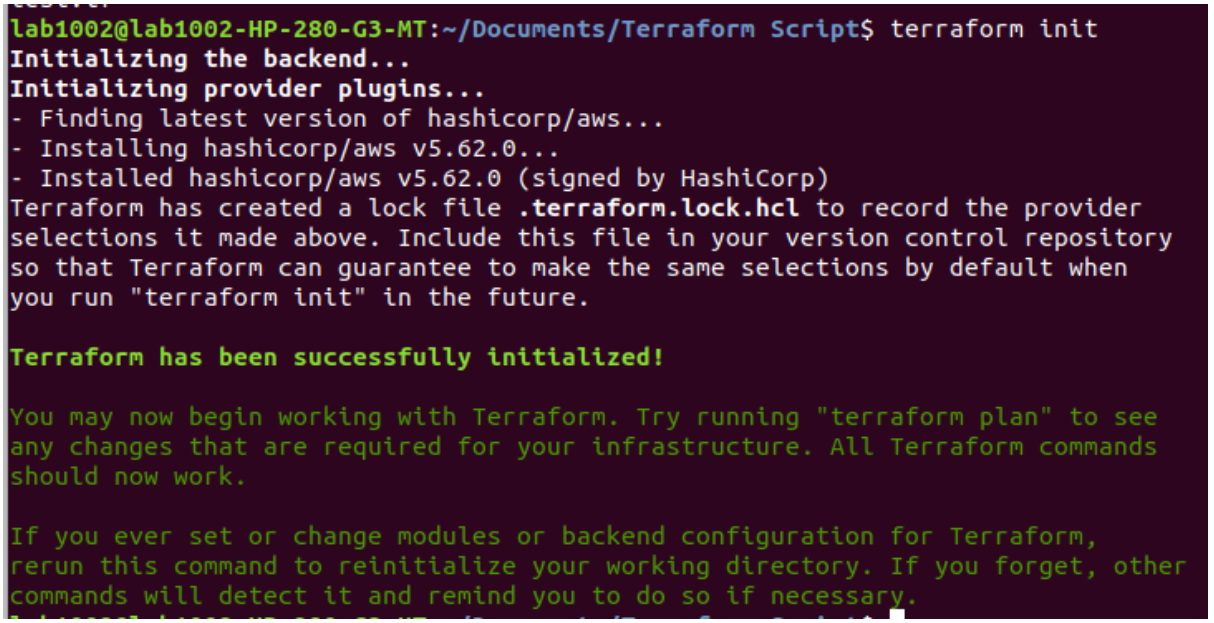
6. Create a Folder ‘Terraform Script’ (or any name) and create a .tf file with a custom name and type this into it. Replace the key and secret key

“

7. Give Appropriate Permissions to the user in order to create instances.



8. Run Terraform Init after opening the directory with .tf file.



9. Run Terraform plan

```
lab1002@lab1002-HP-280-G3-MT:~/Documents/Terraform Script$ terraform plan

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

Terraform will perform the following actions:

  # aws_instance.Ubuntu will be created
  + resource "aws_instance" "Ubuntu" {
      + ami                                  = "ami-00399ec92321828f5"
      + 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)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_lifecycle                   = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
      + subnet_id                            = (known after apply)
      + tags_all                             = (known after apply)
      + tenancy                              = (known after apply)
      + user_data                            = (known after apply)
      + user_data_base64                     = (known after apply)
      + user_data_replace_on_change          = false
      + vpc_security_group_ids               = (known after apply)

      + capacity_reservation_specification (known after apply)

      + cpu_options (known after apply)

      + ebs_block_device (known after apply)

      + enclave_options (known after apply)

      + ephemeral_block_device (known after apply)

      + instance_market_options (known after apply)

      + maintenance_options (known after apply)

      + metadata_options (known after apply)

      + network_interface (known after apply)

      + private_dns_name_options (known after apply)

      + root_block_device (known after apply)
    }

Plan: 1 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" now.
```

10. Run Terraform Apply

```
lab1002@lab1002-HP-280-G3-MT:~/Documents/Terraform Script$ terraform apply

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

Terraform will perform the following actions:

  # aws_instance.Ubuntu will be created
  + resource "aws_instance" "Ubuntu" {
      + ami                                  = "ami-00399ec92321828f5"
      + 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)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_lifecycle                   = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
```

```
      + cpu_options (known after apply)

      + ebs_block_device (known after apply)

      + enclave_options (known after apply)

      + ephemeral_block_device (known after apply)

      + instance_market_options (known after apply)

      + maintenance_options (known after apply)

      + metadata_options (known after apply)

      + network_interface (known after apply)

      + private_dns_name_options (known after apply)

      + root_block_device (known after apply)
    }

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

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

  Enter a value: yes

aws_instance.Ubuntu: Creating...
aws_instance.Ubuntu: Still creating... [10s elapsed]
aws_instance.Ubuntu: Still creating... [20s elapsed]
aws_instance.Ubuntu: Still creating... [30s elapsed]
aws_instance.Ubuntu: Creation complete after 35s [id=i-0475c06df86ffeeff]

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

11. Run Terraform Destroy

```
lab1002@lab1002-HP-280-G3-MT:~/Documents/Terraform Script$ terraform destroy
aws_instance.Ubuntu: Refreshing state... [id=i-0475c06df86ffeeff]

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

Terraform will perform the following actions:

  # aws_instance.Ubuntu will be destroyed
  - resource "aws_instance" "Ubuntu" {
      - ami                                  = "ami-00399ec92321828f5" -> null
      - arn                                  = "arn:aws:ec2:us-east-2:058264306232:instance/i-0475c06df86ffeeff" -> null
      - associate_public_ip_address          = true -> null
      - availability_zone                    = "us-east-2a" -> null
      - cpu_core_count                       = 1 -> null
      - cpu_threads_per_core                 = 1 -> null
      - disable_api_stop                     = false -> null
      - disable_api_termination              = false -> null
      - ebs_optimized                        = false -> null
      - get_password_data                    = false -> null
      - hibernation                          = false -> null
      - id                                   = "i-0475c06df86ffeeff" -> null
      - instance_initiated_shutdown_behavior = "stop" -> null
      - instance_state                       = "running" -> null
      - instance_type                        = "t2.micro" -> null
      - ipv6_address_count                   = 0 -> null
      - ipv6_addresses                       = [] -> null
      - monitoring                           = false -> null
      - placement_partition_number           = 0 -> null
      - primary_network_interface_id         = "eni-01100d4760c3736b5" -> null
      - private_dns                          = "ip-172-31-0-193.us-east-2.compute.internal" -> null
      - private_ip                           = "172.31.0.193" -> null
      - public_dns                           = "ec2-3-145-103-163.us-east-2.compute.amazonaws.com" -> null
      - public_ip                            = "3.145.103.163" -> null
      - secondary_private_ips                = [] -> null
      - private_dns_name_options {
          - enable_resource_name_dns_a_record    = false -> null
          - enable_resource_name_dns_aaaa_record = false -> null
          - hostname_type                        = "ip-name" -> null
        }

      - root_block_device {
          - delete_on_termination = true -> null
          - device_name           = "/dev/sda1" -> null
          - encrypted             = false -> null
          - iops                  = 100 -> null
          - tags                  = {} -> null
          - tags_all              = {} -> null
          - throughput            = 0 -> null
          - volume_id             = "vol-00709ed4a8b64b805" -> null
          - volume_size           = 8 -> null
          - volume_type           = "gp2" -> null
          # (1 unchanged attribute hidden)
        }
    }

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

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

  Enter a value: yes

aws_instance.Ubuntu: Destroying... [id=i-0475c06df86ffeeff]
aws_instance.Ubuntu: Still destroying... [id=i-0475c06df86ffeeff, 10s elapsed]
aws_instance.Ubuntu: Still destroying... [id=i-0475c06df86ffeeff, 20s elapsed]
aws_instance.Ubuntu: Still destroying... [id=i-0475c06df86ffeeff, 30s elapsed]
aws_instance.Ubuntu: Still destroying... [id=i-0475c06df86ffeeff, 40s elapsed]
aws_instance.Ubuntu: Destruction complete after 42s

Destroy complete! Resources: 1 destroyed.
```

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Conclusion:

Understanding Terraform involves grasping its core concepts such as providers, resources, modules, state, and plans. The Terraform lifecycle guides the process from writing configurations to applying and destroying infrastructure. Installing Terraform on a Linux machine is straightforward and involves adding the HashiCorp repository and using the package manager to install the tool. Once installed, Terraform provides a robust way to manage infrastructure as code, ensuring consistency, repeatability, and scalability across your cloud environments.