Case Study : CloudFormation

Problem Statement:

You work for XYZ Corporation. Your corporation wants to launch a new

web-based application. The development team has prepared the code but it is

not tested yet. The development team needs the system admins to build a web

server to test the code but the system admins are not available.

Tasks To Be Performed:

1. Web tier: Launch an instance in a public subnet and that instance should allow HTTP and SSH from the internet.
2. Application tier: Launch an instance in a private subnet of the web tier and it should allow only SSH from the public subnet of Web Tier-3.
3. DB tier: Launch an RDS MYSQL instance in a private subnet and it should allow connection on port 3306 only from the private subnet of Application Tier-4.
4. Setup a Route 53 hosted zone and direct traffic to the EC2 instance.

You have been also asked to propose a solution so that:

1. Development team can test their code without having to involve the system admins and can invest their time in testing the code rather than provisioning, configuring and updating the resources needed to test the code.
2. Make sure when the development team deletes the stack, RDS DB instances should not be deleted.

Given below code is to create the resources

```
AWSTemplateFormatVersion: 2010-09-09
Parameters:
  InstanceTypeParameter:
    Type: String
    Default: t2.micro
    Description: Enter instance size. Default is t2.micro.
  AMI:
    Type: String
    Default: ami-066784287e358dad1  #change the ami id
    Description: The Ubuntu AMI to use.
  Key:
    Type: AWS::EC2::KeyPair::KeyName
    Description: Select from Existing Keys.

  MasterUsername:
    Type: String
    Description: The username for the database.

  MasterUserPassword:
    Type: String
    Description: The password for the database.
    "NoEcho": true

Resources:
```

```yaml
VPC:
  Type: AWS::EC2::VPC
  Properties:
    CidrBlock: 10.10.0.0/16
    EnableDnsSupport: true
    EnableDnsHostnames: true
    InstanceTenancy: default
    Tags:
      - Key: Name
        Value: VPCAssessment
InternetGateway:
  Type: AWS::EC2::InternetGateway
  Properties:
    Tags:
      - Key: Name
        Value: InternetGatewayAssessment
VPCGatewayAttachment:
  Type: AWS::EC2::VPCGatewayAttachment
  Properties:
    VpcId: !Ref VPC
    InternetGatewayId: !Ref InternetGateway

#Public Subnet
SubnetA:
  Type: AWS::EC2::Subnet
  Properties:
```

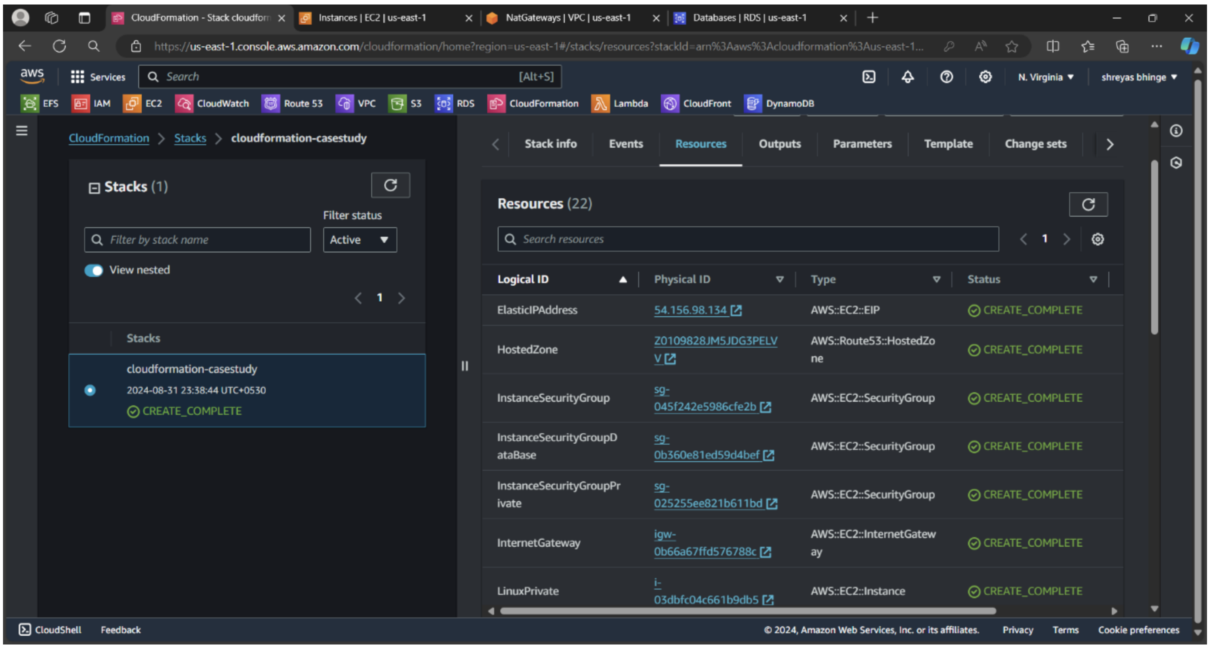
```
  VpcId: !Ref VPC
  CidrBlock: 10.10.1.0/24
  MapPublicIpOnLaunch: true
  Tags:
   - Key: Name
    Value: PublicSubnetAssessment
PublicRouteTable:
 Type: AWS::EC2::RouteTable
 Properties:
  VpcId: !Ref VPC
  Tags:
   - Key: Name
    Value: RouteTablePublicSubnet
PublicInternetRoute:
 Type: AWS::EC2::Route
 DependsOn: VPCGatewayAttachment
 Properties:
  DestinationCidrBlock: 0.0.0.0/0
  GatewayId: !Ref InternetGateway
  RouteTableId: !Ref PublicRouteTable
SubnetARouteTableAssociation:
 Type: AWS::EC2::SubnetRouteTableAssociation
 Properties:
  RouteTableId: !Ref PublicRouteTable
  SubnetId: !Ref SubnetA
```

```
#Private Subnet
SubnetB:
  Type: AWS::EC2::Subnet
  Properties:
    VpcId: !Ref VPC
    CidrBlock: 10.10.2.0/24
    MapPublicIpOnLaunch: false
    Tags:
      - Key: Name
        Value: PrivateSubnetAssessment

# A NAT Gateway:
NATGateway:
 Type: AWS::EC2::NatGateway
 Properties:
   AllocationId: !GetAtt ElasticIPAddress.AllocationId
   SubnetId: !Ref SubnetA
   Tags:
   - Key: Name
     Value: NatGetwayAssessment
ElasticIPAddress:
  Type: AWS::EC2::EIP
  Properties:
    Domain: VPC

RouteTablePrivate:
  Type: AWS::EC2::RouteTable
  Properties:
    VpcId: !Ref VPC
    Tags:
      - Key: Name
        Value: RouteTablePrivateSubnet
NATRoute:
  DependsOn: NATGateway
  Type: AWS::EC2::Route
  Properties:
    RouteTableId: !Ref RouteTablePrivate
    DestinationCidrBlock: 0.0.0.0/0
    NatGatewayId: !Ref NATGateway

SubnetBRouteTableAssociationPrivate:
  Type: AWS::EC2::SubnetRouteTableAssociation
  Properties:
    RouteTableId: !Ref RouteTablePrivate
    SubnetId: !Ref SubnetB

InstanceSecurityGroup:
  Type: AWS::EC2::SecurityGroup
  Properties:
    GroupName: "Internet Group"
    GroupDescription: "SSH and web traffic in, all traffic out."
    VpcId: !Ref VPC
```

```yaml
      SecurityGroupIngress:
        - IpProtocol: tcp
          FromPort: '22'
          ToPort: '22'
          CidrIp:  0.0.0.0/0
        - IpProtocol: tcp
          FromPort: '80'
          ToPort: '80'
          CidrIp:  0.0.0.0/0
      SecurityGroupEgress:
        - IpProtocol: -1
          CidrIp: 0.0.0.0/0

  InstanceSecurityGroupPrivate:
    Type: AWS::EC2::SecurityGroup
    Properties:
      GroupName: "Security Group Private"
      GroupDescription: "SSH from the Public Subnet"
      VpcId: !Ref VPC
      SecurityGroupIngress:
        - IpProtocol: tcp
          FromPort: '22'
          ToPort: '22'
          CidrIp:  10.10.1.0/24
      SecurityGroupEgress:
        - IpProtocol: -1
```

```
          CidrIp: 0.0.0.0/0

  InstanceSecurityGroupDataBase:
    Type: "AWS::EC2::SecurityGroup"
    Properties:
      GroupDescription: "Database instances security group"
      VpcId: !Ref VPC
      SecurityGroupIngress:
          - IpProtocol: tcp
            CidrIp: 10.10.2.0/24
            FromPort: 3306
            ToPort: 3306
      SecurityGroupEgress:
          - IpProtocol: -1
            CidrIp: 0.0.0.0/0

  RDSDBSubnetGroup:
    Type: "AWS::RDS::DBSubnetGroup"
    Properties:
        DBSubnetGroupDescription: "Subnet Group for mySQL database"
        DBSubnetGroupName: !Sub "${AWS::Region}-aws-database-subnet-group14"
        SubnetIds:
          - !Ref SubnetA
          - !Ref SubnetB
        Tags:
          - Key: Name
            Value: DBSubnetGroup

  RDSDBInstance:
        Type: AWS::RDS::DBInstance
        Properties:
            DBInstanceIdentifier: DBAssessment12
            AllocatedStorage: 20
            DBInstanceClass: db.t3.micro
            Engine: "MYSQL"
            MasterUsername: !Ref MasterUsername
            MasterUserPassword: !Ref MasterUserPassword
            MultiAZ: false
            EngineVersion: 8.0.35
            AutoMinorVersionUpgrade: true
            PubliclyAccessible: false
            StorageType: gp2
            Port: 3306
            StorageEncrypted: false
            CopyTagsToSnapshot: true
            EnableIAMDatabaseAuthentication: false
            DeletionProtection: true
            DBSubnetGroupName: !Ref RDSDBSubnetGroup
            VPCSecurityGroups:
              - !Ref InstanceSecurityGroupDataBase
            MaxAllocatedStorage: 1000
            Tags:
              - Key: Name
                Value: DBAssessment
              - Key: createdBy
                Value: Igor Silva
              - Key: Project
                Value: AssessmentModule7
              - Key: Environment
                Value: Prod

  LinuxPublic:
    Type: 'AWS::EC2::Instance'
    Properties:
      SubnetId: !Ref SubnetA
      ImageId: !Ref AMI
      InstanceType: !Ref InstanceTypeParameter
      KeyName: !Ref Key
      SecurityGroupIds:
        - Ref: InstanceSecurityGroup
      Tags:
        - Key: Name
          Value: LinuxPublic

  LinuxPrivate:
    Type: 'AWS::EC2::Instance'
    Properties:
      SubnetId: !Ref SubnetB
    ImageId: !Ref AMI
    InstanceType: !Ref InstanceTypeParameter
    KeyName: !Ref Key
    SecurityGroupIds:
     - Ref: InstanceSecurityGroupPrivate
    Tags:
    - Key: Name
     Value: LinuxPrivate

  HostedZone:
   Type: AWS::Route53::HostedZone
   Properties:
    HostedZoneConfig:
     Comment: ''
    Name: newpracticedomain.ml

  MyDNSRecord:
   Type: AWS::Route53::RecordSet
   Properties:
    HostedZoneId: !Ref HostedZone
    Name: www.newpracticedomain.ml.
    Type: A
    TTL: 300
    ResourceRecords:
    - !GetAtt LinuxPublic.PublicIp
```

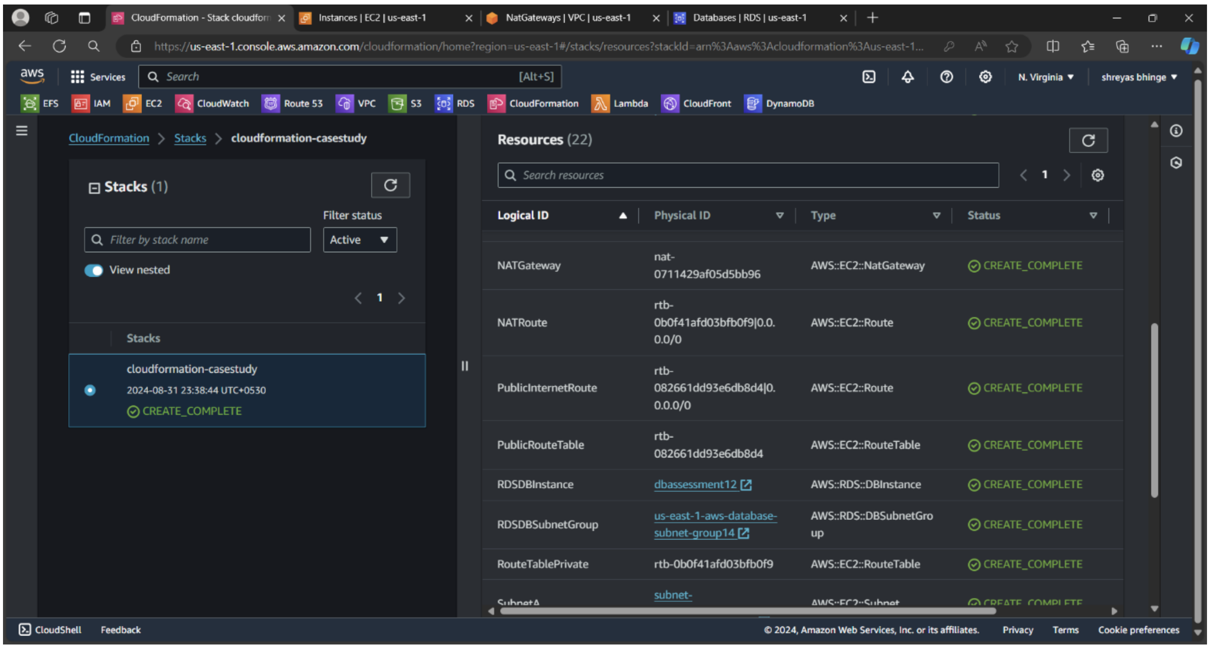
```
Outputs:
  PublicIp:
   Description: Server's PublicIp Address
   Value:
     Fn::GetAtt:
       - LinuxPublic
       - PublicIp
  HostedZoneID:
    Description: The ID of the Hosted Zone.
    Value:
      Ref: HostedZone
```



cloudformation-casestudy
2024-08-31 23:38:44 UTC+0530
CREATE_COMPLETE

Resources (22)

Logical ID	Physical ID	Type	Status
ElasticIPAddress	54.156.98.134	AWS::EC2::EIP	CREATE_COMPLETE
HostedZone	Z0109828JM5JDG3PELVV	AWS::Route53::HostedZone	CREATE_COMPLETE
InstanceSecurityGroup	sg-045f242e5986cfe2b	AWS::EC2::SecurityGroup	CREATE_COMPLETE
InstanceSecurityGroupDataBase	sg-0b360e81ed59d4bef	AWS::EC2::SecurityGroup	CREATE_COMPLETE
InstanceSecurityGroupPrivate	sg-025255ee821b611bd	AWS::EC2::SecurityGroup	CREATE_COMPLETE
InternetGateway	igw-0b66a67ffd576788c	AWS::EC2::InternetGateway	CREATE_COMPLETE
LinuxPrivate	i-03dbfc04c661b9db5	AWS::EC2::Instance	CREATE_COMPLETE


CloudFormation - Stack cloudfor
Instances | EC2 | us-east-1
NatGateways | VPC | us-east-1
Databases | RDS | us-east-1
https://us-east-1.console.aws.amazon.com/cloudformation/home?region=us-east-1#/stacks/resources?stackId=arn%3Aaws%3Acloudformation%3Aus-east-1...
Services
Search
[Alt+S]
N. Virginia
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EFS
IAM
EC2
CloudWatch
Route 53
VPC
S3
RDS
CloudFormation
Lambda
CloudFront
DynamoDB
CloudFormation > Stacks > cloudformation-casestudy
Stacks (1)
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Resources (22)
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Stacks
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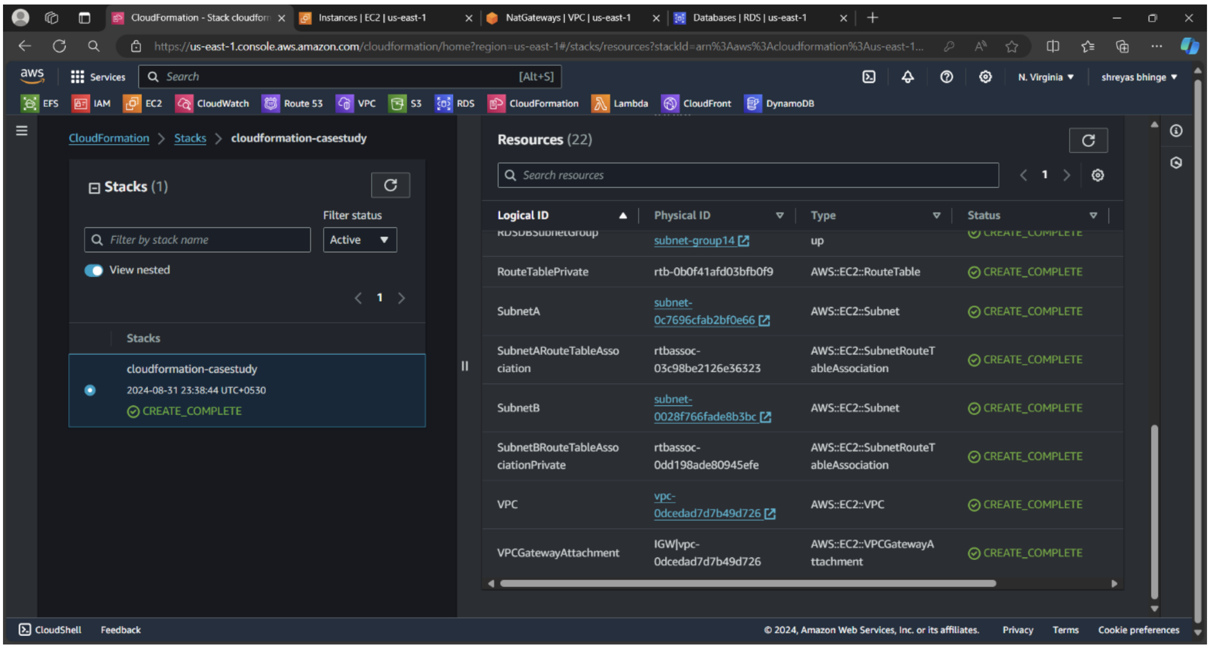
Logical ID	Physical ID	Type	Status
NATGateway	nat-0711429af05d5bb96	AWS::EC2::NatGateway	✓ CREATE_COMPLETE
NATRoute	rtb-0b0f41afd03bfb0f9|0.0.0.0/0	AWS::EC2::Route	✓ CREATE_COMPLETE
PublicInternetRoute	rtb-082661dd93e6db8d4|0.0.0.0/0	AWS::EC2::Route	✓ CREATE_COMPLETE
PublicRouteTable	rtb-082661dd93e6db8d4	AWS::EC2::RouteTable	✓ CREATE_COMPLETE
RDSDBInstance	dbassessment12	AWS::RDS::DBInstance	✓ CREATE_COMPLETE
RDSDBSubnetGroup	us-east-1-aws-database-subnet-group14	AWS::RDS::DBSubnetGroup	✓ CREATE_COMPLETE
RouteTablePrivate	rtb-0b0f41afd03bfb0f9	AWS::EC2::RouteTable	✓ CREATE_COMPLETE
SubnetA	subnet-	AWS::EC2::Subnet	✓ CREATE_COMPLETE


CloudFormation - Stack cloudfor
Instances | EC2 | us-east-1
NatGateways | VPC | us-east-1
Databases | RDS | us-east-1
https://us-east-1.console.aws.amazon.com/cloudformation/home?region=us-east-1#/stacks/resources?stackId=arn%3Aaws%3Acloudformation%3Aus-east-1...
Services
Search
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EFS
IAM
EC2
CloudWatch
Route 53
VPC
S3
RDS
CloudFormation
Lambda
CloudFront
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CloudFormation > Stacks > cloudformation-casestudy
Stacks (1)
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Filter by stack name
Active
View nested
Resources (22)
Search resources
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Stacks
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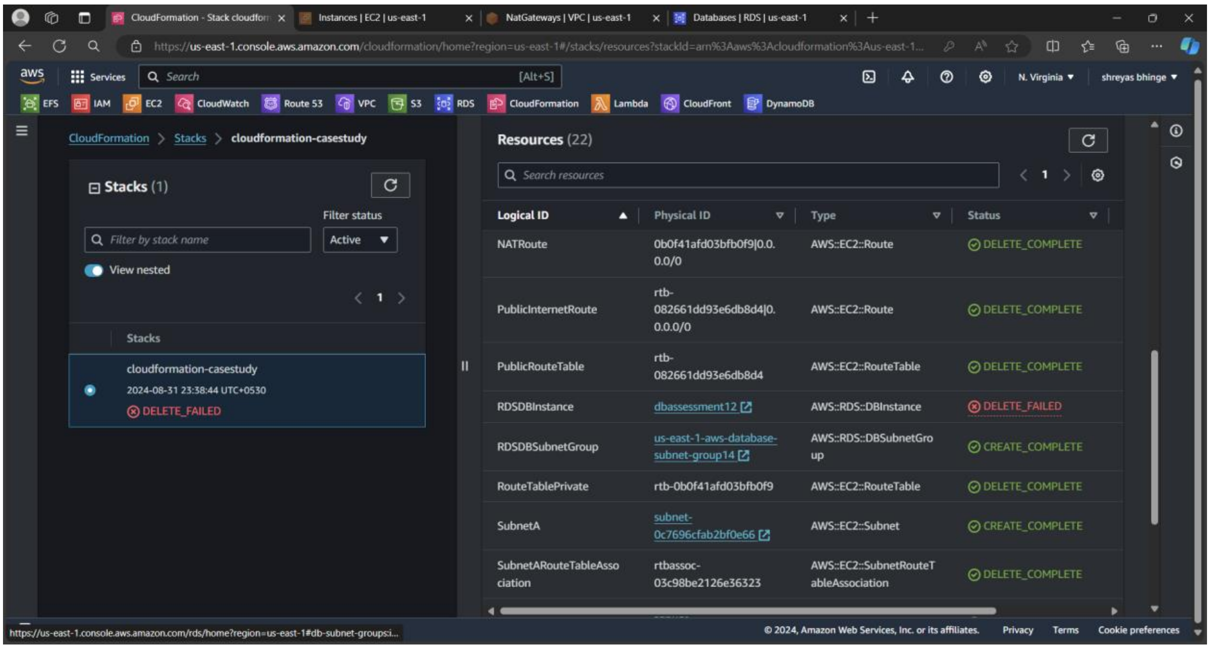
Logical ID	Physical ID	Type	Status
RDSDBSubnetGroup	subnet-group14	up	✓ CREATE_COMPLETE
RouteTablePrivate	rtb-0b0f41afd03bfb0f9	AWS::EC2::RouteTable	✓ CREATE_COMPLETE
SubnetA	subnet-0c7696cfab2bf0e66	AWS::EC2::Subnet	✓ CREATE_COMPLETE
SubnetARouteTableAssociation	rtbassoc-03c98be2126e36323	AWS::EC2::SubnetRouteTableAssociation	✓ CREATE_COMPLETE
SubnetB	subnet-0028f766fade8b3bc	AWS::EC2::Subnet	✓ CREATE_COMPLETE
SubnetBRouteTableAssociationPrivate	rtbassoc-0dd198ade80945efe	AWS::EC2::SubnetRouteTableAssociation	✓ CREATE_COMPLETE
VPC	vpc-0dcedad7d7b49d726	AWS::EC2::VPC	✓ CREATE_COMPLETE
VPCGatewayAttachment	IGW|vpc-0dcedad7d7b49d726	AWS::EC2::VPCGatewayAttachment	✓ CREATE_COMPLETE

After Deleting stack



CloudFormation - Stack cloudfor
Instances | EC2 | us-east-1
NatGateways | VPC | us-east-1
Databases | RDS | us-east-1
https://us-east-1.console.aws.amazon.com/cloudformation/home?region=us-east-1#/stacks/resources?stackId=arn%3Aaws%3Acloudformation%3Aus-east-1...
Services
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CloudFormation > Stacks > cloudformation-casestudy
Stacks (1)
Filter status
Filter by stack name
Active
View nested
1
Stacks
Search resources
1
https://us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#db-subnet-groups:i...
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Stacks
● cloudformation-casestudy 2024-08-31 23:38:44 UTC+0530 ⊗ DELETE_FAILED

Resources (22)

Logical ID	Physical ID	Type	Status
NATRoute	0b0f41afd03bfb0f9|0.0.0.0/0	AWS::EC2::Route	✓ DELETE_COMPLETE
PublicInternetRoute	rtb-082661dd93e6db8d4|0.0.0.0/0	AWS::EC2::Route	✓ DELETE_COMPLETE
PublicRouteTable	rtb-082661dd93e6db8d4	AWS::EC2::RouteTable	✓ DELETE_COMPLETE
RDSDBInstance	dbassessment12	AWS::RDS::DBInstance	⊗ DELETE_FAILED
RDSDBSubnetGroup	us-east-1-aws-database-subnet-group14	AWS::RDS::DBSubnetGroup	✓ CREATE_COMPLETE
RouteTablePrivate	rtb-0b0f41afd03bfb0f9	AWS::EC2::RouteTable	✓ DELETE_COMPLETE
SubnetA	subnet-0c7696cfab2bf0e66	AWS::EC2::Subnet	✓ CREATE_COMPLETE
SubnetARouteTableAssociation	rtbassoc-03c98be2126e36323	AWS::EC2::SubnetRouteTableAssociation	✓ DELETE_COMPLETE

The RDSDB has not been Deleted as mention in template