`

TF AWS Module use document

Terraform **AWS Modules** Directory Path> {**SCM**}::/terraform/AWS/AWS_modules/modules/*

AWS Modules (TF):

- Terraform Module supported TF version: terraform **(0.13)** && providers aws = " version = "~> **3.40**"
- Generally, Root module has main file for the service, variable file and dependent files or nested module and output file
- Most of common and frequently used services are covered in this Module directory path.
- Many modules are category wise folder structured into the respected directory.

```
$ ls

0.0.provider_version/  0.0.provider-aws-accesskey/  0.1.2.0.tf-remote-state/       0.1.2.random/
0.1.4.compute/         0.1.6.network/               0.1.8.storage/
0.0.provider-aws/      0.1.1.aws_network/           0.1.2.1.naming-prefix-module/  0.1.3.security/
0.1.5.devops/          0.1.7.monitoring/            0.1.9.tags/
```

- Below list of AWS services along with tf templates (**Eg**: *provider_version, provider-aws* ***etc...***)

```
$ ls -dR */*

0.0.provider_version/                      0.1.4.compute/eks/               0.1.7.monitoring/aws-budget-alarms-slack/
0.0.provider-aws/                          0.1.4.compute/workspace/         0.1.7.monitoring/cloudwatch_alarm/
0.0.provider-aws-accesskey/(Detailed template)  0.1.5.devops/codebuild/     0.1.7.monitoring/metric-alarms-by-multiple-
dimensions/
0.1.2.0.tf-remote-state/{S3/DynamoDb}
0.1.2.random/                              0.1.5.devops/codecommit/         0.1.7.monitoring/ses/
0.1.1.aws_network/{VPC/FlowLog}            0.1.5.devops/codedeploy/         0.1.7.monitoring/sns-topic/
0.1.3.security/ec2-iam-role/               0.1.5.devops/codepipeline/       0.1.7.monitoring/sqs/
0.1.3.security/iam-enhanced/               0.1.5.devops/lambda/             0.1.8.storage/dynamo-db-table/
0.1.3.security/iam-instance-admin-role/    0.1.6.network/acm/               0.1.8.storage/ebs/
0.1.3.security/secrets-manager/            0.1.6.network/cloudfront/        0.1.8.storage/efs/
0.1.3.security/sg-count/                   0.1.6.network/directory-service/ 0.1.8.storage/fsx/
0.1.3.security/sg-count-adv/               0.1.6.network/eip/               0.1.8.storage/rds/
0.1.3.security/sg-dynamic-ingress/         0.1.6.network/elb/               0.1.8.storage/rds-aurora-serverless-db/
0.1.3.security/sgrule/                     0.1.6.network/route-53-hz-internal/  0.1.8.storage/s3/
0.1.3.security/ssm-patching/*              0.1.6.network/route-53-hz-public/    0.1.9.tags/
0.1.4.compute/asg/                         0.1.6.network/transit-gateway/
0.1.4.compute/ec2-count-auto-recovery/     0.1.6.network/vpn-gateway/{Site / client}*
```

- Setup a **project_folder** to create Terraform configuration or call Terraform modules.
- Some Terraform template structure like: 0.0.provider_version, 0.0.provider-aws, 0.0.provider-aws-accesskey (Detailed template) in place in module section.

  1. Note:
     - Use those **provider** template / configuration as per need directly inside your project (calling as module not recommended)
     - Use those **version** template / configuration as per need directly or you call as module (if you are using only resources which present in this **"{SCM}**…/.. /modules/***"** or any other TF configuration which supports similar **required_version**)

- Here Most of the modules are tested and applied at "project_demo". That can be referred as Module EXAMPLES.

`

1. Path for “project_demo”:” {**SCM**}../../modules/projects/project_demo “
2. Note: Most of the components has count = 0 or /* */ or Disabled. Enable it while using those modules.
3. Some of modules has some example directory with different use cases which is placed in AWS module directory. That also can take as reference while calling modules from the project.

$ ls

```
0.0.0.provider-aws.tf                 3.1.0.0.directory-service.tf
0.0.1.0.aws_network.tf                3.1.0.1.workspace.tf
0.0.1.2.aws_vpc_network_variable.tf   4.0.0.0.devops.tf
0.0.1.3.aws_vpc_flow_log_var.tf       4.0.0.1.devops.auto.tfvars
0.0.1.4.common_tag_variable.tf        4.0.0.1.lambda.tf
0.0.2.1.random_generator.tf           4.0.0.2.rds.tf
0.1.0.0.iam.tf                        4.0.0.3.rds-aurora-serverless.tf
0.1.0.0.security-group.tf             5.0.0.0.ecs.tf
1.0.0.0.ec2-vm.tf                     5.0.0.1.eks-asg.tf
1.0.0.1.s3.tf                         5.0.0.2.eks-ng.tf
1.0.0.2.elb.tf                        5.0.0.3.eks-basic.tf
1.0.0.3.asg.tf                        cli.terraformrc
1.0.1.0.route53i.tf                   cred-var.tf
1.1.0.0.sns.tf                        dev.auto.tfvars
1.1.0.1.sqs.tf                        info-common-value-for-all-module.txt
1.1.0.2.ses.tf                        lambda/
1.1.1.0.cw.tf                         terraform.auto.tfvars
1.1.1.1.budget-alerm.tf               z_backend-remote-tfcloud-state.tf
2.0.0.1.vpngateway.tf                 z_backend-remote-tfcloud-state.hcl
2.0.0.2.client-gateway.tf             tf-file.terraformignore
2.0.0.3.transit-gateway.tf            version.tf
2.0.0.4.wafv2.tf                      z.backend-remote-s3-state.tf
3.0.0.0.cdn-acm.tf
```

- How to call a module?

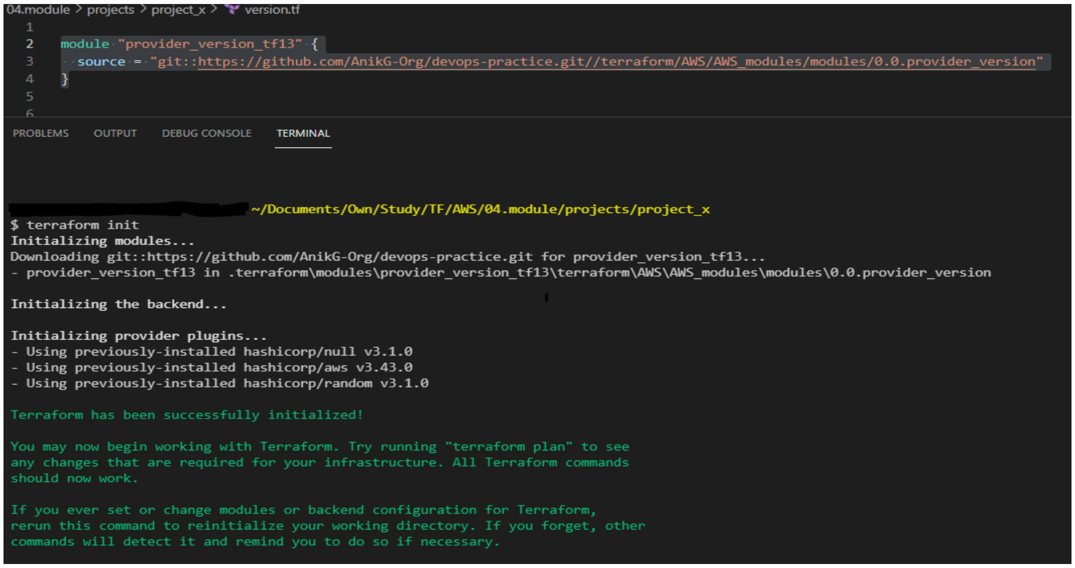
Here many ways to call a module form source(3 way example given):

Eg: Project directory (Module) here called: **project_x.** Note: If you are calling Private SCM, make sure machine has preconfigured connectivity with the target SCM.

1. Directly call module from Git:

source = "git::https://github.com/AnikG-Org/devops-practice.git**//**terraform/AWS/AWS_modules/modules/0.0.provider_version"

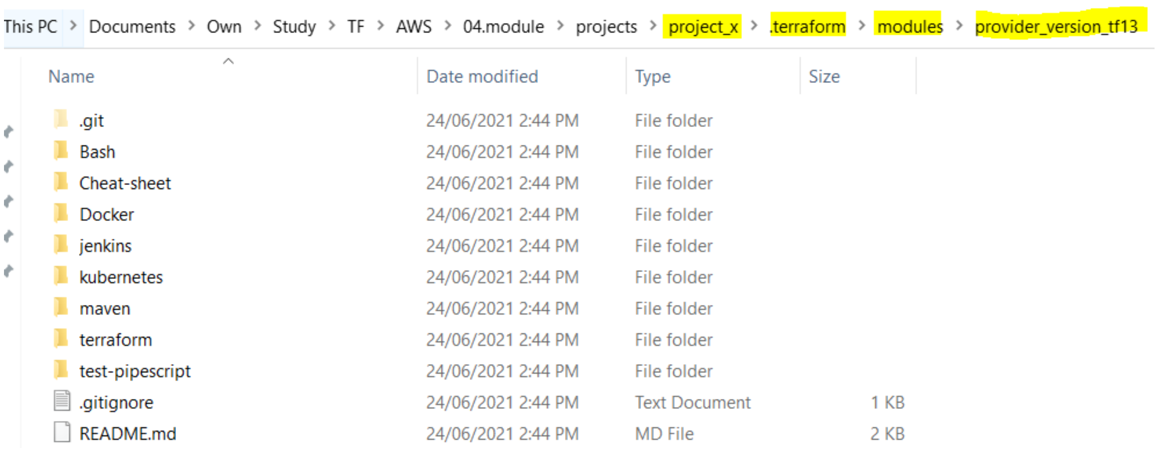
Note: use // after git repo path



```
module "provider_version_tf13" {
  source = "git::https://github.com/AnikG-Org/devops-practice.git//terraform/AWS/AWS_modules/modules/0.0.provider_version"
}
```

```
[redacted] ~/Documents/Own/Study/TF/AWS/04.module/projects/project_x
$ terraform init
Initializing modules...
Downloading git::https://github.com/AnikG-Org/devops-practice.git for provider_version_tf13...
- provider_version_tf13 in .terraform\modules\provider_version_tf13\terraform\AWS\AWS_modules\modules\0.0.provider_version

Initializing the backend...

Initializing provider plugins...
- Using previously-installed hashicorp/null v3.1.0
- Using previously-installed hashicorp/aws v3.43.0
- Using previously-installed hashicorp/random v3.1.0

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.
```

`



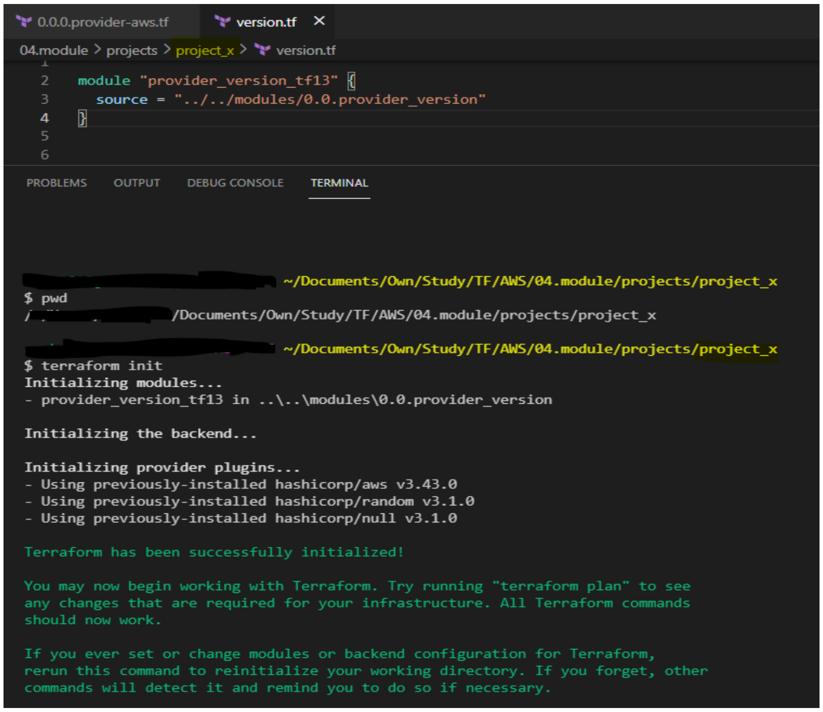
This PC > Documents > Own > Study > TF > AWS > 04.module > projects > project_x > .terraform > modules > provider_version_tf13

Name	Date modified	Type	Size
.git	24/06/2021 2:44 PM	File folder	
Bash	24/06/2021 2:44 PM	File folder	
Cheat-sheet	24/06/2021 2:44 PM	File folder	
Docker	24/06/2021 2:44 PM	File folder	
jenkins	24/06/2021 2:44 PM	File folder	
kubernetes	24/06/2021 2:44 PM	File folder	
maven	24/06/2021 2:44 PM	File folder	
terraform	24/06/2021 2:44 PM	File folder	
test-pipescript	24/06/2021 2:44 PM	File folder	
.gitignore	24/06/2021 2:44 PM	Text Document	1 KB
README.md	24/06/2021 2:44 PM	MD File	2 KB

2. Clone modules locally and call those from local:

When you have local source: Eg:

source = "../../modules/0.0.provider_version"



```
module "provider_version_tf13" {
  source = "../../modules/0.0.provider_version"
}
```

```
[redacted] ~/Documents/Own/Study/TF/AWS/04.module/projects/project_x
$ pwd
/[redacted]/Documents/Own/Study/TF/AWS/04.module/projects/project_x

[redacted] ~/Documents/Own/Study/TF/AWS/04.module/projects/project_x
$ terraform init
Initializing modules...
- provider_version_tf13 in ..\..\modules\0.0.provider_version

Initializing the backend...

Initializing provider plugins...
- Using previously-installed hashicorp/aws v3.43.0
- Using previously-installed hashicorp/random v3.1.0
- Using previously-installed hashicorp/null v3.1.0

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```
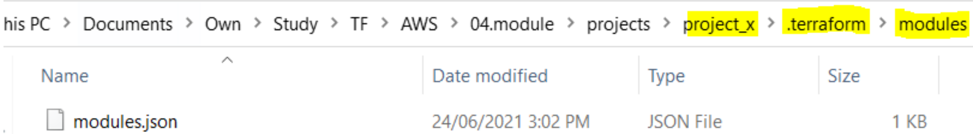



his PC > Documents > Own > Study > TF > AWS > 04.module > projects > project_x > .terraform > modules

Name	Date modified	Type	Size
modules.json	24/06/2021 3:02 PM	JSON File	1 KB

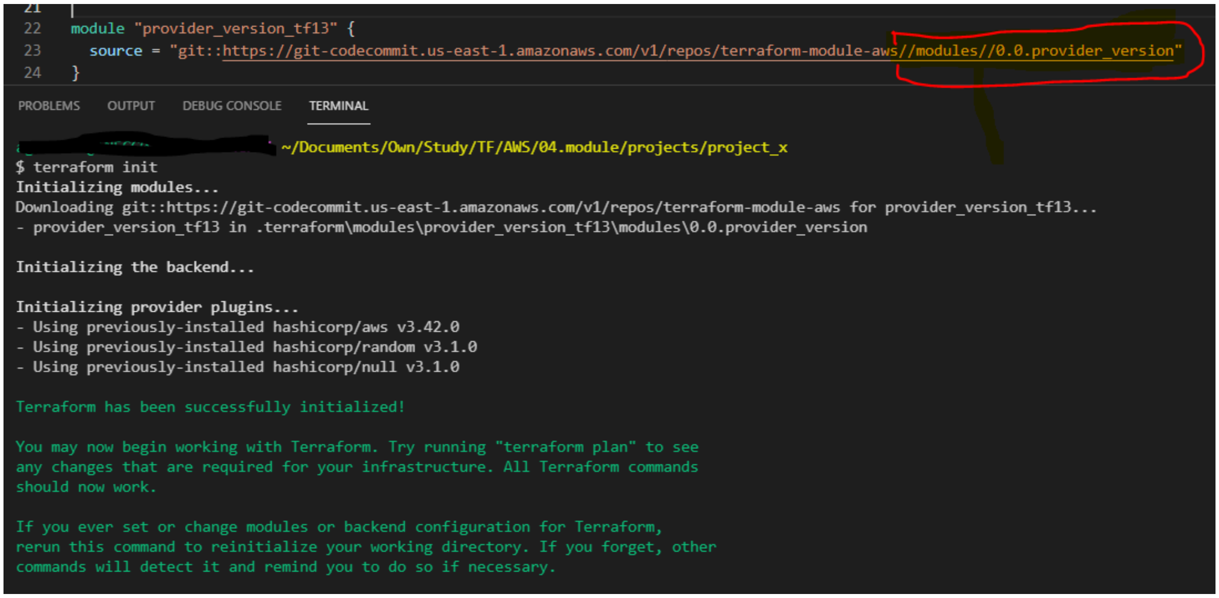
modules.json (mapped this module with local directory path(TF will take care this config)**) >>>**

{"Modules":[{"Key":"","Source":"","Dir":"."},{"Key":"provider_version_tf13","Source":"../../modules/0.0.provider_version","Dir":"../../modules/0.0.provider_version"}]}

3. Directly call module from AWS Codecommit:
   source = **"**git::https://git-codecommit.us-east-1.amazonaws.com/v1/repos/terraform-module-aws//modules//0.0.provider_version**"**

   Note: use **//** after repo link to reach module main file directory.

`



```
module "provider_version_tf13" {
  source = "git::https://git-codecommit.us-east-1.amazonaws.com/v1/repos/terraform-module-aws//modules//0.0.provider_version"
}
```

```
[redacted] ~/Documents/Own/Study/TF/AWS/04.module/projects/project_x
$ terraform init
Initializing modules...
Downloading git::https://git-codecommit.us-east-1.amazonaws.com/v1/repos/terraform-module-aws for provider_version_tf13...
- provider_version_tf13 in .terraform\modules\provider_version_tf13\modules\0.0.provider_version

Initializing the backend...

Initializing provider plugins...
- Using previously-installed hashicorp/aws v3.42.0
- Using previously-installed hashicorp/random v3.1.0
- Using previously-installed hashicorp/null v3.1.0

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commands will detect it and remind you to do so if necessary.
```
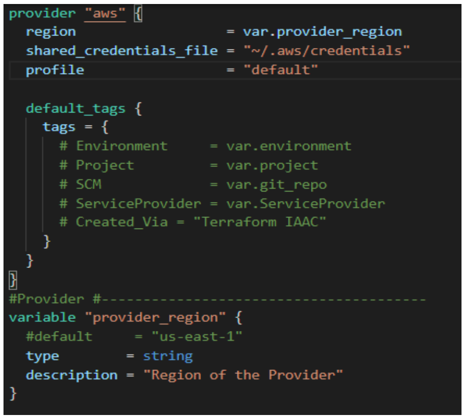

- ✓ Other sources: Terraform Link for better understanding: https://www.terraform.io/docs/language/modules/sources.html
- ✓ Use command: **terraform init** to initialize a working directory containing Terraform configuration files (necessary module/plugins).

Starting a new project?

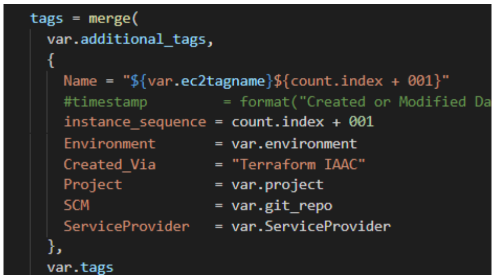
1. Create a Project directory
2. Create an AWS Provider configuration based on needs. (Can take reference of provider module).
3. Create a version configuration by calling the existing module or independent based on use cases.
4. Almost all of services I made mandate String tags. >>>>
   Environment = var.**environment**
   Project = var.**project**
   SCM = var.**git_repo**
   ServiceProvider = var.**ServiceProvider**
   Created_Via = "Terraform IAAC"

   All of those default values is “ ”, means empty.
   You can use those variable tags at child module level to define those tag key values hardcoded.
   Or you can variable there as well (create a comm-tag-var.tf to keep those variable files)
   And add actual value at terraform.tfvars/terraform.auto.tfvars file. For central input management for all variables.

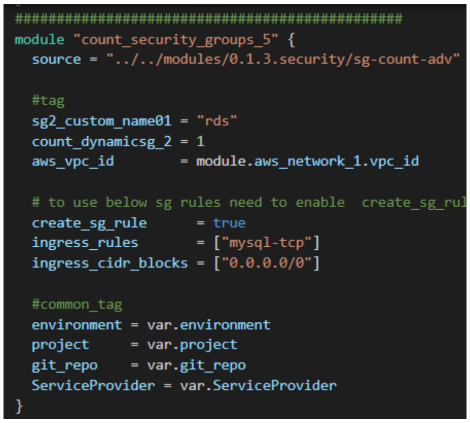
5. Not recommended to store user credential files at configuration/SCM.
6. Some of the modules are mixture of multiple Services, understand the code and make use of them on needs.



```
provider "aws" {
  region                  = var.provider_region
  shared_credentials_file = "~/.aws/credentials"
  profile                 = "default"

  default_tags {
    tags = {
      # Environment     = var.environment
      # Project         = var.project
      # SCM             = var.git_repo
      # ServiceProvider = var.ServiceProvider
      # Created_Via = "Terraform IAAC"
    }
  }
}
#Provider #-------------------------------------
variable "provider_region" {
  #default     = "us-east-1"
  type        = string
  description = "Region of the Provider"
}
```

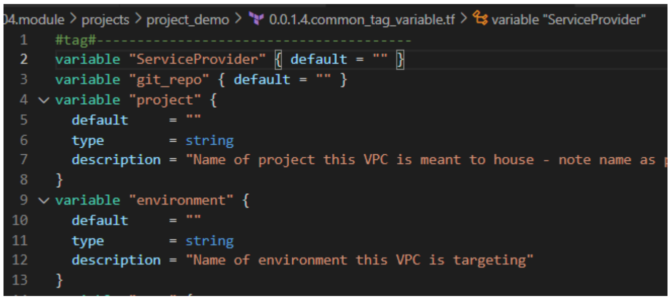


```
  tags = merge(
    var.additional_tags,
    {
      Name = "${var.ec2tagname}${count.index + 001}"
      #timestamp         = format("Created or Modified Da
      instance_sequence = count.index + 001
      Environment       = var.environment
      Created_Via       = "Terraform IAAC"
      Project           = var.project
      SCM               = var.git_repo
      ServiceProvider   = var.ServiceProvider
    },
    var.tags
```

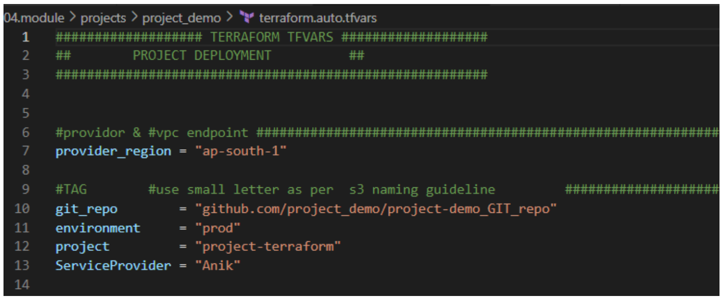


```
################################################
module "count_security_groups_5" {
  source = "../../modules/0.1.3.security/sg-count-adv"

  #tag
  sg2_custom_name01 = "rds"
  count_dynamicsg_2 = 1
  aws_vpc_id        = module.aws_network_1.vpc_id

  # to use below sg rules need to enable  create_sg_rul
  create_sg_rule      = true
  ingress_rules       = ["mysql-tcp"]
  ingress_cidr_blocks = ["0.0.0.0/0"]

  #common_tag
  environment = var.environment
  project     = var.project
  git_repo    = var.git_repo
  ServiceProvider = var.ServiceProvider
}
```

`


04.module > projects > project_demo > 0.0.1.4.common_tag_variable.tf > variable "ServiceProvider"

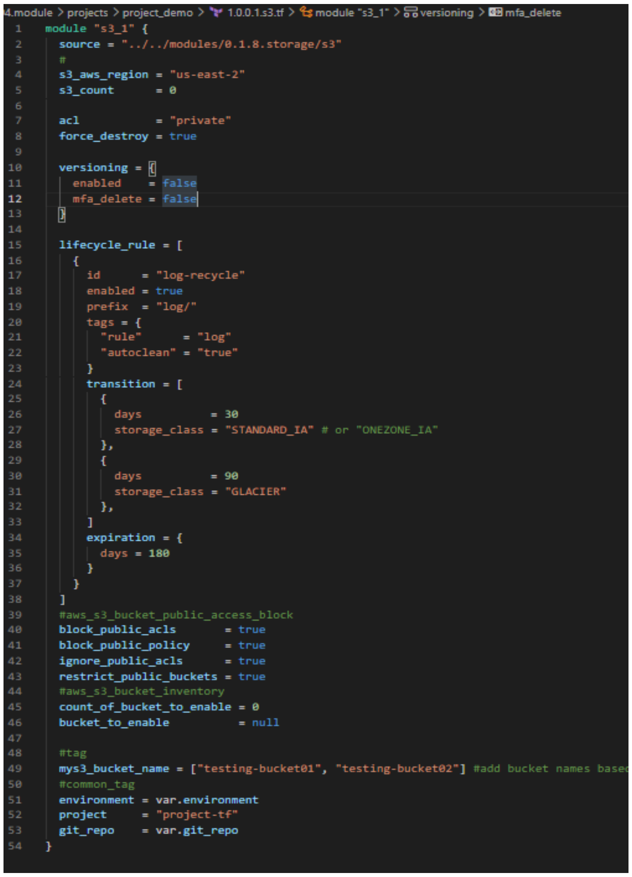
```
#tag#------------------------------------
variable "ServiceProvider" { default = "" }
variable "git_repo" { default = "" }
variable "project" {
  default     = ""
  type        = string
  description = "Name of project this VPC is meant to house - note name as p
}
variable "environment" {
  default     = ""
  type        = string
  description = "Name of environment this VPC is targeting"
}
```



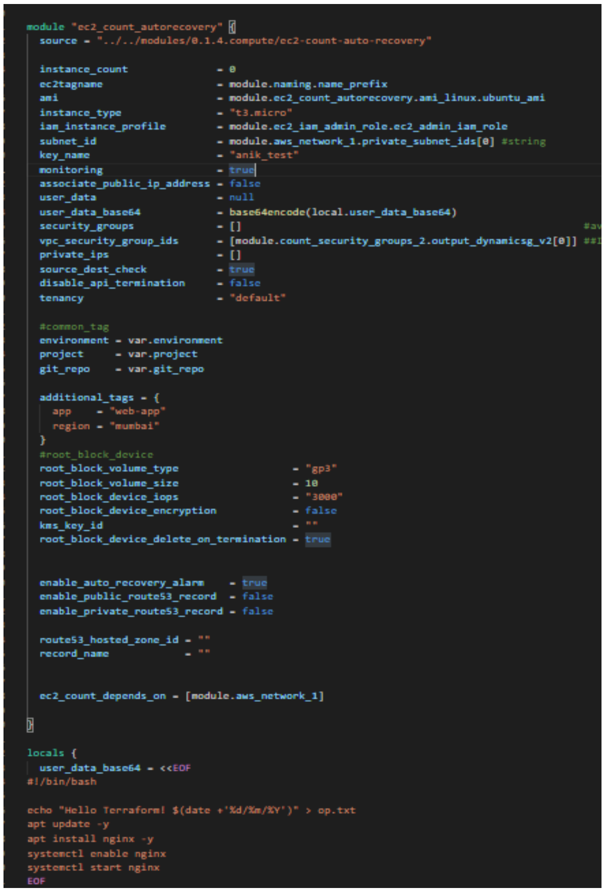
```
################### TERRAFORM TFVARS ###################
##        PROJECT DEPLOYMENT          ##
########################################################


#providor & #vpc endpoint ####################################################
provider_region = "ap-south-1"

#TAG        #use small letter as per  s3 naming guideline        ####################
git_repo        = "github.com/project_demo/project-demo_GIT_repo"
environment     = "prod"
project         = "project-terraform"
ServiceProvider = "Anik"

```

How to use modules / write terraform code by calling existing modules?

Eg: Some screenshot added here: S3>>>   ec2_count_autorecovery>>>


4.module > projects > project_demo > 1.0.0.1.s3.tf > module "s3_1" > versioning > mfa_delete

```
module "s3_1" {
  source = "../../modules/0.1.8.storage/s3"
  #
  s3_aws_region = "us-east-2"
  s3_count      = 0

  acl           = "private"
  force_destroy = true

  versioning = {
    enabled    = false
    mfa_delete = false
  }

  lifecycle_rule = [
    {
      id      = "log-recycle"
      enabled = true
      prefix  = "log/"
      tags = {
        "rule"      = "log"
        "autoclean" = "true"
      }
      transition = [
        {
          days          = 30
          storage_class = "STANDARD_IA" # or "ONEZONE_IA"
        },
        {
          days          = 90
          storage_class = "GLACIER"
        },
      ]
      expiration = {
        days = 180
      }
    }
  ]
  #aws_s3_bucket_public_access_block
  block_public_acls       = true
  block_public_policy     = true
  ignore_public_acls      = true
  restrict_public_buckets = true
  #aws_s3_bucket_inventory
  count_of_bucket_to_enable = 0
  bucket_to_enable          = null

  #tag
  mys3_bucket_name = ["testing-bucket01", "testing-bucket02"] #add bucket names based
  #common_tag
  environment = var.environment
  project     = "project-tf"
  git_repo    = var.git_repo
}
```



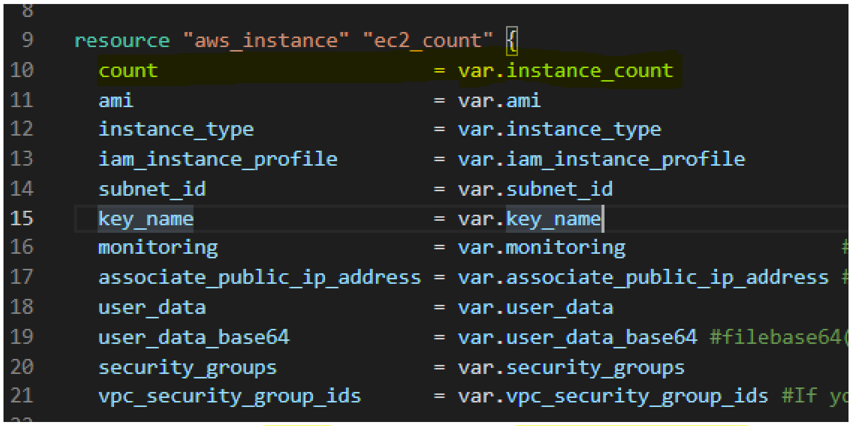
```
module "ec2_count_autorecovery" {
  source = "../../modules/0.1.4.compute/ec2-count-auto-recovery"

  instance_count              = 0
  ec2tagname                  = module.naming.name_prefix
  ami                         = module.ec2_count_autorecovery.ami_linux.ubuntu_ami
  instance_type               = "t3.micro"
  iam_instance_profile        = module.ec2_iam_admin_role.ec2_admin_iam_role
  subnet_id                   = module.aws_network_1.private_subnet_ids[0] #string
  key_name                    = "anik_test"
  monitoring                  = true
  associate_public_ip_address = false
  user_data                   = null
  user_data_base64            = base64encode(local.user_data_base64)
  security_groups             = []                                                  #av
  vpc_security_group_ids      = [module.count_security_groups_2.output_dynamicsg_v2[0]] ##I
  private_ips                 = []
  source_dest_check           = true
  disable_api_termination     = false
  tenancy                     = "default"

  #common_tag
  environment = var.environment
  project     = var.project
  git_repo    = var.git_repo

  additional_tags = {
    app    = "web-app"
    region = "mumbai"
  }
  #root_block_device
  root_block_volume_type                 = "gp3"
  root_block_volume_size                 = 10
  root_block_device_iops                 = "3000"
  root_block_device_encryption           = false
  kms_key_id                             = ""
  root_block_device_delete_on_termination = true


  enable_auto_recovery_alarm    = true
  enable_public_route53_record  = false
  enable_private_route53_record = false

  route53_hosted_zone_id = ""
  record_name            = ""


  ec2_count_depends_on = [module.aws_network_1]

}

locals {
  user_data_base64 = <<EOF
#!/bin/bash

echo "Hello Terraform! $(date +'%d/%m/%Y')" > op.txt
apt update -y
apt install nginx -y
systemctl enable nginx
systemctl start nginx
EOF
```

- So here basically how to call module and create your code already defined above screenshot.
  Point:
  - Name Your local module as per requirement. Call module from exact source
  - Use code variables exactly defined at root level. Example of ec2_count_autorecovery>>

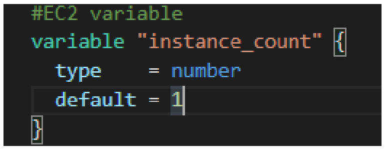
"instance_count" we got this name/variable from master module. Understand what is the use case & identify the need to refer master module.

Once we reached the source code main file path [= "../../modules/0.1.4.compute/ec2-count-auto-recovery"], You can see below.

`



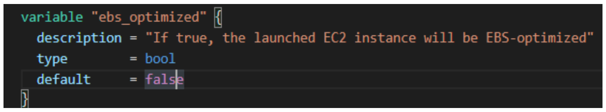
```
resource "aws_instance" "ec2_count" {
  count                       = var.instance_count
  ami                         = var.ami
  instance_type               = var.instance_type
  iam_instance_profile        = var.iam_instance_profile
  subnet_id                   = var.subnet_id
  key_name                    = var.key_name
  monitoring                  = var.monitoring                  #
  associate_public_ip_address = var.associate_public_ip_address #
  user_data                   = var.user_data
  user_data_base64            = var.user_data_base64 #filebase64(
  security_groups             = var.security_groups
  vpc_security_group_ids      = var.vpc_security_group_ids #If yo
```



```
#EC2 variable
variable "instance_count" {
  type    = number
  default = 1
}
```

This is instance has " count" virialized as "var.instance_count". And in the variable file/section you can see >>> instance_count **variable** type is **Number** & default value is 1.

- So, here in the Project/Child module you can define instance_count with your expected value or you can ignore as well when you are good with existing module default value, which is already defined as 1.
- In example files defined with some required example configuration, if you need beyond than this, and if that feature already in place in the root module, please go through the master module, use the feature variable name at child module with required parameter.



```
variable "ebs_optimized" {
  description = "If true, the launched EC2 instance will be EBS-optimized"
  type        = bool
  default     = false
}
```

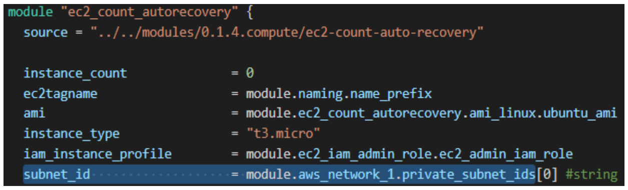
EG: in ec2_count_autorecovery example chile module:

I've not defined ebs_optimized because I left that with default value from root variable.

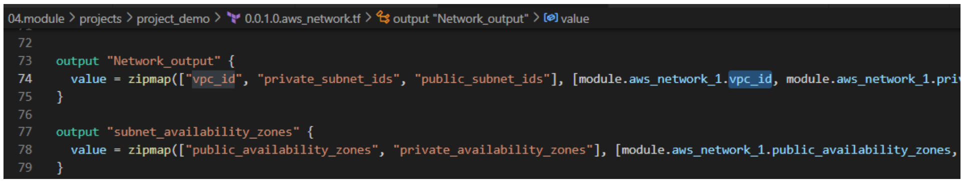
If you need to use that feature in can define at child project/ module with variable value (eg : bool type = true). Keep variable defined type in mind while using at module.

Point Note: Write your code while calling root module according to root module definition.

- You can use same modules as many as possible with different naming based on case to case.
- Generally Main module has main file for the service, variable file and dependent files and output file.
  - If you need to use other modules output value as different/dependent modules input, you can make use of output feature of the service from main module.
  - For better understanding visit Root module output file.
  - Output Values TF document: https://www.terraform.io/docs/language/values/outputs.html

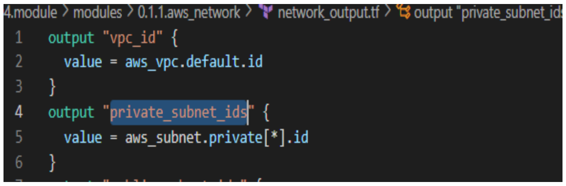


```
module "ec2_count_autorecovery" {
  source = "../../modules/0.1.4.compute/ec2-count-auto-recovery"

  instance_count                = 0
  ec2tagname                    = module.naming.name_prefix
  ami                           = module.ec2_count_autorecovery.ami_linux.ubuntu_ami
  instance_type                 = "t3.micro"
  iam_instance_profile          = module.ec2_iam_admin_role.ec2_admin_iam_role
  subnet_id                     = module.aws_network_1.private_subnet_ids[0] #string
```



04.module > projects > project_demo > 0.0.1.0.aws_network.tf > output "Network_output" > value

```
output "Network_output" {
  value = zipmap(["vpc_id", "private_subnet_ids", "public_subnet_ids"], [module.aws_network_1.vpc_id, module.aws_network_1.pri
}

output "subnet_availability_zones" {
  value = zipmap(["public_availability_zones", "private_availability_zones"], [module.aws_network_1.public_availability_zones,
}
```



4.module > modules > 0.1.1.aws_network > network_output.tf > output "private_subnet_ids

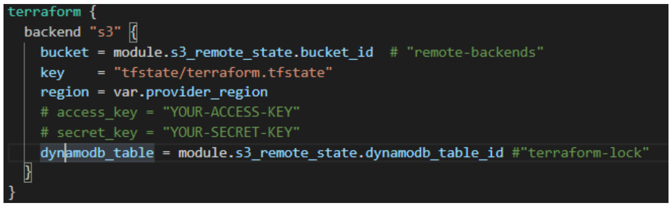
```
output "vpc_id" {
  value = aws_vpc.default.id
}
output "private_subnet_ids" {
  value = aws_subnet.private[*].id
}
```

`

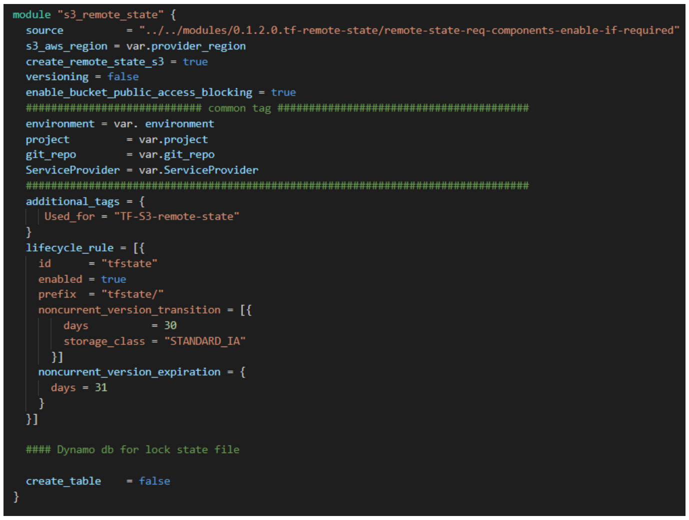
- Terraform Backend with AWS native services:
    1. Terraform Backend used to keep TF state file at remote location and safe.
    2. You can use module “0.1.2.0.tf-remote-state/remote-state-req-components-enable-if-required” (OPTIONAL)

       Which contains S3 and DynamoDB.

       Enable and configure services based on requirement.
    3. create a S3 backend configuration with target S3 and DynamoDB table (OPTIONAL- used for "terraform-state-lock")



```
terraform {
  backend "s3" {
    bucket = module.s3_remote_state.bucket_id  # "remote-backends"
    key    = "tfstate/terraform.tfstate"
    region = var.provider_region
    # access_key = "YOUR-ACCESS-KEY"
    # secret_key = "YOUR-SECRET-KEY"
    dynamodb_table = module.s3_remote_state.dynamodb_table_id #"terraform-lock"
  }
}
```



```
module "s3_remote_state" {
  source          = "../../modules/0.1.2.0.tf-remote-state/remote-state-req-components-enable-if-required"
  s3_aws_region = var.provider_region
  create_remote_state_s3 = true
  versioning = false
  enable_bucket_public_access_blocking = true
  ############################ common tag ########################################
  environment = var. environment
  project         = var.project
  git_repo        = var.git_repo
  ServiceProvider = var.ServiceProvider
  ################################################################################
  additional_tags = {
    Used_for = "TF-S3-remote-state"
  }
  lifecycle_rule = [{
    id      = "tfstate"
    enabled = true
    prefix  = "tfstate/"
    noncurrent_version_transition = [{
        days          = 30
        storage_class = "STANDARD_IA"
      }]
    noncurrent_version_expiration = {
      days = 31
    }
  }]

  #### Dynamo db for lock state file

  create_table    = false
}
```