Module Checklist

Infrastructure as Code with Terraform

By Techworld with Nana

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Video Overview

Demo Projects	
Git Project	https://gitlab.com/nanuchi/terraform-learn

Introduction to Terraform

❏ Watched video

Install Terraform & Local Setup

❏ Watched video
❏ **Demo executed - Install Terraform:**
  ❏ Terraform installed
  ❏ "terraform" project created

Useful Links:

● Guide to install Terraform for different OS:
  https://learn.hashicorp.com/tutorials/terraform/install-cli
  https://www.terraform.io/downloads.html
● Visual Studio Code Installation: https://code.visualstudio.com/download

Providers

❏ Watched video
❏ **Demo executed:**
  ❏ Use AWS Provider

Useful Links:

● Browse Terraform Providers: https://registry.terraform.io/browse/providers
● Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Resources and Data Sources

- ❏ Watched video
- ❏ **Demo executed**
  - ❏ Created new VPC
  - ❏ Created Subnet in that new VPC
  - ❏ Created new Subnet in existing default VPC (with data)

Useful Links:

- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Change and destroy resources

- ❏ **Watched video**
- ❏ **Demo executed :**
  - ❏ added tags to existing resources
  - ❏ removed tag
  - ❏ destroyed a resource

Useful Links:

- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

More terraform commands

- ❏ **Watched video**
- ❏ **Demo executed :**
  - ❏ Executed preview command
  - ❏ Applied config file without preview
  - ❏ Destroyed complete infrastructure

Useful Links:

- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Terraform State

- ❏ Watched videos
- ❏ **Demo executed**

Useful Links:

- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Terraform Output

- ❏ Watched video
- ❏ **Demo executed - define output values**

Useful Links:

- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Variables

- ❏ Watched video
- ❏ **Demo executed:**
  - ❏ Passed variables in 3 different ways
  - ❏ Restricted value of variable by defining a type

Useful Links:

- Everything about Input Variables:
  https://www.terraform.io/docs/configuration/variables.html
- Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Environment variables

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Used environment variables to extract AWS credentials
    - ❏ Set variable using *TF_VAR_name* environment variable

Useful Links:

- ● Custom Environment variables:
  https://www.terraform.io/docs/commands/environment-variables.html
- ● Project: https://gitlab.com/nanuchi/terraform-learn/-/tree/master

Initialize Git Repository

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Created Remote Git Repository for Terraform Configuration Files
    - ❏ Connected remote Git Repository with local project
    - ❏ Added .gitignore files

Best Practices so far:

- ● **Security:** Don't include sensitive data in the Terraform configuration file! Because it will be checked in in your git repository.
- ● Use terraform apply with the configuration file to make infrastructure changes, instead of executing commands directly. Especially when you work in a team. Because otherwise, infrastructure's current state and the desired state represented in the configuration file do not correspond anymore!

Terraform & AWS

Demo Project 1: Automate AWS Infrastructure (Part 1, 2 + 3)

- ❏ Watched video
- ❏ **Demo executed:**
  - ❏ Created VPC & Subnet
  - ❏ Created custom Route Table
  - ❏ Added Subnet Association with Route Table
  - ❏ Configured Default/Main Route Table
  - ❏ Created Security Group
  - ❏ Configured Default Security Group
  - ❏ Created EC2 Instance (Fetch AMI, Create ssh key-pair and download .pem file and restrict permission)
  - ❏ SSH into EC2 instance
  - ❏ Configured ssh key pair in Terraform config file
  - ❏ Created EC2 Instance
    - Fetch AMI
    - Create ssh key-pair and download .pem file
    - restrict permission
  - ❏ SSH into EC2 instance
  - ❏ Automated ssh key-pair - configured ssh key pair in Terraform config file
  - ❏ Configured Terraform to install Docker and run nginx image
  - ❏ Extract shell commands to own shell script
  - ❏ Accessed nginx through Browser

Demo Project 1: Automate AWS Infrastructure (Part 1, 2 + 3)

Useful Links:

- Project Repo - Provision EC2 with new components:
  https://gitlab.com/nanuchi/terraform-learn/-/tree/feature/deploy-to-ec2
- Project Repo - Provision EC2 with default components:
  https://gitlab.com/nanuchi/terraform-learn/-/tree/feature/deploy-to-ec2-default-components
- EC2 Instance Resource:
  https://registry.terraform.io/providers/hashicorp/aws/latest/docs/resources/instance
- Data Sources Filtering:
  https://registry.terraform.io/providers/hashicorp/oci/latest/docs/guides/filters
- Generate a new ssh key: https://www.ssh.com/ssh/keygen/

Best Practices:

- With Terraform: Create own VPC and leave the defaults created by AWS as is
- **Security**: Store your .pem file ssh private key in .ssh folder. Restrict permission (only read for our User) on .pem file
- **Security**: Don't hardcode public_key in Terraform config file!
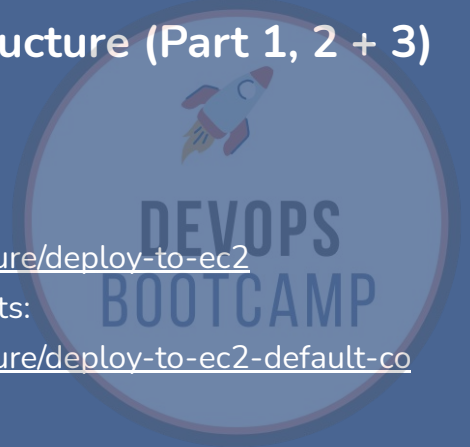
Provisioners

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Used "remote-exec" provisioner
    - ❏ Used "file" provisioner
    - ❏ Used "local-exec" provisioner

Useful Links:

- Project Repo:
  https://gitlab.com/nanuchi/terraform-learn/-/tree/feature/provisioners

Best Practices:

- Use configuration management tools instead of Terraform provisioners

Modules (Part 1, 2, 3)

- ❏ Watched videos
- ❏ **Demo executed:**
    - ❏ Extracted output values, variables and providers into its own file
    - ❏ Created subnet module and used it in root config file
    - ❏ Created webserver module and used it in root config file
    - ❏ Executed terraform apply successfully

Useful Links:

- Module Creation - Recommended Pattern:
  https://learn.hashicorp.com/tutorials/terraform/pattern-module-creation?in=terraform/modules
- Project Repo: https://gitlab.com/nanuchi/terraform-learn/-/tree/feature/modules

Best Practices:

- Terraform Project Structure: Own .tf file for providers, variables, data sources and output values
- Modules: encapsulate configuration into distinct logical components

Terraform & AWS EKS

Demo Project 2: Terraform & AWS EKS (Part 1, 2 & 3)

- ❏ Watched videos
- ❏ **Demo executed:**
    - ❏ Created the VPC by using the VPC module
    - ❏ Created the EKS cluster and worker nodes by using the EKS module
    - ❏ Configured Kubernetes provider to authenticate with K8s cluster
    - ❏ Applied configurations
    - ❏ Deployed nginx Application/Pod
    - ❏ Terraform destroy (IMPORTANT: delete all your components, if you don't want to get charged for a running cluster!)

Useful Links:

- Project Repo: https://gitlab.com/nanuchi/terraform-learn/-/tree/feature/eks
- VPC Module:
  https://registry.terraform.io/modules/terraform-aws-modules/vpc/aws/latest
- EKS Cluster Module:
  https://registry.terraform.io/modules/terraform-aws-modules/eks/aws/latest
- Kubernetes Provider:
  https://registry.terraform.io/providers/hashicorp/kubernetes/latest/docs

Terraform & Jenkins

Demo Project 3: CI/CD with Terraform (Part 1, 2 & 3)

- ❏ Watched videos
- ❏ **Demo executed:**
  - ❏ Created SSH key pair for EC2 Instance
  - ❏ Created Credential in Jenkins
  - ❏ Installed Terraform inside Jenkins Container
  - ❏ Created Terraform configuration files to provision an ec2 server
  - ❏ Created entry-script.sh file to install docker, docker-compose and start containers through docker-compose command
  - ❏ Adjusted Jenkinsfile to include provision and deployment stage
  - ❏ Included docker login to be able to pull Docker Images from private Docker repository
  - ❏ Executed CI/CD pipeline successfully

Useful Links:

- Project Repo:
  https://gitlab.com/nanuchi/java-maven-app/-/tree/feature/sshagent-terraform
- Install Terraform: https://learn.hashicorp.com/tutorials/terraform/install-cli
- Install docker-compose: https://docs.docker.com/compose/install/
- Terraform environment variables:
  https://www.terraform.io/docs/commands/environment-variables.html

Best Practice:

- Include TF configuration files in your project folder

Demo Project 3: CI/CD with Terraform (Part 1, 2 & 3)

Useful Commands

- Install Terraform in Jenkins:

```
# add HashiCorp key
curl -fsSL https://apt.releases.hashicorp.com/gpg | apt-key add -

# install apt-add-repo command
apt-get install software-properties-common

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

# update and install
apt-get update && apt-get install terraform

# verify
terraform -v
```

Terraform Remote State

- ❏ Watched video
- ❏ **Demo executed:**
    - ❏ Configured Remote Storage

Useful Links:

- Project Repo:
  https://gitlab.com/nanuchi/java-maven-app/-/tree/feature/sshagent-terraform
- Backends: https://www.terraform.io/docs/backends/
- Remote State: https://www.terraform.io/docs/state/remote.html
- AWS S3: https://aws.amazon.com/s3/

Best Practice:

- Use Remote Terraform State when working in a team
- Use S3 Bucket Versioning
- **Security**: Enable encryption for the S3 Bucket

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More Resources...

More Best Practices

- Use _ (underscore) instead of - (dash) in all resource names, data source names, variable names, outputs etc.
- Only use lowercase letters and numbers
- Use remote state, instead of on your laptop or in Git
- Use a consistent structure and naming convention
- Don't hardcode values as much as possible - pass as variables or use data sources to get a value

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