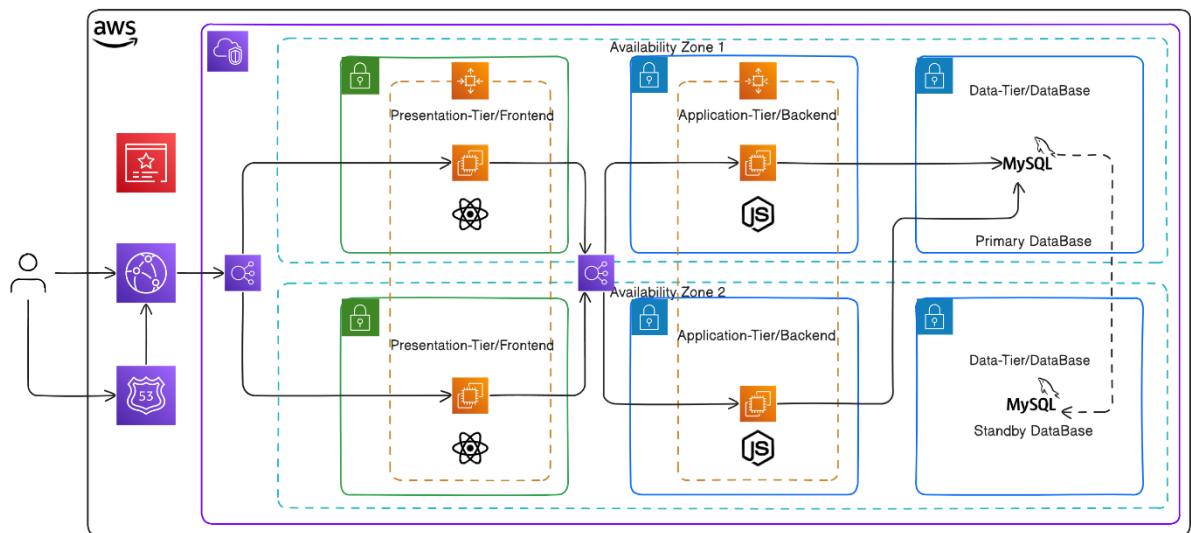


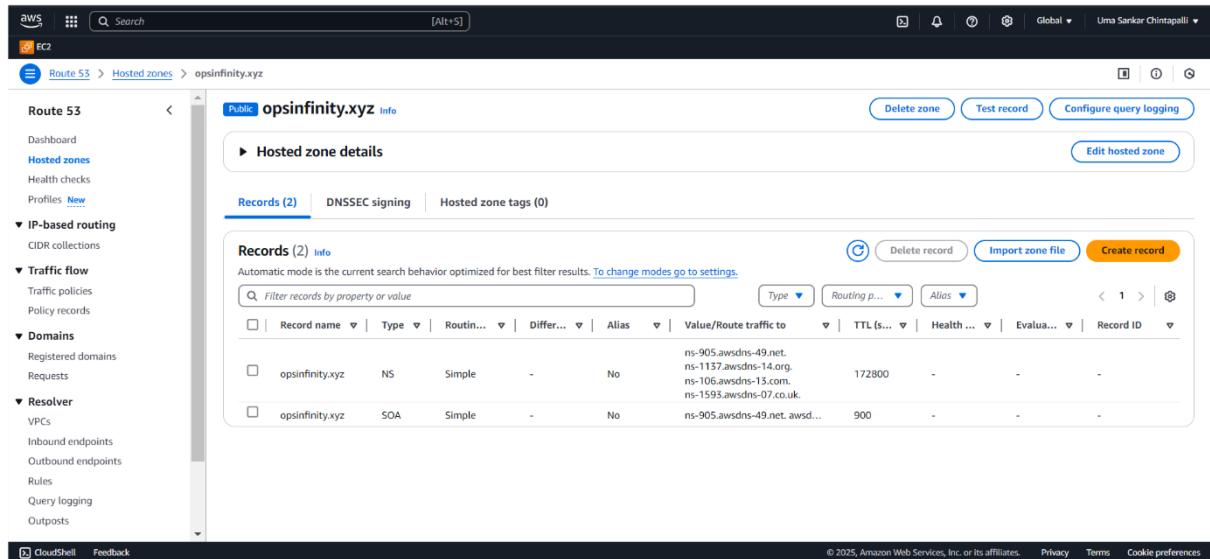
Deploying a Production Grade Highly Available & Scalable 3 Tier Architecture in AWS



Step-1: Configuring Route53

Amazon Route 53 is a highly available and scalable cloud Domain Name System (DNS) web service.

1. Navigate to the Route53 dashboard in AWS
2. Click on Create Hosted Zone
 - Provide the domain name
 - Choose Public Hosted Zone
3. Note the NS (NameServer) Records provided and update them in your domain provider (e.g., GoDaddy)
4. Allow up to an hour for DNS propagation



The screenshot shows the AWS Route 53 console. The left sidebar is collapsed. The main area displays the 'Hosted zone details' for the domain 'opsinfinity.xyz'. The 'Records' tab is selected, showing two records: an NS record and an SOA record. The NS record has a TTL of 172800 and the SOA record has a TTL of 900. The table includes columns for Record name, Type, Routing policy, Alias, Value/Route traffic to, TTL, Health, Evaluation, and Record ID.

| Record name | Type | Routing p... | Alias | Value/Route traffic to | TTL (s...) | Health ... | Evaluat... | Record ID |
|-----------------|------|--------------|-------|--|------------|------------|------------|-----------|
| opsinfinity.xyz | NS | Simple | - | ns-905.awsdns-49.net, ns-1137.awsdns-14.org, ns-106.awsdns-13.com, ns-1593.awsdns-07.co.uk | 172800 | - | - | - |
| opsinfinity.xyz | SOA | Simple | - | ns-905.awsdns-49.net. awsd... | 900 | - | - | - |

Step-2: Requesting a Public SSL Certificate using ACM

AWS Certificate Manager (ACM) is a service that simplifies the process of managing SSL (Secure Sockets Layer) / TLS (Transport Layer Security) certificates for use with AWS services and internal connected resources.

SSL was an earlier cryptographic protocol designed to provide secure communication over a computer network, but it has been largely replaced by TLS due to security vulnerabilities. TLS is the current standard for securing internet communications, ensuring privacy, integrity, and authenticity of data transferred between web browsers and servers.

1. Navigate to the Certificate Manager in AWS
2. Click Request a Certificate

- Enter the domain name (e.g., opsinfinity.com, www.opsinfinity.com)
3. Use Route53 to validate the domain automatically
 4. Wait for the certificate to be issued

The screenshot shows the AWS Certificate Manager (ACM) interface. A certificate named '9aceb53c-858a-4cfb-b13d-3cc5d5b52c83' is displayed. The 'Certificate status' section shows 'Status: Issued'. The 'Domains' section lists two domains: 'opsinfinity.xyz' and 'www.opsinfinity.xyz', both with 'Status: Success'. The 'Type' for both domains is 'CNAME', and the 'CNAME name' is listed as '_6bc90d4955a8d05b68b41ae212cce3f5.opsinfinity.xyz' and '_2b6422a260d190893a2f77821f82814a.www.opsinfinity.xyz' respectively. There are buttons for 'Create records in Route 53' and 'Export to CSV'.

Step-3: Creating VPC and Subnets

Amazon Virtual Private Cloud (VPC) is a service provided by Amazon Web Services (AWS) that allows you to create a logically isolated virtual network within the AWS cloud.

In AWS, **Public and Private Subnets** are used to manage network traffic within a Virtual Private Cloud (VPC).

1. Navigate to the VPC Dashboard.
2. Click Create VPC and select VPC and More
 - Name: 3-Tier-Architecture
 - Availability Zones: 2
 - Public Subnets: 2
 - Private Subnets: 4
 - NAT Gateway: Enabled in one AZ
3. Once created, go to Subnets and enable Auto-assign Public IP for the public subnets.

VPC Details

- VPC ID:** vpc-04b199568cd190f98
- State:** Available
- Block Public Access:** Off
- DNS resolution:** Enabled
- Main network ACL:** acl-0259739b3032c3fcc
- IPv6 CIDR:** 10.0.0.0/16
- Default VPC:** No
- Network Address Usage metrics:** Disabled
- Route 53 Resolver DNS Firewall rule groups:** -
- Block Public Access:** Off
- DNS hostnames:** Enabled
- Main route table:** rtb-04aadf83a5a900d
- IPv6 pool:** -
- Owner ID:** 891377231581

Resource map

- VPC:** 3-Tier-Architecture-vpc
- Subnets (6):**
 - us-east-1a: 3-Tier-Architecture-subnet-public..., 3-Tier-Architecture-subnet-private..., 3-Tier-Architecture-subnet-private...
 - us-east-1b: 3-Tier-Architecture-subnet-public..., 3-Tier-Architecture-subnet-private..., 3-Tier-Architecture-subnet-private...
- Route tables (6):**
 - 3-Tier-Architecture-rtb-private2-us-e...
 - 3-Tier-Architecture-rtb-private1-us-e...
 - 3-Tier-Architecture-rtb-public
 - 3-Tier-Architecture-rtb-private4-us-e...
 - 3-Tier-Architecture-rtb-private5-us-e...
- Network connections (2):**
 - 3-Tier-Architecture-igw
 - 3-Tier-Architecture-nat-public1-us-e...

Edit subnet settings

Subnet

- Subnet ID:** subnet-0b0e159a6b3a7f2bd
- Name:** 3-Tier-Architecture-subnet-public2-us-east-1b

Auto-assign IP settings

- Enable AWS to automatically assign a public IPv4 or IPv6 address to a new primary network interface for an instance in this subnet.**
- Enable auto-assign public IPv4 address:**
- Enable auto-assign customer-owned IPv4 address:** Option disabled because no customer owned pools found.

Step-4: Creating Security Groups

A **security group** acts as a virtual firewall for your EC2 instances to control incoming and outgoing traffic. Inbound rules control the incoming traffic to your instance, and outbound rules control the outgoing traffic from your instance.

Create the following security groups:

1. Bastion-Host

- Inbound Rule: Allow SSH from anywhere IPv4

EC2 > Security Groups > sg-026c55c4bb4e07618 - Bastion-Host

Details

| | | | |
|---------------------|----------------------|----------------------|--------------------|
| Security group name | sg-026c55c4bb4e07618 | Description | Bastion-Host |
| Owner | 891377231581 | Inbound rules count | 1 Permission entry |
| | | Outbound rules count | 1 Permission entry |

Inbound rules | Outbound rules | Sharing - new | VPC associations - new | Tags

Inbound rules (1)

| Name | Security group rule ID | IP version | Type | Protocol | Port range |
|------|------------------------|------------|------|----------|------------|
| - | sgr-0f1bec0568d54ef0a | IPv4 | SSH | TCP | 22 |

2. Presentation-Tier-ALB:

- Inbound Rule: Allow HTTP from anywhere IPv4

sg-0cbbb43fecdeeab13 - Presentation-Tier-ALB

Details

| | | | |
|---------------------|----------------------|----------------------|-----------------------|
| Security group name | sg-0cbbb43fecdeeab13 | Description | Presentation-Tier-ALB |
| Owner | 891377231581 | Inbound rules count | 1 Permission entry |
| | | Outbound rules count | 1 Permission entry |

Inbound rules | Outbound rules | Sharing - new | VPC associations - new | Tags

Inbound rules (1)

| Name | Security group rule ID | IP version | Type | Protocol | Port range |
|------|------------------------|------------|------|----------|------------|
| - | sgr-06d8f33a3fe844945 | IPv4 | HTTP | TCP | 80 |

3. Presentation-Tier-EC2:

- Inbound Rules:
 - Allow SSH from Bastion-Host
 - Allow HTTP from Presentation-Tier-ALB

sg-0659af39f3da762be - Presentation-Tier-EC2

Actions ▾

Details

| | | | |
|--|---|--|---|
| Security group name Presentation-Tier-EC2 | Security group ID sg-0659af39f3da762be | Description Presentation-Tier-EC2 | VPC ID vpc-04b199568cd190f98 |
| Owner 891377231581 | Inbound rules count 2 Permission entries | Outbound rules count 1 Permission entry | |

[Inbound rules](#) [Outbound rules](#) [Sharing - new](#) [VPC associations - new](#) [Tags](#)

Inbound rules (2)

[Manage tags](#) [Edit inbound rules](#)

| <input type="checkbox"/> | Name | Security group rule ID | IP version | Type | Protocol | Port range |
|--------------------------|------|------------------------|------------|------|----------|------------|
| <input type="checkbox"/> | - | sgr-0ca0ccc8c6c9341e7 | - | HTTP | TCP | 80 |
| <input type="checkbox"/> | - | sgr-0bbab69368f0a53fa | - | SSH | TCP | 22 |

4. Application-Tier-ALB:

- Inbound Rule: Allow HTTP from Presentation-Tier-EC2

sg-043a7c278fb0552ec - Application-Tier-ALB

Actions ▾

Details

| | | | |
|---|---|---|---|
| Security group name Application-Tier-ALB | Security group ID sg-043a7c278fb0552ec | Description Application-Tier-ALB | VPC ID vpc-04b199568cd190f98 |
| Owner 891377231581 | Inbound rules count 1 Permission entry | Outbound rules count 1 Permission entry | |

[Inbound rules](#) [Outbound rules](#) [Sharing - new](#) [VPC associations - new](#) [Tags](#)

Inbound rules (1)

[Manage tags](#) [Edit inbound rules](#)

| <input type="checkbox"/> | Name | Security group rule ID | IP version | Type | Protocol | Port range |
|--------------------------|------|------------------------|------------|------|----------|------------|
| <input type="checkbox"/> | - | sgr-0361aa9e4bc6383b2 | - | HTTP | TCP | 80 |

5. Application-Tier-EC2:

- Inbound Rules:

- Allow SSH from Bastion-Host
- Allow Custom TCP (Port 3200) from Application-Tier-ALB

sg-06df6071dc34eb3ed - Application-Tier-EC2

Actions ▾

| Details | | Security group ID | | Description | | VPC ID | |
|---------------------|--------------------------------------|--------------------------------------|---------------------|--------------------------------------|----------------------|---------------------------------------|----------------------|
| Security group name | Application-Tier-EC2 | sg-06df6071dc34eb3ed | | Application-Tier-EC2 | | vpc-04b199568cd190f98 | Edit |
| Owner | 891377231581 | | Inbound rules count | 2 Permission entries | Outbound rules count | 1 Permission entry | |

Inbound rules | Outbound rules | Sharing - new | VPC associations - new | Tags

Inbound rules (2)

Manage tags | Edit inbound rules

| <input type="checkbox"/> | Name | Security group rule ID | IP version | Type | Protocol | Port range |
|--------------------------|------|------------------------|------------|------------|----------|------------|
| <input type="checkbox"/> | - | sgr-08419c18caab3ba4c | - | Custom TCP | TCP | 3200 |
| <input type="checkbox"/> | - | sgr-04ceed034eb36dec6 | - | SSH | TCP | 22 |

6. Data-Tier:

- Inbound Rules:
 - Allow MySQL/Aurora traffic from Bastion-Host
 - Allow MySQL/Aurora traffic from Application-Tier-EC2

sg-0e2b956439895a0c7 - Data-Tier

Actions ▾

| Details | | Security group ID | | Description | | VPC ID | |
|---------------------|------------------------------|--------------------------------------|---------------------|---------------------------|----------------------|---------------------------------------|----------------------|
| Security group name | Data-Tier | sg-0e2b956439895a0c7 | | Data-Tier | | vpc-04b199568cd190f98 | Edit |
| Owner | 891377231581 | | Inbound rules count | 2 Permission entries | Outbound rules count | 1 Permission entry | |

Inbound rules | Outbound rules | Sharing - new | VPC associations - new | Tags

Inbound rules (2)

Manage tags | Edit inbound rules

| <input type="checkbox"/> | Name | Security group rule ID | IP version | Type | Protocol | Port range |
|--------------------------|------|------------------------|------------|--------------|----------|------------|
| <input type="checkbox"/> | - | sgr-053653179980c765d | - | MySQL/Aurora | TCP | 3306 |
| <input type="checkbox"/> | - | sgr-09638c23d4506de78 | - | MySQL/Aurora | TCP | 3306 |

Step-5: Launching Bastion Host

A **Bastion Host** in AWS is a specially configured EC2 instance that acts as a secure gateway to access private instances within an AWS VPC environment.

1. Navigate to EC2 dashboard and click Launch Instance
 - Name: Bastion-Host
 - AMI: Amazon Linux 2023
 - Instance Type: t2.micro
 - Key Pair: Create or Select an existing key pair

- VPC: 3-Tier-Architecture
- Subnet: Select a public subnet
- Security Group: Select Bastion-Host

2. Click launch instance

EC2 > Instances > i-0b89b8681a8925803

Instance summary for i-0b89b8681a8925803 (Bastion-Host)

Updated less than a minute ago

Instance ID: i-0b89b8681a8925803

IPv6 address: -

Hostname type: IP name: ip-10-0-19-150.ec2.internal

Answer private resource DNS name: -

Auto-assigned IP address: 54.197.195.169 [Public IP]

IAM Role: -

IMDSv2: Required

Public IPv4 address: 54.197.195.169 | [open address](#)

Instance state: Running

Private IP DNS name (IPv4 only): ip-10-0-19-150.ec2.internal

Instance type: t2.micro

VPC ID: vpc-04b199568cd190f98 (3-Tier-Architecture-vpc)

Subnet ID: subnet-0b0e159a6b3a7f2bd (3-Tier-Architecture-subnet-public2-us-east-1b)

Instance ARN: arn:aws:rds:us-east-1:891377231581:instance/i-0b89b8681a8925803

Private IPv4 addresses: 10.0.19.150

Public IPv4 DNS: ec2-54-197-195-169.compute-1.amazonaws.com | [open address](#)

Elastic IP addresses: -

AWS Compute Optimizer finding: Opt-in to AWS Compute Optimizer for recommendations. | [Learn more](#)

Auto Scaling Group name: -

Managed: false

Step-6: Setting Up the Data Tier with RDS

Amazon RDS (Relational Database Service) is a managed database service provided by Amazon Web Services (AWS) that simplifies the setup and operation of relational databases in the cloud.

1. Navigate to Amazon RDS and create a DB subnet group
 - Name: dev-db-subnet-group
 - Select the VPC and private subnets

RDS > Subnet groups > dev-db-subnet-group

Subnet group details

VPC ID: vpc-04b199568cd190f98

ARN: arn:aws:rds:us-east-1:891377231581:subgrp:dev-db-subnet-group

Supported network types: IPv4

Description: dev-db-subnet-group

Subnets (2)

| Availability zone | Subnet name | Subnet ID | CIDR block |
|-------------------|--|--------------------------|---------------|
| us-east-1b | 3-Tier-Architecture-subnet-private2-us-east-1b | subnet-0342498cb9a294937 | 10.0.144.0/20 |
| us-east-1a | 3-Tier-Architecture-subnet-private3-us-east-1a | subnet-0d4b6b02e026aea6c | 10.0.160.0/20 |

2. Create the database:
 - Engine: MySQL/Aurora

- Multi-AZ deployment
- Identifier: dev-db-instance
- Credentials: Self-managed (admin123)
- Security group: Data-Tier

3. Note the database endpoint once it is available

Connecting to Database

Once your Database is up and running:

1. Open Command Prompt
2. Locate the path of your key pair
3. Add the key to the SSH agent:
 - `ssh-add <pem-file>`
4. Connect to the database through the Bastion Host:
 - `ssh -N -L 3307:<database-endpoint>:3306 ec2-user@<bastion-host-public-ip>`

```
Command Prompt - ssh -N -L 3307:dev-db-instance.c5gqgi0omsdq.us-east-1.rds.amazonaws.com:3306 ec2-user@ec2-54-197-195-169.compute-1.amazonaws.com
ec2-user@ip-10-0-135-221:~
```

Microsoft Windows [Version 10.0.22631.4602]
 (c) Microsoft Corporation. All rights reserved.

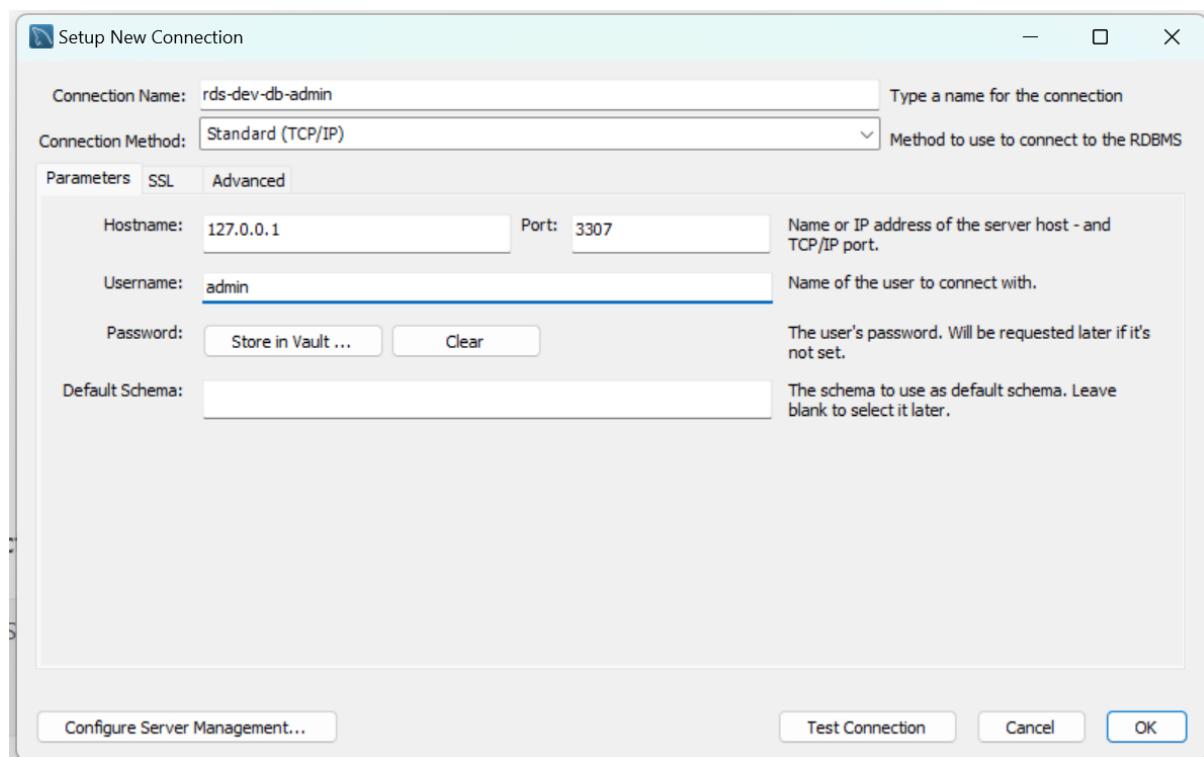
C:\Users\umasa>cd keys

C:\Users\umasa\keys>ssh-add aws_login.pem
 Identity added: aws_login.pem (aws_login.pem)

C:\Users\umasa\keys>ssh -N -L 3307:dev-db-instance.c5gqgi0omsdq.us-east-1.rds.amazonaws.com:3306 ec2-user@ec2-54-197-195-169.compute-1.amazonaws.com
 The authenticity of host 'ec2-54-197-195-169.compute-1.amazonaws.com (54.197.195.169)' can't be established.
 ED25519 key fingerprint is SHA256:/PEFzd/sa1qQUNfzxXrKXolunUw3VknSzb3okFOgdek.
 This key is not known by any other names.
 Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
 Warning: Permanently added 'ec2-54-197-195-169.compute-1.amazonaws.com' (ED25519) to the list of known hosts.

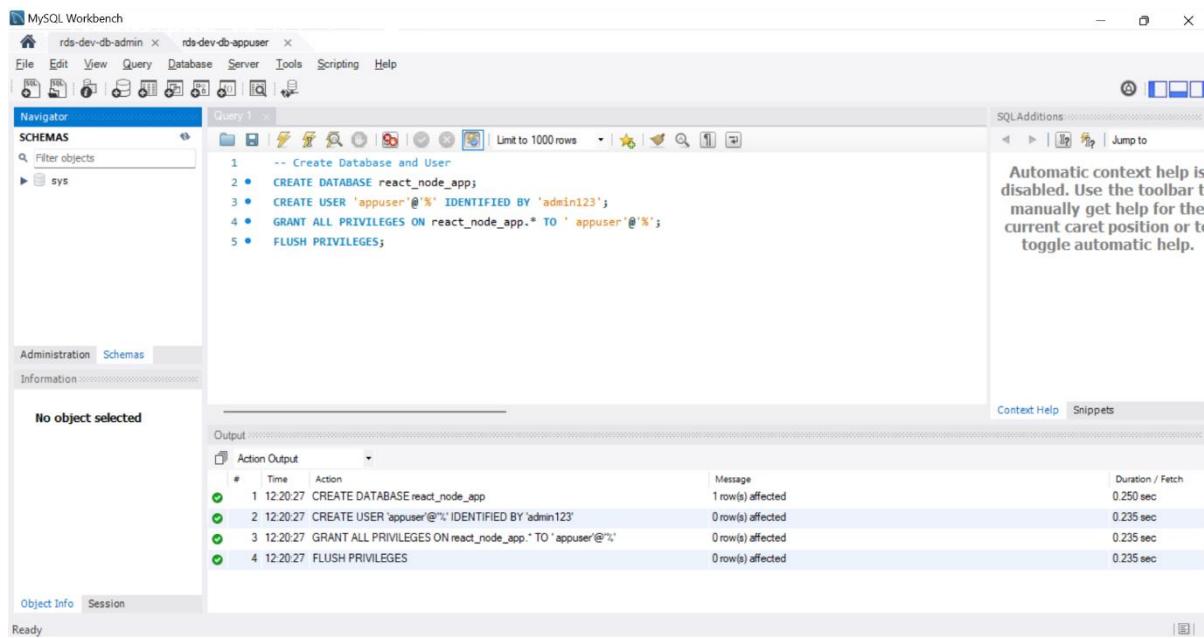
Creating and Restoring Database

1. Open MySQL Workbench
2. Add a new connection:
 - Click +
 - Name: rds-dev-db-admin
 - Port: 3307
 - Username: admin
 - Password: admin123



3. Test the connection. If successful, open SQL editor and run the following commands/querys:

```
-- Create Database and User
CREATE DATABASE react_node_app;
CREATE USER 'appuser'@'%' IDENTIFIED BY 'admin123';
GRANT ALL PRIVILEGES ON react_node_app.* TO
'appuser'@'%';
FLUSH PRIVILEGES;
```



The screenshot shows the MySQL Workbench interface. In the 'Navigator' pane, the 'SCHEMAS' section is selected, showing a 'sys' schema. The 'Query 1' pane contains the following SQL code:

```

1 -- Create Database and User
2 • CREATE DATABASE react_node_app;
3 • CREATE USER 'appuser'@'%' IDENTIFIED BY 'admin123';
4 • GRANT ALL PRIVILEGES ON react_node_app.* TO 'appuser'@'%';
5 • FLUSH PRIVILEGES;

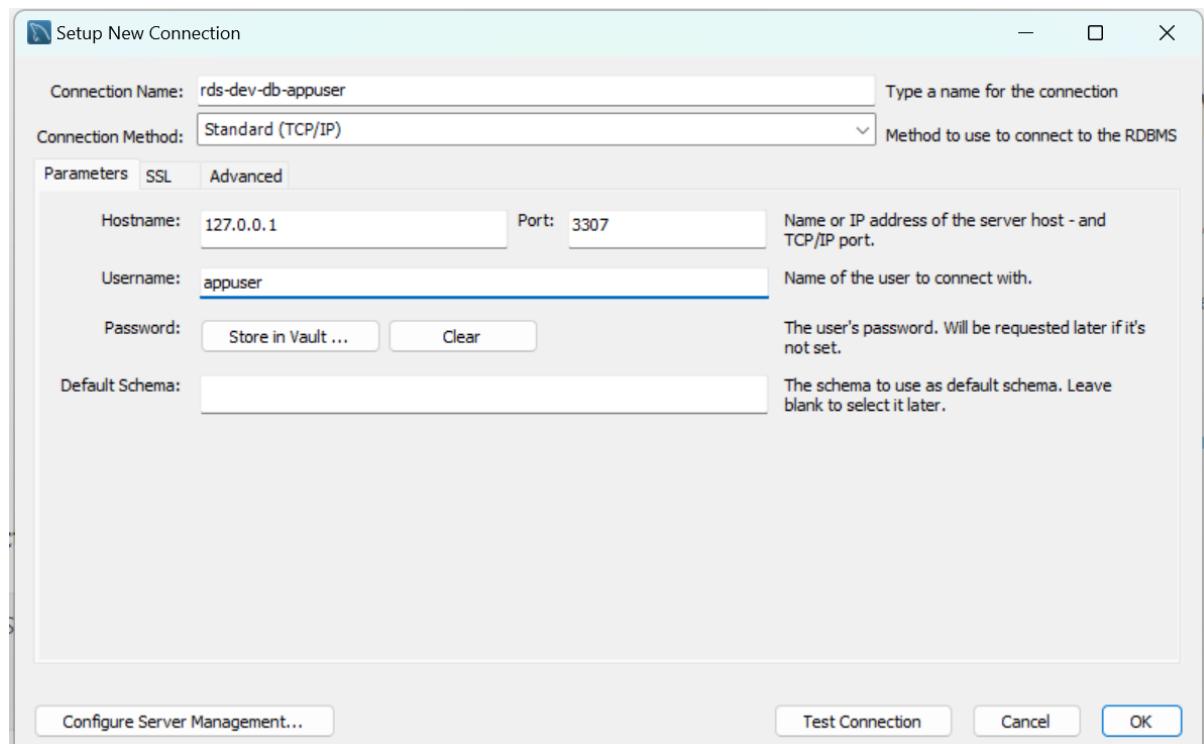
```

The 'Output' pane shows the execution results:

| # | Time | Action | Message | Duration / Fetch |
|---|----------|---|-------------------|------------------|
| 1 | 12:20:27 | CREATE DATABASE react_node_app | 1 row(s) affected | 0.250 sec |
| 2 | 12:20:27 | CREATE USER 'appuser'@'%' IDENTIFIED BY 'admin123' | 0 row(s) affected | 0.235 sec |
| 3 | 12:20:27 | GRANT ALL PRIVILEGES ON react_node_app.* TO 'appuser'@'%' | 0 row(s) affected | 0.235 sec |
| 4 | 12:20:27 | FLUSH PRIVILEGES | 0 row(s) affected | 0.235 sec |

4. Add another connection:

- Name: rds-dev-db-appuser
- Port: 3307
- Username: appuser
- Password: admin123



5. Test the connection. If successful, open SQL editor and run the following commands/queries:

```
USE react_node_app;
```

```
-- Create Tables
```

```
CREATE TABLE `author` (
  `id` int NOT NULL AUTO_INCREMENT,
  `name` varchar(255) NOT NULL,
  `birthday` date NOT NULL,
  `bio` text NOT NULL,
  `createdAt` date NOT NULL,
  `updatedAt` date NOT NULL,
  PRIMARY KEY (`id`)
) ENGINE=InnoDB AUTO_INCREMENT=8 DEFAULT
CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
```

```
CREATE TABLE `book` (
```

```
  `id` int NOT NULL AUTO_INCREMENT,
  `title` varchar(255) NOT NULL,
  `releaseDate` date NOT NULL,
  `description` text NOT NULL,
  `pages` int NOT NULL,
  `createdAt` date NOT NULL,
  `updatedAt` date NOT NULL,
  `authorId` int DEFAULT NULL,
  PRIMARY KEY (`id`),
  KEY `FK_66a4f0f47943a0d99c16ecf90b2` (`authorId`),
  CONSTRAINT `FK_66a4f0f47943a0d99c16ecf90b2` FOREIGN
  KEY (`authorId`) REFERENCES `author` (`id`)
) ENGINE=InnoDB AUTO_INCREMENT=10 DEFAULT
CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
```

```
-- Restore Data
```

```
INSERT INTO `author` VALUES
```

```
(1,'J.K. Rowling (Joanne Kathleen Rowling)','1965-07-31','J.K.
Rowling is a British author best known for writing the Harry Potter
fantasy series.', '2024-05-29', '2024-05-29'),
```

(3,'Jane Austen','1775-12-16','Jane Austen was an English novelist known for her wit, social commentary, and romantic stories.','2024-05-29','2024-05-29'),
(4,'Harper Lee','1960-07-11','Harper Lee was an American novelist best known for her Pulitzer Prize-winning novel To Kill a Mockingbird.','2024-05-29','2024-05-29'),
(5,'J.R.R. Tolkien','1954-07-29','J.R.R. Tolkien was a British philologist and writer best known for his fantasy novels The Hobbit and The Lord of the Rings.','2024-05-29','2024-05-29'),
(6,'Mary Shelley','1818-03-03','Mary Shelley was a British novelist, playwright, and short story writer.','2024-05-29','2024-05-29'),
(7,'Douglas Adams','1979-10-12','Douglas Adams was an English science fiction writer, satirist, humorist, dramatist, and screenwriter.','2024-05-29','2024-05-29');

INSERT INTO `book` VALUES

(1,'Harry Potter and the Sorcerer"s Stone','1997-07-26','Harry Potter discovers that he is the son of two well-known wizards.','223','2024-05-29','2024-05-29',1),
(3,'Harry Potter and the Chamber of Secrets','1998-07-02','Harry Potter investigates a malevolent threat to their classmates.','251','2024-05-29','2024-05-29',1),
(4,'Pride and Prejudice','1813-01-28','The story centers on the relationships among the Bennet sisters and Mr. Darcy.','224','2024-05-29','2024-05-29',3),
(5,'Harry Potter and the Prisoner of Azkaban','1999-07-08','Harry"s third year of studies at Hogwarts is threatened by Sirius Black"s escape.','317','2024-05-29','2024-05-29',1),
(6,'Harry Potter and the Goblet of Fire','2000-07-08','Hogwarts prepares for the Triwizard Tournament.','636','2024-05-29','2024-05-29',1),
(7,'The Hitchhiker"s Guide to the Galaxy','1979-10-12','A comic science fiction comedy series created by Douglas Adams.','184','2024-05-29','2024-05-29',7),

(8,'Frankenstein; or, The Modern Prometheus','1818-03-03','A Gothic novel by Mary Shelley that tells the story of Victor Frankenstein.','211','2024-05-29','2024-05-29',6),

(9,'The Lord of the Rings: The Fellowship of the Ring','1954-07-29','Frodo Baggins embarks on a quest to destroy the One Ring.','482','2024-05-29','2024-05-29',5);

```

rds-dev-db-admin x rds-dev-db-appuser x
File Edit View Query Database Server Tools Scripting Help
Navigator: book book book author author book author book author
SCHEMAS
  Filter objects
  react_node_app
    Tables
      author
      book
    Views
    Stored Procedures
    Functions
  Administration Schemas
Information
No object selected

Query 1 x book book book author author book author book author
1 • USE react_node_app;
2
3 -- Create Tables
4 • CREATE TABLE `author` (
5   `id` int NOT NULL AUTO_INCREMENT,
6   `name` varchar(255) NOT NULL,
7   `birthday` date NOT NULL,
8   `bio` text NOT NULL,
9   `createdAt` date NOT NULL,
10  `updatedAt` date NOT NULL,
11  PRIMARY KEY (`id`)
12 ) ENGINE=InnoDB AUTO_INCREMENT=8 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci;
13
14 • CREATE TABLE `book` (

```

- Now you can see the data in schema field.

| id | name | birthday | bio | createdAt | updatedAt |
|----|--|------------|---|------------|------------|
| 1 | J.K. Rowling (Joanne Kathleen Rowling) | 1965-07-31 | J.K. Rowling is a British author best known for ... | 2024-05-29 | 2024-05-29 |
| 3 | Jane Austen | 1775-12-16 | Jane Austen was an English novelist known for ... | 2024-05-29 | 2024-05-29 |
| 4 | Harper Lee | 1960-07-11 | Harper Lee was an American novelist best known... | 2024-05-29 | 2024-05-29 |
| 5 | J.R.R. Tolkien | 1954-07-29 | J.R.R. Tolkien was a British philologist and write... | 2024-05-29 | 2024-05-29 |
| 6 | Mary Shelley | 1818-03-03 | Mary Shelley was a British novelist, playwright, ... | 2024-05-29 | 2024-05-29 |
| 7 | Douglas Adams | 1979-10-12 | Douglas Adams was an English science fiction w... | 2024-05-29 | 2024-05-29 |

| id | title | releaseDate | description | pages | createdAt | updatedAt |
|----|--|-------------|--|-------|------------|------------|
| 1 | Harry Potter and the Sorcerer's Stone | 1997-07-26 | On his birthday, Harry Potter discovers that he ... | 223 | 2024-05-29 | 2024-05-29 |
| 3 | Harry Potter and the Chamber of Secrets | 1998-07-02 | Harry Potter and the sophomores investigate a ... | 251 | 2024-05-29 | 2024-05-29 |
| 4 | Pride and Prejudice | 1813-01-28 | An English novel of manners by Jane Austen, fir... | 224 | 2024-05-29 | 2024-05-29 |
| 5 | Harry Potter and the Prisoner of Azkaban | 1999-07-08 | Harry's third year of studies at Hogwarts is thre... | 317 | 2024-05-29 | 2024-05-29 |
| 6 | Harry Potter and the Goblet of Fire | 2000-07-08 | Hogwarts prepares for the Triwizard Tournament... | 636 | 2024-05-29 | 2024-05-29 |

Step-7: Setting Up the Presentation Tier

7.1 Creating Launch Template

An **AWS Launch Template** is a resource in Amazon EC2 that allows you to save and manage the configuration settings required to launch EC2 instances.

1. Navigate to Launch Template in EC2 dashboard
 - Name: Presentation-Tier-It
 - Version: 1
 - Enable Auto Scaling Guidance
 - AMI: Amazon Linux
 - Instance Type: t2.micro
 - Key Pair: Select the key pair one you selected for Bastion Host
 - Security Group: Presentation-Tier-EC2
 - In advanced option add the following user data script

```
#!/bin/bash
sudo yum update -y
sudo yum install -y nginx
sudo systemctl start nginx
sudo systemctl enable nginx
TOKEN=$(curl -X PUT "http://169.254.169.254/latest/api/token"
-H "X-aws-ec2-metadata-token-ttl-seconds: 21600")
INSTANCE_ID=$(curl -H "X-aws-ec2-metadata-token:
$TOKEN" "http://169.254.169.254/latest/meta-data/instance-id")
PUBLIC_IP=$(curl -H "X-aws-ec2-metadata-token: $TOKEN"
"http://169.254.169.254/latest/meta-data/public-ipv4")
sudo bash -c "cat > /usr/share/nginx/html/index.html <<EOF
<h1>Instance Details</h1>
<p><b>Instance ID:</b> $INSTANCE_ID</p>
<p><b>Public IP:</b> $PUBLIC_IP</p>
EOF"
sudo systemctl restart nginx
- Click on Launch Template
```

7.2 Create Target Group

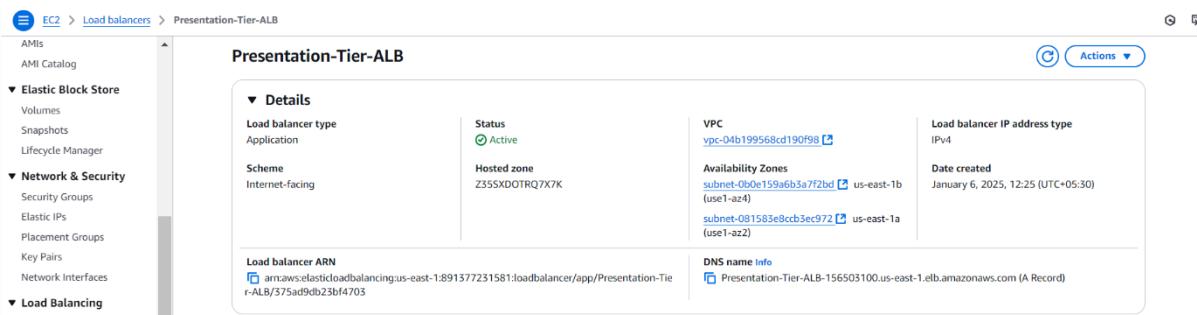
A **Target Group** in AWS is a logical grouping of targets that enables a load balancer to efficiently distribute incoming traffic, perform health checks, and adapt dynamically to changes in the application environment.

- Navigate to Target Groups in EC2 dashboard
- Select Instances option
- Name: Presentation-Tier-TG
- VPC: 3-Tier-Architecture
- Protocol: HTTP
- Health Check Path: /health
- Click on Create Target Group

7.3 Create Load Balancer

Elastic Load Balancing (ELB) automatically distributes incoming application traffic across multiple targets and virtual appliances in one or more Availability Zones (AZs).

- Name: Presentation-Tier-ALB
- Type: internet-facing
- VPC: 3-Tier-Architecture
- Subnets: Select Public Subnets
- Security Group: Presentation-Tier-ALB
- Target Group: Select the target group (Presentation-Tier-TG) which we created in previous step
- Click on Create Load Balancer



The screenshot shows the AWS EC2 Load Balancers console. The left sidebar has a navigation tree with 'EC2' selected, followed by 'Load balancers' and 'Presentation-Tier-ALB'. The main content area is titled 'Presentation-Tier-ALB' and shows the following details:

| Details | |
|-------------------------------|---|
| Load balancer type | Application |
| Status | Active |
| Scheme | Internet-facing |
| Hosted zone | Z355XD0TRQ7X7K |
| VPC | vpc-04b199568cd190f98 |
| Availability Zones | subnet-0b0e159a6b3a7f2bd (us-east-1b (use1-az2)) subnet-081583e8ccb3ec972 (us-east-1a (use1-az2)) |
| Load balancer IP address type | IPv4 |
| Date created | January 6, 2025, 12:25 (UTC+05:30) |
| Load balancer ARN | arn:aws:elasticloadbalancing:us-east-1:891377231581:loadbalancer/app/Presentation-Tier-ALB/375ad9db23bf4703 |
| DNS name | Presentation-Tier-ALB-156503100.us-east-1.elb.amazonaws.com (A Record) |

7.4 Create Auto Scaling Group

An **AWS Auto Scaling Group (ASG)** is a service in Amazon Web Services (AWS) that automatically adjusts the number of EC2 instances within a specified group based on demand. It helps ensure that your application has the right amount of compute capacity to handle varying traffic levels, without over-provisioning or under-provisioning resources.

- Name: Presentation-Tier-ASG
- Launch Template: Select the launch template (Presentation-Tier-It) which we created in step-7.1
- VPC: 3-Tier-Architecture
- Subnets: Select Public Subnets
- Click on Next
- Click on Attach to an existing Load Balancer
- Select Target Group (Presentation-Tier-TG)
- Enable Health Check of Load Balancer

- Click on Next
- Desired Capacity: 3
- Minimum: 2
- Maximum: 4
- Select Target Tracking Scaling Policy
- Create Auto Scaling Group

The screenshot shows the AWS EC2 Auto Scaling Groups page. The main title is 'Presentation-Tier-ASG'. Under 'Presentation-Tier-ASG Capacity overview', it shows 'Desired capacity' as 3, 'Scaling limits (Min - Max)' as 2 - 4, 'Desired capacity type' as 'Units (number of instances)', and 'Status' as '-' with a 'Monitored' icon. Below this, 'Date created' is listed as 'Mon Jan 06 2025 12:26:57 GMT+0530 (India Standard Time)'. The 'Details' tab is selected, showing the 'Launch template' configuration. The launch template 'lt-0b10ac4249cf2fe58' is selected. It includes fields for 'AMI ID' (ami-01816d07b1128cd2d), 'Instance type' (t2.micro), 'Owner' (arn:aws:iam::891377231581:root), 'Security groups' (none), 'Security group IDs' (sg-0659af39f3da762be), 'Create time' (Mon Jan 06 2025 12:24:00 GMT+0530 (India Standard Time)), 'Description' (1), 'Storage (volumes)' (none), 'Key pair name' (aws_login), and 'Request Spot Instances' (No). Other tabs visible include 'Integrations - new', 'Automatic scaling', 'Instance management', 'Instance refresh', 'Activity', and 'Monitoring'.

If the configuration is set up correctly, it will create three instances in EC2 dashboard.

Step-8: Setting Up the Application Tier

Repeat the steps in Step-7.

8.1 Creating Launch Template

- Name: Application-Tier-It
- Version: 1
- Enable Auto Scaling Guidance
- AMI: Amazon Linux
- Instance Type: t2.micro
- Key Pair: Select the key pair one you selected for Bastion Host
- Security Group: Application-Tier-EC2
- In advanced option add the following user data script

```
#!/bin/bash
```

```
# Update package list and install required packages
```

```
sudo yum update -y
```

```
sudo yum install -y git
# Install Node.js (use NodeSource for the latest version)
curl -fsSL https://rpm.nodesource.com/setup_18.x | sudo bash -
sudo yum install -y nodejs
# Install PM2 globally
sudo npm install -g pm2
# Define variables
REPO_URL="https://github.com/suneelprojects/react-node-
mysql-app.git"
BRANCH_NAME="feature/add-logging"
REPO_DIR="/home/ec2-user/react-node-mysql-app/backend"
ENV_FILE="$REPO_DIR/.env"
# Clone the repository
cd /home/ec2-user
sudo -u ec2-user git clone $REPO_URL
cd react-node-mysql-app
# Checkout to the specific branch
sudo -u ec2-user git checkout $BRANCH_NAME
cd backend
# Define the log directory and ensure it exists
LOG_DIR="/home/ec2-user/react-node-mysql-
app/backend/logs"
mkdir -p $LOG_DIR
sudo chown -R ec2-user:ec2-user $LOG_DIR
# Append environment variables to the .env file
echo "LOG_DIR=$LOG_DIR" >> "$ENV_FILE"
echo "DB_HOST=\"<rds-
instance.end.point.region.rds.amazonaws.com>\" >>
"$ENV_FILE"
echo "DB_PORT=\"3306\" >> "$ENV_FILE"
```

```

echo "DB_USER=<db-user>"" >> "$ENV_FILE"
echo "DB_PASSWORD=<db-user-password>"" >>
"$ENV_FILE" # Replace with actual
password
echo "DB_NAME=<db-name>"" >> "$ENV_FILE"
# Install Node.js dependencies as ec2-user
sudo -u ec2-user npm install
# Start the application using PM2 as ec2-user
sudo -u ec2-user npm run serve

# Ensure PM2 restarts on reboot as ec2-user
sudo -u ec2-user pm2 startup systemd
sudo -u ec2-user pm2 save

```

8.2 Create Target Group

- Create Target Group in EC2 dashboard
- Select Instances option
- Name: Application-Tier-TG
- VPC: 3-Tier-Architecture
- Protocol: HTTP
- Port: 3200
- Health Check Path: /health
- Click on Create Target Group

EC2 > Target groups > Application-Tier-TG

Application-Tier-TG

Details

arn:aws:elasticloadbalancing:us-east-1:891377231581:targetgroup/Application-Tier-TG/7fae91fc9fc475d3

| | | |
|-----------------|-----------------|------------------|
| Target type | Protocol : Port | Protocol version |
| Instance | HTTP: 3200 | HTTP1 |
| IP address type | Load balancer | |
| IPv4 | None associated | |

VPC: vpc-04b199568cd190f98

| | | |
|-----------------|-----------|-------------|
| 0 Total targets | 0 Healthy | 0 Unhealthy |
| 0 Anomalous | | |
| 0 Unused | | |
| 0 Initial | | |
| 0 Draining | | |

8.3 Create Load Balancer

- Name: Application-Tier-ALB
- Type: Internal
- VPC: 3-Tier-Architecture
- Subnets: Select Private Subnets
- Security Group: Application-Tier-ALB
- Target Group: Select the target group(Application-Tier-TG) which we created in previous step
- Click on Create Load Balancer

EC2 > Load balancers > Application-Tier-ALB

Application-Tier-ALB

Details

| | | | |
|--------------------|----------------|--|------------------------------------|
| Load balancer type | Status | VPC | Load balancer IP address type |
| Application | Active | vpc-04b199568cd190f98 | IPv4 |
| Scheme | Hosted zone | Availability Zones | Date created |
| Internal | Z355XD0TRQ7X7K | subnet-02926fc0de169448 us-east-1b (use1-az2) subnet-01cfed70dd354a4e us-east-1a (use1-az2) | January 6, 2025, 12:32 (UTC+05:30) |

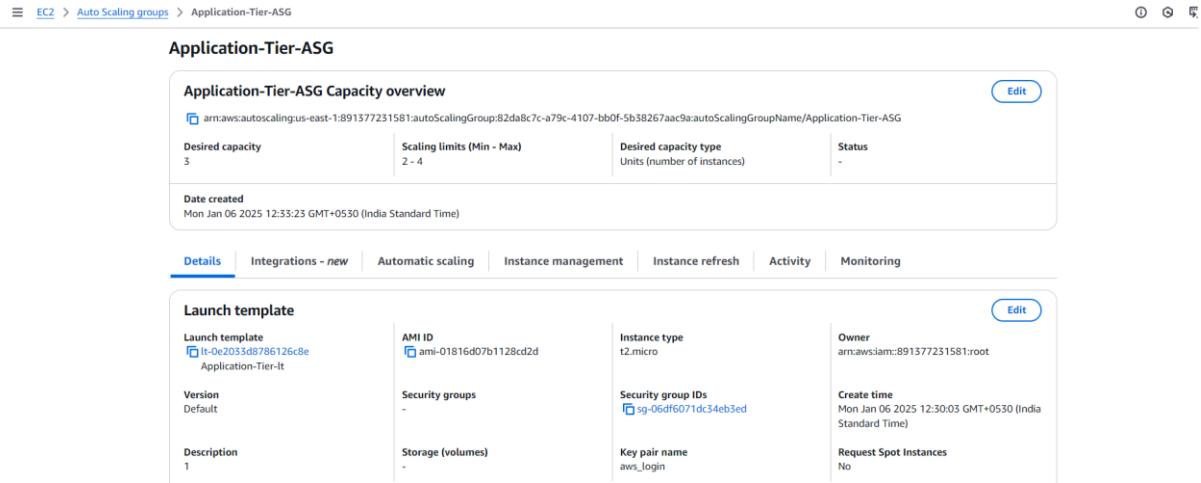
Load balancer ARN: arn:aws:elasticloadbalancing:us-east-1:891377231581:loadbalancer/app/Application-Tier-ALB/16a68230e0837b42

DNS name info: internal-Application-Tier-ALB-1758921781.us-east-1.elb.amazonaws.com (A Record)

8.4 Create Auto Scaling Group

- Name: Presentation-Tier-ASG
- Launch Template: Select the launch template(Application-Tier-It) which we created in step-8.1
- VPC: 3-Tier-Architecture
- Subnets: Select Private Subnets
- Click on Next
- Click on Attach to an existing Load Balancer
- Select Target Group(Application-Tier-TG)
- Enable Health Check of Load Balancer
- Click on Next
- Desired Capacity: 3

- Minimum: 2
- Maximum: 4
- Select Target Tracking Scaling Policy
- Create Auto Scaling Group



The screenshot shows the AWS EC2 Auto Scaling Groups page with the following details:

Application-Tier-ASG Capacity overview

| | | | |
|-----------------------|-------------------------------------|--|-------------|
| Desired capacity 3 | Scaling limits (Min - Max) 2 - 4 | Desired capacity type Units (number of instances) | Status - |
|-----------------------|-------------------------------------|--|-------------|

Date created
Mon Jan 06 2025 12:33:23 GMT+0530 (India Standard Time)

Launch template

| | | | |
|---|---------------------------------|--|--|
| Launch template Il-0e20535d8786126c8e Application-Tier-It | AMI ID ami-01816d07b1128cd2d | Instance type t2.micro | Owner arn:aws:iam::891377231581:root |
| Version Default | Security groups - | Security group IDs sg-06df6071dc34eb3ed | Create time Mon Jan 06 2025 12:30:03 GMT+0530 (India Standard Time) |
| Description 1 | Storage (volumes) - | Key pair name aws_login | Request Spot Instances No |

If the configuration is set up correctly, it will create another three instances in EC2 dashboard.

To check whether the backend is working or not by connecting to a Private instance of Application-Tier via Bastion-Host.

Open Terminal and run the following commands:

```
ssh -A ec2-user@<bastion-host-public-ip>
```

once, bastion host is logged in then connect to private instance of application tier

```
ssh ec2-user@<private-ip>
```

To see the logs run the following command:

```
pm2 logs
```

```

-/m/
[ec2-user@ip-10-0-135-221 ~]$ pm2 logs
[TAILING] Tailing last 15 lines for [all] processes (change the value with --lines option)
/home/ec2-user/.pm2/pm2.log last 15 lines:
PM2 | 2025-01-06T07:04:31: PM2 log: PM2 version      : 5.4.3
PM2 | 2025-01-06T07:04:31: PM2 log: Node.js version  : 18.20.5
PM2 | 2025-01-06T07:04:31: PM2 log: Current arch     : x64
PM2 | 2025-01-06T07:04:31: PM2 log: PM2 home        : /home/ec2-user/.pm2
PM2 | 2025-01-06T07:04:31: PM2 log: PM2 PID file     : /home/ec2-user/.pm2/pm2.pid
PM2 | 2025-01-06T07:04:31: PM2 log: RPC socket file   : /home/ec2-user/.pm2/rpc.sock
PM2 | 2025-01-06T07:04:31: PM2 log: BUS socket file   : /home/ec2-user/.pm2/pub.sock
PM2 | 2025-01-06T07:04:31: PM2 log: Application log path: /home/ec2-user/.pm2/logs
PM2 | 2025-01-06T07:04:31: PM2 log: Worker Interval   : 30000
PM2 | 2025-01-06T07:04:31: PM2 log: Process dump file  : /home/ec2-user/.pm2/dump.pm2
PM2 | 2025-01-06T07:04:31: PM2 log: Concurrent actions  : 2
PM2 | 2025-01-06T07:04:31: PM2 log: SIGTERM timeout   : 1600
PM2 | 2025-01-06T07:04:31: PM2 log: =====
PM2 | 2025-01-06T07:04:31: PM2 log: App [server:0] starting in -fork mode-
PM2 | 2025-01-06T07:04:31: PM2 log: App [server:0] online

/home/ec2-user/.pm2/logs/server-error.log last 15 lines:
/home/ec2-user/.pm2/logs/server-out.log last 15 lines:
0|server | Server is running on port http://localhost:3200
0|server | 2025-01-06 07:04:32 [INFO]: Connected to MySQL Database
|

```

Step-9: Modifying Presentation Tier Launch Template for Front-End Deployment

9.1 Updating the launch template

- Go to Launch Templates
- Select Presentation-Tier-It
- Click on Modify template in Actions menu
- Version: 2
- Change the User Data in Advance options

```

#!/bin/bash

# Update package list and install required packages
sudo yum update -y
sudo yum install -y git

# Install Node.js (use NodeSource for the latest version)
curl -fsSL https://rpm.nodesource.com/setup_18.x | sudo bash -
sudo yum install -y nodejs

# Install NGINX
sudo yum install -y nginx

# Start and enable NGINX
sudo systemctl start nginx
sudo systemctl enable nginx

# Define variables

```

```
REPO_URL="https://github.com/suneelprojects/react-node-mysql-app.git"
BRANCH_NAME="feature/add-logging"
REPO_DIR="/home/ec2-user/react-node-mysql-app/frontend"
ENV_FILE="$REPO_DIR/.env"
APP_TIER_ALB_URL="http://<internal-application-tier-alb-end-point.region.elb.amazonaws.com>" # Replace with your actual alb endpoint
API_URL="/api"
# Clone the repository as ec2-user
cd /home/ec2-user
sudo -u ec2-user git clone $REPO_URL
cd react-node-mysql-app

# Checkout to the specific branch
sudo -u ec2-user git checkout $BRANCH_NAME
cd frontend
# Ensure ec2-user owns the directory
sudo chown -R ec2-user:ec2-user /home/ec2-user/react-node-mysql-app
# Create .env file with the API_URL
echo "VITE_API_URL=\"$API_URL\"" >> "$ENV_FILE"
# Install Node.js dependencies as ec2-user
sudo -u ec2-user npm install
# Build the frontend application as ec2-user
sudo -u ec2-user npm run build
# Copy the build files to the NGINX directory
sudo cp -r dist /usr/share/nginx/html/
# Update NGINX configuration
NGINX_CONF="/etc/nginx/nginx.conf"
```

```
SERVER_NAME="<domain subdomain>" # Replace with your
actual domain name

# Backup existing NGINX configuration
sudo cp $NGINX_CONF ${NGINX_CONF}.bak

# Write new NGINX configuration
sudo tee $NGINX_CONF > /dev/null <<EOL
user nginx;

worker_processes auto;

error_log /var/log/nginx/error.log warn;

pid /run/nginx.pid;

events {

    worker_connections 1024;

}

http {

    include /etc/nginx/mime.types;

    default_type application/octet-stream;

    log_format main '$remote_addr - $remote_user [$time_local]
"$request"

'$status $body_bytes_sent "$http_referer" '
"$http_user_agent" "$http_x_forwarded_for";

    access_log /var/log/nginx/access.log main;

    sendfile on;

    tcp_nopush on;

    tcp_nodelay on;

    keepalive_timeout 65;

    types_hash_max_size 2048;

    include /etc/nginx/conf.d/*.conf;

}
```

EOL

```
# Create a separate NGINX configuration file
sudo tee /etc/nginx/conf.d/presentation-tier.conf > /dev/null
<<EOL
server {
    listen 80;
    server_name $SERVER_NAME;
    root /usr/share/nginx/html/dist;
    index index.html index.htm;
    #health check
    location /health {
        default_type text/html;
        return 200 "<!DOCTYPE html><p>Health check
endpoint</p>\n";
    }
    location / {
        try_files \$uri /index.html;
    }
    location /api/ {
        proxy_pass \$APP_TIER_ALB_URL;
        proxy_set_header Host \$host;
        proxy_set_header X-Real-IP \$remote_addr;
        proxy_set_header X-Forwarded-For
\$proxy_add_x_forwarded_for;
        proxy_set_header X-Forwarded-Proto \$scheme;
    }
}
EOL
```

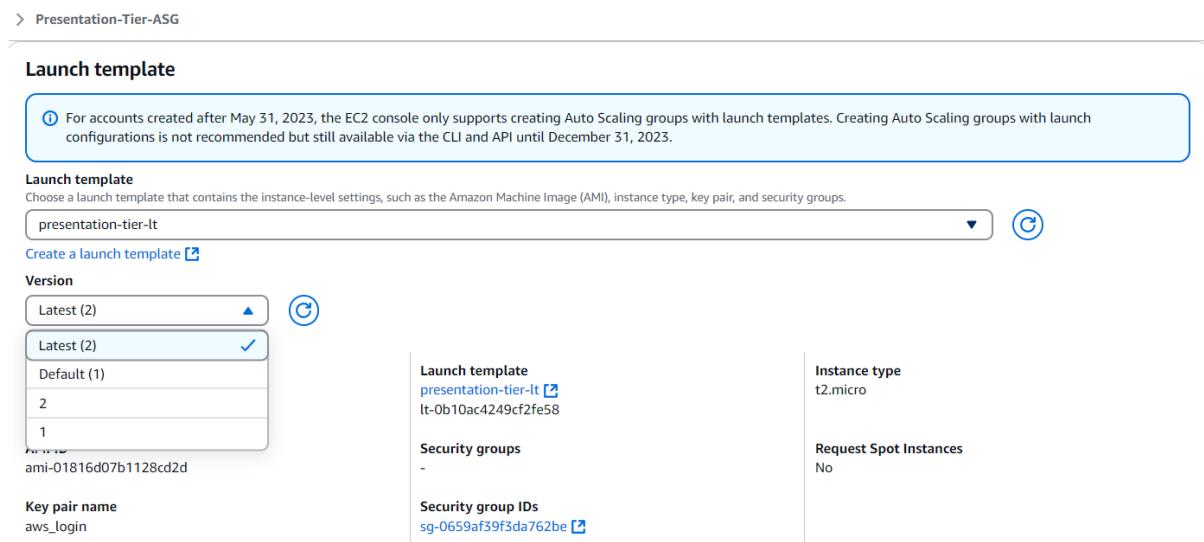
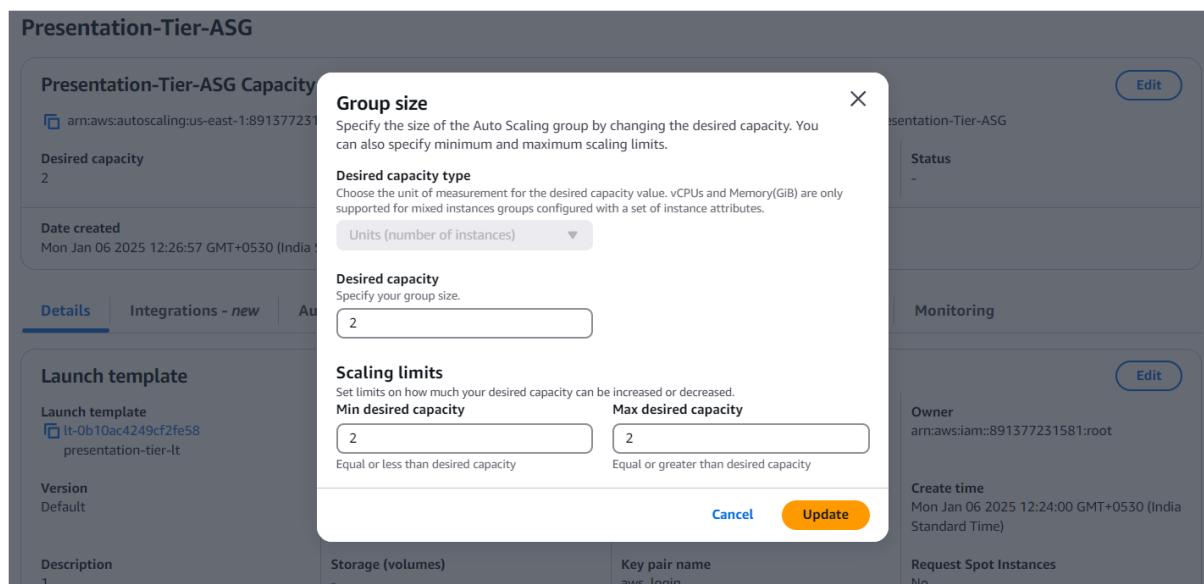
```
# Restart NGINX to apply the new configuration
```

```
sudo systemctl restart nginx
```

- Click on Update

9.2 Modifying the Auto Scaling Group

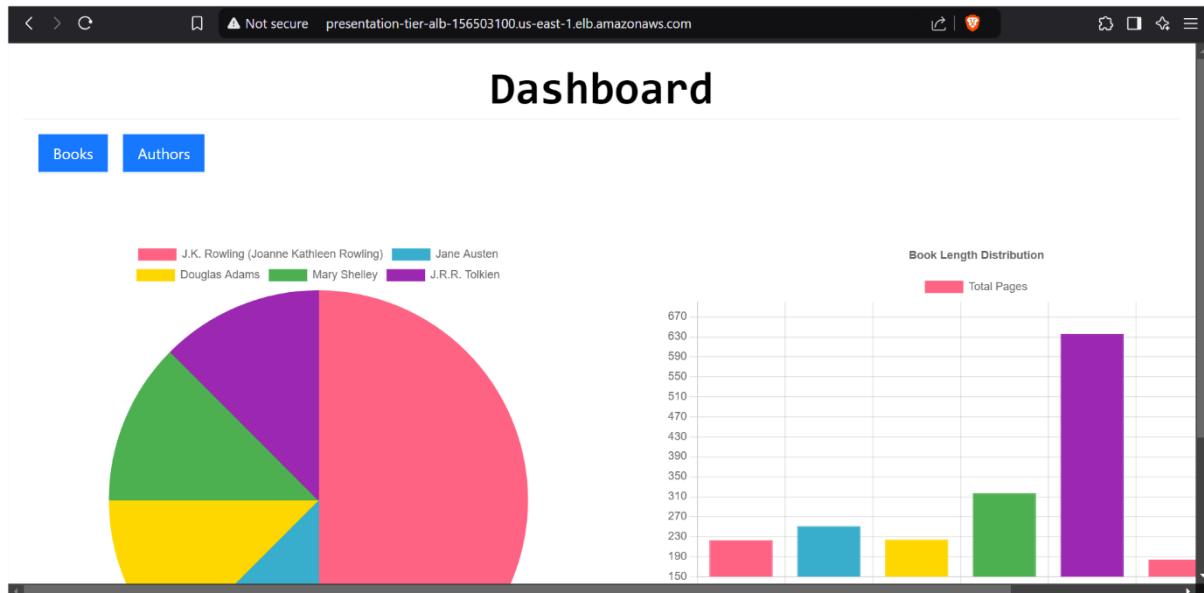
- Go to Auto Scaling Group
- Click on Presentation-Tier-ASG
- Click on edit
- Changes to do:
 - Desired Capacity: 2
 - Minimum: 2
 - Maximum: 2
- Update the launch template version to 2(latest)
- Click on update



Once the modification is done, go to the EC2 dashboard and terminate the old

presentation instances. As auto scaling group is configured it will automatically create two new instances.

The application is now accessible via the DNS of the presentation-tier load balancer URL.



The 'Manage Books' page lists four books in a table format. Each row includes the book's ID, title, description, release date, author, and creation and update dates. Action buttons for edit, view, and delete are provided for each book.

| ID | Title | Description | Release Date | Author | Created Date | Updated Date | Actions |
|----|---|--|-----------------------|--|--------------------------|--------------------------|---------|
| 1 | Harry Potter and the Sorcerer's Stone | On his birthday, Harry Potter discovers that he is the son of two well-known wizards, from whom he has inherited magical powers. He must attend a famous school of magic and sorcery, where he establishes a friendship with two young men who will become his companions on his adventure. During his first year at Hogwarts, he discovers that a malevolent and powerful wizard named Voldemort is in search of a philosopher's stone that prolongs the life of its owner. | 1997-07-26T00:00:000Z | J.K. Rowling (Joanne Kathleen Rowling) | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 3 | Harry Potter and the chamber of secrets | Harry Potter and the sophomores investigate a malevolent threat to their Hogwarts classmates, a menacing beast that hides within the castle. | 1998-07-02T00:00:000Z | J.K. Rowling (Joanne Kathleen Rowling) | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 4 | Pride and Prejudice | An English novel of manners by Jane Austen, first published in 1813. The story centres on the relationships among the Bennet sisters, in particular Elizabeth Bennet the middle daughter and | 1813-01-18T00:00:000Z | Jane Austen | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |

| ID | Author | Birthday | Description | Created Date | Updated Date | Actions |
|----|---|--------------------------|---|--------------------------|--------------------------|---------|
| 1 | J.K. Rowling (Joanne Kathleen Rowling) | 1965-07-31T00:00:00.000Z | J.K. Rowling is a British author best known for writing the Harry Potter fantasy series. The series has won multiple awards and sold over 500 million copies, becoming the best-selling book series in history. Rowling has also written other novels, including The Casual Vacancy and the Cormoran Strike crime series under the pen name Robert Galbraith. | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 3 | Jane Austen | 1775-12-16T00:00:00.000Z | Jane Austen was an English novelist known for her wit, social commentary, and romantic stories. Her six major novels, which explore themes of love, marriage, and money, have earned her a place as one of the greatest writers in the English language. | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 4 | Harper Lee | 1960-07-11T00:00:00.000Z | Harper Lee was an American novelist best known for her Pulitzer Prize-winning novel To Kill a Mockingbird. The novel explores themes of racial injustice and the importance of compassion. Lee published a sequel, Go Set a Watchman, in 2015. | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 5 | J.R.R. Tolkien | 1954-07-15T00:00:00.000Z | J.R.R. Tolkien was a British philologist and writer best known for his fantasy novels The Hobbit and The Lord of the Rings. | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |

Step-10: Integrating application logs with Amazon CloudWatch

10.1 Checking the Application logs

Access a Private Application-Tier instance via Bastion-Host

- Use ll/ls command to see the directory
- Now, cd to the directory (react-node-mysql-app) / backend / logs /
- In combined.logs file you can see the logs

```
[ec2-user@ip-10-0-135-221 ~]$ ll
total 0
drwxr-xr-x. 5 ec2-user ec2-user 66 Jan  6 07:04 react-node-mysql-app
[ec2-user@ip-10-0-135-221 ~]$ cd react-node-mysql-app/backend/
[ec2-user@ip-10-0-135-221 backend]$ ll
total 76
-rw-r--r--. 1 ec2-user ec2-user 709 Jan  6 07:04 app.js
drwxr-xr-x. 2 ec2-user ec2-user 19 Jan  6 07:04 configs
drwxr-xr-x. 2 ec2-user ec2-user 60 Jan  6 07:04 controllers
-rw-r--r--. 1 ec2-user ec2-user 6485 Jan  6 07:04 db.sql
drwxr-xr-x. 2 ec2-user ec2-user 43 Jan  6 07:04 logs
drwxr-xr-x. 104 ec2-user ec2-user 16384 Jan  6 07:04 node_modules
-rw-r--r--. 1 ec2-user ec2-user 40143 Jan  6 07:04 package-lock.json
-rw-r--r--. 1 ec2-user ec2-user 491 Jan  6 07:04 package.json
drwxr-xr-x. 2 ec2-user ec2-user 22 Jan  6 07:04 routes
-rw-r--r--. 1 ec2-user ec2-user 167 Jan  6 07:04 server.js
drwxr-xr-x. 2 ec2-user ec2-user 23 Jan  6 07:04 utils
[ec2-user@ip-10-0-135-221 backend]$ cd logs/
[ec2-user@ip-10-0-135-221 logs]$ ll
total 4
-rw-r--r--. 1 ec2-user ec2-user 242 Jan  6 07:25 combined.log
-rw-r--r--. 1 ec2-user ec2-user 0 Jan  6 07:04 error.log
[ec2-user@ip-10-0-135-221 logs]$ vim combined.log |
```

```
Command Prompt - ssh -N -L  X  ec2-user@ip-10-0-135-221:~/i  X  +  v
2025-01-06 07:04:32 [INFO]: Connected to MySQL Database
2025-01-06 07:25:04 [INFO]: BooksController [GET]
2025-01-06 07:25:04 [INFO]: Books count: 8
2025-01-06 07:25:14 [INFO]: BooksController [GET]
2025-01-06 07:25:14 [INFO]: Books count: 8
~
```

Add Author

Name

Birthday

Description

Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society.

Cancel Add

| | | | | | | |
|---|---------------|--------------------------|--|--------------------------|--------------------------|--|
| 7 | Douglas Adams | 1979-10-12T00:00:00.000Z | Douglas Adams was an English science fiction writer, satirist, humorist, dramatist, screenwriter, and occasional actor. He is best known for the Hitchhiker's Guide to the Galaxy comedy series, which inspired a radio comedy, several books, stage shows, comic books, a 1981 TV series, a 1984 video game, a 2005 feature film, and a 2008 sequel film. | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | |
| 8 | Peter Thiel | 1967-10-11T00:00:00.000Z | Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society. | 2025-01-06T00:00:00.000Z | 2025-01-06T00:00:00.000Z | |

Add Book

Title

Release Date

Description

J.K. Rowling (Joanne Kathleen Rowling)

Jane Austen

Harper Lee

J.R.R. Tolkien

Mary Shelley

Douglas Adams

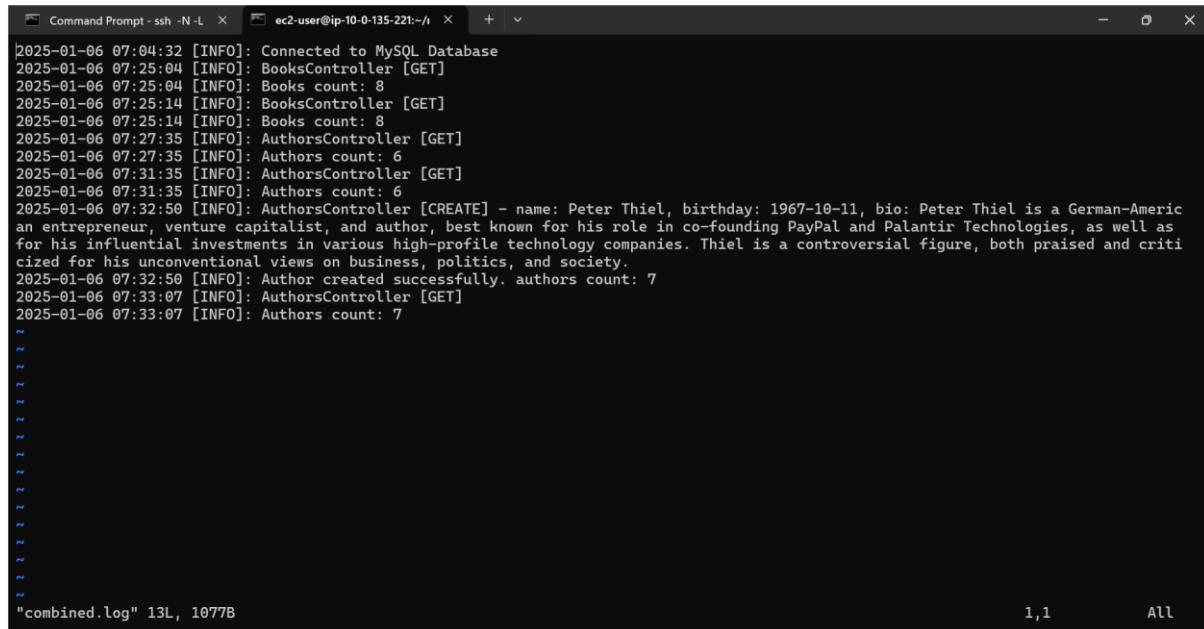
Peter Thiel

Peter Thiel

[Cancel](#) [Add](#)

| | | | |
|--|---|--|--|
| 9 The Lord of the Rings: The Fellowship of the Ring | <small>THE FIRST BOOK IN J.R.R. TOLKIEN'S EPIC FANTASY TRILOGY, THE LORD OF THE RINGS. THE FELLOWSHIP OF THE RING FOLLOWS HOBBIT FRODO BAGGINS AS HE INHERITS THE ONE RING, AN EVIL ARTIFACT OF POWER CREATED BY THE DARK LORD SAURON. FRODO EMBARKS ON A QUEST TO DESTROY THE RING IN THE FIRES OF MOUNT DOOM, ACCOMPANIED BY A FELLOWSHIP OF EIGHT COMPANIONS.</small> | 1954-07-29T00:00:00.000Z J.R.R. Tolkien 2024-05-29T00:00:00.000Z 2024-05-29T00:00:00.000Z | |
| 10 Zero to One | <small>"ZERO TO ONE: NOTES ON STARTUPS, OR HOW TO BUILD THE FUTURE" IS A BOOK BY PETER THIEL, CO-FOUNDER OF PAYPAL AND PALANTIR, AND A PROMINENT VENTURE CAPITALIST. PUBLISHED IN 2014, THE BOOK EXPLORES THIEL'S UNCONVENTIONAL IDEAS ABOUT INNOVATION, STARTUPS, AND ENTREPRENEURSHIP, OFFERING A UNIQUE PERSPECTIVE ON HOW TO CREATE BREAKTHROUGH COMPANIES THAT GO FROM "ZERO TO ONE" — MEANING TO BUILD SOMETHING TRULY NEW AND VALUABLE, RATHER THAN JUST COPYING EXISTING IDEAS.</small> | 2014-09-16T00:00:00.000Z Peter Thiel 2025-01-06T00:00:00.000Z 2025-01-06T00:00:00.000Z | |

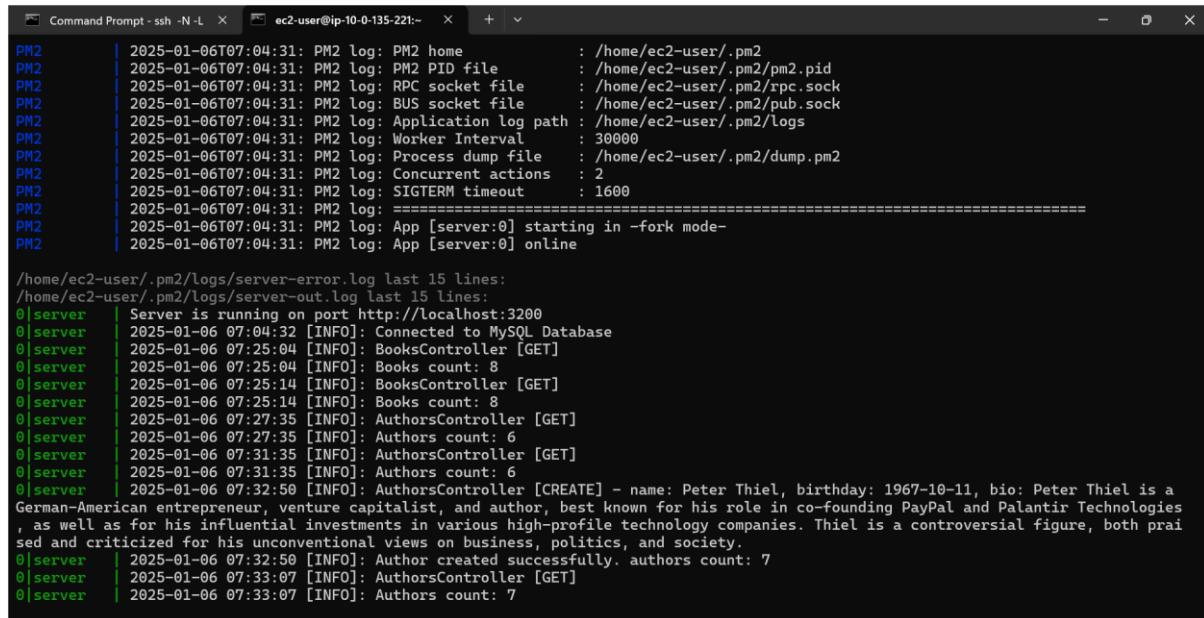
< 1 >



```

2025-01-06 07:04:32 [INFO]: Connected to MySQL Database
2025-01-06 07:25:04 [INFO]: BooksController [GET]
2025-01-06 07:25:04 [INFO]: Books count: 8
2025-01-06 07:25:14 [INFO]: BooksController [GET]
2025-01-06 07:25:14 [INFO]: Books count: 8
2025-01-06 07:27:35 [INFO]: AuthorsController [GET]
2025-01-06 07:27:35 [INFO]: Authors count: 6
2025-01-06 07:31:35 [INFO]: AuthorsController [GET]
2025-01-06 07:31:35 [INFO]: Authors count: 6
2025-01-06 07:32:50 [INFO]: AuthorsController [CREATE] - name: Peter Thiel, birthday: 1967-10-11, bio: Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society.
2025-01-06 07:32:50 [INFO]: Author created successfully. authors count: 7
2025-01-06 07:33:07 [INFO]: AuthorsController [GET]
2025-01-06 07:33:07 [INFO]: Authors count: 7
```
combined.log" 13L, 1077B

```



```

PM2 | 2025-01-06T07:04:31: PM2 log: PM2 home : /home/ec2-user/.pm2
PM2 | 2025-01-06T07:04:31: PM2 log: PM2 PID file : /home/ec2-user/.pm2/pm2.pid
PM2 | 2025-01-06T07:04:31: PM2 log: RPC socket file : /home/ec2-user/.pm2/rpc.sock
PM2 | 2025-01-06T07:04:31: PM2 log: BUS socket file : /home/ec2-user/.pm2/pub.sock
PM2 | 2025-01-06T07:04:31: PM2 log: Application log path: /home/ec2-user/.pm2/logs
PM2 | 2025-01-06T07:04:31: PM2 log: Worker Interval : 30000
PM2 | 2025-01-06T07:04:31: PM2 log: Process dump file : /home/ec2-user/.pm2/dump.pm2
PM2 | 2025-01-06T07:04:31: PM2 log: Concurrent actions : 2
PM2 | 2025-01-06T07:04:31: PM2 log: SIGTERM timeout : 1600
PM2 | 2025-01-06T07:04:31: PM2 log: =====
PM2 | 2025-01-06T07:04:31: PM2 log: App [server:0] starting in -fork mode-
PM2 | 2025-01-06T07:04:31: PM2 log: App [server:0] online

/home/ec2-user/.pm2/logs/server-error.log last 15 lines:
/home/ec2-user/.pm2/logs/server-out.log last 15 lines:
0|server | Server is running on port http://localhost:3200
0|server | 2025-01-06 07:04:32 [INFO]: Connected to MySQL Database
0|server | 2025-01-06 07:25:04 [INFO]: BooksController [GET]
0|server | 2025-01-06 07:25:04 [INFO]: Books count: 8
0|server | 2025-01-06 07:25:14 [INFO]: BooksController [GET]
0|server | 2025-01-06 07:25:14 [INFO]: Books count: 8
0|server | 2025-01-06 07:27:35 [INFO]: AuthorsController [GET]
0|server | 2025-01-06 07:27:35 [INFO]: Authors count: 6
0|server | 2025-01-06 07:31:35 [INFO]: AuthorsController [GET]
0|server | 2025-01-06 07:31:35 [INFO]: Authors count: 6
0|server | 2025-01-06 07:32:50 [INFO]: AuthorsController [CREATE] - name: Peter Thiel, birthday: 1967-10-11, bio: Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society.
0|server | 2025-01-06 07:32:50 [INFO]: Author created successfully. authors count: 7
0|server | 2025-01-06 07:33:07 [INFO]: AuthorsController [GET]
0|server | 2025-01-06 07:33:07 [INFO]: Authors count: 7

```

## 10.2 Connecting to CloudWatch logs

### 10.2.1 Creating IAM Role

- Navigate to IAM dashboard
- Click on Roles
- Create Role
- In use case select EC2
- Permission Policies:
  - CloudWatchLogsFullAccess
  - CloudWatchAgentServerPolicy
- Role Name: EC2InstanceRoleForCloudWatchLogs
- Click on Create Role

## 10.2.2 Creating CloudWatch Log Groups

- Navigate to CloudWatch
- Click on Log Groups
- Create Log Group
- Name: backend-node-app-logs
- Click on Create

## Step-11: Modifying Application Tier Launch Template for Integrating CloudWatch

### 11.1 Updating Launch Template

- Go to Launch Template
- Select Application-Tier-It
- Click on Modify template in Actions menu
- Version: 2
- In Advanced details Select IAM instance profile and attach the IAM role we have created
- Enable the detailed cloudwatch monitoring

**IAM instance profile** | [Info](#)

EC2InstanceRoleForCloudWatchLogs  
arn:aws:iam::891377231581:instance-profile/EC2InstanceRoleForCloudWatchLogs

[Create new I/P](#)

**Hostname type** | [Info](#)

Don't include in launch template

**DNS Hostname** | [Info](#)

Enable resource-based IPv4 (A record) DNS requests

Enable resource-based IPv6 (AAAA record) DNS requests

**Instance auto-recovery** | [Info](#)

Don't include in launch template

**Shutdown behavior** | [Info](#)

Don't include in launch template

**Stop - Hibernate behavior** | [Info](#)

Don't include in launch template

**Termination protection** | [Info](#)

Don't include in launch template

**Stop protection** | [Info](#)

Don't include in launch template

**Detailed CloudWatch monitoring** | [Info](#)

Enable

[Additional charges apply](#)

- Add the below User Data script to the existing script in Advance options

```
Install CloudWatch agent
sudo yum install -y amazon-cloudwatch-agent
Create CloudWatch agent configuration
sudo tee /opt/aws/amazon-cloudwatch-agent/etc/amazon-
cloudwatch-agent.json >
/dev/null <<EOL
{
"logs": {
"logs_collected": {
"files": {
"collect_list": [
{

```

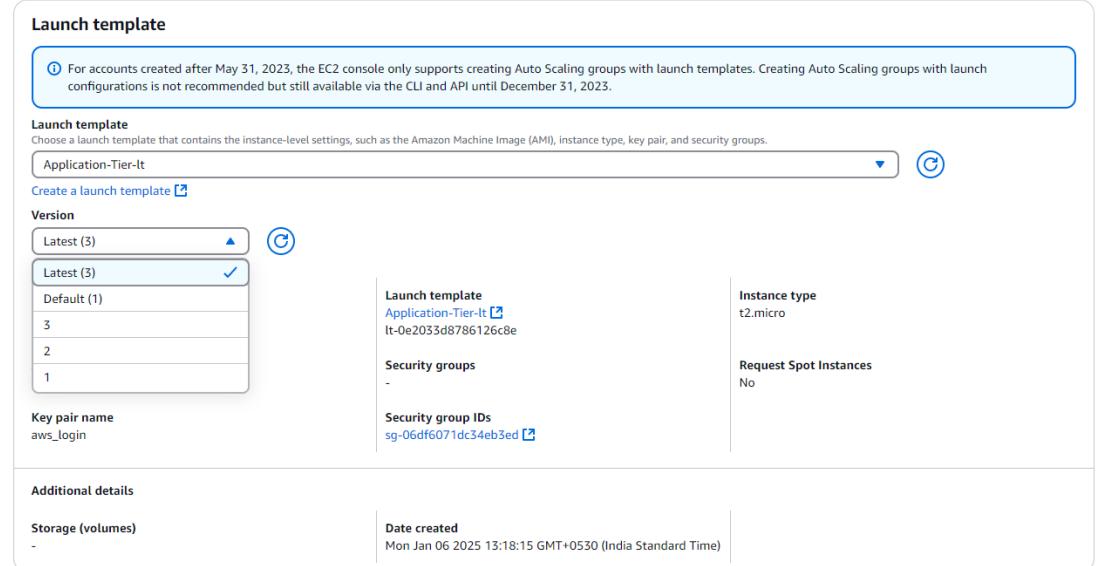
```
"file_path": "/home/ec2-user/react-node-mysql-
app/backend/logs/*.log",
"log_group_name": "backend-node-app-logs",
"log_stream_name": "{instance_id}",
"timestamp_format": "%Y-%m-%d %H:%M:%S"
}
]
}
}
}
}
}
}
}
}
EOL
```

```
Start CloudWatch agent
sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-
cloudwatch-agent-ctl -a
fetch-config -m ec2 -c
file:/opt/aws/amazon-cloudwatch-agent/etc/amazon-
cloudwatch-agent.json -s
```

- Click on Update

## 11.2 Modifying the Auto Scaling Group

- Go to Auto Scaling Group
- Click on Application-Tier-ASG
- Click on edit
- Update the launch template version to 2(latest)
- Click on update



Once the modification is done, go to the EC2 dashboard and terminate the old presentation instances. As auto scaling group is configured it will automatically create new instances.

### 11.3 Checking the Logs in CloudWatch

- Navigate to Application Interface
- Use the provided functionality to add a book
- Go to CloudWatch Log Groups and locate the relevant log group associated with the application
- Review the logs for any relevant information or errors related to the “Add Book” action.

```

[2025-01-06 07:53:03 [INFO]: Connected to MySQL Database
2025-01-06 07:54:06 [INFO]: BooksController [GET]
2025-01-06 07:54:06 [INFO]: Books count: 9
2025-01-06 07:54:09 [INFO]: AuthorsController [GET]
2025-01-06 07:54:09 [INFO]: Authors count: 7
2025-01-06 07:54:12 [INFO]: AuthorsController [GET]
2025-01-06 07:54:12 [INFO]: Authors count: 7
2025-01-06 07:54:16 [INFO]: BooksController [GET]
2025-01-06 07:54:16 [INFO]: Books count: 9
2025-01-06 07:54:25 [INFO]: BooksController [GET]
2025-01-06 07:54:25 [INFO]: Books count: 9
2025-01-06 07:54:32 [INFO]: BooksController [GET]
2025-01-06 07:54:32 [INFO]: Books count: 9
2025-01-06 07:54:34 [INFO]: AuthorsController [GET]
2025-01-06 07:54:34 [INFO]: Authors count: 7
2025-01-06 07:54:40 [INFO]: BooksController [GET]
2025-01-06 07:54:40 [INFO]: Books count: 9
2025-01-06 07:55:03 [INFO]: BooksController [GET]
2025-01-06 07:55:03 [INFO]: Books count: 9
2025-01-06 07:55:04 [INFO]: AuthorsController [GET]
2025-01-06 07:55:04 [INFO]: Authors count: 7
2025-01-06 07:56:19 [INFO]: BooksController [CREATE] - title: The Diversity Myth, description: "The Diversity Myth: Multiculturalism and Political Intolerance on Campus" (1995), co-authored by Peter Thiel and David O. Sacks, is a critique of the culture of political correctness and identity politics that they argue had taken over American college campuses during the 1990s. Drawing on their experiences as students at Stanford University, Thiel and Sacks explore the impact of the "diversity" movement, which was seen as a growing focus on race, gender, and identity-based policies in universities, on intellectual discourse, freedom of speech, and academic life.
, releaseDate: 1995-10-01, pages: 256, authorId: 8
2025-01-06 07:56:19 [INFO]: Book created successfully. books count: 10
"
~
~
~
"
"react-node-mysql-app/backend/logs/combined.log" 23L, 1789B

```

```

CloudWatch < 2025-01-06 07:54:09 [INFO]: Authors count: 7
Favorites and recents > 2025-01-06 07:54:12 [INFO]: AuthorsController [GET]
2025-01-06 07:54:12 [INFO]: Authors count: 7
2025-01-06 07:54:16 [INFO]: BooksController [GET]
2025-01-06 07:54:16 [INFO]: Books count: 9
2025-01-06 07:54:25 [INFO]: BooksController [GET]
2025-01-06 07:54:25 [INFO]: Books count: 9
2025-01-06 07:54:32 [INFO]: BooksController [GET]
2025-01-06 07:54:32 [INFO]: Books count: 9
2025-01-06 07:54:34 [INFO]: AuthorsController [GET]
2025-01-06 07:54:34 [INFO]: Authors count: 7
2025-01-06 07:54:48 [INFO]: BooksController [GET]
2025-01-06 07:55:03 [INFO]: Books count: 9
2025-01-06 07:55:04 [INFO]: AuthorsController [GET]
2025-01-06 07:55:04 [INFO]: Authors count: 8
2025-01-06 07:56:19 [INFO]: BooksController [CREATE] - title: The Diversity Myth, description: "The Diversity Myth: Multiculturalism and Political Intolerance on Campus" (1995), co-authored by Peter Thiel and David O. Sacks, is a critique of the culture of political correctness and identity politics that they argue had taken over American college campuses during the 1990s. Drawing on their experiences as students at Stanford University, Thiel and Sacks explore the impact of the "diversity" movement, which was seen as a growing focus on race, gender, and identity-based policies in universities, on intellectual discourse, freedom of speech, and academic life.,, releaseDate: 1995-10-01, pages: 256, authorId: 8
2025-01-06 07:56:19 [INFO]: Book created successfully., books count: 10
No newer events at this moment. Auto retry paused. Resume

```

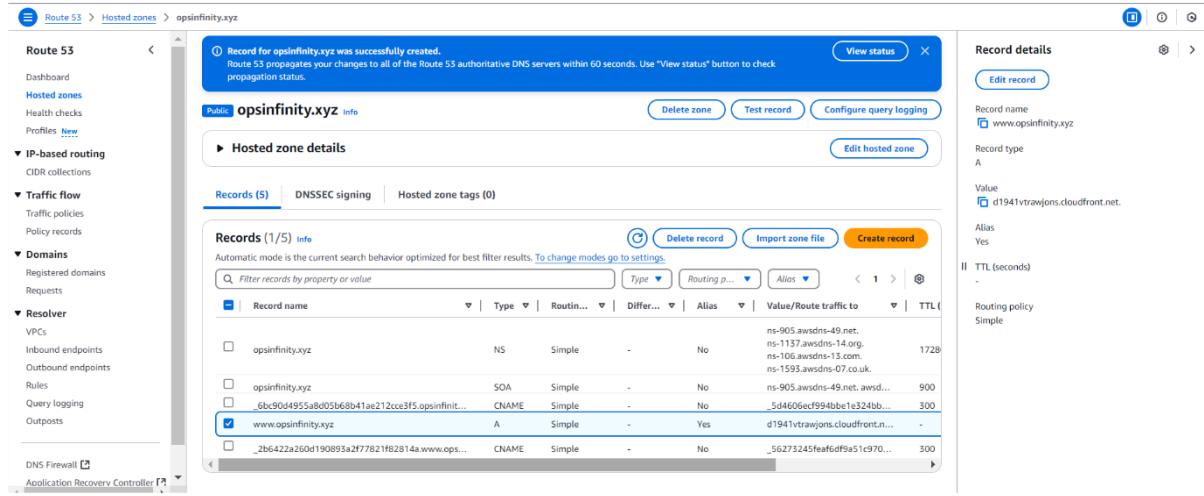
## Step-12: Setting Up CloudFront Distribution

- Navigate to CloudFront
- Create a new CloudFront Distribution
- Choose the origin domain (Presentation-Tier-ALB)
- Protocol settings:
  - Redirect HTTP to HTTPS
- Do not enable WAF (Web Application Firewall)
- Select the regions needed for your distribution
- Add alternative domain names (opsinfinity.xyz & www.opsinfinity.xyz)
- Attach an SSL Certificate for your custom domain
- Finalize and create the CloudFront distribution

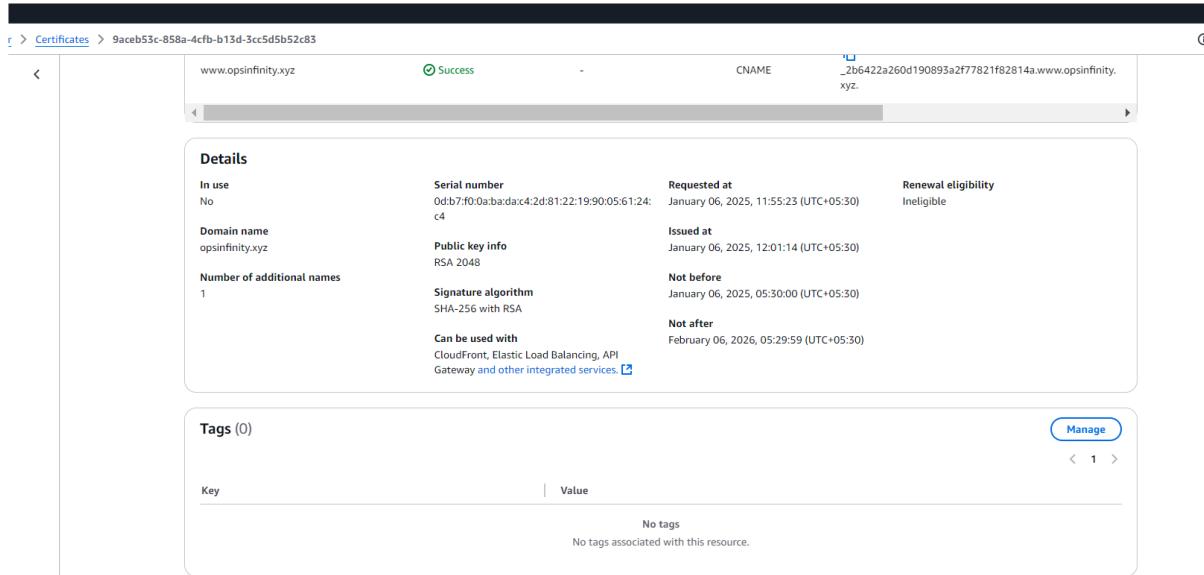
| General                                                                                                                          |                                                                                                                                                                  |                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Details</b>                                                                                                                   | <b>ARN</b>                                                                                                                                                       | <b>Last modified</b>                                                         |
| Distribution domain name<br><a href="#">d1941vtrawjons.cloudfront.net</a>                                                        | arn:aws:cloudfront:891577231581:distribution/E3DPOZXRMJP8JMI                                                                                                     | Deploying                                                                    |
| <b>Settings</b>                                                                                                                  | <b>Edit</b>                                                                                                                                                      |                                                                              |
| Description<br>Price class<br>Use all edge locations (best performance)<br>Supported HTTP versions<br>HTTP/2, HTTP/1.1, HTTP/1.0 | Alternate domain names<br>www.opsinfinity.xyz<br>opsinfinity.xyz<br>Custom SSL certificate<br><a href="#">opsinfinity.xyz</a><br>Security policy<br>TLSv1.2_2021 | Standard logging<br>Off<br>Cookie logging<br>Off<br>Default root object<br>- |
| <b>Continuous deployment</b> <small>Info</small>                                                                                 |                                                                                                                                                                  |                                                                              |
| <a href="#">Create staging distribution</a>                                                                                      |                                                                                                                                                                  |                                                                              |

## Step-13: Configuring DNS Records in Route 53 for Your CloudFront Distribution

- Navigate to Route53
- Open your Hosted Zone
- Click Add Records to create a new DNS record
- Choose alias as record type
- Select your CloudFront distribution from the dropdown list in the Alias Target field
- Select your distribution
- Save the record to complete the configuration



| Record name                                      | Type     | Routing policy | Alias | Value                                                                                                | TTL (seconds) |
|--------------------------------------------------|----------|----------------|-------|------------------------------------------------------------------------------------------------------|---------------|
| opsinfinity.xyz                                  | NS       | Simple         | -     | ns-905.awsdns-10.net.<br>ns-1137.awsdns-14.org.<br>ns-105.awsdns-13.com.<br>ns-1593.awsdns-07.co.uk. | 1728          |
| opsinfinity.xyz                                  | SOA      | Simple         | -     | ns-905.awsdns-49.net.awsd...                                                                         | 900           |
| _5bc90d4955a8d05b68b41ae212cce3f5.opsinfinity... | CNAME    | Simple         | -     | _544606cf5940be1e324bb...                                                                            | 300           |
| <b>www.opsinfinity.xyz</b>                       | <b>A</b> | Simple         | -     | <b>d1941vtrawjons.cloudfront.net.</b>                                                                | -             |
| _2b6422a260d190893a2f77821f82814a.www.ops...     | CNAME    | Simple         | -     | _56273245feaf6df9a51c970...                                                                          | 300           |

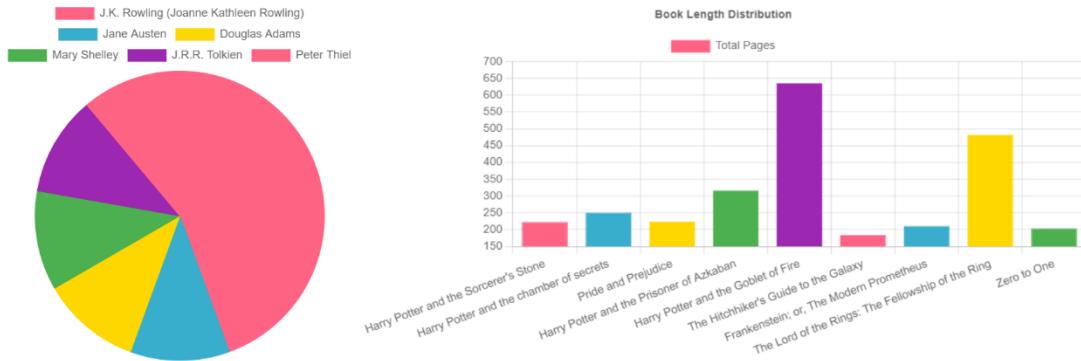
| Key                                    | Value |
|----------------------------------------|-------|
| No tags                                |       |
| No tags associated with this resource. |       |

## Step-14: Testing the Application

Access the application using the domain name.

# Dashboard

Books Authors



## Add Author

Name

Peter Thiel

Birthday

11-10-1967

Description

Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society.

Cancel

Add

|   |               |                          |                                                                                                                                                                                                                                                                                                                                                                                |                          |                          |  |  |  |
|---|---------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--|--|--|
| 7 | Douglas Adams | 1979-10-12T00:00:00.000Z | Douglas Adams was an English science fiction writer, satirist, humorist, dramatist, screenwriter, and occasional actor. He is best known for the Hitchhiker's Guide to the Galaxy comedy series, which inspired a radio comedy, several books, stage shows, comic books, a 1981 TV series, a 1984 video game, a 2005 feature film, and a 2008 sequel film.                     | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z |  |  |  |
| 8 | Peter Thiel   | 1967-10-11T00:00:00.000Z | Peter Thiel is a German-American entrepreneur, venture capitalist, and author, best known for his role in co-founding PayPal and Palantir Technologies, as well as for his influential investments in various high-profile technology companies. Thiel is a controversial figure, both praised and criticized for his unconventional views on business, politics, and society. | 2025-01-06T00:00:00.000Z | 2025-01-06T00:00:00.000Z |  |  |  |

Add Book X

Title

Release Date  Calendar icon

Description

Cancel Add

|    |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                          |                |                          |                          |                                                                                                                                                                                                                                                                                                                           |
|----|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------|--------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9  | The Lord of the Rings: The Fellowship of the Ring | THE FIRST BOOK IN J.R.R. TOLKIEN'S EPIC FANTASY TRILOGY, THE LORD OF THE RINGS. THE FELLOWSHIP OF THE RING FOLLOWS HOBBIT FRODO BAGGINS AS HE INHERITS THE ONE RING, AN EVIL ARTIFACT OF POWER CREATED BY THE DARK LORD SAURON. FRODO EMBARKS ON A QUEST TO DESTROY THE RING IN THE FIRES OF MOUNT DOOM, ACCOMPANIED BY A FELLOWSHIP OF EIGHT COMPANIONS.                                                                                                                       | 1954-07-29T00:00:00.000Z | J.R.R. Tolkien | 2024-05-29T00:00:00.000Z | 2024-05-29T00:00:00.000Z | <span style="border: 1px solid #ccc; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">Edit</span> <span style="border: 1px solid #0072BD; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">View</span> <span style="border: 1px solid #ccc; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">Delete</span> |
| 10 | Zero to One                                       | "ZERO TO ONE: NOTES ON STARTUPS, OR HOW TO BUILD THE FUTURE" IS A BOOK BY PETER THIEL, CO-FOUNDER OF PAYPAL AND PALANTIR, AND A PROMINENT VENTURE CAPITALIST. PUBLISHED IN 2014, THE BOOK EXPLORES THIEL'S UNCONVENTIONAL IDEAS ABOUT INNOVATION, STARTUPS, AND ENTREPRENEURSHIP, OFFERING A UNIQUE PERSPECTIVE ON HOW TO CREATE BREAKTHROUGH COMPANIES THAT GO FROM "ZERO TO ONE" — MEANING TO BUILD SOMETHING TRUE NEW AND VALUABLE, RATHER THAN JUST COPYING EXISTING IDEAS. | 2014-09-16T00:00:00.000Z | Peter Thiel    | 2025-01-06T00:00:00.000Z | 2025-01-06T00:00:00.000Z | <span style="border: 1px solid #ccc; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">Edit</span> <span style="border: 1px solid #0072BD; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">View</span> <span style="border: 1px solid #ccc; border-radius: 50%; padding: 2px 5px; margin: 0 5px;">Delete</span> |

**This is a fully functional, scalable, and highly available 3-tier architecture designed for seamless performance and reliability.**