

Terraform ECS Deployment

Prerequisites

1. AWS Account with an IAM User with administrative permissions.
 2. Terraform installed.
-

Using Terraform Modules to Provision AWS Infrastructure

1. Create the Terraform project.
2. Download the [modules](#) folder and copy it inside the above-created terraform project.
3. Create a *provider.tf* file inside the created terraform project.
4. Inside the *provider.tf* file, define the following:
 - terraform
 - required_providers
 - provider
 - docker
 - aws
5. The reference code is attached below.

```
terraform {  
  required_providers {  
    docker = {  
      source  = "kreuzwerker/docker"  
      version = "~> 2.20.0"  
    }  
    aws = {  
      source  = "hashicorp/aws"  
      version = "~> 5.64"  
    }  
  }  
}  
  
provider "docker" {}  
  
provider "aws" {  
  region = local.aws_region  
  // shared_config_files = ["~/.aws/config"]  
  shared_credentials_files = ["~/.aws/credentials"]  
}
```

6. The definition of *provider.tf* file is complete.
7. Create the *main.tf* file.
8. Inside *main.tf* file, call the following modules:
 - vpc
 - s3

- rds
- ecr
- load-balancer
- ecs

9. Also define the following s3 resource for uploading local .env file:

- aws_s3_object

10. The reference code is attached below.

```
module "vpc" {
  source = "../modules/aws/vpc"

  vpc-properties = local.vpc-properties
}

module "s3" {
  source = "../modules/aws/s3"

  s3-properties = local.s3-properties
}

resource "aws_s3_object" "env-file" {
  bucket = local.s3-bucket-id
  key    = "awards/env.config"
  source = "../../compose/.env"
  etag   = filemd5("../../compose/.env")
}

module "rds" {
  source = "../modules/aws/rds"

  vpc-id                = local.vpc-id
  vpc-public-subnets  = local.vpc-public-subnets
  vpc-private-subnets = local.vpc-private-subnets
  database-properties  = local.database-properties
  bastion-properties   = local.bastion-properties

  depends_on = [
    module.vpc
  ]
}

// module "ecr-repo" {
//   source      = "../modules/aws/ecr"
//   ecr-repo-name = local.ecr-repo-name
// }

module "load-balancer" {
  source = "../modules/aws/load-balancer"

  vpc-id                = local.vpc-id
  vpc-public-subnets  = local.vpc-public-subnets
  vpc-private-subnets = local.vpc-private-subnets
}
```

```
load-balancer-properties = local.load-balancer-properties
}

module "ecs" {
  source = "../modules/aws/ecs"

  vpc-id            = local.vpc-id
  vpc-public-subnets = local.vpc-public-subnets
  vpc-private-subnets = local.vpc-private-subnets
  availability-zones = local.vpc-properties.availability-zones

  // ecr-repo-url = module.ecr-repo.repository-url
  repo-url = local.repo-url

  ecs-properties            = local.ecs-properties
  ecs-container-definition = local.ecs-container-definition
  target-group-arn          = local.target-group-arn
  load-balancer-sg-id       = local.load-balancer-sg-id

  depends_on = [
    module.s3,
    module.rds
  ]
}
```

10. *main.tf* file definition is completed.

11. Now we will create *locals.tf* file.

12. Define the following variables:

- aws_region
- vpc-properties
 - availability-zones
 - vpc-cidr-block
 - vpc-subnet-count
 - vpc-public-subnet-cidr-blocks
 - vpc-private-subnet-cidr-blocks
 - vpc-tag-value
 - vpc-public-subnet-tag-value
 - vpc-private-subnet-tag-value
 - vpc-igw-tag-value
- vpc-id
- vpc-public-subnets
- vpc-private-subnets
- s3-properties
 - s3-bucket-name
 - s3-bucket-force-destroy
 - s3-bucket-versioning
- s3-bucket-id
- database-properties
 - identifier

- allocated-storage
- engine
- engine-version
- instance-class
- skip-final-snapshot
- publicly-accessible
- db-username
- db-password
- db-sg-tag-value
- db-tag-value
- bastion-properties
 - count
 - instance-type
 - bastion-host-public-key
 - bastion-host-sg-tag-value
 - bastion-host-tag-value
- ecr-repo-name
- ecr-repo-url
- repo-url
- load-balancer-properties
 - load-balancer-name
 - load-balancer-type
 - target-group-name
 - port
 - load-balancer-sg-tag-value
- ecs-properties
 - ecs-cluster-name
 - ecs-task-execution-role-name
 - ecs-task-family
 - ecs-task-name
 - ecs-container-name
 - ecs-container-port
 - s3-config-bucket
 - s3-config-path
 - ecs-service-name
 - ecs-services-sg-tag-value
- ecs-container-definition
- target-group-arn
- load-balancer-sg-id

13. The reference code is attached below.

```
locals {  
  
  aws_region = "ap-south-1"  
  
  // vpc variables
```

```
vpc-properties = {
  availability-zones = [
    "ap-south-1a",
    "ap-south-1b",
    "ap-south-1c"
  ]
  vpc-cidr-block = "10.0.0.0/16"
  vpc-subnet-count = {
    "public" = 2,
    "private" = 2
  }
  vpc-public-subnet-cidr-blocks = [
    "10.0.1.0/24",
    "10.0.2.0/24",
    "10.0.3.0/24",
    "10.0.4.0/24"
  ]
  vpc-private-subnet-cidr-blocks = [
    "10.0.101.0/24",
    "10.0.102.0/24",
    "10.0.103.0/24",
    "10.0.104.0/24"
  ]

  vpc-tag-value = ""
  vpc-public-subnet-tag-value = ""
  vpc-private-subnet-tag-value = ""
  vpc-igw-tag-value = ""
}

vpc-id = module.vpc.vpc-id
vpc-private-subnets = module.vpc.vpc-private-subnets
vpc-public-subnets = module.vpc.vpc-public-subnets

// s3 variables
s3-properties = {
  s3-bucket-name = ""
  s3-bucket-force-destroy = true
  s3-bucket-versioning = "Disabled"
}
s3-bucket-id = module.s3.s3-bucket-id

// rds variables
database-properties = {
  identifier = ""
  allocated-storage = 20
  engine = "mysql"
  engine-version = "8.0.35"
  instance-class = "db.t3.micro"
  skip-final-snapshot = true
  publicly-accessible = false

  db-username = ""
  db-password = ""
}
```

```

    db-sg-tag-value = ""
    db-tag-value    = ""
  }

  bastion-properties = {
    count                = 1
    instance-type        = "t2.micro"
    bastion-host-public-key = "~/.ssh/bastion-key.pub"

    bastion-host-sg-tag-value = ""
    bastion-host-tag-value   = ""
  }

  // ecr variables
  // ecr-repo-name = ""
  // ecr-repo-url  = module.ecr-repo.repository-url
  repo-url = ""

  // load balancer variables
  load-balancer-properties = {
    load-balancer-name = ""
    load-balancer-type = ""
    target-group-name  = ""
    port               = "${local.ecs-properties.ecs-container-port}"

    load-balancer-sg-tag-value = ""
  }

  // ecs variables
  ecs-properties = {
    ecs-cluster-name           = ""
    ecs-task-execution-role-name = ""
    ecs-task-family            = ""
    ecs-task-name              = ""
    ecs-container-name          = ""
    ecs-container-port          = ""
    s3-config-bucket            = ""
    s3-config-path              = ""
    ecs-service-name            = ""

    ecs-service-sg-tag-value = ""
  }

  ecs-container-definition = <<DEFINITION
  [
    {
      "name": "${local.ecs-properties.ecs-container-name}",
      "image": "${local.repo-url}",
      "cpu": 512,
      "memory": 1024,
      "essential": true,
      "portMappings": [
        {

```

```

        "containerPort": ${local.ecs-properties.ecs-container-port},
        "hostPort": ${local.ecs-properties.ecs-container-port}
    }
],
"environment": [
    {
        "name": "S3_CONFIG_BUCKET",
        "value": "${local.ecs-properties.s3-config-bucket}"
    },
    {
        "name": "S3_CONFIG_PATH",
        "value": "${local.ecs-properties.s3-config-path}"
    }
]
}
]
}
DEFINITION

target-group-arn    = module.load-balancer.target-group-arn
load-balancer-sg-id = module.load-balancer.load-balancer-sg-id
}

```

14. The definition of *locals.tf* file is complete.

15. Now we will create *outputs.tf* file.

16. Define the following outputs:

- DB_HOST
- bastion-host-ip

17. The reference code is attached below.

```

output "DB_HOST" {
    description = "db host address"
    value      = module.rds.DB_HOST
}

output "bastion-host-ip" {
    description = "bastion host ip address"
    value      = module.rds.bastion-host-ip
}

```

18. The definition of *outputs.tf* file is complete.

Provisioning the Infrastructure

Now we will provision the infrastructure by applying the above-created configuration files.

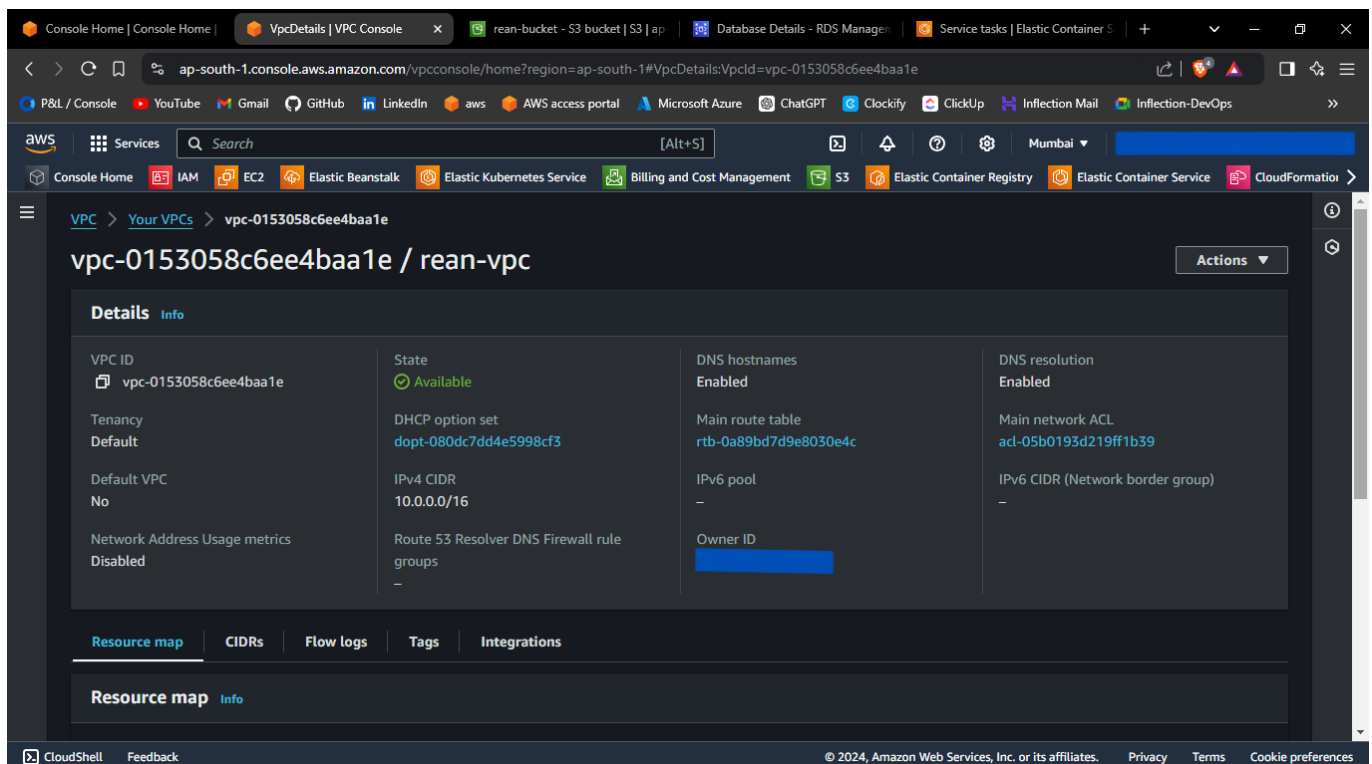
Ensure AWS CLI is configured with appropriate AWS user credentials and enough permissions.

Steps:

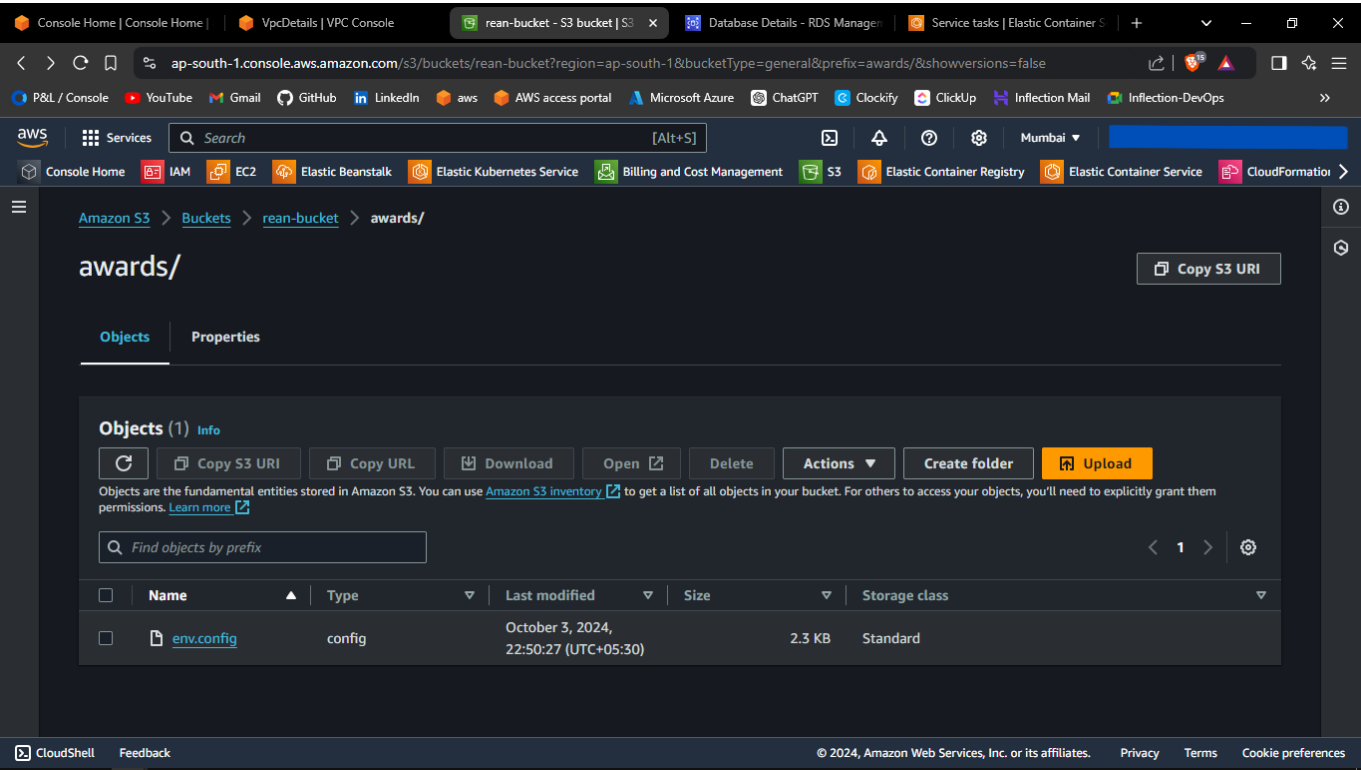
1. Open the PowerShell.
2. Change the directory to the above-created Terraform Project.
3. Run the `terraform init` command to initialize the `terraform`.
4. Run the `terraform fmt --recursive` command to format the syntax of the files.
5. Run the `terraform validate` command to validate the configuration files.
6. Run the `terraform plan` command to plan the resources to be created.
7. Run the `terraform apply` command and if prompted, type `yes` to provision the infrastructure.
8. Run the `terraform output` command to get the values of defined variables in `outputs.tf` file.
9. Head to the AWS console, and verify the created resources.
10. Then,
 - Head towards EC2 dashboard.
 - Select *Load Balancers*, and select the created load balancer.
 - Copy the DNS address.
 - Paste the address in the browser to access the application.

Screenshots of Provisioned Infrastructure

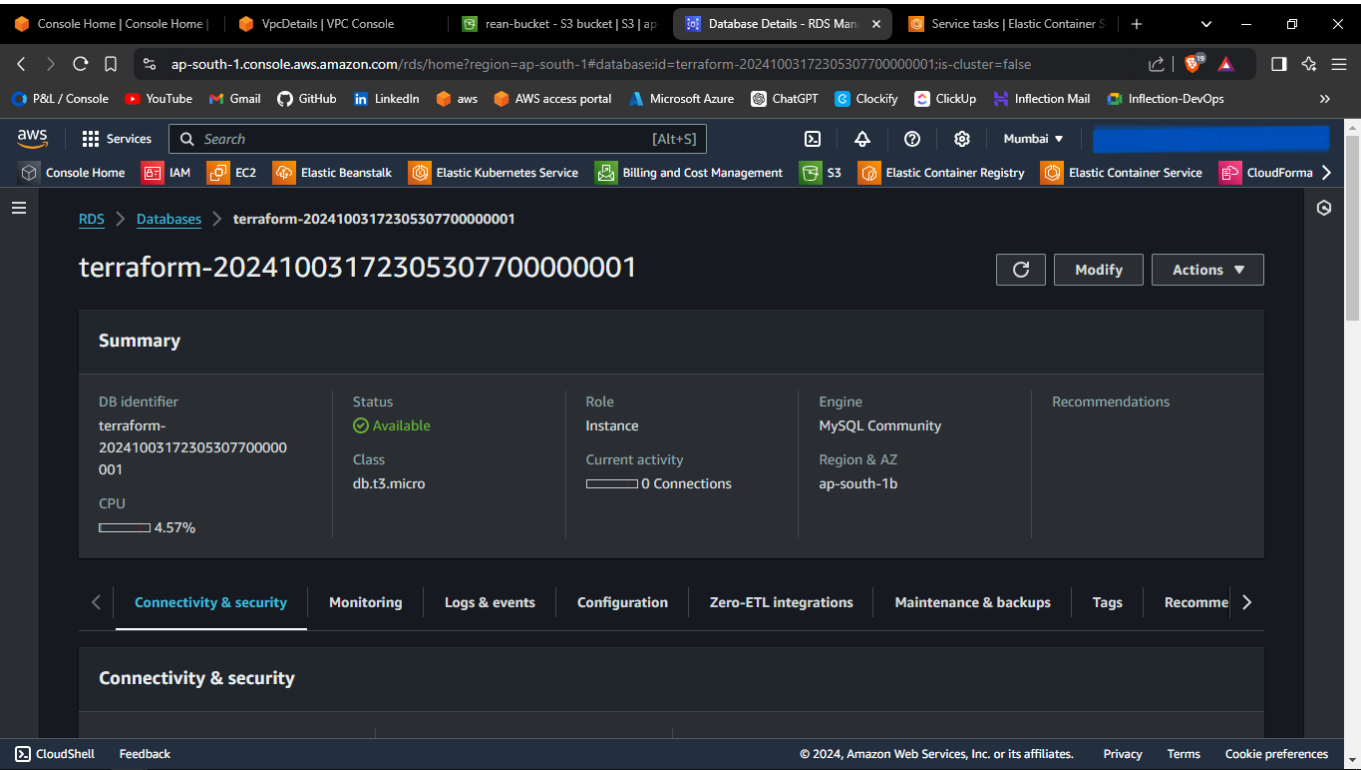
VPC Image



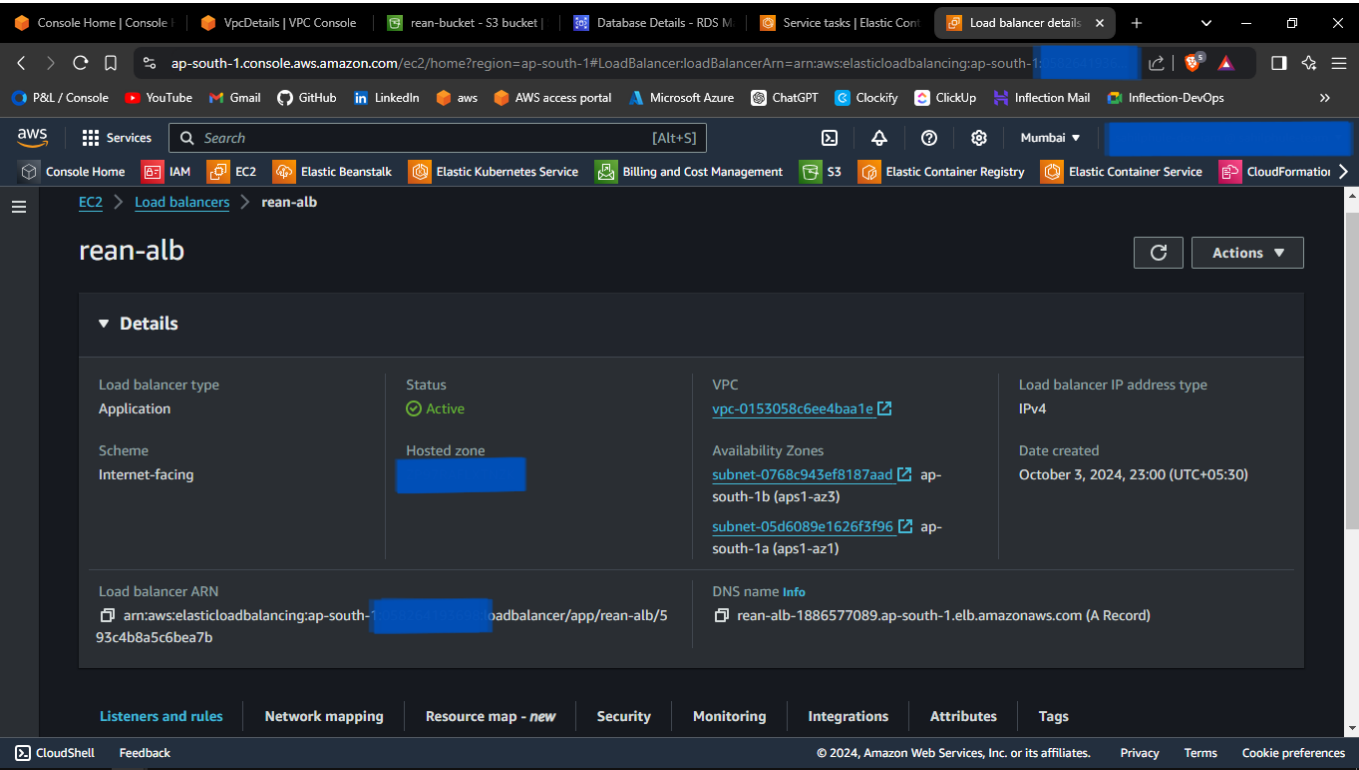
S3 Image



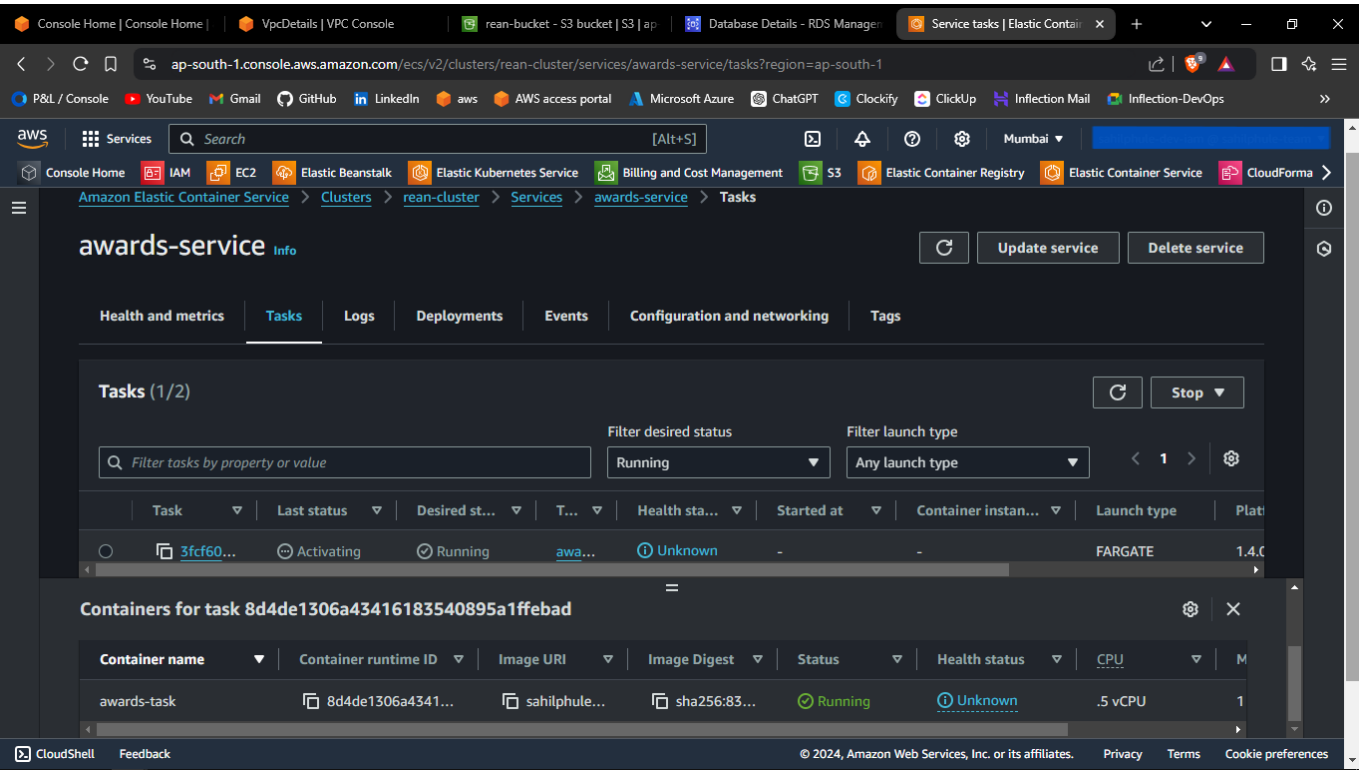
RDS Image



ALB Image



ECS Image

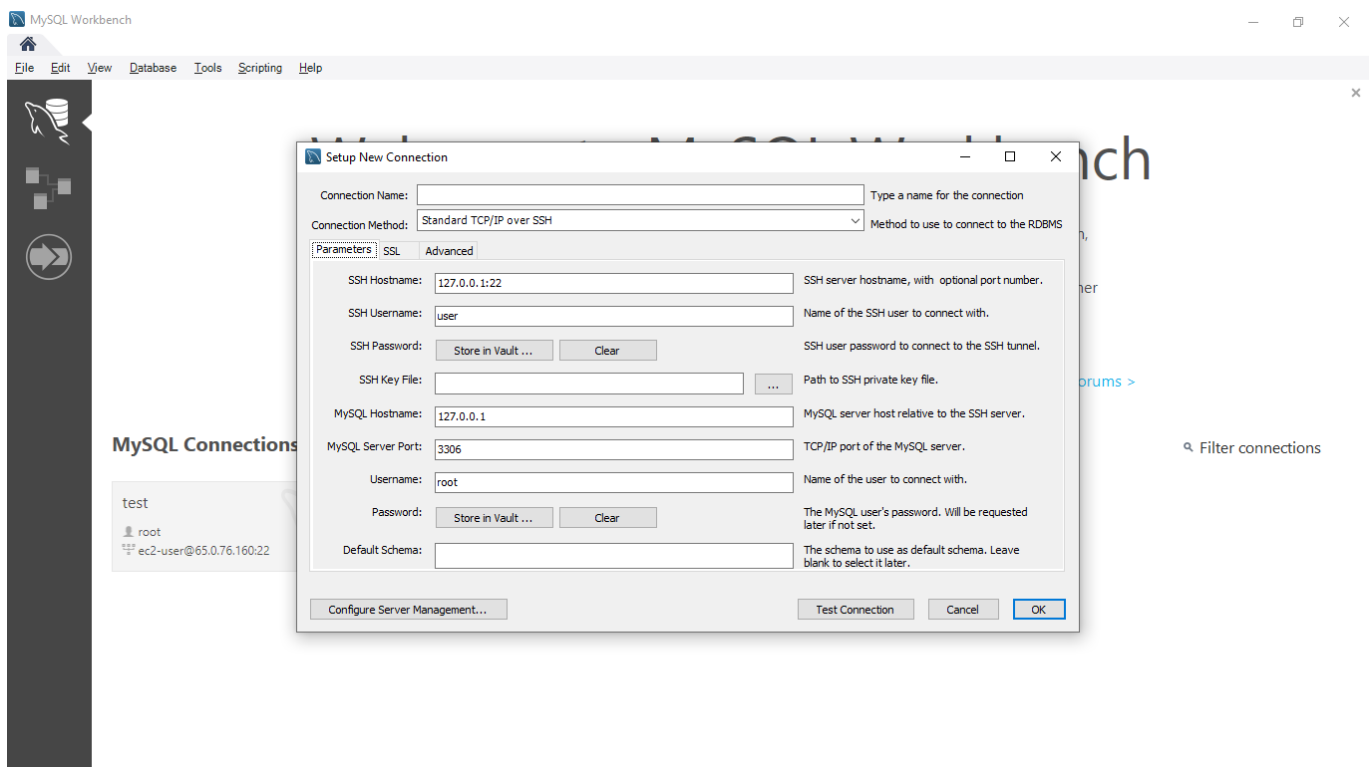


Connect to the RDS database through Bastion Host

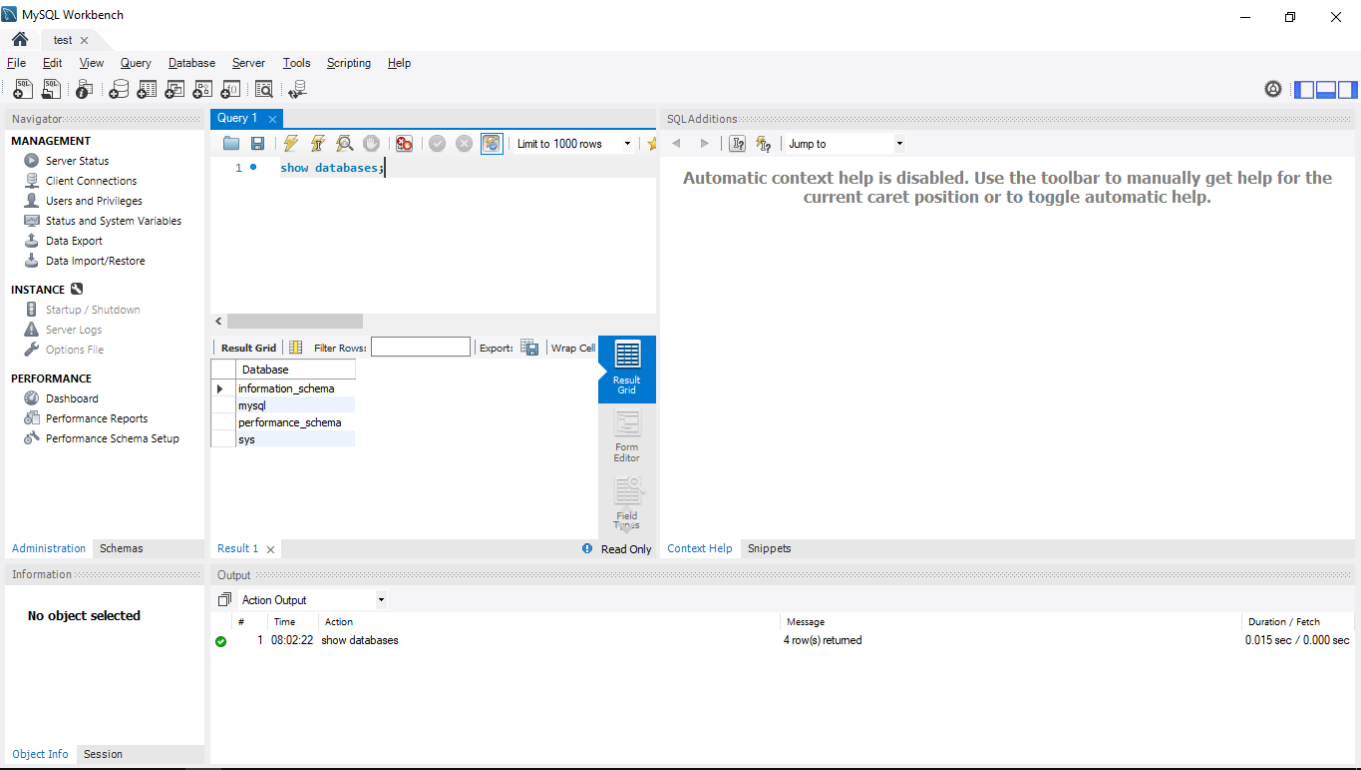
1. Open MySQL Workbench.
2. Click Add Connection.
3. Select connection method as **Standard TCP/IP over SSH**.
4. In SSH Hostname, enter *bastion-host-ip:22* where *bastion-host-ip* is received from **terraform output**.
5. In SSH Username, enter *ec2-user*.
6. In SSH Key File, select *bastion-key.pem* file passed in above *locals.tf* file from your local computer.
7. In MySQL Hostname, enter *DB_HOST* where *DB_HOST* is received from **terraform output**.
8. In the Password section, select *Store in Vault*, and enter the password passed in above-created *locals.tf* file.
9. Click *OK* and open the connection.
10. Now you can run `mysql` commands to access databases, and verify the successful connection of *ecs-container*.

Screenshots of MySQL Workbench

Connection Page



Commands Page



Destroy the provisioned infrastructure

1. To destroy infrastructure, change directory to the above created Terraform Project.
2. Run `terraform destroy` & if prompted, type `yes`.
3. Infrastructure will be destroyed.