

CLOUD COMPUTING



SUBMITTED TO
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BSE V-A

Lab 11 – GH CLI Codespaces + AWS + Terraform: Variables, Collections, Sensitivity & EC2 Provisioning

Task 0 Lab Setup (Codespace & GH CLI)

- taskA_codespace_create_and_list.png

```
C:\Users\ABC\Downloads\gh_2.83.2_windows_amd64\bin>gh codespace list


| NAME                             | DISPLAY NAME     | REPOSITORY                       | BRANCH | STATE    | CREATED AT       |
|----------------------------------|------------------|----------------------------------|--------|----------|------------------|
| studious-journey-q7x57x9ww649... | studious journey | HamnaMahmood20/CC-Hamna-Mahmo... | main*  | Shutdown | about 6 days ago |


```

- taskA_codespace_ssh_connected.png

```
C:\Users\ABC\Downloads\gh_2.83.2_windows_amd64\bin>gh codespace ssh -c studious-journey-q7x57x9ww649hx57g
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-1030-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Last login: Tue Jan  6 17:07:52 2026 from ::1
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-1030-azure x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Last login: Tue Jan  6 17:07:52 2026 from ::1
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $
```

Task 1- Provider & Basic variable

- task1_touch_main_tf.png

```
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ touch main.tf
```

- task1_main_tf_provider.png

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

- task1_terraform_init.png

```
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform init
Initializing the backend...
Initializing provider plugins...
- Reusing previous version of hashicorp/aws from the dependency lock file
- Using previously-installed hashicorp/aws v6.27.0

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.
```

- 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

```
@hamna-mahmood [ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) ] $ terraform apply -auto-approve
subnet_cidr_blockvar.subnet_cidr_block
Enter a value:
```

- task1_apply_with_default.png

```
variable "subnet_cidr_block" {
  type = string
  default = "10.0.0.0/24"
}
```

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

Outputs:

```
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.0.0/24"
```

- task1_env_var_set_and_apply.png

```
@hamna-mahmood [ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) ] $ export TF_VAR_subnet_cidr_block=10.0.20.0/24
@hamna-mahmood [ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) ] $ terraform apply -auto-approve
data.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 0s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96ba1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Changes to Outputs:
  ~ subnet_cidr_block_output = "10.0.0.0/24" -> "10.0.20.0/24"

You can apply this plan to save these new output values to the Terraform state, without changing any real
infrastructure.

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

Outputs:
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.20.0/24"
```

- task1_terraform_tfvars_and_apply.png

```
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ cat terraform.tfvars
subnet_cidr_block = "10.0.30.0/24"
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply -auto-approve
data.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 1s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96be1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Changes to Outputs:
  ~ subnet_cidr_block_output = "10.0.20.0/24" -> "10.0.30.0/24"

You can apply this plan to save these new output values to the Terraform state, without changing any real
infrastructure.

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

Outputs:
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.30.0/24"
```

- task1_var_override_with_dash_var.png

```
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply -auto-approve -var "subnet_cidr_block=1
0.0.40.0/24"
# -var is hdata.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 0s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96be1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Changes to Outputs:
  ~ subnet_cidr_block_output = "10.0.30.0/24" -> "10.0.40.0/24"

You can apply this plan to save these new output values to the Terraform state, without changing any real
infrastructure.

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

Outputs:
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.40.0/24"
```

- task1_printenv_tf_var_and_unset.png

```
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ printenv | grep TF_VAR_
TF_VAR_subnet_cidr_block=10.0.20.0/24
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ unset TF_VAR_subnet_cidr_block
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ printenv | grep TF_VAR_
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $
```

Task 2- Variable validation & sensitive/ephemeral variables

- task2_subnet_variable_with_validation.png

```
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.subnet_cidr_block))
    error_message = "The subnet_cidr_block must be a valid CIDR notation string, such as 10.0.0.0/24."
  }
}
```

- task2_subnet_validation_error.png

```
@hamna-mahmood /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply -auto-approve -var "subnet_cidr_block=10.0.0"
rdata.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 1s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96be1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Planning failed. Terraform encountered an error while generating this plan.

Error: Invalid value for variable

  on main.tf line 58:
  58: 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:66,3-13.
```

- task2_api_token_variable_added.png

```
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 contain only letters, numbers, hyphens, or underscores."
  }
}

output "api_session_token_output" {
  value     = var.api_session_token
  sensitive = true
}
```

- task2_api_token_apply_sensitive.png

```

@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply -auto-approve -var "api_session_token=my_API_session_Token"
te for outputsdata.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 0s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96be1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Changes to Outputs:
  + api_session_token_output = (sensitive value)
  ~ subnet_cidr_block_output = "10.0.40.0/24" -> "10.0.30.0/24"

You can apply this plan to save these new output values to the Terraform state, without changing any real infrastructure.

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

Outputs:

api_session_token_output = <sensitive>
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.30.0/24"

```

- task2_check_terraform_state_api_token.png

```

"api_session_token_output": {
  "value": "my_API_session_Token",
  "type": "string",
  "sensitive": true
},

```

- task2_api_token_ephemeral_error.png

```

variable "api_session_token" {
  ephemeral=true
}

```

```

@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply

Error: Error acquiring the state lock

Error message: 2 problems:

- Unsupported state file format: The state file could not be parsed as JSON: syntax error at byte offset 264.
- Unsupported state file format: The state file does not have a "version" attribute, which is required to identify the format version.

Terraform acquires a state lock to protect the state from being written by multiple users at the same time. Please resolve the issue above and try again. For most commands, you can disable locking with the "-lock=false" flag, but this is not recommended.

```

- task2_api_token_default_apply.png

```

hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ terraform apply -auto-approve
data.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-00e2aa2a7430fc24c]
data.aws_vpc.existing_vpc: Read complete after 1s [id=vpc-0b412746b28b797e7]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-01f96be1fa93f203d]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0cf0259a916972e54]

Changes to Outputs:
  + api_session_token_output = (sensitive value)

You can apply this plan to save these new output values to the Terraform state, without changing any real
infrastructure.

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

Outputs:
api_session_token_output = <sensitive>
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
subnet_cidr_block_output = "10.0.30.0/24"

```

Task3- Project level variables, locals & outputs

- task3_variables_added.png

```

variable "environment" {}
variable "project_name" {}
variable "primary_subnet_id" {}
variable "subnet_count" {}
variable "monitoring" {}

```

- task3_terraform_tfvars_populated.png

```

environment="dev"
project_name="lab_work"
primary_subnet_id="subnet-01f96be1fa93f203d "
subnet_count=3
monitoring=true
~
~

```

- task3_locals_tf_created.png

```

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

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

Outputs:

```
api_session_token_output = <sensitive>
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-01f96be1fa93f203d "
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

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

Outputs:

```
api_session_token_output = <sensitive>
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-01f96be1fa93f203d "
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

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

```
Outputs:
```

```
api_session_token_output = <sensitive>
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-01f96be1fa93f203d "
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
```

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]
}

variable "availability_zones" {
  type = set(string)
  default = ["me-central-1b", "me-central-1a", "me-central-1b"]
}

output "compare_collections" {
  value = {
    list_example = var.server_names
    tuple_example = var.server_metadata
    set_example = var.availability_zones
  }
}
```

- task5_compare_collections.png

```
Apply complete! Resources: 0 added, 0 changed, 0 destroyed.
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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
primary_public_subnet = "subnet-01f96be1fa93f203d "
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
}
```

- task5_locals_mutations.png

```
locals {
  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

```

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false

monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
primary_public_subnet = "subnet-01f96be1fa93f203d "
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})

```

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

```

- task6_optional_tag_no_value.png

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
```

- task6_optional_tag_with_value.png

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
```

```
monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d"
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
subnet_cidr_block_output = "10.0.30.0/24"
subnet_count = 3
tags = tomap({
  "Environment" = "dev"
  "Owner" = "platform-team"
  "Project" = "sample-app"
})
```

- task6_dynamic_value_string.png

```
Changes to Outputs:
+ value_received = "hello"

You can apply this plan to save these new output values to

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"

dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d"
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
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

```
~ value_received = "hello" -> 42

You can apply this plan to save these new output values to

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"

dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d"
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
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

```
Changes to Outputs:
~ value_received = 42 -> [
  "a",
  "b",
  "c",
]

You can apply this plan to save these new output values to th

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

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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false
monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d"
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
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

```

Apply complete! Resources: 0 added, 0 changed, 0 destroyed.
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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false

monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d "
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
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

```

Apply complete! Resources: 0 added, 0 changed, 0 destroyed.
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",
    4,
    true,
  ]
}
dev-subnet-cidr_block = "10.0.10.0/24"
dev-subnet-region = "me-central-1a"
dev-subnet-tags_all = tomap({
  "Name" = "subnet-1-dev"
})
dev-subnet-tags_name = "subnet-1-dev"
dev-vpc-cidr_block = "10.0.0.0/16"
dev-vpc-region = "me-central-1"
dev-vpc-tags_all = tomap({
  "Name" = "development"
})
dev-vpc-tags_name = "development"
is_production = false

monitoring_enabled = true
mutation_comparison = {
  "mutated_tuple" = toset([
    "4",
    "true",
    "web-1",
    "web-2",
  ])
  "original_tuple" = [
    "web-1",
    4,
    true,
  ]
}
optional_tag = {
  "Custom" = "dev"
  "Name" = "web-server"
}
primary_public_subnet = "subnet-01f96be1fa93f203d "
resource_name = "lab_work-dev"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t3.micro"
  "monitoring" = true
  "name" = "web-server"
  "storage_gb" = 20
}
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

```
form/*
*.tfstate
*.tfstate.*
*.tfvars
*.pem
~
~
```

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

- task8_clean_files.png

```
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ rm terraform.tfvars
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ rm main.tf
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ rm locals.tf
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ touch main.tf
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ vim 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

```
resource "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

```
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

Your VPCs (3) [Info](#)

Find VPCs by attribute or tag

Last updated less than a minute ago [Actions](#) [Create VPC](#)

<input type="checkbox"/>	Name	VPC ID	State	Encryption c...	Encryption control ...	Block Public...	IPv4 CIDR	IPv6 CIDR
<input type="checkbox"/>	dev-vpc	vpc-05aa4ccb3cf969fa1	Available	-	-	Off	10.0.0.0/16	-
<input type="checkbox"/>	prod-vpc	vpc-09822723aed1d2815	Available	-	-	Off	10.0.0.0/16	-
<input type="checkbox"/>	-	vpc-0b412746b28b797e7	Available	-	-	Off	172.31.0.0/16	-

Subnets (5) [Info](#)

Find subnets by attribute or tag

Last updated 1 minute ago [Actions](#) [Create subnet](#)

<input type="checkbox"/>	Name	Subnet ID	State	VPC	Block Public...	IPv4 CIDR	IPv6 CIDR
<input type="checkbox"/>	-	subnet-078f1b79825a5fee0	Available	vpc-0b412746b28b797e7	Off	172.31.16.0/20	-
<input type="checkbox"/>	dev-subnet-1	subnet-082ba110498bcf841	Available	vpc-05aa4ccb3cf969fa1 dev-vpc	Off	10.0.10.0/24	-
<input type="checkbox"/>	prod-public-subnet	subnet-0a2cee75f0ad691a6	Available	vpc-09822723aed1d2815 pro...	Off	10.0.10.0/24	-
<input type="checkbox"/>	-	subnet-03aece612a1e2607f	Available	vpc-0b412746b28b797e7	Off	172.31.0.0/20	-
<input type="checkbox"/>	-	subnet-0f3fcff0e6b1889fc	Available	vpc-0b412746b28b797e7	Off	172.31.32.0/20	-

- task8_igw_route_table_before_apply.png

Internet gateways (1) [Info](#)

Find internet gateways by attribute or tag

Last updated 4 minutes ago [Actions](#) [Create internet gateway](#)

<input type="checkbox"/>	Name	Internet gateway ID	State	VPC ID
<input type="checkbox"/>	-	igw-042ad3ff5f6411b8b	Attached	vpc-04a77041d4db59245

Route tables (1) [Info](#)

Find route tables by attribute or tag

Last updated 4 minutes ago [Actions](#) [Create route table](#)

<input type="checkbox"/>	Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC
<input type="checkbox"/>	-	rtb-09ca838cfa1ea785b	-	-	Yes	vpc-0

- task8_igw_route_table_after_apply.png

Route tables (5) [Info](#)

Find route tables by attribute or tag

Last updated 2 minutes ago [Actions](#) [Create route ta](#)

<input type="checkbox"/>	Name	Route table ID	Explicit subnet associ...	Edge associations	Main	VPC	Owner ID
<input type="checkbox"/>	-	rtb-000461310bb92433a	-	-	Yes	vpc-0b412746b28b797e7	542622959327
<input type="checkbox"/>	dev-rt	rtb-05c987809e89fcd3	subnet-082ba110498bcf...	-	No	vpc-05aa4ccb3cf969fa1 dev-vpc	542622959327
<input type="checkbox"/>	-	rtb-083c4d05710186299	-	-	Yes	vpc-09822723aed1d2815 pro...	542622959327
<input type="checkbox"/>	prod-public-rt	rtb-0586238f2c56ea9ac	subnet-0a2cee75f0ad691...	-	No	vpc-09822723aed1d2815 pro...	542622959327
<input type="checkbox"/>	-	rtb-058ec44464c1c6742	-	-	Yes	vpc-05aa4ccb3cf969fa1 dev-vpc	542622959327

Internet gateways (3) [Info](#)

Find internet gateways by attribute or tag

[Actions](#) [Create internet gatew](#)

<input type="checkbox"/>	Name	Internet gateway ID	State	VPC ID	Owner
<input type="checkbox"/>	prod-igw	igw-0468cffffd1df556b	Attached	vpc-09822723aed1d2815 prod-vpc	542622959327
<input type="checkbox"/>	dev-igw	igw-053d919d43bb235fb	Attached	vpc-05aa4ccb3cf969fa1 dev-vpc	542622959327
<input type="checkbox"/>	-	igw-0c6d9e84143733f82	Attached	vpc-0b412746b28b797e7	542622959327

- task8_association_apply.png

Subnets (5) Info

Find subnets by attribute or tag

Name	Subnet ID	State	VPC	Block Public...	IPv4 CIDR	IPv6 CIDR
-	subnet-078f1b79825a5fced0	Available	vpc-0b412746b28b797e7	Off	172.31.16.0/20	-
dev-subnet-1	subnet-082ba110498b9cf841	Available	vpc-05aa4c3cf969fa1 dev-vpc	Off	10.0.10.0/24	-
prod-public-subnet	subnet-0a2cee75f0ad691a6	Available	vpc-09822723aed1d2815 pro...	Off	10.0.10.0/24	-
-	subnet-03aace612a1e2607f	Available	vpc-0b412746b28b797e7	Off	172.31.0.0/20	-
-	subnet-0731f1f0e6b1889f	Available	vpc-0b412746b28b797e7	Off	172.31.32.0/20	-

Route tables (5) Info

Find route tables by attribute or tag

Name	Route table ID	Explicit subnet associ...	Edge associations
-	rtb-000461310b92433a	-	-
dev-rt	rtb-05c987809e89fcd3	subnet-082ba110498b9cf...	-
-	rtb-083c4d05710186299	-	-
prod-public-rt	rtb-0586238f2c56ea9ac	subnet-0a2cee75f0ad691...	-
-	rtb-058ec44464c1c742	-	-

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

Outputs:

```
server_config = {
  "backup_enabled" = false
  "instance_type" = "t2.micro"
  "monitoring" = true
  "name" = "lab-server-1"
  "storage_gb" = 20
}
```

- task8_default_route_table.png

```
resource "aws_default_route_table" "main_rt" {
  default_route_table_id = aws_vpc.myapp_vpc.default_route_table_id

  route {
    cidr_block = "0.0.0.0/0"
    gateway_id = aws_internet_gateway.myapp_igw.id
  }

  tags = {
    Name = "${var.env_prefix}-rt"
  }
}
```

- task8_default_route_table_apply.png

```
Apply complete! Resources: 1 added, 0 changed, 2 destroyed.

Outputs:

server_config = {
  "backup_enabled" = false
  "instance_type" = "t2.micro"
  "monitoring" = true
  "name" = "lab-server-1"
  "storage_gb" = 20
}
```

Task 9- Security group, key apir, EC2 instance, user_data & nginx

- task9_my_ip_variable_added.png

```
tags = {
  Name = "${var.env_prefix}-rt"
}
}
variable "my_ip" {}
```

- task9_public_ip_curl.png

```
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ curl icanhazip.com
20.192.21.54
```

```
my_ip = "20.192.21.54/32"
instance_type = "t3.micro"
availability_zone = "me-central-1a" # or your chosen AZ
env_prefix = "dev"

-- INSERT --
```

- task9_security_group_apply.png

```
resource "aws_default_security_group" "myapp_sg" {
  vpc_id = aws_vpc.myapp_vpc.id

  ingress {
    from_port = 22
    to_port   = 22
    protocol  = "tcp"
    cidr_blocks = [var.my_ip]
  }

  ingress {
    from_port = 80
    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"]
    prefix_list_ids = []
  }

  tags = {
    Name = "${var.env_prefix}-sg"
  }
}
```

```
Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
```

```
Outputs:
```

```
server_config = {
  "backup_enabled" = false
  "instance_type" = "t2.micro"
  "monitoring" = true
  "name" = "lab-server-1"
  "storage_gb" = 20
}
```

```
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $
```

- task9_keypair_created_and_saved.png

```
00 MyE@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ chmod 600 MyED25519Key.pem
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ aws ec2 create-key-pair --key-name MyED25519Key --k
ey-type ed25519 --key-format pem --query 'KeyMaterial' --output text > MyED25519Key.pem
```

```
@hamna-mahmood [ ] /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ cat .gitignore
form/*
*.tfstate
*.tfstate.*
*.tfvars
*.pem
*.pem
```

- **task9_instance_type_set.png**

```
resource "aws_instance" "myapp-server" {
  ami                = "ami-05524d6658fcf35b6" # Amazon Linux 2023
  instance_type      = var.instance_type
  subnet_id          = aws_subnet.myapp_subnet_1.id
  security_groups    = [aws_default_security_group.default_sg.id]
  availability_zone   = var.availability_zone
  associate_public_ip_address = true
  key_name            = "MyED25519Key"

  tags = {
    Name = "${var.env_prefix}-ec2-instance"
  }
}

output "aws_instance_public_ip" {
  value = aws_instance.myapp-server.public_ip
}
```

- **task9_ec2_apply_and_public_ip.png**

```
Changes to Outputs:
+ aws_instance_public_ip = (known after apply)
aws_instance.myapp-server: Creating...
aws_instance.myapp-server: Still creating... [00m10s elapsed]
aws_instance.myapp-server: Creation complete after 13s [id=i-06f2433df6a51e8e4]

Warning: Value for undeclared variable

The root module does not declare a variable named "cidr_block" but a value was found in file "terraform.tfvars". If
you meant to use this value, add a "variable" block to the configuration.

To silence these warnings, use TF_VAR_... environment variables to provide certain "global" settings to all
configurations in your organization. To reduce the verbosity of these warnings, use the -compact-warnings option.

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Outputs:

aws_instance_public_ip = "3.28.191.9"
server_config = {
  "backup_enabled" = false
  "instance_type" = "t2.micro"
  "monitoring" = true
  "name" = "lab-server-1"
  "storage_gb" = 20
}
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $
```

- **task9_ssh_into_ec2.png**

```
@hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ ssh -i MyED25519Key.pem ec2-user@3.28.191.9
The authenticity of host '3.28.191.9 (3.28.191.9)' can't be established.
ED25519 key fingerprint is SHA256:Q/edvNjeVfia/Llikda4JRq3iBftGokFQtrEopvY1bg.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '3.28.191.9' (ED25519) to the list of known hosts.
```

- **task9_ssh_keypair_and_ssh.png**

```
ghamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ ssh-keygen -t ed25519 -f ~/.ssh/id_ed25519 -N ""
Generating public/private ed25519 key pair.
Your identification has been saved in /home/codespace/.ssh/id_ed25519
Your public key has been saved in /home/codespace/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:tYzLqo3cDRtHka2S3p4Unzf0jEkcaL30xbb3ki4ugLQ codespace@codespaces-aa6536
The key's randomart image is:
+--[ED25519 256]--+
|      +O+ .      |
|    . O B.. +   |
|  + * =O O .    |
| + *BB.+ . .    |
|+ *So+.   O .   |
| .E=.B   O .    |
| + +. . . .     |
|   . . .        |
|   O..          |
+-----[SHA256]-----+
```

- **task9_ssh_keypair_and_shh2.png**

```
resource "aws_instance" "myapp-server" {
  ami           = "ami-05524d6658fcf35b6" # Amazon Linux 2023
  instance_type = var.instance_type
  subnet_id     = aws_subnet.myapp_subnet_1.id
  security_groups = [aws_default_security_group.myapp_sg.id]
  availability_zone = var.availability_zone
  associate_public_ip_address = true
  key_name       = aws_key_pair.ssh_key.key_name
}
```

```
resource "aws_key_pair" "ssh_key" {
  key_name     = "serverkey"
  public_key   = file("~/ssh/id_ed25519.pub")
}
```

- **task9 ec2 apply and public ip**

```
Apply complete! Resources: 2 added, 0 changed, 1 destroyed.
```

Outputs:

```
aws_instance_public_ip = "51.112.229.108"
server_config = {
    "backup_enabled" = false
    "instance_type" = "t2.micro"
    "monitoring" = true
    "name" = "lab-server-1"
    "storage_gb" = 20
}
```

- **task9 ssh keypair And ssh3**

```
[Hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main)] $ ssh ec2-user@51.112.229.108
The authenticity of host '51.112.229.108 (51.112.229.108)' can't be established.
ED25519 key fingerprint is SHA256:F6IX2Dlh2f53v82zUaP77+F38RNIxyv6T8uRYfP1wAY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '51.112.229.108' (ED25519) to the list of known hosts.
```

The terminal window shows the command prompt [Hamna-mahmood @ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main)] followed by the command ssh ec2-user@51.112.229.108. The output displays the standard SSH warning about the host's authenticity, showing the ED25519 key fingerprint and asking for confirmation to proceed. After typing 'yes', it warns that the host has been permanently added to the known hosts list. Below this, the terminal shows the ASCII art logo for Amazon Linux 2023, which includes a stylized tree-like structure made of hash symbols (#). To the right of the logo, the text 'Amazon Linux 2023' and the URL 'https://aws.amazon.com/linux/amazon-linux-2023' are displayed. At the bottom of the terminal, the prompt changes to [ec2-user@ip-10-0-10-254 ~]\$.

```
#          Amazon Linux 2023
#####
#####
#####
#|         https://aws.amazon.com/linux/amazon-linux-2023
#|
#|
#|
#|
#|
#|
#|
#|
#|
#|
```

```
[ec2-user@ip-10-0-10-254 ~]$
```

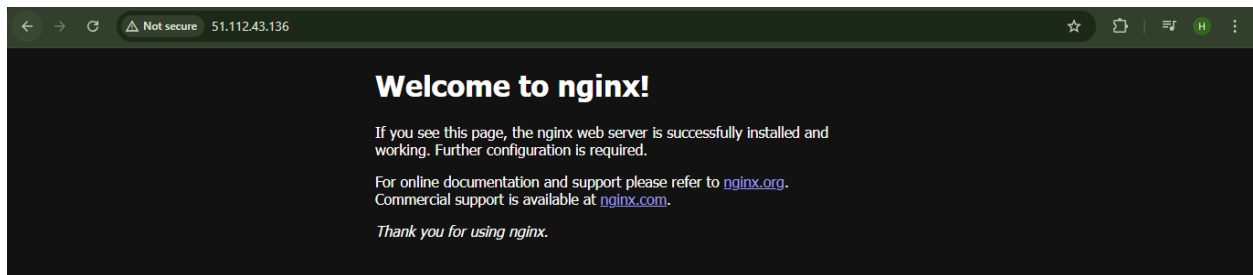
- task9_nginx_local_curl.png

```
[ec2-user@ip-10-0-10-62 ~]$ curl localhost
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
[ec2-user@ip-10-0-10-62 ~]$
```

- task9_nginx_browser_page.png



Cleanup

- cleanup_destroy.png

```
Destroy complete! Resources: 7 destroyed.
@hamna-mahmood /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $
```

- cleanup_state_files.png

```
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ cat terraform.tfstate
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 97,
  "lineage": "44daad15-ff50-9119-441e-f71bf3fee6a5",
  "outputs": {},
  "resources": [],
  "check_results": null
}
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ cat terraform.tfstate.backup
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 89,
  "lineage": "44daad15-ff50-9119-441e-f71bf3fee6a5",
  "outputs": {
    "aws_instance_public_ip": {
      "value": "52.23.122.222",
      "type": "string"
    },
    "server_config": {
      "value": {
        "backup_enabled": false,
        "instance_type": "t2.micro",
        "monitoring": true,
        "name": "lab-server-1",
        "storage_gb": 20
      }
    }
  }
}
```

- cleanup_verify_no_secrets.png

```
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ git status
On branch main
Your branch is up to date with 'origin/main'.

Untracked files:
  (use "git add <file>..." to include in what will be committed)
    .gitignore
    .main.tf.swp
    .main.tf.swp
    .terraform.lock.hcl
    .terraform/
    aws/
    awscliv2.zip
    "ec2 describe-vpcs \\"
    main.tf
    variables.tf

nothing added to commit but untracked files present (use "git add" to track)
@hamna-mahmood █ /workspaces/CC-Hamna-Mahmood-25-BSE-VA (main) $ cat .gitignore
form/*
*.tfstate
*.tfstate.*
*.tfvars
*.pem
*.pem
```