Terraform

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What is Terraform?
Terraform is an open-source Infrastructure as Code (IaC) tool created by HashiCorp.
It allows you to define and provision infrastructure using a high-level configuration language.

Key Features of Terraform:

Declarative Language: Users write configurations in *HashiCorp Configuration Language (HCL)* or JSON.
Execution Plans: Terraform generates an execution plan showing what it will do before making changes.
Resource Graph: It builds a dependency graph and determines the most efficient sequence to create, update, or destroy resources.
Change Automation: Manages changes and dependencies across infrastructure.

Installing Terraform
Download and Install:

Go to the Terraform website.
Download the appropriate package for your operating system.
Unzip the package and place the binary in a directory included in your system's PATH.

Verify Installation:

Run terraform --version in your terminal to ensure Terraform is installed correctly.

Basic Concepts

1. *Providers*:

Providers are responsible for understanding API interactions and exposing resources.
Examples: AWS, Azure, Google Cloud, Kubernetes, etc.

2. *Resources*:

Resources are the most important element in the Terraform language.
Each resource block describes one or more infrastructure objects.

3. *Variables:*

Variables allow you to parameterize your Terraform configurations.
They can be defined in the .tf files or via environment variables.

4. *State:*

Terraform maintains a state file to map your configuration to real-world resources.
The state file is used to track the current state of the infrastructure.

Writing Your First Terraform Configuration

Create a Directory:

Create a new directory for your Terraform configuration files.

Define a Provider:

```
provider "aws" {
  region = "us-west-2"
}


resource "aws_instance" "example" {
  ami           = "ami-0c55b159cbfafe1f0"
  instance_type = "t2.micro"
}
```

Initialize Terraform:

1. Run terraform init to initialize the working directory and download necessary providers.
2. Create an Execution Plan:
3. Run terraform plan to create an execution plan.
4. This shows what actions Terraform will take to achieve the desired state.
5. Apply the Changes:
6. Run terraform apply to execute the plan and create the resources.

Inspect the State:

Run terraform show to display the current state of your infrastructure.

Terraform is an open-source infrastructure as code software tool created by HashiCorp. Users define and provide data center infrastructure using a declarative configuration language known as HashiCorp Configuration Language, or optionally JSON.

Resources:

- https://www.youtube.com/watch?v=HmxkYNv1ksg
- https://www.youtube.com/watch?v=YcJ9IeukJL8&t=2889s
- https://www.youtube.com/watch?v=iRaai1IBlB0
- https://www.youtube.com/watch?v=SLB_c_ayRMo
- https://www.youtube.com/c/AntonPutra

Links:

- https://www.terraform.io/
- https://learn.hashicorp.com/terraform?utm_source=terraform_io
- https://learn.hashicorp.com/collections/terraform/aws-get-started
- https://learn.hashicorp.com/collections/terraform/cloud-get-started

Courses:

- https://www.udemy.com/course/terraform-beginner-to-advanced/
- Check out the terraform learning website, it has all you need to know about terraform

Getting Started:

- Install terraform CLI
- Terraform Concepts
- Terraform Modules
- Terraform State
- Terraform with kubernetes

Certifications:

- https://www.hashicorp.com/certification/terraform-associate

To create a basic Kubernetes cluster and deploy a simple Docker container on AWS using Terraform

Installing Terraform:

```
Initializing the backend...

Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v5.43.0...
```

Main.tf File:

```
# Define the provider (AWS)
provider "aws" {
  region = "us-west-2"  # Specify your desired AWS region
}
# Create an EC2 instance for the Kubernetes cluster
resource "aws_instance" "kubernetes_cluster" {
  ami           = "ami-0c55b159cbfafe1f0"  # Specify a suitable AMI for
your EC2 instance
  instance_type = "t2.micro"               # Specify the instance type
(adjust as needed)
  key_name      = "your_key_pair"          # Specify your SSH key pair
}
# Create a security group for the EC2 instance (open ports for
Kubernetes and Docker)
resource "aws_security_group" "kubernetes_security_group" {
  name_prefix = "kubernetes-"

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

  ingress {
```

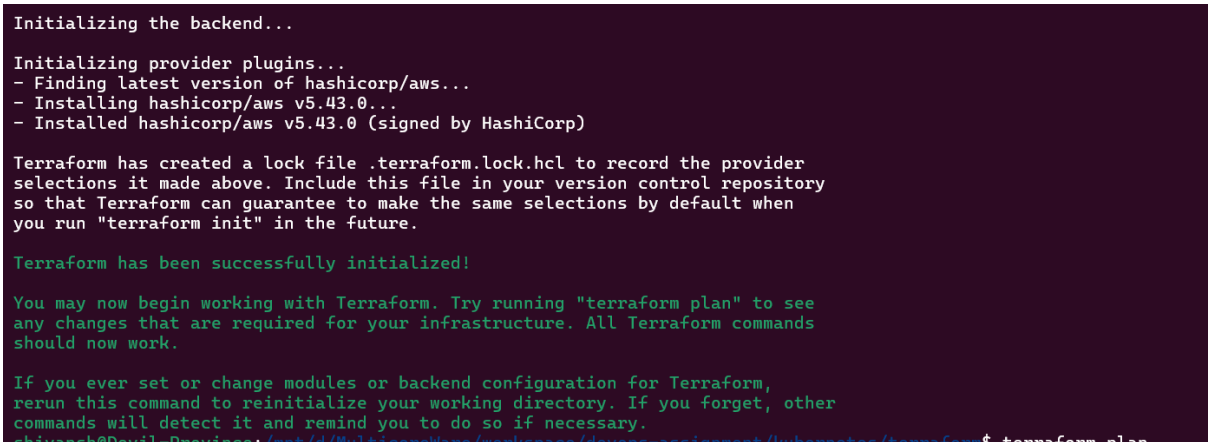
```
    from_port   = 6443  # Kubernetes API server
    to_port     = 6443
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

  ingress {
    from_port   = 80    # HTTP (Docker container)
    to_port     = 80
    protocol    = "tcp"
    cidr_blocks = ["0.0.0.0/0"]
  }

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

  tags = {
    Name = "kubernetes-security-group"
  }
}
```

Terraform Init:



Terraform Plan.
Terraform Apply.

- Create an Nginx deployment with 4 replicas using kubectl.

```
# main.tf

# Provider configuration for Kubernetes
provider "kubernetes" {
  config_context_cluster = "YOUR_CLUSTER_NAME"  # Replace with your
cluster name
}

# Define the Nginx deployment
resource "kubernetes_deployment" "nginx_deployment" {
  metadata {
    name = "nginx-deployment"
  }

  spec {
    replicas = 4

    selector {
      match_labels = {
        app = "nginx"
      }
    }

    template {
      metadata {
        labels = {
          app = "nginx"
        }
      }

      spec {
        container {
          image = "nginx:latest"
          name  = "nginx"
          ports {
            container_port = 80
          }
        }
      }
    }
  }
}
```

```
terraform apply

Initializing the backend...

Initializing provider plugins...
- Reusing previous version of hashicorp/kubernetes from the dependency lock file
- Using previously-installed hashicorp/kubernetes v2.27.0

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.
```