Terraform

Monday, May 27, 2024 10:01 AM

30% there and rest will be hands on.
Terraform with azure.
But if you understand azure.
GCP in aws.

1. VM: unmanaged service vm netwoking storage
2. Managed service. IAM aks eks RDS database.

Aws not on azure.
Region
Resource group

IAC

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Infrastructure as code.
Software Development Lifecycle.
Waterfall Model

1. Requirement
2. Designing
3. Development
4. Testing
5. Deployment
6. Maintained

   Any drawback of this SDLC model.
   Till your software is not available we do not know the end result. Once your software has been fully built
   But it take time to build it.
   Changes become difficult
   Whenever you want to make changes you need to shut down the app.

   Let's think about a business model. Depend on technology.
   Cable tv in there home.
   Move to OTT netflix
   Uber: inventory
   If the business depends on technology.

1. Keep on changing
2. Frequent changes

1. Adapt to the requirement
2. Fixing a software.
3. Everything now a days are created using open source technology
4. React js node js spring boot python go lang. they are geeting freuqnet updated
5. Frequently our application.

Agile practice
Where as per customer required we need to modify the application.
Out preferences are changing.
Grocery. Blinkit
Ai ml.
When changes are being freuqent.
I need to redeploy the application. I don’t want a downtime.
Standby
Dev test staging prod

You need a platform which can be provision and de provison easily.

1. I can provision and deprovison whenever we need it
2. Clean environment.

iAC-2

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IAC has two things
1.Configuration management: post activity once your vm get created we update the configuration I modify mysql. Ansible chef and puppet

2. Provision tools. Building the environment in the cloud. Aws azure gcp vmware. Terraform
3. Using terraform we can build our environment.
4. Using terraform we can do configuration also.

But this is not recommended. Terraform will never keep the record what it has done.
Small script connect the vm with chef ansible or puppet server.
Null

Provisioning tools and configuration management tool need to work together.

App is changing so I need to provision and de-provison my environment frequently.
Scaling
Predictive

Terratest. Using the same you will get vulnerability report on your IAC.
You need to write down your test script using go lang.
Synk-NSIT CVV on your code
Checkov python
22 0.0.0.0/0

Audit file

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1. The infra we created we need a log. Provisioning process.
2. When you want to de-provision this log file need to be read.

Tfstate in terraform

Anything I delete from cloud service provider we can recreated the same again using terraform apply.

What is this process is called as ? Drift in terrform. Manage this drift.

Lab Uses

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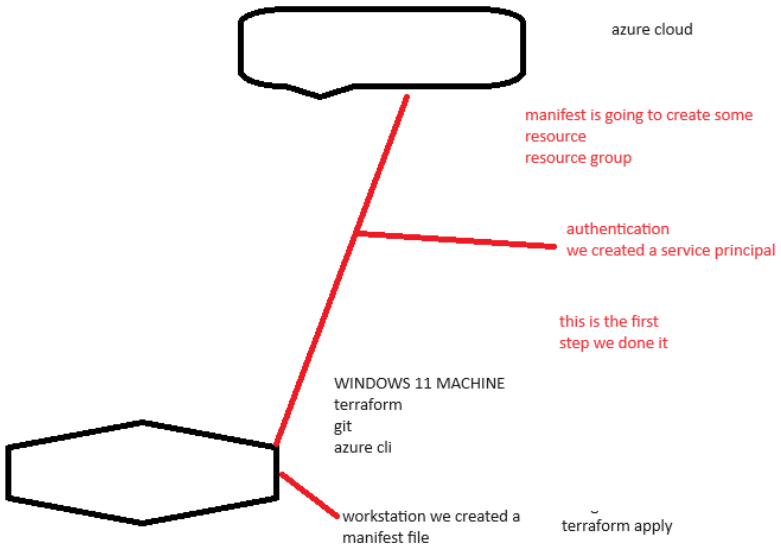
It will be your personal email id
Gmail or outlook till work fine

In windows also we can install a package manager called as chocollatey

All this activity need to be done on top of windows vm we have installed.



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Folder

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All the manifest file will be creaed inside the folder

inventory project

you need to create a folder
db: this folder contains all
the manifest file required to
execute your application

inside the folder we have file

the file need to have an extension.
yaml
py
java

similar to that terraform file extension will be only
.tf

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Older code
Main.tf
Varabiles.tf

Terraform langauge

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Evrything will be in json format

Yaml all the indentation happen using two spaces

All the resource configuration in terraform is done using curl braces.
Open and close braces

Ansible: really it is python. Then why we use yaml
Terraform is being build using which langauge. Golang

Terraform is an wrapper json
It is really converting into go Lang then executing

Why they have created this wrapper.

Wrapper: on top of a finished product.
Mens I cannot compile it and find bugs in it.
Python java golang
I need to use the same as it is.

When you want to provision anything using ansible.
I want to create a resource in aws azure gcp
Terraform should also give you the documentation

If already the documentation is there what is need of writing the script.
Those are genralized script. Everything is included
We always have custom requirement
Storage size should be 50 GB
Firewall: 80 443

Terraform workflow

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Why we did teraform init.
Means it will initialized something.
And you need to run this command inside the current directory where your manifest file exist

PS C:\Users\gopal\OneDrive\Desktop> terraform init
Terraform initialized in an empty directory!

The directory has no Terraform configuration files. You may begin working
with Terraform immediately by creating Terraform configuration files.

Terraform init will always run in the current directory where your manifest files are there

Terraform init will download the cloud service provider plugin.
Aws internally use Cloud formation template. Azure arm template.
I need to tell terraform that this is the cloud service provider download the plugin required to communicate with specific cloud

To do this activity we need to write down some code.

We are creting resource
Resource block

Recap

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We learn about Infra structure as code is divided into two part

1. Provisioning Tools : we are creating resource we use terraform. Ansible
2. Configuration Management Tools: on existing resource I am making changes ansible chef puppet

What is the need of an IAC tool

1. Reusability
2. Standardization template
3. Optimum utilziation resource
4. Economy

Application architecture are changing frequently.
Our requirement are also changing.
After the pendamic there is huge change in our lifestyle.

1. Food delivery platform
2. Grocery
   Dmart Jio amazon flikart
   Blinkit- time quickly

   When software changes we need to also update our infra frequently.
   All the cloud service provider they have their own tool to do automation. Then why terraform
   You need to learn one single language and make changes in any of the cloud.
   Multi cloud

1. Availability
2. Price also
3. Complaince

Smasung pay. Run on top of aws.
Uae the presnec of aws.
Azure.
CICD pipelines.
Development process has been autmated
Jenkins azure devops circle ci travis ci

authentication

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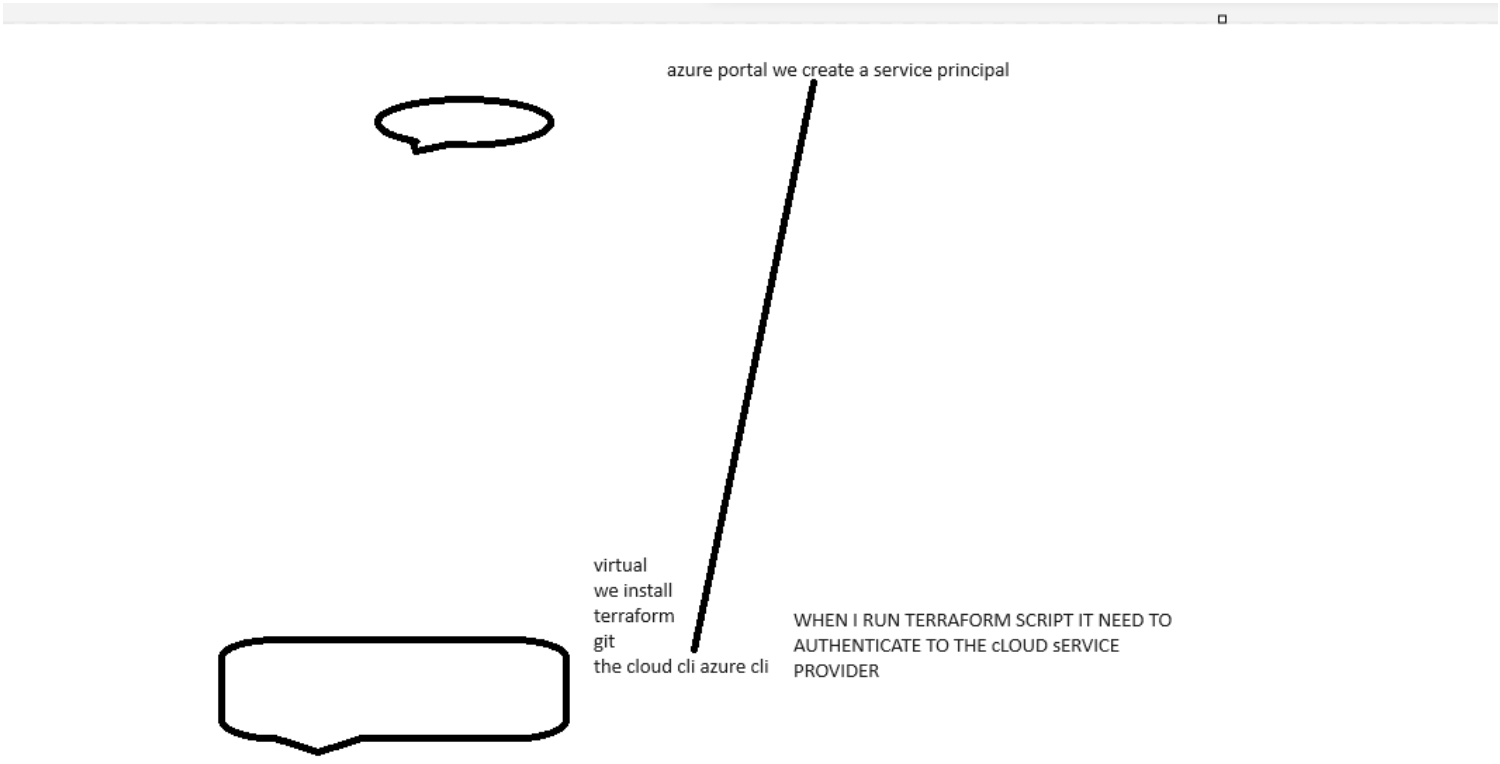

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Terraform manifest

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We created a folder.
Every folder will be like an project. Developer whenever they want to build an application first they will create a folder workspace.

Inside the folder we create some files.

What is the extension of those file.
All the terraform script should be written with a file extension of .tf

Inside one of the file we define provider setting.
Provide the defination of the cloud service provider

Resource block

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As the name suggest what this block will do.
It will used for creating resource.

You need to understand the workflow of the cloud service provider.
Cloud behave
First I need to create a rg

Terraform workflow

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Terraform validate: it just do syntax validation
Terraform plan will give you a dry run
Terraform apply.-it will also show you the planner -yes once you approve it will create the resource.
Once the resource are being created the resource information need to stored inside a file.

Terraform destroy will not read your manifest files with extension .tf
It will always read the tfstate file

If you want to destroy only specific resource
terraform destroy --resource azurerm_vm_instance

Our hdd is an read write storage

You need an storage where same file name versioing can be done.
S3 bucket and azure blob store. Object enable versioing
Red.txt - stored
Red.txt -timestamp

Remote storage in terraform

Vnet

Tuesday, May 28, 2024 10:49 AM

Why ?
This way azure works. There are some requirement which need to be fulfilled
When you create your own custom infra in cloud.
What is the first thing you need to do.
We create a network vpc. Why do not use the default networking.
For security purpose
Secure your network.
Default network we do not know everything is open.
We need to create a custom netwopkr

CIDR class less internet domain register.
Internal to your network.
Divide you network into smaller network

Vnet activity

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1. resourcegroup
2. Azure virtual network
3. We will create subnet and attach the subnet with vpc
4. We will create nsg and attach nsg with subnet

We will create the subnet and attach security group to the subnet in azure it is called as NSG

1. Azure_resource_group
2. Azure_virtual_network
3. Azurerm_subnet
4. Azurerm_network_security_group
5. Need to assicate
6. Azurerm network security rule

Input varaibles
Local values
For_each
Deppends_on

##what is the use variables

Varaibles activity

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We will hardcoded the name of the resource group
region

Local in terrafomr

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Suppose I want to assign a name to an expression
I want to make my code much more readables
Azure behave abnormally and resource creation take time

Depends on it is an meta argument in terrafomr you can use the same for resource depency

1. Subnet
2. Nsg
3. To make the relationship we need to attach the nsg with subnet
4. Nsg is blank
5. We need to create another resource called as nsg rule

Resource block multiple times

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Every resource can create a single real infrastructure

But you have scenario where you want fixed pool of resource to be created

Like I want to open multiple ports in nsg
I want to create multiple vm together.

To loop a resource block in terraform we had a

```
for (int i = 0; i < 5; i++) {
  System.out.println(i);
}
```

Not an programming language.
I need to provide intial value

Meta argument it is called as for_each

Vm creation

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To create the vm we will

1. First create an startup or bootstrap script. So I want to install some packages. We can provide the same in shell format
2. Next we want to access the vm outside the azure network. Public ip
3. We need to create a nic card

```
${path.module} it is an function in terraform
What this function do
Cd . #it will look for the file in current directory
```

Bastion host

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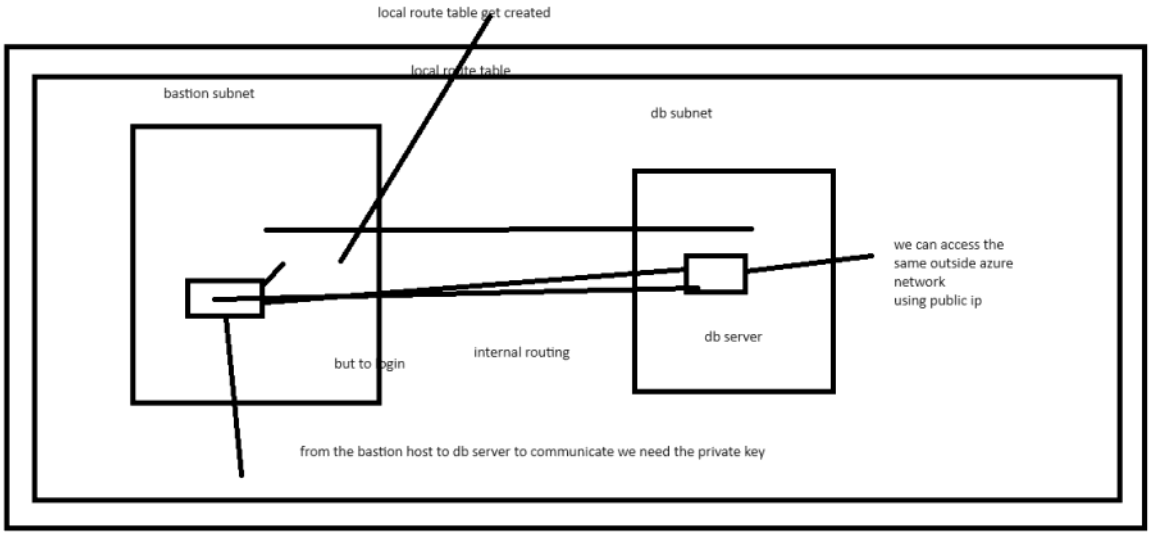
It is like an jump host.
Jump host
Bastion host
Putty
Azure they will open the terminal in browser
They will open the terminal in browser you can do rdp
Sts token

Jump host azure is giving this facility we also need a vm
I need to convert the vm into bastion service.



wehile provisioning i want to upload the ssh key inside the bastion host.

chef agent
Jenkins cluster

null

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Recap

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We learn about variables
Input variables.
Multi purpose
Reusability

Using terraform I want to create an vnet
All this required value need to put in key value format
In terraform it is called as argument

For_each
What is the use of for_each.

Every resource block will always create single resource.
There are secnarion similar kind of infrastructure I want to create. For_each
For loop

```
for
(int i = 0; i < 5; i++) {
  System.out.println(i);
}
```

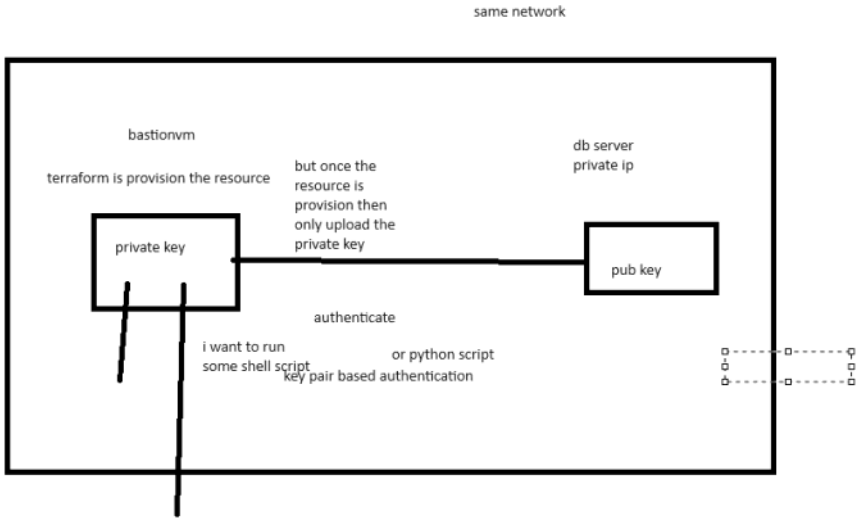
But to run this for loop we need to start from somewhere
Int I =0
Using greeted than symbol with the condtion
As terraform is not an programmatic language.
Now to do the iteration

Each.key and each.value

Bastion host

Wednesday, May 29, 2024 10:00 AM

Bastion host
Jumpy Box
In azure they provide the jump bastion host as a service
But this service need to be run inside a vm.
Linux
Or widnows



ssh key gen command generate two key
one is private and pub
while provisioin the infra

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While running the startup script the script is with azure
Complaince
PCI DSS or Fedramp or GDRP
No confidential information should be visible in the cloud service provider
KMS key
Hardware based

Whatever activity you will do with null provision. Inside state file there will be no information available
Do as much as less activity using null provisenar

Load balancer

Wednesday, May 29, 2024 11:46 AM

Frontend ip: the public ip you need to create
Backend pool will be you need the vm to be behind your lb
Inbound rule for lb

Before we go with the load balancer.
But I want to create multiple resource
So I need to use for_each

But for each required some value for iteration.
Local
Withought the condition for each will not execute

String
List string{array}
Map it is a data structure collection of key-value pairs
Similar to dictionary in other programming language.

Luxury car
Kia : sonet
Mercedez: cclass

Varaibles types
String : single string
default : value

List(string)array
default = val1 val2

Map(string)

Default =
Key:value
Key: value

Tfvars

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Currently all varaibles we have define in multiples file

Generic value we have define in generic input variables
Vnet we define the varaibles in different file
Map values also in a different file
Same kind of infra need to be deployed
For hrms application
Vnet name will different
Subnet name
Subnet value will be different
Instance name will be different
You are working with salesforce infrastructure.
CRM package
Industry travel industry
Easymytrip
Makemytrip
Go ibibo
##all this three orgnization business is same
CRM package
Sales force has created a CRM package for travel industry
They also give you an terraform template to create the infra on top of that they will deploy there application
Tommrow another new travel site open. They also approch salesforce.
You already have an standard template for deploying there application.

I can create a file inside that I ll provide all those values

In the varaibles file we have define the default value
If you want to overwrite the default value
Create a file with sales.auto.tfvars this will overwrite the default value
If you want pass the value as an input
Terraform apply --var-file=makemytip.tfvars
Terraform destroy --var-file=makemytip.tfvars

Remote state

Wednesday, May 29, 2024 4:00 PM

Problem with state file.
How many times we made changes today.
Terraform.tfstate it will just keep the recent change
The older change will go to terraform.tfstate.backup
Tommorow the audit people come and they want to see the change for past few days.
We need an storage where I can keep the changes for longer duration.
Cloud provide me with object storage.
S3 azure blob storage.
Same file name I can upload multiple times
Versioing enable
As we are using azure. Blob storage
This blob storage we can create using terraform.
We will do it manually

In s3 we create bucket
All this value inside my terraform code

Recap

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We started with bastion host.
What is the use of the bastion host.
Using browser. You need to start the bastion host service.

Resource group : pointer. No change.
If you modify the resource group name using terraform. It is going to delete the previous one create a new one
Then we use null provisioner
Will do activity outside terraform state file

We learn about a new varaibles called as map

Name: against that it will have expression expression can be of type
Concationat
Multiple key values

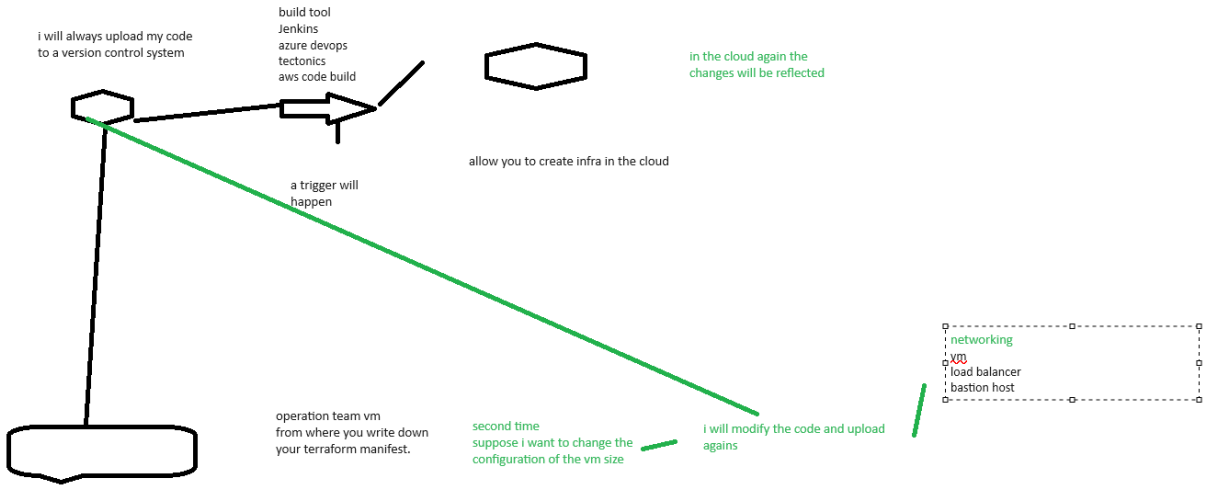
Then we created a load balancer.
Front ip
Backend ip
Health checkup
_____
Both the vm are backend pool
Both the vm do not have public ip

Finally we learn about tfvars file.
Varaibles in one single file
Key = value
--var-file=file.tfvars
Filename.auto.tfvars - overwrite the default value

Azure Devops

Thursday, May 30, 2024 10:03 AM

Why we are creating a pipeline.
What is pipeline.
Automating the deployment of code.
stages



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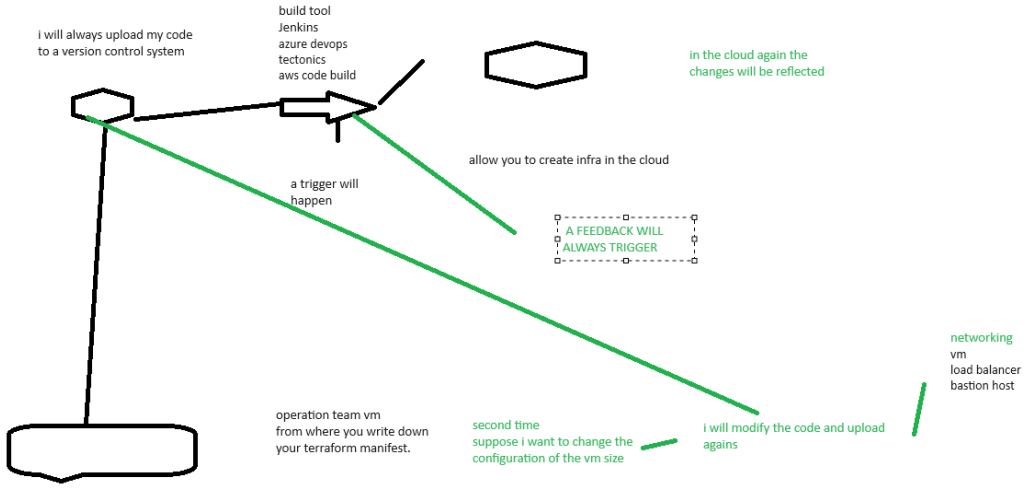

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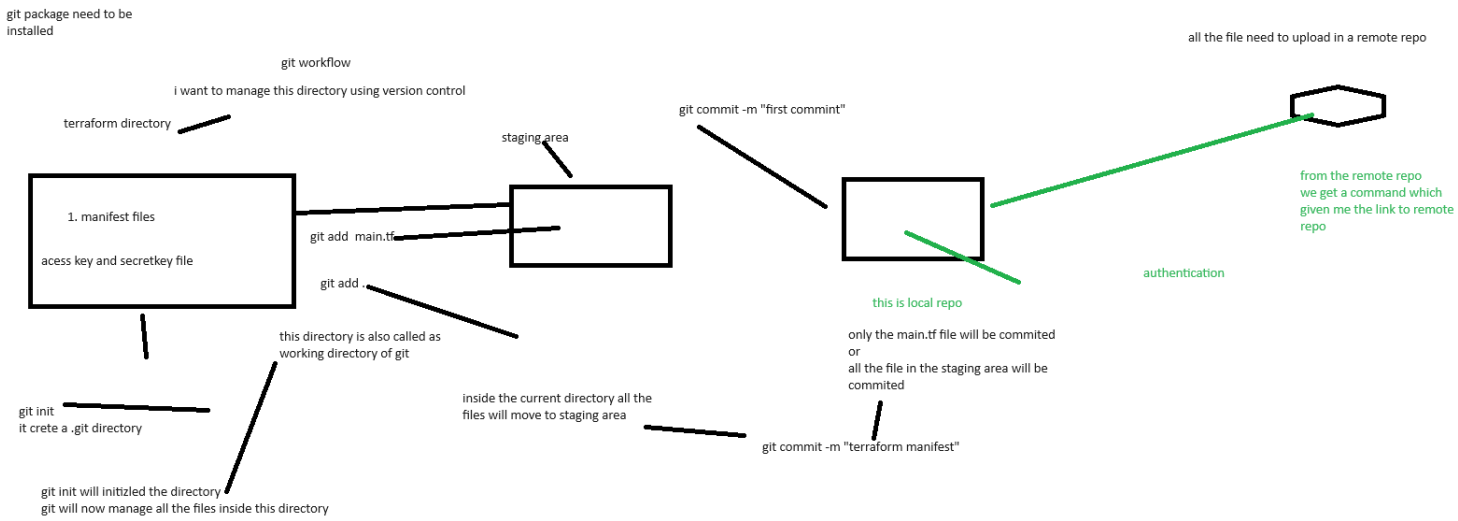
Integrate my code with azure repo

Thursday, May 30, 2024 10:22 AM



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First stage of pushing my code to the repo is completed.
next

Stage 2- execute the code

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I need to execute or build my code.
When I do building we required resource.
A vm which can give me cpu and ram
Azure devops: for every execution they are going to charge you. To get the execution environment from azure takes 24 hours.
How to avoid this charges.

As most of orgnaization they have plenty of vm lying ideal.
Inside the vm we can install an azure devops agent and can use the same as execution environment.
Self Hosted Agent.
We will launch an ubuntu machine in azure. Think this ubuntu machine as your agent where I can execute my code.
This ubuntu machine need to reachable to azure devops.
This ubuntu vm can be on prem or it can be on other cloud.
First lets see the error.
Then we will resolve it.

Install the agent
Then do the authentication

Stage 3

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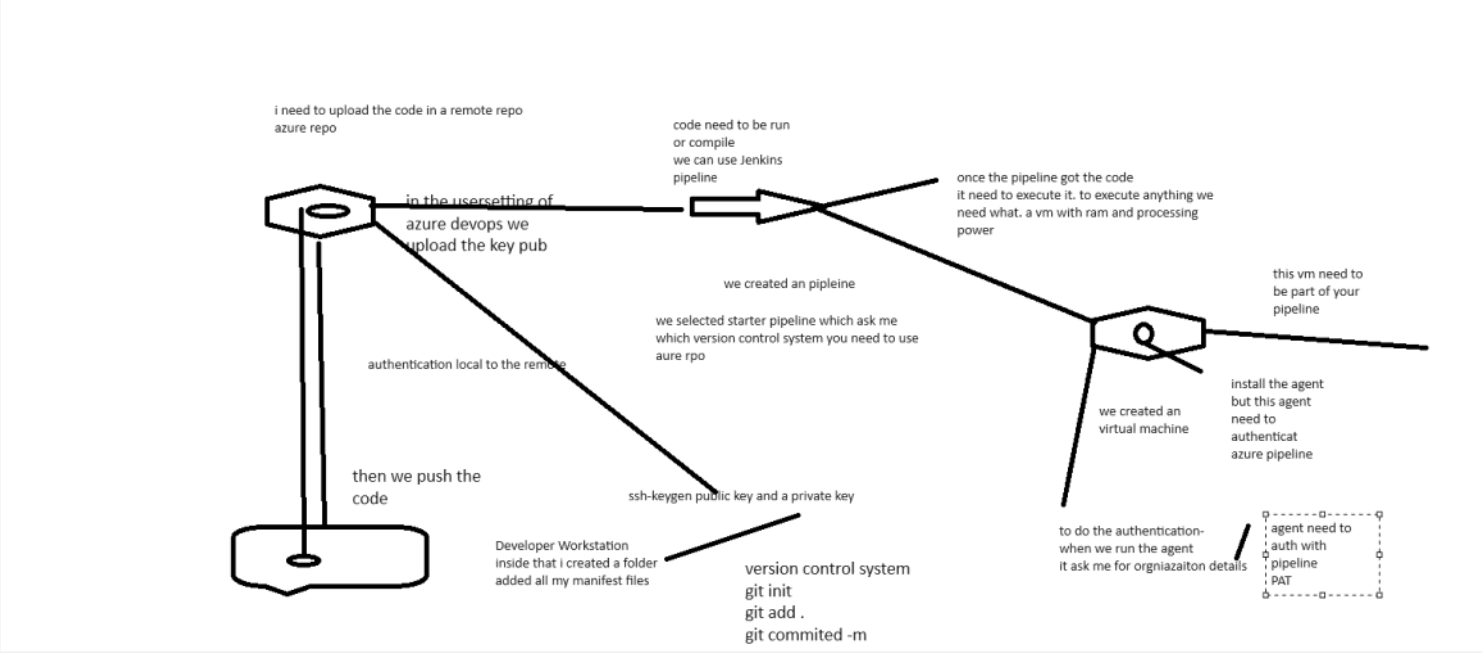
Before I execute
Azure devops to azure cloud I need to do authentication
In project setting we have connection

Recap:
I want my code to be executed automatically.
We are keep on changing in my code.
Every time building manually is not an right way to do it.
Changes should be applied autmatically
To do this activity we need a cicd tools.
Is to provide you an integration.
Joining all the stages
We use to have jenkins.
To manage the code we use git
##########
In place of that azure devops has come up with something called as a asingle tools where you can do all the activity.

1. Once I created my code I need to store it inside azure repo-down the line azure repo is running a version control system which is git. Microsft



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Recap azure devops

Friday, May 31, 2024 9:45 AM

We try to build an continues delivery pipeline.
Continues Integration Pipeline.
CI used by developer build test archival deployment.

Why we are building this pipeline. ?
Automate the process of deployment.
Feedback

Now to build this cd pipeline.

1. We creted the manifest file. Using git we manage the manifest file.
2. We push the code to our azure repo. Remote repo where our code is being stored. Later on merging it.
3. We are also having the code we will also manage it using a remote repo.
4. To upload the code. Authentication. Key pair there are two keys we need to generate one is private another public. In remote
5. Once we upload the code. It need to executed-so we need an execution tool. Jenkins. Smaller teams where they want an single tool where they will get everything.
6. Azure devops --which gives you pipeline. Where I can execute the code. Azure boards.
7. We created a sample pipeline. But first time the pipeline do not execute. Pipeline required an execution environment. It need a vm or container.
8. We have created a vm with ubuntu os.

1. Project setting
2. Agent
3. Download the agent inside the ubuntu machine.
4. Then authetication using PAT
5. This agent is for organization or just for project
6. Dev.azue.com/projectname

Organization already have plenty of virtual machine.
To create the pipeline :
We install a plugin. Terraform
Ansible pipeline.
From azure devops to azure cloud : how do we make the connection.
Inside project setting we created a connected service principal.

##then as usal to build the pipeline we follow a process
Terraform workflow.

1. Terraform init
2. Terraform validate
3. Terraform plan

###after completing this three stages

4. We put an approval stage.
5. Alert will go to the approval.

Modules

Friday, May 31, 2024 11:43 AM

Modules in terraform.
Currently the folder where all your manifest file is stored they are also called as modules.
Root modules

Suppose I don’t want to visualized the whole code.
Or I want to make use of my code as much as possible.

1. Every vnet. Common task
2. Subnet is a common task
3. Creating user in the azure entra id azure.

Inside module
All the resource defination will be created the name of the file will be main.tf
Varaibles will go inside variables.tf
Output go inside output.tf
Provider will go inside provider.tf

Modules

Friday, May 31, 2024 2:20 PM

Tfvars files
Bajafinance.
There application run on azure only
They have created a rule in azure
Every resource will have a specific tag value.
If you don’t put that specif tag value
It is not going to create the resource.
I can create module
Inside the resource block I ll define those tags

Fully managed service

Friday, May 31, 2024 4:40 PM

Aks
Cloud sql
You need to work less to create it.