

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.

Step-By-Step Procedure:

Step1:Using **AWS CloudFormation**, we create a **multi-tier EC2 architecture**. First, write the template in any **code editor** and save the file. The code below represents the **CloudFormation template used for this assignment**.

Casestudy template.yml

AWSTemplateFormatVersion: '2010-09-09'

Parameters:

Amild:

Type: String

Description: "AMI ID for the EC2 instance"

KeyName:

Type: 'AWS::EC2::KeyPair::KeyName'

Description: "Name of an existing EC2 KeyPair to enable SSH access."

DBName:
 Type: String
 Default: "testdb"
 Description: "The name of the database to be created in the RDS instance."

DBUser:
 Type: String
 Default: "dbadmin"
 Description: "The database admin account username."

DBPassword:
 Type: String
 Description: "The database admin account password (must be at least 8 chars)."
 MinLength: 8

Resources:

MyVPC:
 Type: AWS::EC2::VPC
Properties:
 CidrBlock: 10.0.0.0/16
 EnableDnsSupport: true
 EnableDnsHostnames: true
 Tags: [{Key: Name, Value: Dev-VPC}]

InternetGateway:
 Type: AWS::EC2::InternetGateway

VPCGatewayAttachment:
 Type: AWS::EC2::VPCGatewayAttachment
Properties:
 VpcId: !Ref MyVPC
 InternetGatewayId: !Ref InternetGateway

PublicSubnetWeb:
 Type: AWS::EC2::Subnet
Properties:
 VpcId: !Ref MyVPC

```
CidrBlock: 10.0.1.0/24
AvailabilityZone: !Select [ 0, !GetAZs " " ]
MapPublicIpOnLaunch: true
Tags: [{Key: Name, Value: Web-Tier-Public}]
```

```
PrivateSubnetApp:
Type: AWS::EC2::Subnet
Properties:
  VpcId: !Ref MyVPC
  CidrBlock: 10.0.2.0/24
  AvailabilityZone: !Select [ 0, !GetAZs " " ]
  Tags: [{Key: Name, Value: App-Tier-Private}]
```

```
PrivateSubnetDB:
Type: AWS::EC2::Subnet
Properties:
  VpcId: !Ref MyVPC
  CidrBlock: 10.0.3.0/24
  AvailabilityZone: !Select [ 1, !GetAZs " " ] # Different AZ for RDS High
  Availability
  Tags: [{Key: Name, Value: DB-Tier-Private}]
```

```
MyDBSubnetGroup:
Type: AWS::RDS::DBSubnetGroup
Properties:
  DBSubnetGroupDescription: Subnets for RDS Instance
  SubnetIds:
    - !Ref PrivateSubnetApp
    - !Ref PrivateSubnetDB
```

```
PublicRouteTable:
Type: AWS::EC2::RouteTable
Properties:
  VpcId: !Ref MyVPC
```

```
DefaultPublicRoute:
Type: AWS::EC2::Route
```

DependsOn: VPCGatewayAttachment

Properties:

RouteTableId: !Ref PublicRouteTable

DestinationCidrBlock: 0.0.0.0/0

GatewayId: !Ref InternetGateway

PublicSubnetRouteAssociation:

Type: AWS::EC2::SubnetRouteTableAssociation

Properties:

SubnetId: !Ref PublicSubnetWeb

RouteTableId: !Ref PublicRouteTable

WebSecurityGroup:

Type: AWS::EC2::SecurityGroup

Properties:

GroupDescription: Allow HTTP and SSH from Internet

VpcId: !Ref MyVPC

 SecurityGroupIngress:

 - **IpProtocol:** tcp

FromPort: 80

ToPort: 80

CidrIp: 0.0.0.0/0

 - **IpProtocol:** tcp

FromPort: 22

ToPort: 22

CidrIp: 0.0.0.0/0

AppSecurityGroup:

Type: AWS::EC2::SecurityGroup

Properties:

GroupDescription: Allow SSH only from Web Tier

VpcId: !Ref MyVPC

 SecurityGroupIngress:

 - **IpProtocol:** tcp

FromPort: 22

ToPort: 22

SourceSecurityGroupId: !Ref WebSecurityGroup

DBSecurityGroup:

Type: AWS::EC2::SecurityGroup

Properties:

GroupDescription: Allow MySQL from App Tier

VpcId: !Ref MyVPC

SecurityGroupIngress:

- IpProtocol: tcp

FromPort: 3306

ToPort: 3306

SourceSecurityGroupId: !Ref AppSecurityGroup

WebInstance:

Type: AWS::EC2::Instance

Properties:

ImageId: !Ref Amild

KeyName: !Ref KeyName

InstanceType: t2.micro

SubnetId: !Ref PublicSubnetWeb

SecurityGroupIds: [!Ref WebSecurityGroup]

AppInstance:

Type: AWS::EC2::Instance

Properties:

ImageId: !Ref Amild

KeyName: !Ref KeyName

InstanceType: t2.micro

SubnetId: !Ref PrivateSubnetApp

SecurityGroupIds: [!Ref AppSecurityGroup]

RDSInstance:

Type: AWS::RDS::DBInstance

DeletionPolicy: Retain

Properties:

DBName: !Ref DBName

MasterUsername: !Ref DBUser

MasterUserPassword: !Ref DBPassword

DBSubnetGroupName: !Ref MyDBSubnetGroup

AllocatedStorage: '20'

DBInstanceClass: db.t3.micro
Engine: mysql
VPCSecurityGroups: [!Ref DBSecurityGroup]

Outputs:

WebPublicIP:

Description: "Public IP address of the Web Instance"
Value: !GetAtt WebInstance.PublicIp

AppPrivateIP:

Description: "Private IP address of the App Instance"
Value: !GetAtt AppInstance.PrivateIp

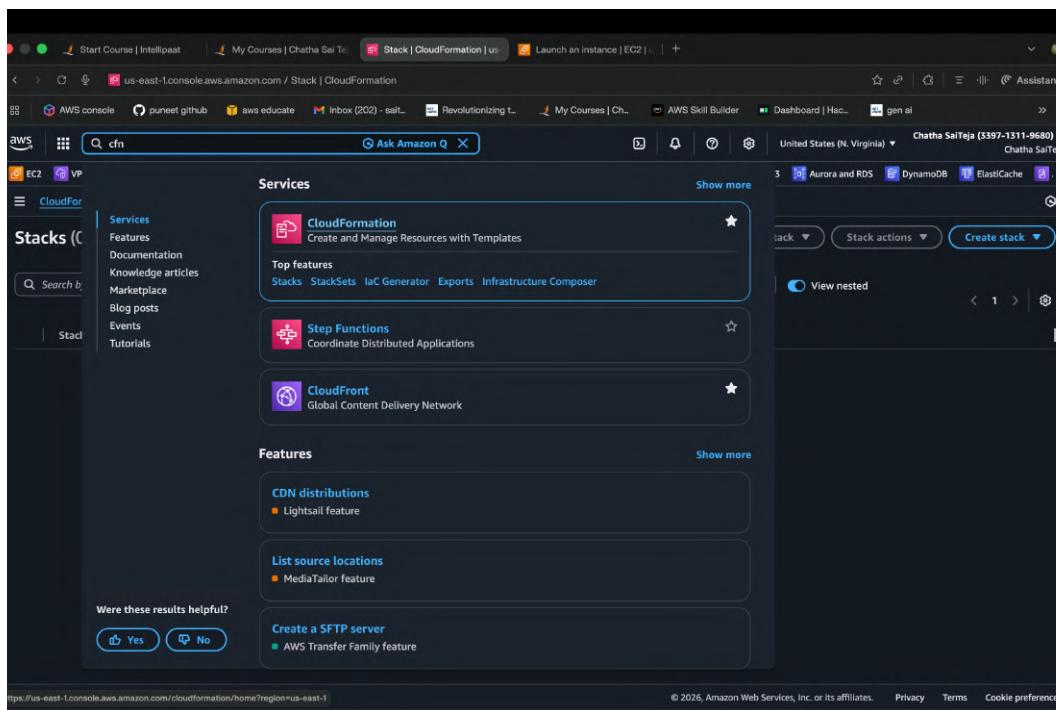
RDSEndpoint:

Description: "The connection endpoint for the RDS Database"
Value: !GetAtt RDSDInstance.Endpoint.Address

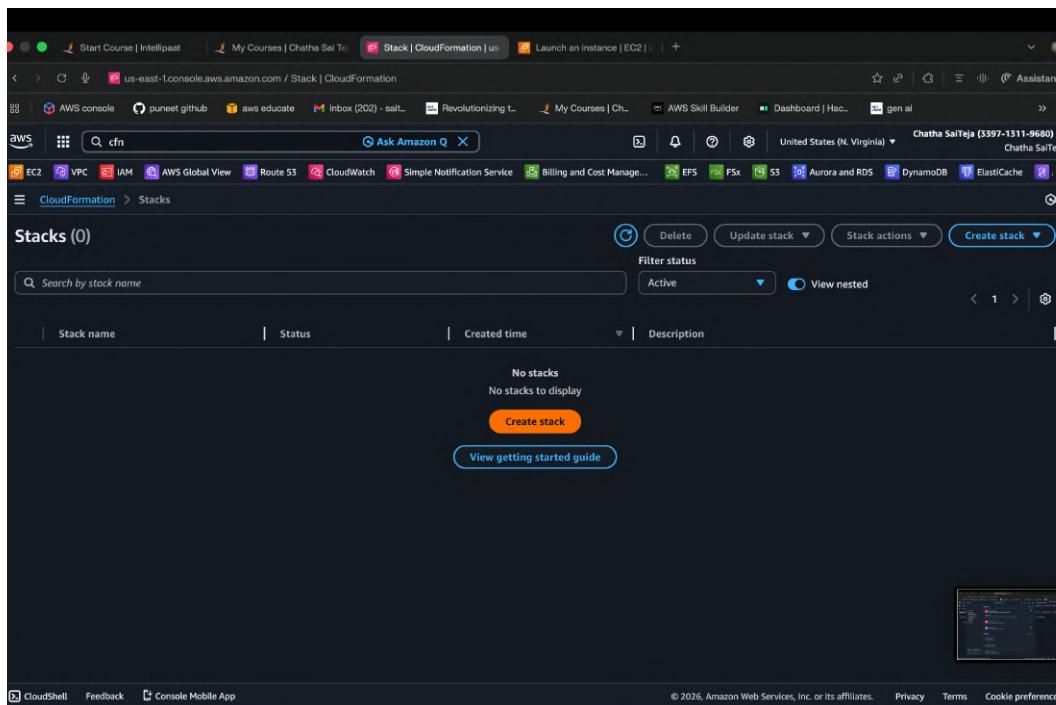
Step 2:- Save the file, open the **CloudFormation console**, and click **Create stack**. Upload the template, click **Next**, specify stack name and give inputs in parameters section ,ignore the optional steps, and select **Create stack**. It takes a few minutes to provision the stack. Once completed, **verify the created resources** in the stack.

```
casestudy_template.yml
1 AWSTemplateFormatVersion: '2010-09-09'
2
3 Parameters:
4   Amild:
5     Type: String
6     Description: "AMI ID for the EC2 instance"
7
8   KeyName:
9     Type: 'AWS::EC2::KeyPair::KeyName'
10    Description: "Name of an existing EC2 KeyPair to enable SSH access."
11
12  DBName:
13    Type: String
14    Default: "testdb"
15    Description: "The name of the database to be created in the RDS instance."
16
17  DBUser:
18    Type: String
19    Default: "dbadmin"
20    Description: "The database admin account username."
21
22  DBPassword:
23    Type: String
24    Description: "The database admin account password (must be at least 8 chars)."
25    MinLength: 8
26
27 Resources:
28   MyVPC:
29     Type: AWS::EC2::VPC
30     Properties:
31       CidrBlock: 10.0.0.0/16
32       EnableDnsSupport: true
33       EnableDnsHostnames: true
34     Tags: [{Key: Name, Value: Dev-VPC}]
35
36 InternetGateway:
```

Save the file



Open cloud formation in console



Click on create stack

Prerequisite - Prepare template

You can also create a template by scanning your existing resources in the [IaC generator](#).

Prepare template

Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.

Choose an existing template
Upload or choose an existing template.

Build from Infrastructure Composer
Create a template using a visual builder.

Specify template [Info](#)

This [GitHub repository](#) contains sample CloudFormation templates that can help you get started on new infrastructure projects. [Learn more](#)

Template source

Selecting a template generates an Amazon S3 URL where it will be stored. A template is a JSON or YAML file that describes your stack's resources and properties.

Amazon S3 URL
Provide an Amazon S3 URL to your template.

Upload a template file
Upload your template directly to the console.

Sync from Git
Sync a template from your Git repository.

Upload a template file

JSON or YAML formatted file

S3 URL: Will be generated when template file is uploaded

View in Infrastructure Composer

Cancel Next

Click on upload template file

Assignment - CloudFormat...

casestudy_template.yaml

Today

	Size	Kind	Date Added
5 KB	YAML		Today at 3:21PM
155 KB	PDF Document		15 Dec 2025 at 6:38PM
150 KB	PDF Document		15 Dec 2025 at 6:38PM
150 KB	PDF Document		15 Dec 2025 at 6:38PM

Shared

Favorites

Appli...

Desktop...

Docu...

Down...

Movies

Music

Pictur...

Locations

iCloud...

OneD...

chath...

Teja's...

Cu...

Tags

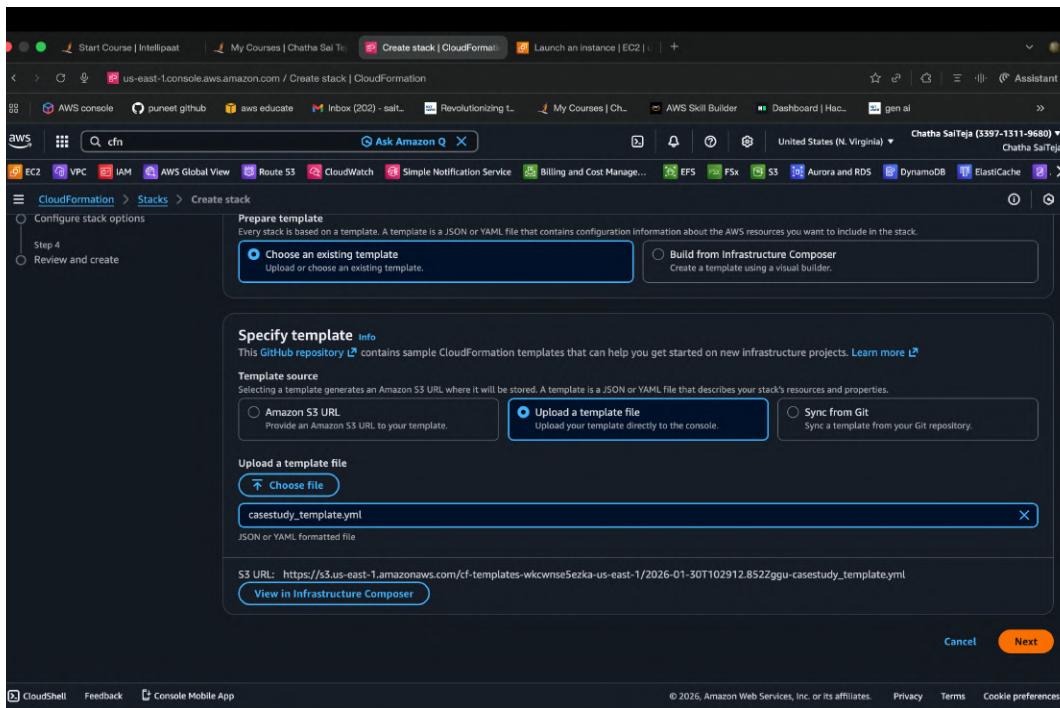
Red

Orange

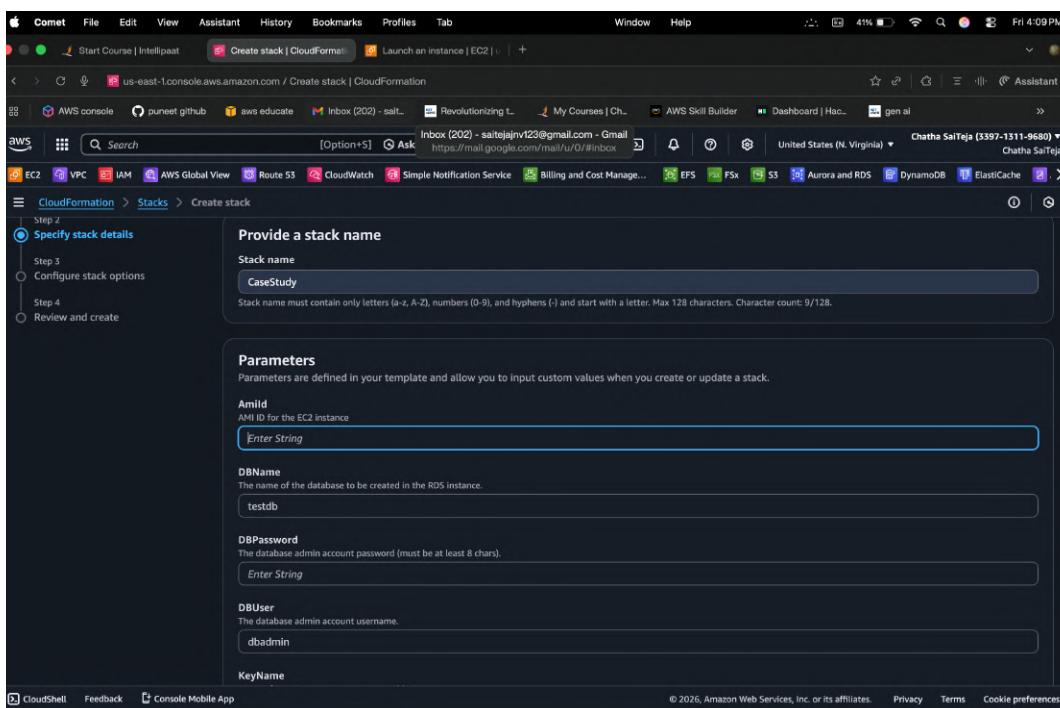
Yellow

Cancel Open

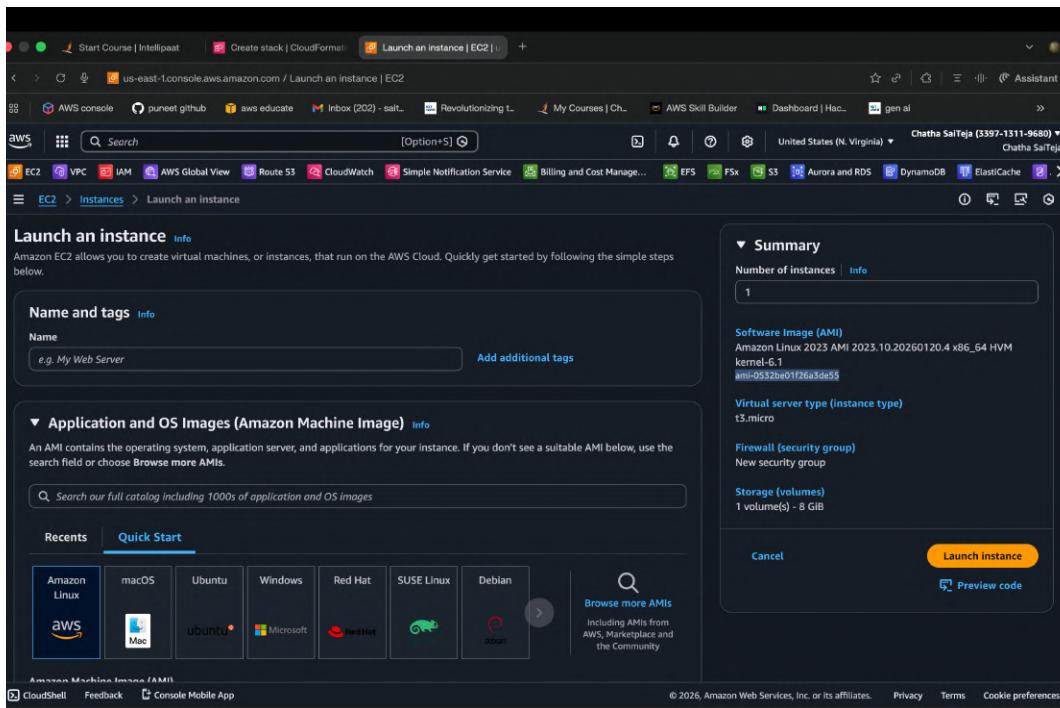
Choose the file



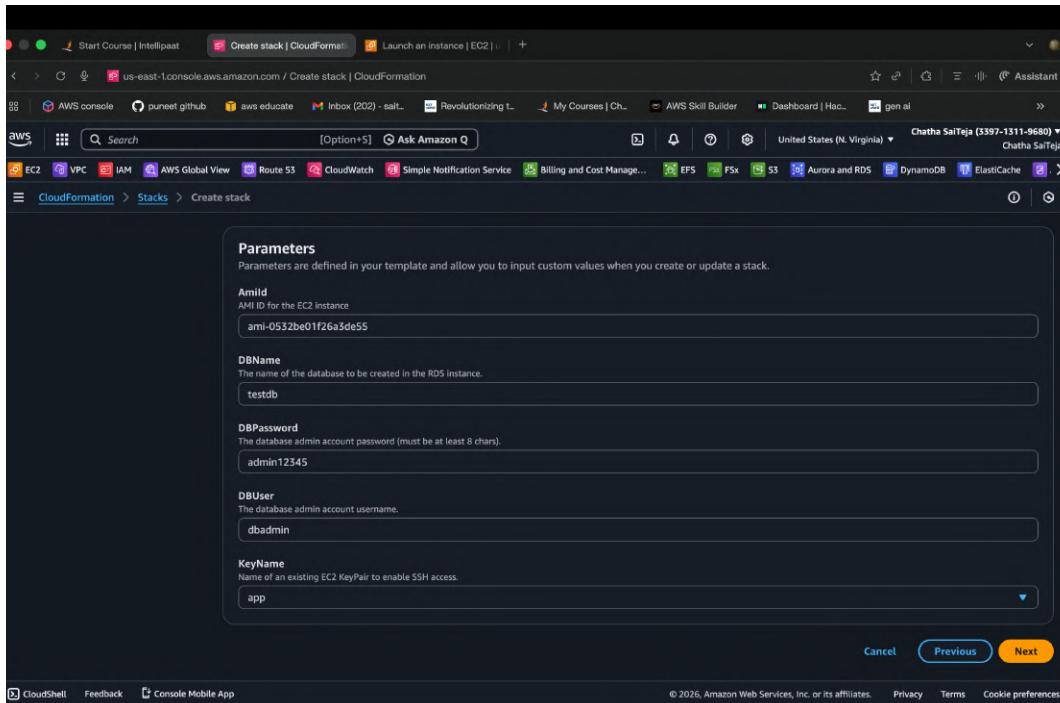
Template is uploaded ->click on next



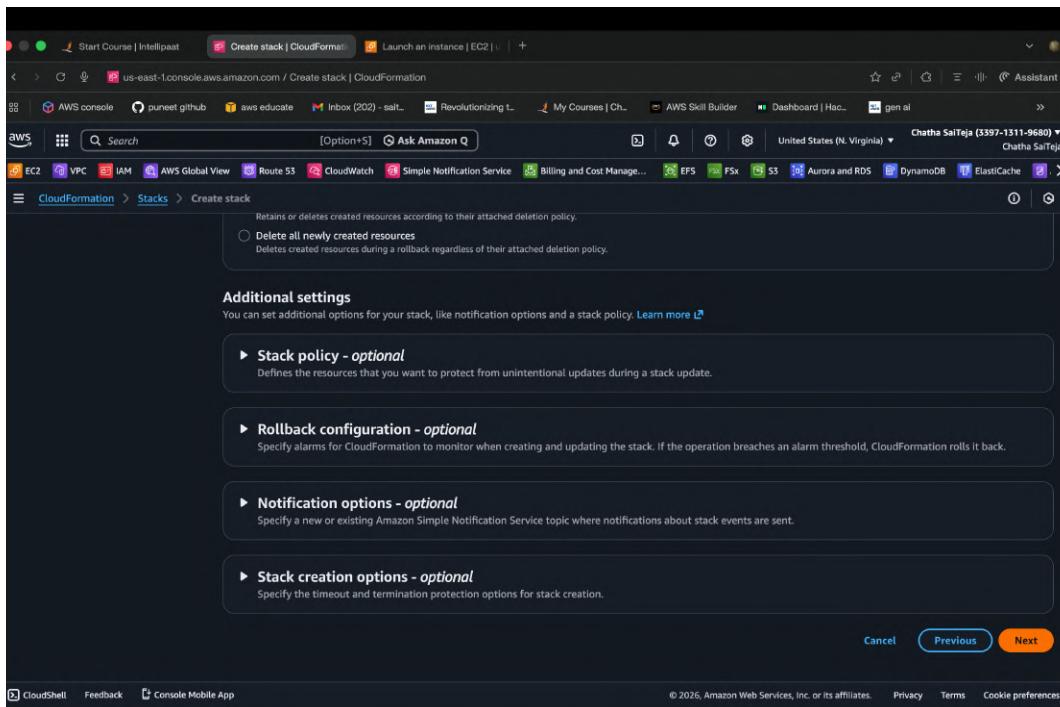
Enter stack name



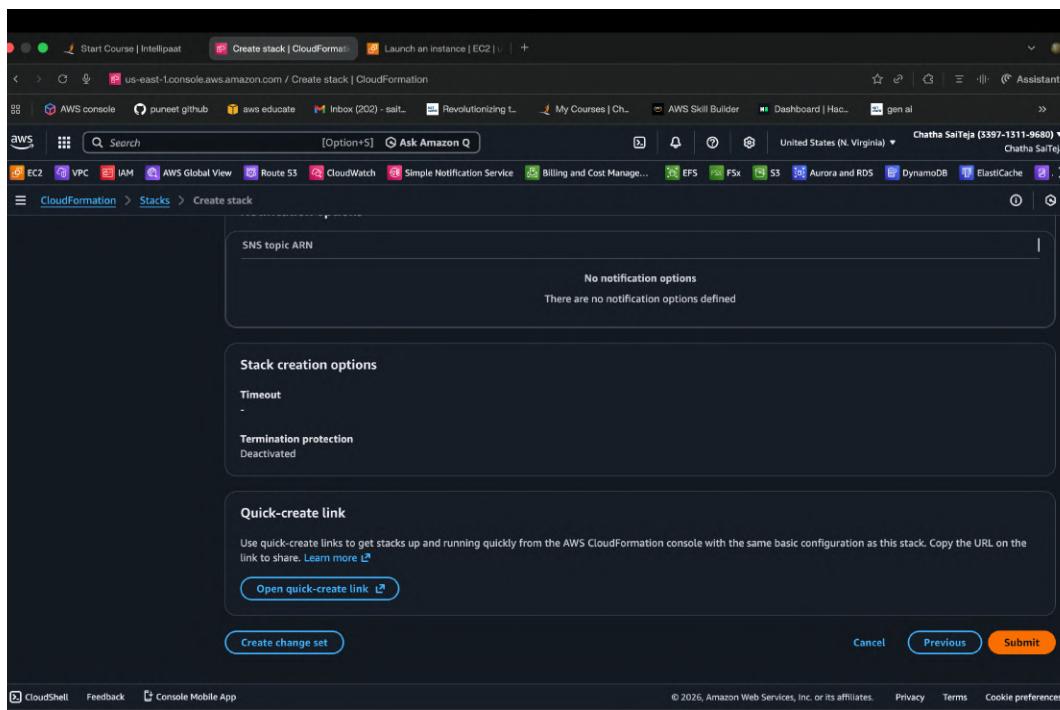
For AMI ID copy the AMI ID



Specify all inputs then click next



Ignore the optional steps ->click next



Click on submit

The screenshot shows the AWS CloudFormation console with the 'CaseStudy' stack. The 'Events' tab is active, showing 51 events. One event for the RDS instance creation is shown as 'CREATE_IN_PROGRESS'. Other events for the stack and application instances are listed as 'CREATE_COMPLETE'.

Operation ID	Timestamp	Logical ID	Status	Detailed status
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:11:39 UTC+0530	AppInstance	CREATE_COMPLETE	-
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:11:35 UTC+0530	RDSInstance	CREATE_IN_PROGRESS	-
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:11:34 UTC+0530	RDSInstance	CREATE_IN_PROGRESS	-

It takes few minutes to create the resources

The screenshot shows the AWS CloudFormation console with the 'CaseStudy' stack. The 'Events' tab is active, showing 53 events. All events for the stack and its resources are now listed as 'CREATE_COMPLETE'.

Operation ID	Timestamp	Logical ID	Status	Detailed status
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:18:49 UTC+0530	CaseStudy	CREATE_COMPLETE	-
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:18:45 UTC+0530	RDSInstance	CREATE_COMPLETE	-
96caa92c-7578-472d-84af-7bbbddef1228f	2026-01-30 16:11:39 UTC+0530	AppInstance	CREATE_COMPLETE	-

Stack creation is completed

VPC dashboard < Your VPCs

VPCs | VPC encryption controls

Your VPCs (1/2) Info

Name	VPC ID	State	Encryption c...	Encryption control ...	Block Public...
vpc-07c56690086316e6f	vpc-07c56690086316e6f	Available	-	-	Off
Dev-VPC	vpc-0a2b462d2f7e70eba	Available	-	-	Off

Details | Resource map | CIDRs | Flow logs | Tags | Integrations

Details

VPC ID vpc-0a2b462d2f7e70eba	State Available	Block Public Access Off	DNS hostnames Enabled
DNS resolution Enabled	Tenancy default	DHCP option set dopt-0a4443a57c116ea95	Main route table rtb-0ed75ea69eb8ch9
Main network ACL acl-06036385532f6ecbd	Default VPC No	IPv4 CIDR 10.0.0.0/16	IPv6 pool -
IPv6 CIDR (Network border group) -	Network Address Usage metrics Disabled	Route 53 Resolver DNS Firewall rule groups Route 53 Resolver DNS Firewall rule groups	Owner ID 539713119680

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As stack created it creates a VPC for multtier

VPC dashboard < Subnets

Subnets (3/9) Info

Name	Subnet ID	State	VPC	Block Public...	IPv4
Web-Tier-Public	subnet-0a0f5a0a6a1826e1	Available	vpc-07c56690086316e6f	Off	172...
App-Tier-Private	subnet-03a839f5872ab0d34	Available	vpc-0a2b462d2f7e70eba Dev-...	Off	10.0.
DB-Tier-Private	subnet-015535b5273e8b764	Available	vpc-0a2b462d2f7e70eba Dev-...	Off	10.0.

Subnets: subnet-03a839f5872ab0d34, subnet-015535b5273e8b764, subnet-04d23c5e1eaa80bfe

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Three subnets are created(web tier, apptier, db tier)

The screenshot shows the AWS EC2 Instances page. The left sidebar is collapsed. The main area displays a table of instances:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability zone
webinstance	i-07096b8f6229c53e2	Running	t2.micro	2/2 checks passed	View alarms	us-east-1a
applinstance	i-07ed0946a0c346a32	Running	t2.micro	2/2 checks passed	View alarms	us-east-1a

Two instances is created

The screenshot shows the AWS CloudFormation Stacks page. The left sidebar is collapsed. The main area displays the CaseStudy stack:

Key	Value	Description	Export name
AppPrivateIP	10.0.2.147	Private IP address of the App Instance (Accessible via SSH from Web Tier)	-
RDSEndpoint	casestudy-rdsinstance-09g11ba9p57cs.ccdmwa6q69s6.us-east-1.rds.amazonaws.com	The connection endpoint for the RDS Database	-
WebPublicIP	3.95.34.167	Public IP address of the Web Instance	-

outputs section of the stack containing webInstance PublicIP, ApplInstance privateIP, db endpoint.