CLOUD COMPUTING

LAB 11

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Submitted To:

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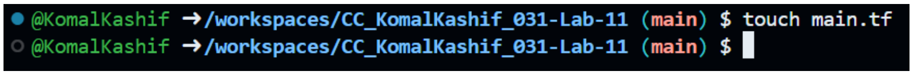
BSE V-A

2023-BSE-031

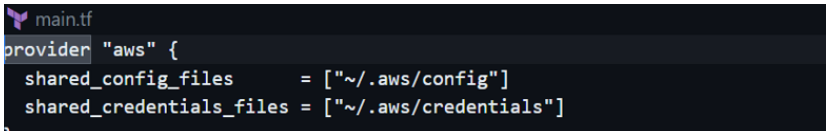
Task 1 — Provider & Basic variable

task1_touch_main_tf.png



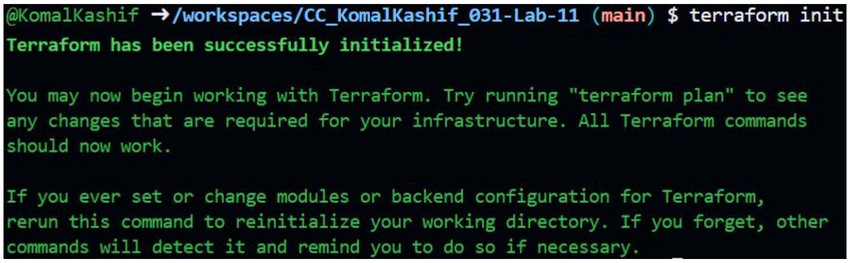
```
● @KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ touch main.tf
○ @KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ 
```

task1_main_tf_provider.png



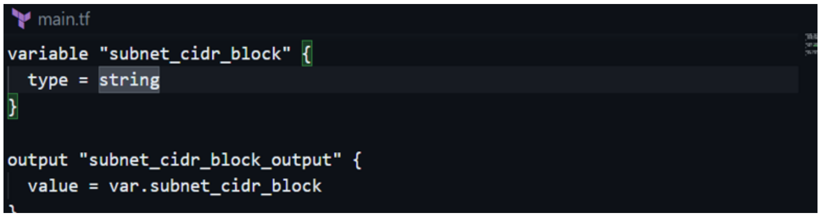
```
provider "aws" {
  shared_config_files      = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
```

task1_terraform_init.png



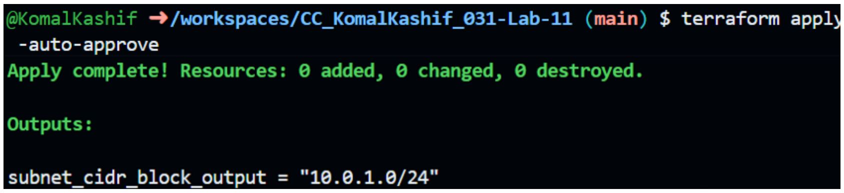
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform init
Terraform has been successfully initialized!

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.
```

task1_variable_and_output_added.png



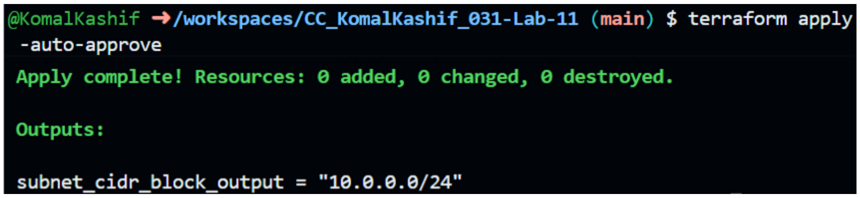
```
variable "subnet_cidr_block" {
  type = string
}

output "subnet_cidr_block_output" {
  value = var.subnet_cidr_block
```

task1_apply_prompt_for_var.png



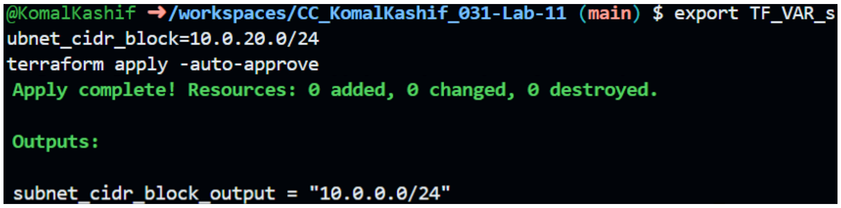
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply
 -auto-approve
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

Outputs:

subnet_cidr_block_output = "10.0.1.0/24"
```

task1_apply_with_default.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply
 -auto-approve
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

Outputs:

subnet_cidr_block_output = "10.0.0.0/24"
```

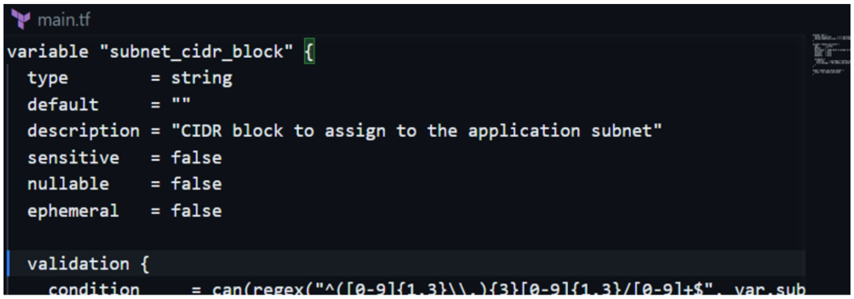
task1_env_var_set_and_apply.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ export TF_VAR_s
ubnet_cidr_block=10.0.20.0/24
terraform apply -auto-approve
 Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

 Outputs:

 subnet_cidr_block_output = "10.0.0.0/24"
```

Task 2 — Variable validation & sensitive / ephemeral variables

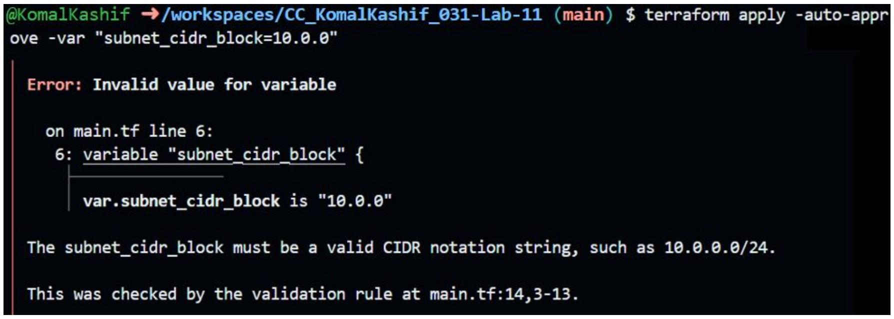
task2_subnet_variable_with_validation.png



main.tf

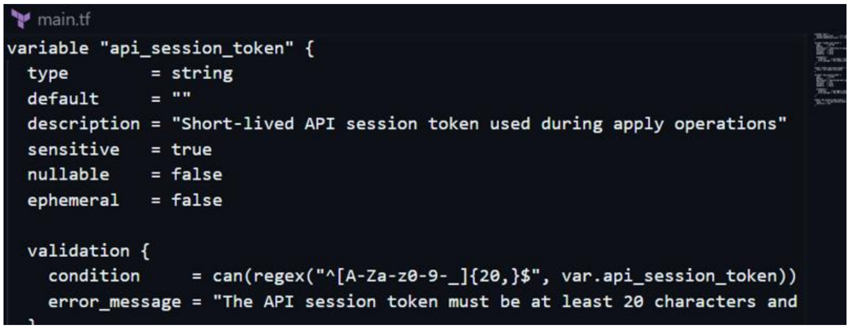
```
variable "subnet_cidr_block" {
  type        = string
  default     = ""
  description = "CIDR block to assign to the application subnet"
  sensitive   = false
  nullable    = false
  ephemeral   = false

  validation {
    condition     = can(regex("^([0-9]{1,3}\\.){3}[0-9]{1,3}/[0-9]+$", var.sub
```

task2_subnet_validation_error.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-appr
ove -var "subnet_cidr_block=10.0.0"

 Error: Invalid value for variable

   on main.tf line 6:
    6: variable "subnet_cidr_block" {

       var.subnet_cidr_block is "10.0.0"

 The subnet_cidr_block must be a valid CIDR notation string, such as 10.0.0.0/24.

 This was checked by the validation rule at main.tf:14,3-13.
```

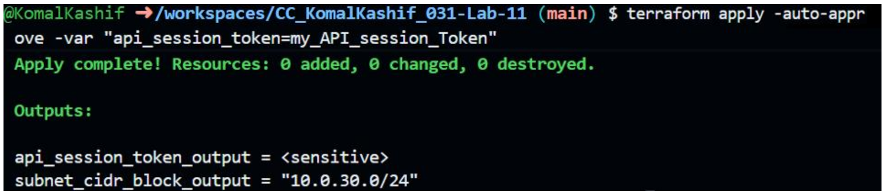
task2_api_token_variable_added.png



main.tf

```
variable "api_session_token" {
  type        = string
  default     = ""
  description = "Short-lived API session token used during apply operations"
  sensitive   = true
  nullable    = false
  ephemeral   = false

  validation {
    condition     = can(regex("^[A-Za-z0-9-_]{20,}$", var.api_session_token))
    error_message = "The API session token must be at least 20 characters and
  }
```

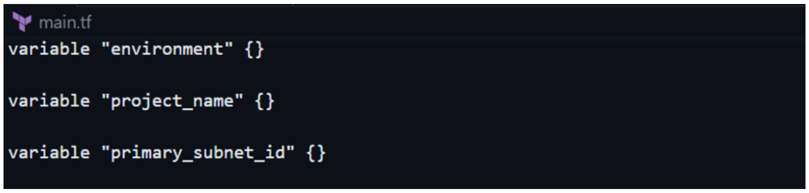
task2_api_token_apply_sensitive.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-appr
ove -var "api_session_token=my_API_session_Token"
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

Outputs:

api_session_token_output = <sensitive>
subnet_cidr_block_output = "10.0.30.0/24"
```

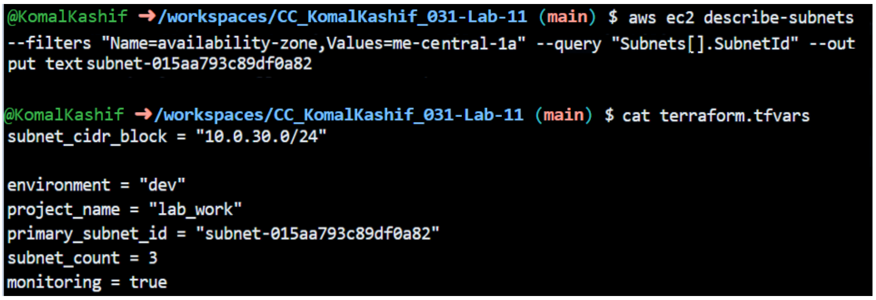
Task 3 — Project-level variables, locals, and outputs

task3_variables_added.png



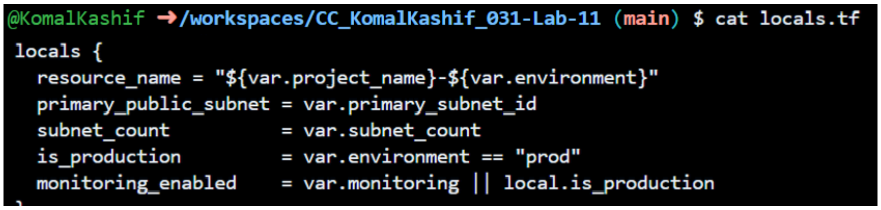
```
variable "environment" {}

variable "project_name" {}

variable "primary_subnet_id" {}
```

task3_terraform_tfvars_populated.png



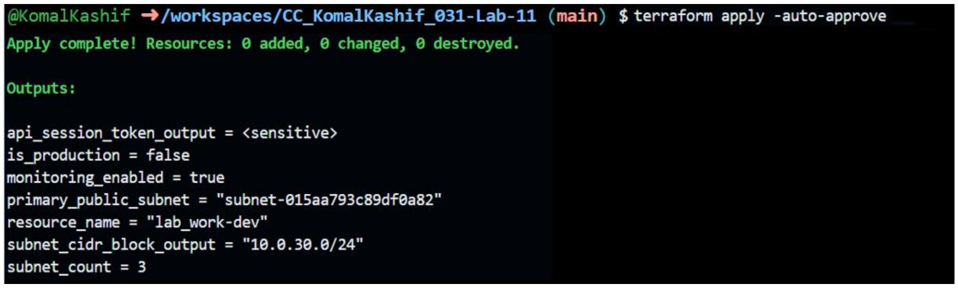
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ aws ec2 describe-subnets
--filters "Name=availability-zone,Values=me-central-1a" --query "Subnets[].SubnetId" --out
put text subnet-015aa793c89df0a82

@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ cat terraform.tfvars
subnet_cidr_block = "10.0.30.0/24"

environment = "dev"
project_name = "lab_work"
primary_subnet_id = "subnet-015aa793c89df0a82"
subnet_count = 3
monitoring = true
```

task3_locals_tf_created.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ cat locals.tf
locals {
  resource_name = "${var.project_name}-${var.environment}"
  primary_public_subnet = var.primary_subnet_id
  subnet_count          = var.subnet_count
  is_production         = var.environment == "prod"
  monitoring_enabled    = var.monitoring || local.is_production
```

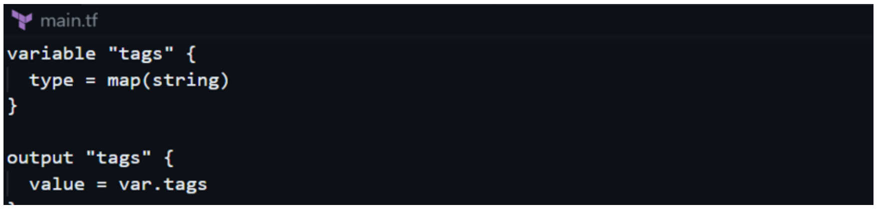
task3_outputs_apply.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

Outputs:

api_session_token_output = <sensitive>
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-015aa793c89df0a82"
resource_name = "lab_work-dev"
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
```

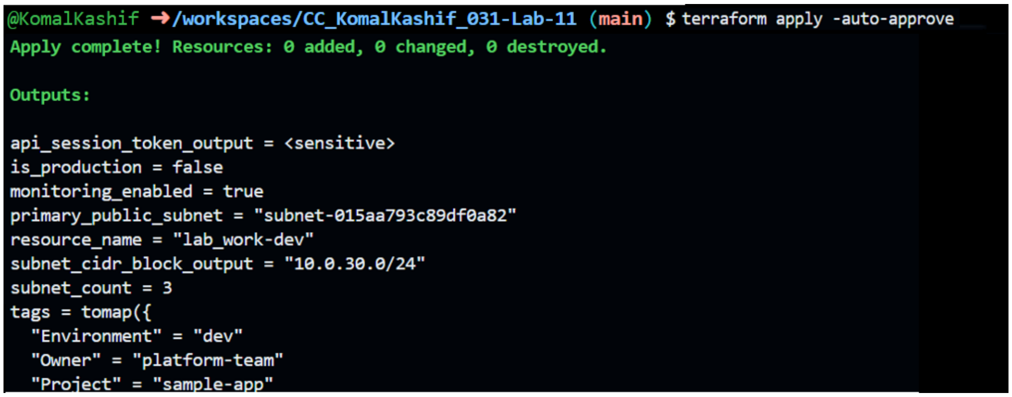
Task 4 — Maps and Objects

task4_tags_variable_added.png



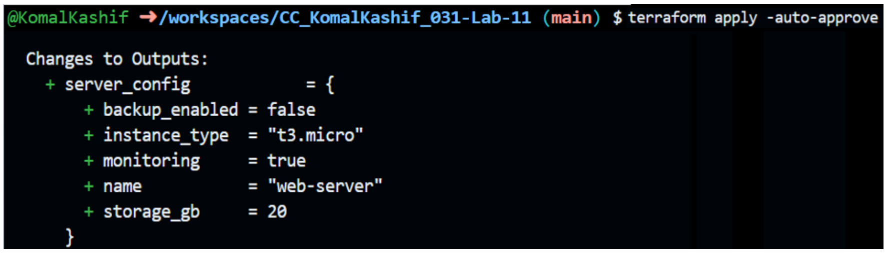
```
variable "tags" {
  type = map(string)
}

output "tags" {
  value = var.tags
```

task4_tags_output.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.

Outputs:

api_session_token_output = <sensitive>
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-015aa793c89df0a82"
resource_name = "lab_work-dev"
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
```

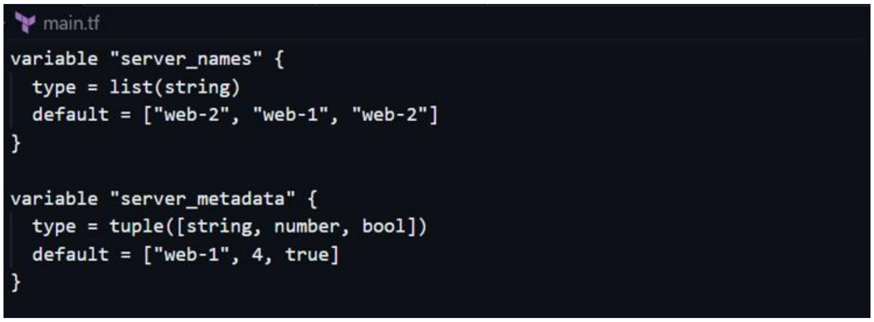
task4_server_config_output.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve

 Changes to Outputs:
   + server_config            = {
       + backup_enabled = false
       + instance_type  = "t3.micro"
       + monitoring     = true
       + name           = "web-server"
       + storage_gb     = 20
     }
```

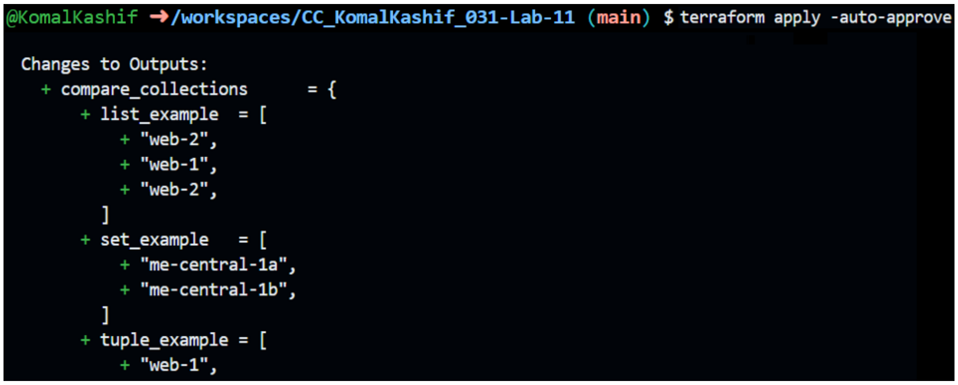
Task 5 — Collections: list, tuple, set & mutation via locals

task5_collections_defined.png



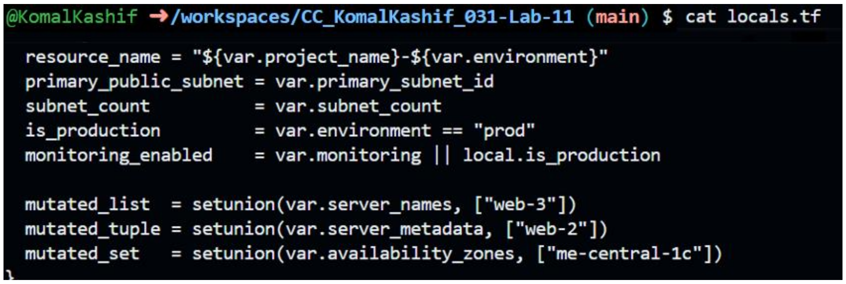
```
variable "server_names" {
  type = list(string)
  default = ["web-2", "web-1", "web-2"]
}

variable "server_metadata" {
  type = tuple([string, number, bool])
  default = ["web-1", 4, true]
}
```

task5_compare_collections.png



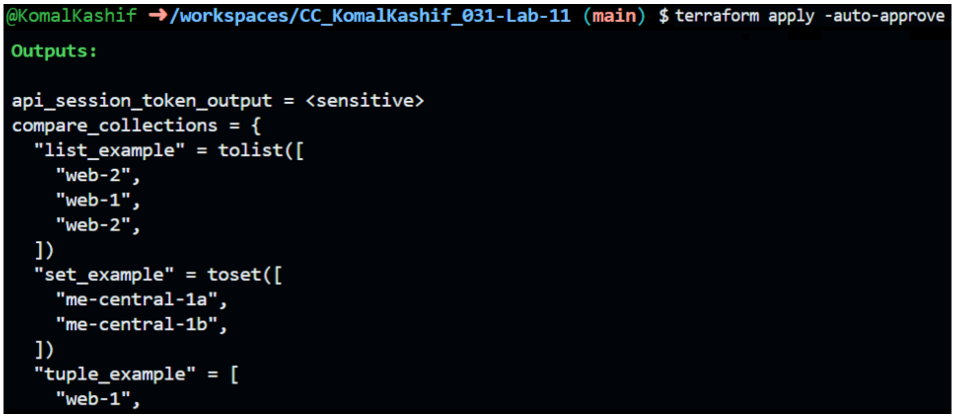
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve

 Changes to Outputs:
   + compare_collections     = {
       + list_example  = [
           + "web-2",
           + "web-1",
           + "web-2",
         ]
       + set_example   = [
           + "me-central-1a",
           + "me-central-1b",
         ]
       + tuple_example = [
           + "web-1",
```

task5_locals_mutations.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ cat locals.tf

  resource_name = "${var.project_name}-${var.environment}"
  primary_public_subnet = var.primary_subnet_id
  subnet_count          = var.subnet_count
  is_production         = var.environment == "prod"
  monitoring_enabled    = var.monitoring || local.is_production

  mutated_list  = setunion(var.server_names, ["web-3"])
  mutated_tuple = setunion(var.server_metadata, ["web-2"])
  mutated_set   = setunion(var.availability_zones, ["me-central-1c"])
```

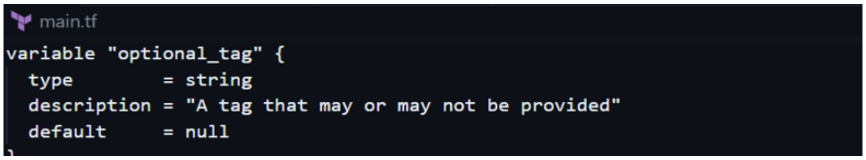
task5_mutation_comparison.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
Outputs:

api_session_token_output = <sensitive>
compare_collections = {
  "list_example" = tolist([
    "web-2",
    "web-1",
    "web-2",
  ])
  "set_example" = toset([
    "me-central-1a",
    "me-central-1b",
  ])
  "tuple_example" = [
    "web-1",
```

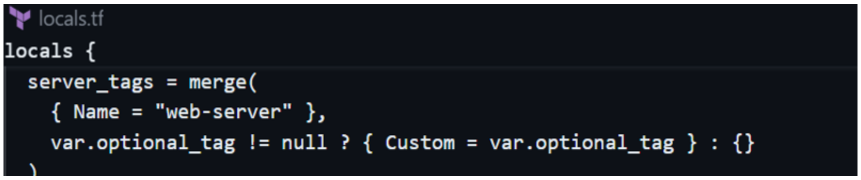
Task 6 — Null, any type & dynamic values

task6_optional_tag_variable.png



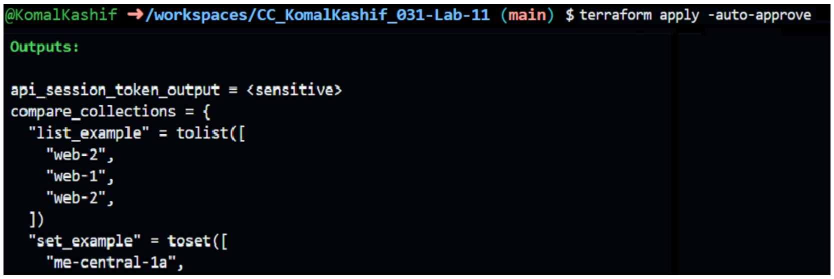
```
variable "optional_tag" {
  type        = string
  description = "A tag that may or may not be provided"
  default     = null
```

task6_locals_merge.png



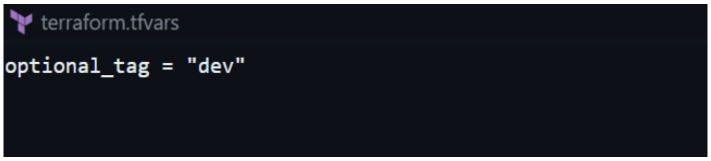
```
locals.tf
locals {
  server_tags = merge(
    { Name = "web-server" },
    var.optional_tag != null ? { Custom = var.optional_tag } : {}
  )
```

task6_optional_tag_no_value.png



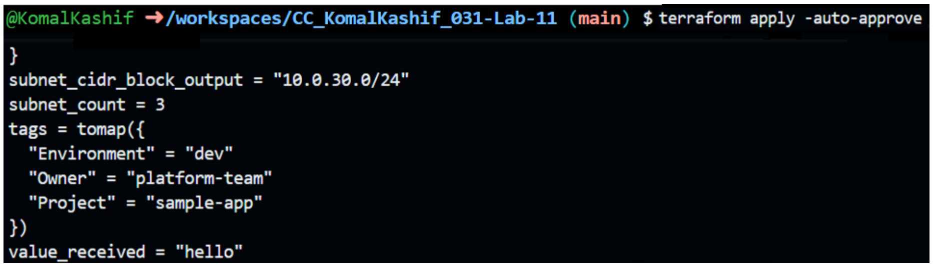
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
Outputs:

api_session_token_output = <sensitive>
compare_collections = {
  "list_example" = tolist([
    "web-2",
    "web-1",
    "web-2",
  ])
  "set_example" = toset([
    "me-central-1a",
```

task6_optional_tag_with_value.png



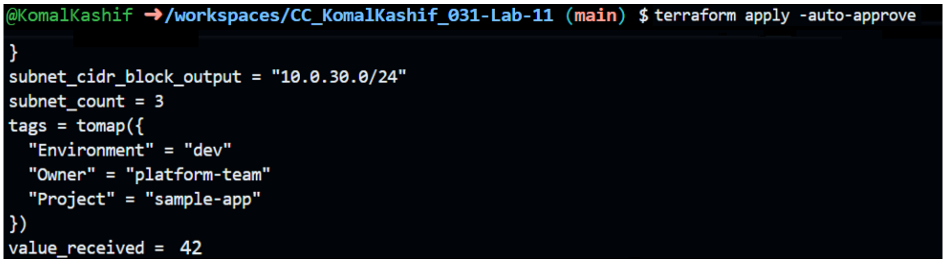
```
terraform.tfvars
optional_tag = "dev"
```

task6_dynamic_value_string.png



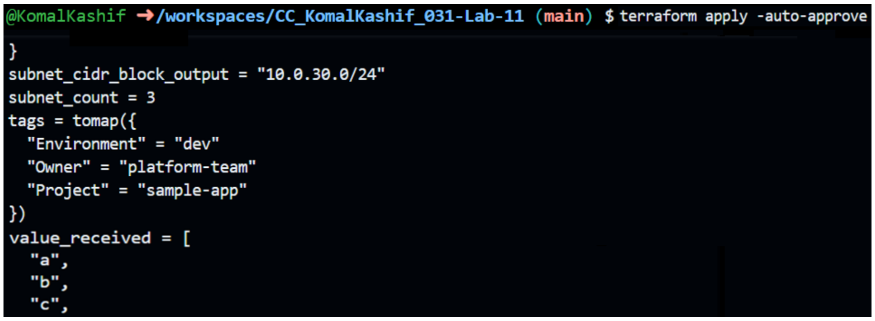
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
value_received = "hello"
```

task6_dynamic_value_number.png



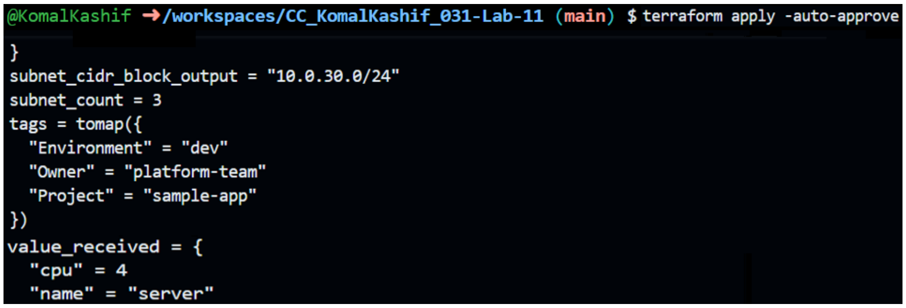
```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
value_received =  42
```

task6_dynamic_value_list.png



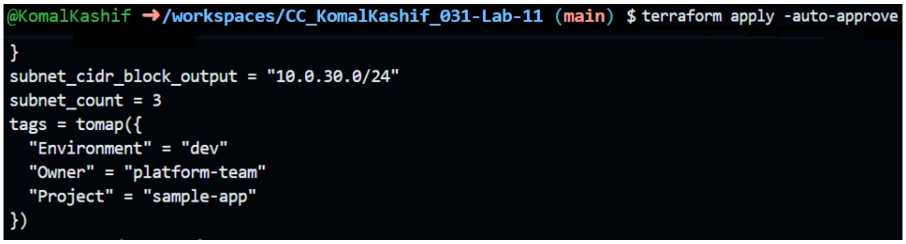
```
@KomalKashif ➜ /workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
value_received = [
  "a",
  "b",
  "c",
```

task6_dynamic_value_map.png



```
@KomalKashif ➜ /workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
value_received = {
  "cpu" = 4
  "name" = "server"
```

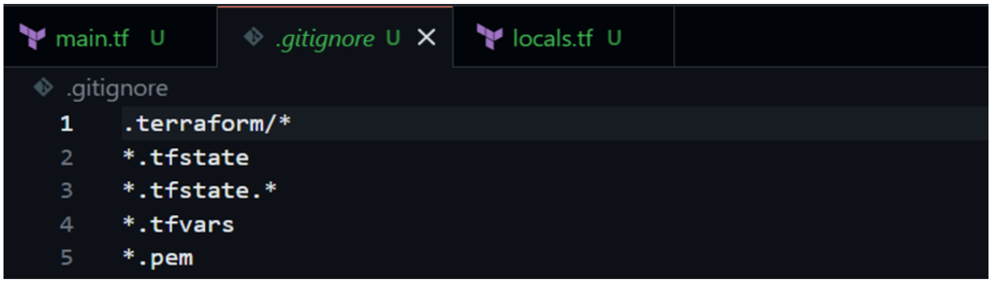
task6_dynamic_value_null.png



```
@KomalKashif ➜ /workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
```

Task 7 — Git ignore

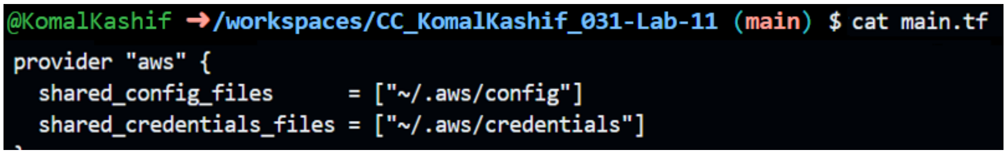
task7_gitignore_created.png



```
.terraform/*
*.tfstate
*.tfstate.*
*.tfvars
*.pem
```

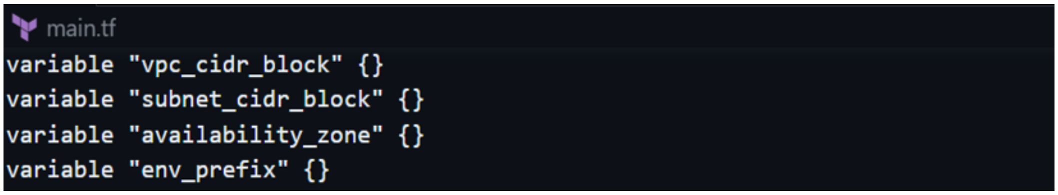
Task 8 — Clean-up then build real infra (VPC, Subnet, IGW, routing, default route table)

task8_clean_files.png



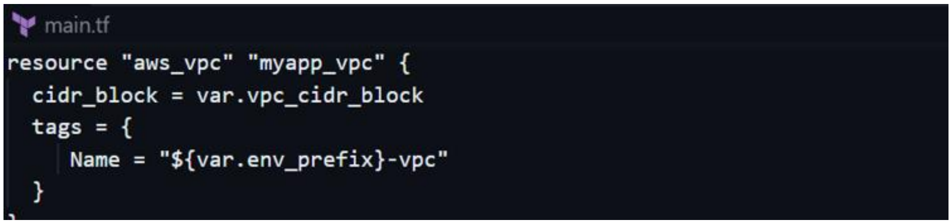
```
@KomalKashif ➜ /workspaces/CC_KomalKashif_031-Lab-11 (main) $ cat main.tf
provider "aws" {
  shared_config_files      = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
```

task8_variables_recreated.png



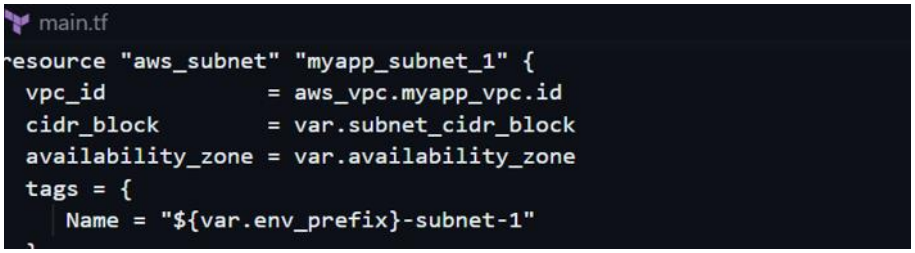
```
variable "vpc_cidr_block" {}
variable "subnet_cidr_block" {}
variable "availability_zone" {}
variable "env_prefix" {}
```

task8_vpc_resources_added.png



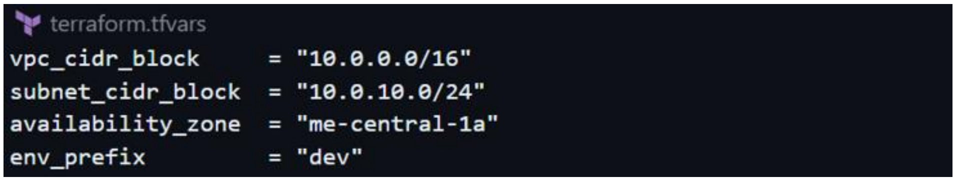
```
resource "aws_vpc" "myapp_vpc" {
  cidr_block = var.vpc_cidr_block
  tags = {
    Name = "${var.env_prefix}-vpc"
  }
```

task8_subnet_resources_added.png



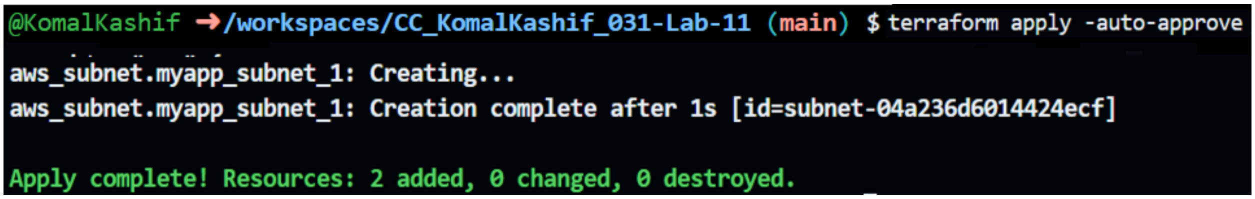
```
esource "aws_subnet" "myapp_subnet_1" {
  vpc_id            = aws_vpc.myapp_vpc.id
  cidr_block        = var.subnet_cidr_block
  availability_zone = var.availability_zone
  tags = {
    Name = "${var.env_prefix}-subnet-1"
```

task8_terraform_tfvars_vpc_values.png



```
vpc_cidr_block      = "10.0.0.0/16"
subnet_cidr_block   = "10.0.10.0/24"
availability_zone   = "me-central-1a"
env_prefix          = "dev"
```

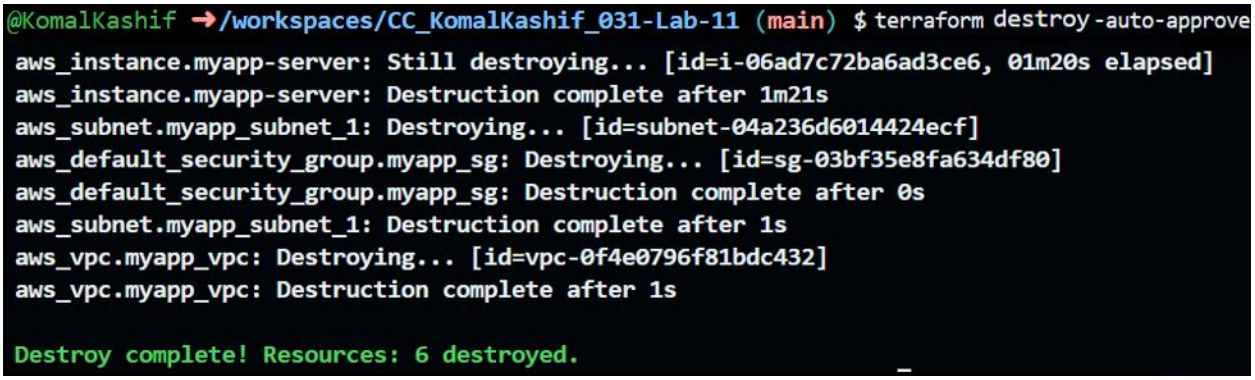
task8_vpc_subnet_apply.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform apply -auto-approve
aws_subnet.myapp_subnet_1: Creating...
aws_subnet.myapp_subnet_1: Creation complete after 1s [id=subnet-04a236d6014424ecf]

Apply complete! Resources: 2 added, 0 changed, 0 destroyed.
```

Cleanup:

cleanup_destroy.png



```
@KomalKashif ➜/workspaces/CC_KomalKashif_031-Lab-11 (main) $ terraform destroy -auto-approve
aws_instance.myapp-server: Still destroying... [id=i-06ad7c72ba6ad3ce6, 01m20s elapsed]
aws_instance.myapp-server: Destruction complete after 1m21s
aws_subnet.myapp_subnet_1: Destroying... [id=subnet-04a236d6014424ecf]
aws_default_security_group.myapp_sg: Destroying... [id=sg-03bf35e8fa634df80]
aws_default_security_group.myapp_sg: Destruction complete after 0s
aws_subnet.myapp_subnet_1: Destruction complete after 1s
aws_vpc.myapp_vpc: Destroying... [id=vpc-0f4e0796f81bdc432]
aws_vpc.myapp_vpc: Destruction complete after 1s

Destroy complete! Resources: 6 destroyed.
```