

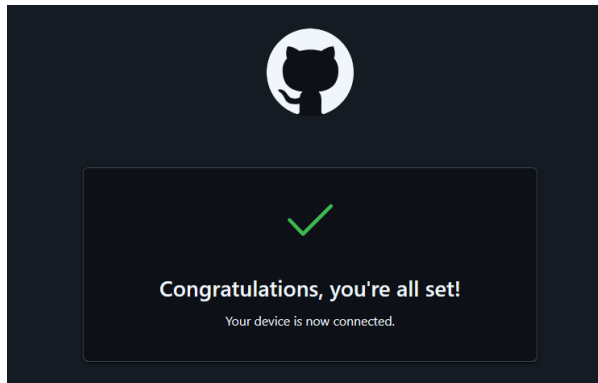
NAME: SANA TARIQ
CLASS: BSE 5B
REG.NO: 058
SUBJECT: CLOUD COMPUTING

LAB#10

TASK 1: GitHub CLI & Codespace Setup

```
PS C:\Windows\system32> winget install --id GitHub.cli
Found an existing package already installed. Trying to upgrade the installed package...
No available upgrade found.
No newer package versions are available from the configured sources.
PS C:\Windows\system32>
```

```
Authentication complete.
- gh config set -h github.com git_protocol https
Configured git protocol
Logged in as SanaTariq205
! You were already logged in to this account
PS C:\Windows\system32>
```



```

PS C:\Windows\system32> gh codespace ssh -c opulent-space-fiesta-wrq7qxqwrvxrf7x9
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

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

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applicable law.

@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $

```

TASK 2: Install AWS CLI & Terraform

```

inflating: aws/dist/wheel-0.45.1.dist-info/LICENSE.txt
inflating: aws/dist/wheel-0.45.1.dist-info/INSTALLER
inflating: aws/dist/wheel-0.45.1.dist-info/RECORD
inflating: aws/dist/wheel-0.45.1.dist-info/entry_points.txt
inflating: aws/dist/wheel-0.45.1.dist-info/WHEEL
inflating: aws/dist/wheel-0.45.1.dist-info/METADATA
inflating: aws/dist/wheel-0.45.1.dist-info/REQUESTED
inflating: aws/dist/wheel-0.45.1.dist-info/direct_url.json
@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ sudo ./aws/install
You can now run: /usr/local/bin/aws --version
@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ aws --version
aws-cli/2.32.26 Python/3.13.11 Linux/6.8.0-1030-azure exe/x86_64.ubuntu.24
@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $

Default region name [None]: us-east-1
Default output format [None]: json
@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $

@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ cat ~/.aws/config
[default]
region = us-east-1
output = json
@sanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $

```

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ wget -O - https://apt.releases.hashicorp.com/gpg | sudo gpg --dearmor -o /usr/share/keyrings/hashicorp-archive-keyring.gpg
https://apt.releases.hashicorp.com $(grep -oP '(?<=UBUNTU_CODENAME=).*' /etc/os-release || lsb_release -cs) main" | sudo tee /etc/apt/sources.list.d/hashicorp.list
sudo apt update
sudo apt install terraform -y--2026-01-02 13:45:17-- https://apt.releases.hashicorp.com/gpg
Resolving apt.releases.hashicorp.com (apt.releases.hashicorp.com)... 18.172.78.30, 18.172.78.65, 18.172.78.12, ...
Connecting to apt.releases.hashicorp.com (apt.releases.hashicorp.com)|18.172.78.30|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3980 (3.9K) [binary/octet-stream]
Saving to: 'STDOUT'

-                  100%[=====] 3.89K --.-KB/s in 0s

2026-01-02 13:45:17 (770 MB/s) - written to stdout [3980/3980]

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/hashicorp-archive-keyring.gpg] https://apt.releases.hashicorp.com $(grep -oP '(?<=UBUNTU_CODENAME=).*' /etc/os-

```

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ sudo apt install terraform
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  terraform
0 upgraded, 1 newly installed, 0 to remove and 51 not upgraded.
Need to get 30.6 MB of archives.
After this operation, 101 MB of additional disk space will be used.
Get:1 https://apt.releases.hashicorp.com noble/main amd64 terraform amd64 1.14.3-1 [30.6 MB]
Fetched 30.6 MB in 0s (123 MB/s)
Selecting previously unselected package terraform.
(Reading database ... 58629 files and directories currently installed.)
Preparing to unpack .../terraform_1.14.3-1_amd64.deb ...
Unpacking terraform (1.14.3-1) ...
Setting up terraform (1.14.3-1) ...
@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ terraform --version
Terraform v1.14.3
on linux_amd64

```

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ cat main.tf
provider "aws" {
  shared_config_files      = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
}

```

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ terraform init
Initializing the backend...
Initializing provider plugins...
- Finding latest version of hashicorp/aws...
- Installing hashicorp/aws v6.27.0...
- Installed hashicorp/aws v6.27.0 (signed by HashiCorp)
Terraform has created a lock file .terraform.lock.hcl to record the provider
selections it made above. Include this file in your version control repository
so that Terraform can guarantee to make the same selections by default when
you run "terraform init" in the future.

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.

```

```
@SanaTariq205 [ ] /workspaces/cc_sanatariq_058 (main) $ cat .terraform.lock.hcl
# This file is maintained automatically by "terraform init".
# Manual edits may be lost in future updates.

provider "registry.terraform.io/hashicorp/aws" {
  version = "6.27.0"
  hashes = [
    "h1:bixp2PSsP5ZGBcz6CxcbsDn6lF5QFLUX1Nroq9cdab4=",
    "zh:177a24b806c72e8484b5cab93b2b38e3d770ae6f745a998b54d6619fd0e8129",
    "zh:4ac4a85c14fb868a3306b542e6a56c10bd6c6d5a67bc0c9b8f6a9060cf5f3be7",
    "zh:552652185bc85c8ba1da1d65dea47c454728a5c6839c458b6dcd3ce71c19ccfc",
    "zh:60284b8172d09aee91eae0856f09855eaf040ce3a58d6933602ae17c53f8ed04",
    "zh:6be38d156756ca61fb8e7c752cc5d769cd709686700ac4b230f40a6e95b5dbc9",
    "zh:7a409138fae4ef42e3a637e37cb9efedf96459e28a3c764fc4e855e8db9a7485",
    "zh:8070cf5224ed1ed3a3e9a59f7c30ff88bf071c7567165275d477c1738a56c064",
    "zh:894439ef340a9a79f69cd759e27ad11c7826adeca27be1b1ca82b3c9702fa300",
    "zh:89d035eebf08a97c89374ff06040955ddc09f275ecca609d0c9d58d149bef5cf",
    "zh:985b1145d724cf1f38369099e4a5087141885740fd6c0b1dbc492171e73c2e49",
    "zh:9b12af85486a96aedd8d7984b0ff811a4b42e3d88dad1a3fb4c0b580d04fa425",
    "zh:a80b47ae8d1475201c86bd94a5dcb9dd4da5e8b73102a90820b68b66b76d50fd",
    "zh:d3395be1556210f82199b9166a6b2e677cee9c4b67e96e63f6c3a98325ad7ab0",
    "zh:db0b869d09657f6f1e4110b56093c5fcd9dbdd97c020db1e577b239c0adcbce",
    "zh:ffc72e680370ae7c21f9bd3082c6317730df805c6797427839a6b6b7e9a26a01",
  ]
}
@SanaTariq205 [ ] /workspaces/cc_sanatariq_058 (main) $ ls .terraform/
providers
```

TASK 3: Create VPC & Subnet

```
@SanaTariq205 [ ] /workspaces/cc_sanatariq_058 (main) $ cat main.tf
provider "aws" {
  shared_config_files      = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
}

resource "aws_vpc" "development_vpc" {
  cidr_block = "10.0.0.0/16"
}

resource "aws_subnet" "dev_subnet_1" {
  vpc_id            = aws_vpc.development_vpc.id
  cidr_block        = "10.0.10.0/24"
  availability_zone = "me-central-1a"
}
@SanaTariq205 [ ] /workspaces/cc_sanatariq_058 (main) $
```

```
aws_subnet.dev_subnet_1: Creating...
aws_subnet.dev_subnet_1: Creation complete after 2s [id=sub

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
@SanaTariq205 [ ] /workspaces/cc_sanatariq_058 (main) $
```

TASK 4: Data Sources, Targeted Destroy, Tags

```

@SanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ aws ec2 describe-subnets --filter "Name=subnet-0dbba25036add9859"
{
  "Subnets": [
    {
      "AvailabilityZoneId": "use1-az1",
      "MapCustomerOwnedIpOnLaunch": false,
      "OwnerId": "623705168110",
      "AssignIpv6AddressOnCreation": false,
      "Ipv6CidrBlockAssociationSet": [],
      "SubnetArn": "arn:aws:ec2:us-east-1:623705168110:subnet/subnet-0dbba25036add9859",
      "EnableDns64": false,
      "Ipv6Native": false,
      "PrivateDnsNameOptionsOnLaunch": {
        "HostnameType": "ip-name",
        "EnableResourceNameDnsRecord": false,
        "EnableResourceNameDnsAAAARecord": false
      }
    }
  ]
}

```

```

@SanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ aws ec2 describe-vpcs --filter "Name=vpc-id,Values=[vpc-03b640d8e17012753]"
{
  "Vpcs": [
    {
      "OwnerId": "623705168110",
      "InstanceTenancy": "default",
      "CidrBlockAssociationSet": [
        {
          "AssociationId": "vpc-cidr-assoc-0c910514093b38224",
          "CidrBlock": "10.0.0.0/16",
          "CidrBlockState": {
            "State": "associated"
          }
        }
      ]
    }
  ]
}

```

```

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

  Enter a value: yes

aws_subnet.dev_subnet_1_existing: Creating...
aws_subnet.dev_subnet_1_existing: Creation complete after 1s [id=subnet-0d56a65d6d5c20ac2]

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

```

```

aws_subnet.dev_subnet_1_existing: Destruction complete after 1s

Warning: Applied changes may be incomplete

The plan was created with the -target option in effect, so some
changes may have been ignored and the output values may not be fully updated. Run the
following command to refresh the state:
  terraform plan

Note that the -target option is not suitable for routine use, as it may leave
resources in a state that is not recoverable from errors or mistakes, or when Terraform
specifically requires the use of the -target option.

Destroy complete! Resources: 1 destroyed.

```

```

@SanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ terraform refresh
data.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-03b640d8e17012753]
data.aws_vpc.existing_vpc: Read complete after 2s [id=vpc-0a9005120b91c]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0dbba25036add9859]

```

```

aws_subnet.dev_subnet_1_existing: Creating...
aws_subnet.dev_subnet_1_existing: Creation complete after 2s

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

```

Enter a value: yes

```
aws_subnet.dev_subnet_1_existing: Destroying...
aws_subnet.dev_subnet_1: Destroying... [id=subnet-1-dev]
aws_subnet.dev_subnet_1: Destruction complete
aws_vpc.development_vpc: Destroying... [id=vpc-1-dev]
aws_subnet.dev_subnet_1_existing: Destruction complete
aws_vpc.development_vpc: Destruction complete

Destroy complete! Resources: 3 destroyed.
```

Enter a value: yes

```
aws_vpc.development_vpc: Creating...
aws_subnet.dev_subnet_1_existing: Creating...
aws_subnet.dev_subnet_1_existing: Creation complete after 2s [id=subnet-1-dev]
aws_vpc.development_vpc: Creation complete after 3s [id=vpc-1-dev]
aws_subnet.dev_subnet_1: Creating...
aws_subnet.dev_subnet_1: Creation complete after 1s [id=subnet-1-dev]

Apply complete! Resources: 3 added, 0 changed, 0 destroyed.
```

```
@sanatariq205 @ /workspaces/cc_sanatariq_058 (main) $ cat main.tf
provider "aws" {
  shared_config_files    = ["~/.aws/config"]
  shared_credentials_files = ["~/.aws/credentials"]
}

resource "aws_vpc" "development_vpc" {
  cidr_block = "10.0.0.0/16"
  tags = {
    Name     = "development"
    vpc_env = "dev"
  }
}

resource "aws_subnet" "dev_subnet_1" {
  vpc_id            = aws_vpc.development_vpc.id
  cidr_block        = "10.0.10.0/24"
  availability_zone = "us-east-1a"
  tags = {
    Name = "subnet-1-dev"
  }
}

data "aws_vpc" "existing_vpc" {
  default = true
}

resource "aws_subnet" "dev_subnet_1_existing" {
  vpc_id            = data.aws_vpc.existing_vpc.id
  cidr_block        = "172.31.240.0/24"
  availability_zone = "us-east-1a"
  tags = {
    Name = "subnet-1-default"
  }
}
```

```
Plan: 2 to add, 0 to change, 0 to destroy.
aws_subnet.dev_subnet_1_existing: Creating...
aws_subnet.dev_subnet_1: Creating...
aws_subnet.dev_subnet_1_existing: Creation complete after 2s [id=subnet-1-dev]
aws_subnet.dev_subnet_1: Creation complete after 2s [id=subnet-1-dev]

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

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ terraform plan
data.aws_vpc.existing_vpc: Reading...
aws_vpc.development_vpc: Refreshing state... [id=vpc-0786a140267f2fecf]
data.aws_vpc.existing_vpc: Read complete after 2s [id=vpc-0a9005120b91ce98c]
aws_subnet.dev_subnet_1_existing: Refreshing state... [id=subnet-082b951856ab9407e]
aws_subnet.dev_subnet_1: Refreshing state... [id=subnet-0d1333f4eab5286a0]

Terraform used the selected providers to generate the following execution plan. Resources to be
added, changed, or destroyed are highlighted below.

Terraform will perform the following actions:

# aws_vpc.development_vpc will be updated in-place
~ resource "aws_vpc" "development_vpc" {
  id          = "vpc-0786a140267f2fecf"
  ~ tags      = {
    "Name" = "development"
    "vpc_env" = "dev" -> null
  }
  ~ tags_all = {
    "vpc_env" = "dev" -> null
    # (1 unchanged element hidden)
  }
  # (19 unchanged attributes hidden)
}

Plan: 0 to add, 1 to change, 0 to destroy.

```

```

Plan: 0 to add, 1 to change, 0 to destroy.
aws_vpc.development_vpc: Modifying... [id=vpc-0786a140267f2fecf]
aws_vpc.development_vpc: Modifications complete after 3s [id=vpc-0786a140267f2fecf]

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

```

TASK 5: State Files

```

aws_subnet.dev_subnet_1: Destroying... [id=subnet-0d1333f4eab5286a0]
aws_subnet.dev_subnet_1_existing: Destroying... [id=subnet-082b951856ab9407e]
aws_subnet.dev_subnet_1_existing: Destruction complete!
aws_subnet.dev_subnet_1: Destruction complete!
aws_vpc.development_vpc: Destroying... [id=vpc-0786a140267f2fecf]
aws_vpc.development_vpc: Destruction complete!

Destroy complete! Resources: 3 destroyed.

```

```

@SanaTariq205 @ /workspaces/cc_sanatariq_058 (main) $ cat terraform.tfstate
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 37,
  "lineage": "b4cad875-1ab7-d043-6a8a-b646b92414c9",
  "outputs": {},
  "resources": [],
  "check_results": null
}

```

```
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 32,
  "lineage": "b4cad875-1ab7-d043-6a8a-b646b92414c9",
  "outputs": {},
  "resources": [
    {
      "mode": "data",
      "type": "aws_vpc",
      "name": "existing_vpc",
      "provider": "provider[\"registry.terraform.io/hashicorp/aws\"]",
      "instances": [
        {
          "schema_version": 0,
          "attributes": {
```

```
aws_vpc.development_vpc: Creating...
aws_subnet.dev_subnet_1_existing: Creating...
aws_subnet.dev_subnet_1_existing: Creation complete after 2s
aws_vpc.development_vpc: Creation complete after 4s [id=vpc-
aws_subnet.dev_subnet_1: Creating...
aws_subnet.dev_subnet_1: Creation complete after 1s [id=subn
Apply complete! Resources: 3 added, 0 changed, 0 destroyed.
```

```
{
  "version": 4,
  "terraform_version": "1.14.3",
  "serial": 37,
  "lineage": "b4cad875-1ab7-d043-6a8a-b646b92414c9",
  "outputs": {},
  "resources": [],
  "check_results": null
}
```

```
[Sanatariq205] @ /workspaces/cc_sanatariq_058 (main) $ terraform state list
data.aws_vpc.existing_vpc
aws_subnet.dev_subnet_1
aws_subnet.dev_subnet_1_existing
aws_vpc.development_vpc
```

```

sanatariq205 @ /workspaces/cc_sanatariq_058 (main) $ terraform show aws_vpc.development_vpc
# aws_vpc.development_vpc:
resource "aws_vpc" "development_vpc" {
  arn = "arn:aws:ec2:us-east-1:623705168110:vpc/vpc-0ba5b5d4eaf680adf"
  assign_generated_ipv6_cidr_block = false
  cidr_block = "10.0.0.0/16"
  default_network_acl_id = "acl-0c22015c15d2c170c"
  default_route_table_id = "rtb-049ad6ee9092bc316"
  default_security_group_id = "sg-087c45fc0297c35bf"
  dhcp_options_id = "dopt-027511ed96e18e969"
  enable_dns_hostnames = false
  enable_dns_support = true
  enable_network_address_usage_metrics = false
  id = "vpc-0ba5b5d4eaf680adf"
  instance_tenancy = "default"
  ipv6_association_id = null
  ipv6_cidr_block = null
  ipv6_cidr_block_network_border_group = null
  ipv6_ipam_pool_id = null
  ipv6_netmask_length = 0
  main_route_table_id = "rtb-049ad6ee9092bc316"
  owner_id = "623705168110"
  region = "us-east-1"
  tags = {
    "Name" = "development"
  }
  tags_all = {
    "Name" = "development"
  }
}

```


TASK 6: Outputs

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

```
Outputs:
```

```
dev-subnet-arn = "arn:aws:ec2:us-east-1:623705168110:subnet/  
dev-subnet-id = "subnet-0726b897438644920"  
dev-vpc-arn = "arn:aws:ec2:us-east-1:623705168110:vpc/vpc-0b  
dev-vpc-id = "vpc-0ba5b5d4eaf680adf"
```

```
aws_subnet.dev_subnet_1_existing: Destroyi  
aws_subnet.dev_subnet_1: Destroying... [id  
aws_subnet.dev_subnet_1: Destruction compl  
aws_vpc.development_vpc: Destroying... [id  
aws_subnet.dev_subnet_1_existing: Destruct  
aws_vpc.development_vpc: Destruction compl
```

```
Destroy complete! Resources: 3 destroyed.
```

```
@SanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ cat terraform.tfstate  
{  
  "version": 4,  
  "terraform_version": "1.14.3",  
  "serial": 47,  
  "lineage": "b4cad875-1ab7-d043-6a8a-b646b92414c9",  
  "outputs": {},  
  "resources": [],  
  "check_results": null  
}
```

```
@SanaTariq205 ~ /workspaces/cc_sanatariq_058 (main) $ cat terraform.tfstate.backup  
{  
  "version": 4,  
  "terraform_version": "1.14.3",  
  "serial": 42,  
  "lineage": "b4cad875-1ab7-d043-6a8a-b646b92414c9",  
  "outputs": {  
    "dev-subnet-arn": {  
      "value": "arn:aws:ec2:us-east-1:623705168110:subnet/subnet-0726b897438644920",  
      "type": "string"  
    },  
    "dev-subnet-id": {
```