San Jose State University

Software Engineering Department

CMPE 273 - Enterprise Distributed systems

Project: Reddit Prototype

Instructor: Dr Simon Shim

Submitted By

Group 6

Name	SJSU ID
Divya Mittal	015351349
Kiran Bala Devineni	015218866
Naitik Vajani	015270710
Nikhil Raj Karlapudi	014668121
Saketh Reddy Banda	014843881
Vinay Guda	015255123

Work Partition:

- **Team Member 1 (Divya Mittal)** :
  Created login page with validations • signup page with validations • logout page for Reddit with validations •Designed database for SQL and MongoDB • MongoDB model creation •S3 Bucket setup for image upload • Create Community• Edit Community • Delete Community • My Community page to show all the communities created by the owner •Different sorting implementation for myCommunity page• Upload multiple images using s3 • Setting up Kafka for the application•Kafka Migration for multiple api's •Dark Mode implementation for the pages implemented • Community Analytics page to show different graphs related to a community • Messaging app • Redis client caching • Styling for the application using bootstrap and material ui • JWT token implementation for the APIs • Pagination for different components• Worked on load balancer • AWS configuration of application • Complete end to end testing of the application with multiple bug fixes • Mocha test cases

- **Team Member 2 (Kiran Bala Devineni) :**
  Created APIs for • community search • user profile details • Developed the Community Search Page which required: • showing the list of all the communities with most recently created first • Implemented both regular and load more on scroll pagination i.e., infinite scroll for community search results • upvote or downvote a community • sort communities by created at, most number of users, most number of posts, most upvoted posts in ascending and descending order • Navigation bar search field functionality in community search page • search for a community by name • Worked on the User Profile Page which involved: • Navigating to a particular user's profile page on clicking other users' profiles displayed in search page • showing the user's profile details like their picture, name, location preferences and the communities they are part of • Developed the User Interface for both community search page and user profile details page • Migration of community search and user profile details APIs into Kafka • System Architecture design

- **Team Member 3 (Naitik Vajani):**
  Created APIs for • creating a post • removing a user from a community • sending the invites •showing the status of invites for moderator • accepting an invite • rejecting an invite • getting all the posts for dashboard • Community Analytics • Add/Edit/Delete a topic • get communities for owner • add a comment • get communities created by a user • get communities details • check the user is the moderator for giving invitation page access • get Listed users details • worked on complex aggregate APIs for different pages • Developed Invitation page for community owner to send the invites •Notification page to show the invitation • accept/reject the invites • dashboard page to show the posts from all the communities in which the user is a member • Established the Redis structure • Worked on load balancer • AWS configuration of application • Complete end to end testing of the application for multiple bug fixes • Mocha test cases

- **Team Member 4 (Nikhil Raj Karlapudi) :**

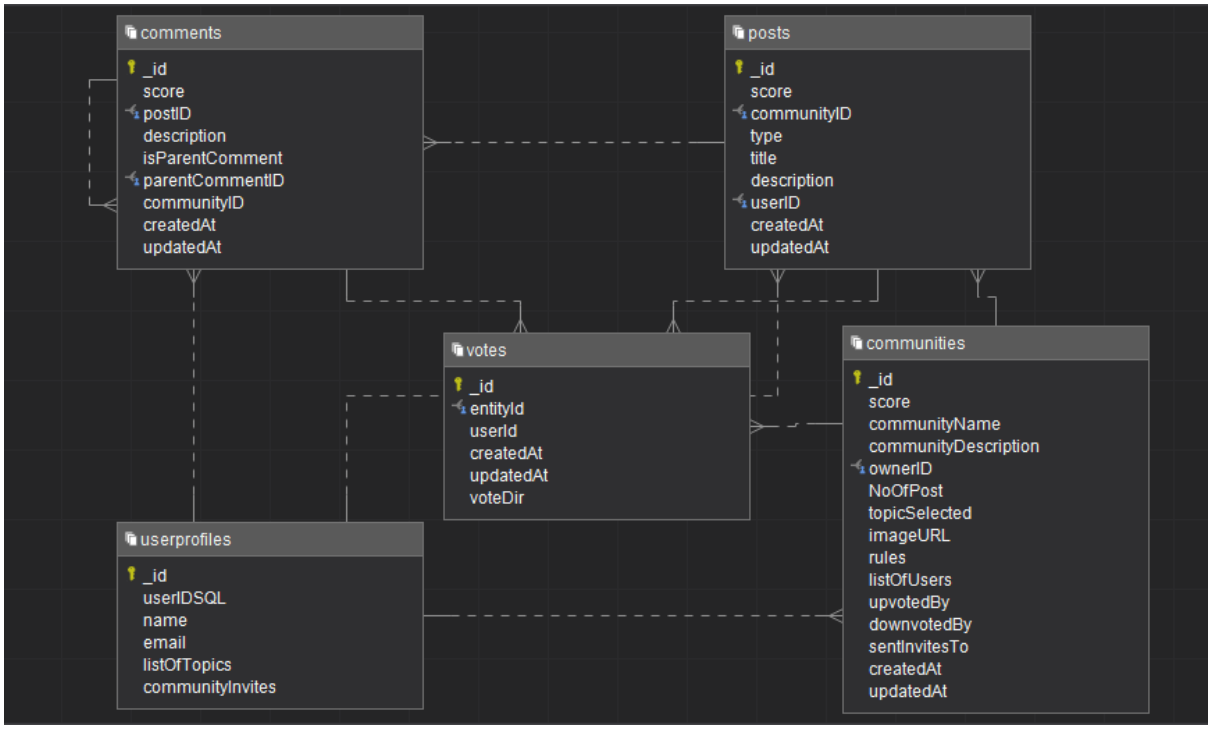
Connection to Amazon RDS • setting up of sequelize ORM for MySQL queries • Schema design for MySQL and MongoDB • Created APIs for the entire community moderation page, Adding multiple selected users to a particular community which the user is the moderator of and rejecting multiple for the same • Removing multiple users from multiple selected communities and then deleted all the subsequent Posts and comments by those users in those communities • Pagination in community moderation page • Setting up Kafka skeleton and migrating API • Kafka support for JWT authentication • Multiple APIs for community analytics page and displaying graphs for the same • Complete UI/UX interactions for login, signup and navbar components • Dark mode support for pages implemented • Worked on end to end testing and multiple bug fixes • Mocha test cases. Improved UI and placement for multiple components in the application.

- **Team Member 5 (Saketh Reddy Banda)**:
  React express setup. Community page and create post UI. Navigation in React. Widgets in community page. Rules and community details. Database design and API documentation. Voting schema design for community, posts and comments. voting and commenting UI. Kafka backend for multiple apis. Post card and comments count implementation. Fast rendering of votes count which doesn't make the UI slow. Added Css using react bootstrap for multiple UI components. Wrote optimized Backend apis for getting posts , comments(sorting based on upvotes and tiebreaker as createdAt) and communities. Tried implementing redis for storing top posts to show to users for fast rendering of the UI. Dark mode styling for community page. Getting relative time for the date posted. Added scripts in package.json. Fixed some of the minor bugs and tested the entire application.

  Team Member 6 (Vinay Guda) :
  Established all pages base routing and navigation in React Frontend • Home page widgets • User profile screen • Add/Delete/Edit topic in the user profile • Community Home Page, Community Home Page Widgets and their interactions, Post, Detailed Post View, Comments and Comment thread UI Design and implementation. • Community Home Page header to show multiple variations based on user status(Moderator/Join/Leave/Accept, Reject/Request denied/Waiting for Approval/Invite Rejected) • Create Post Screen • Navigating to a particular user's profile page on clicking other users' profiles displayed in post, comment, community widgets • Dark Mode support with material theming. • Implemented application level loader to highlight the ongoing background API call's status with set and unset methods available to all pages • Mongo collection and connection • Error 404 page • No data available Reddit style UI screen in multiple screens • Reddit style randomizing user/community profile pictures with avatars. • Utils functions to calculate relative time. • Complete end-to-end testing of the application and bug fixes all around the application. • Implemented controlled voting behaviour on vote buttons to avoid uncontrolled clicks. • Kafka migration for 15+ APIs • AWS deployment and load balancing • Github branch maintenance - PRs from dev to main.

Database Schema:

MongoDB:


comments
_id
score
postID
description
isParentComment
parentCommentID
communityID
createdAt
updatedAt
posts
_id
score
communityID
type
title
description
userID
createdAt
updatedAt
votes
_id
entityId
userId
createdAt
updatedAt
voteDir
communities
_id
score
communityName
communityDescription
ownerID
NoOfPost
topicSelected
imageURL
rules
listOfUsers
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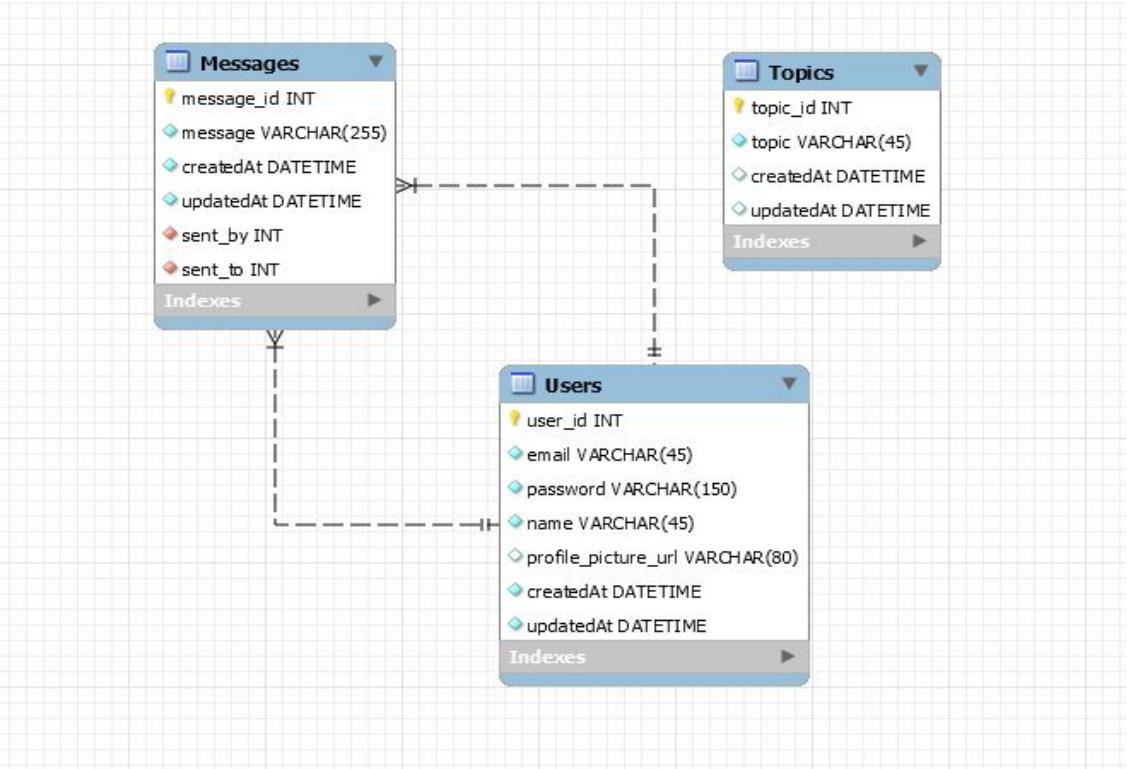
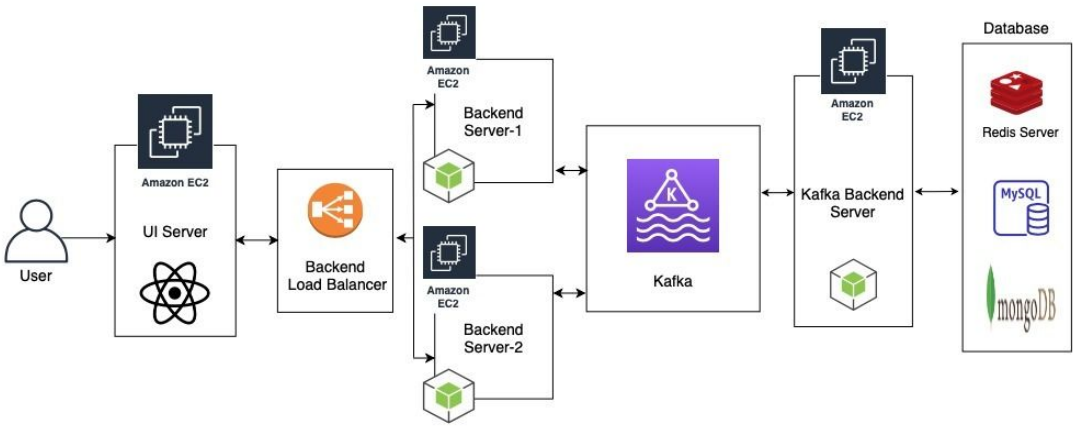
communityInvites

MySQL:



System Design and Architecture:



- **<u>Object management policy</u>:**

- Community, Post, Comment objects were implemented in MongoDB so as to achieve vertical scalability on the fly. As the data inside the documents is ever increasing its suggestible to implement it in MongoDB. Before accessing any object in the document, the request is first authenticated and authorized through JWT and then the objects are returned. Images related to profile, community and posts are stored in the AWS S3 bucket. We are also making use of the life cycle policy to move the images which are not accessed frequently to S3 IA and if the images are not accessed for over a year, we move them to AWS Glacier.

- **Handling heavyweight resources:**

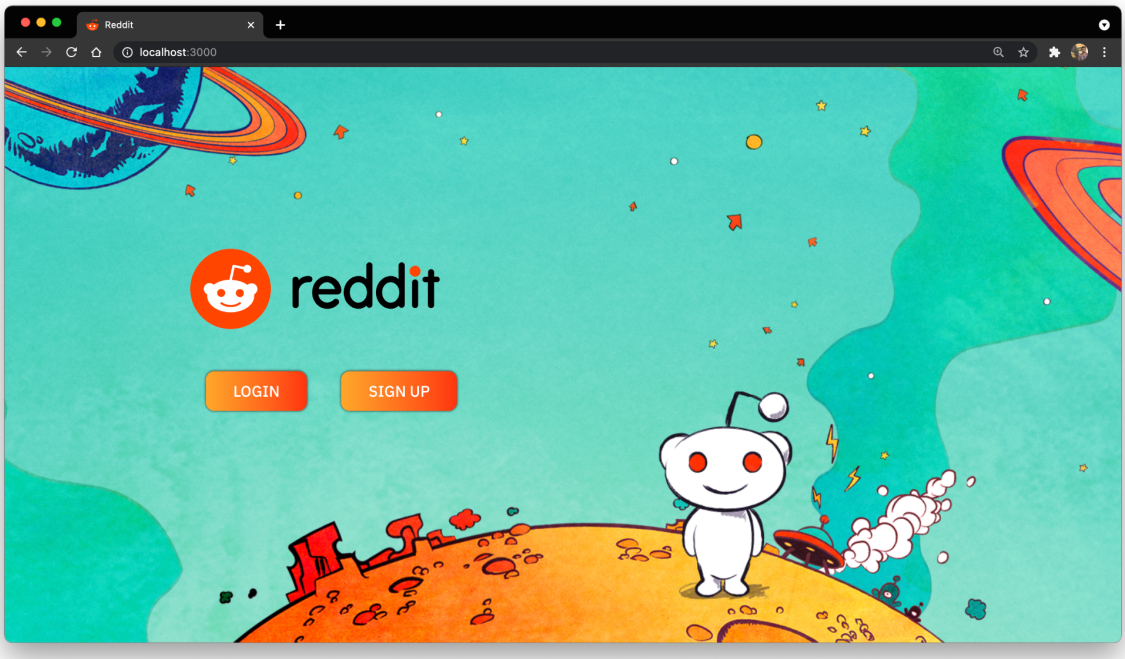
  Read and Write operations on heavyweight resources take a lot of time and decrease the latency. So, we used Redis cache to store the heavy resources which are not changed frequently. For example: user profile is getting fetched at multiple locations to show the username and profile picture. We have added the user profile in Redis to minimize the load. However, data should not stay forever on Redis, therefore added a timeout for the data in Redis. Adding to that, heavy resources like images can be hosted on CDNs for low latency.

- **Policy for writing into Database:**

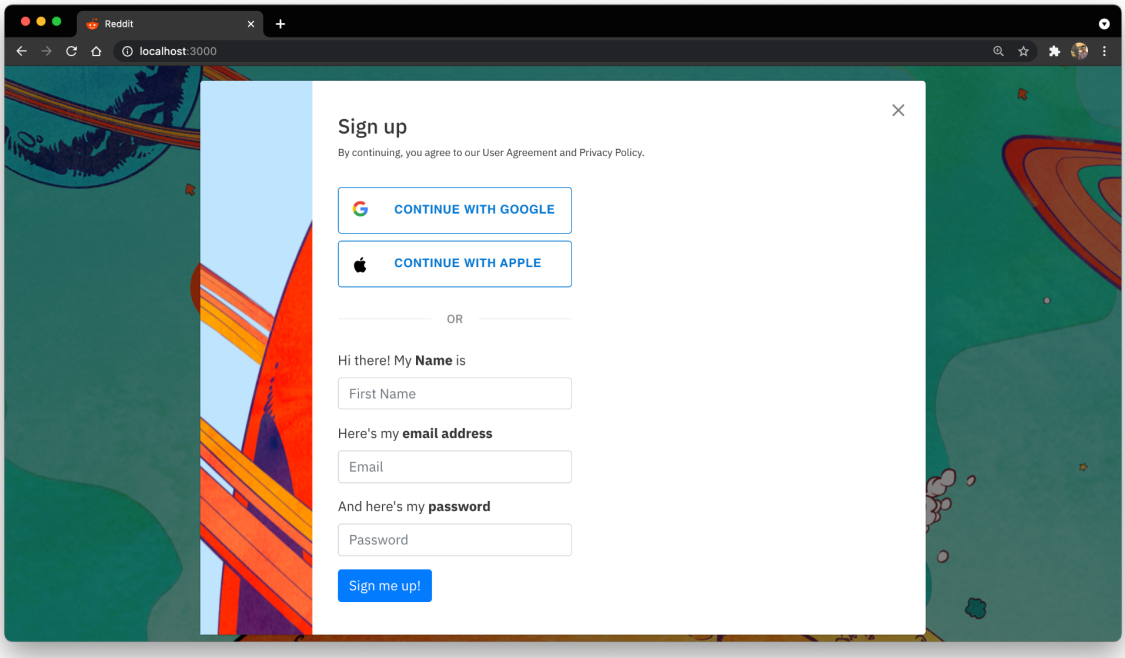
  We used Redis Cache for faster access to the data. So, to avoid data inconsistency, we made sure to update the data in Redis after getting a successful response from the database. Also, instead of writing each vote, we can save them and do batch processing of votes on the database. We will update only the updated fields in the database whenever there is an update query involved.

Screen Captures:

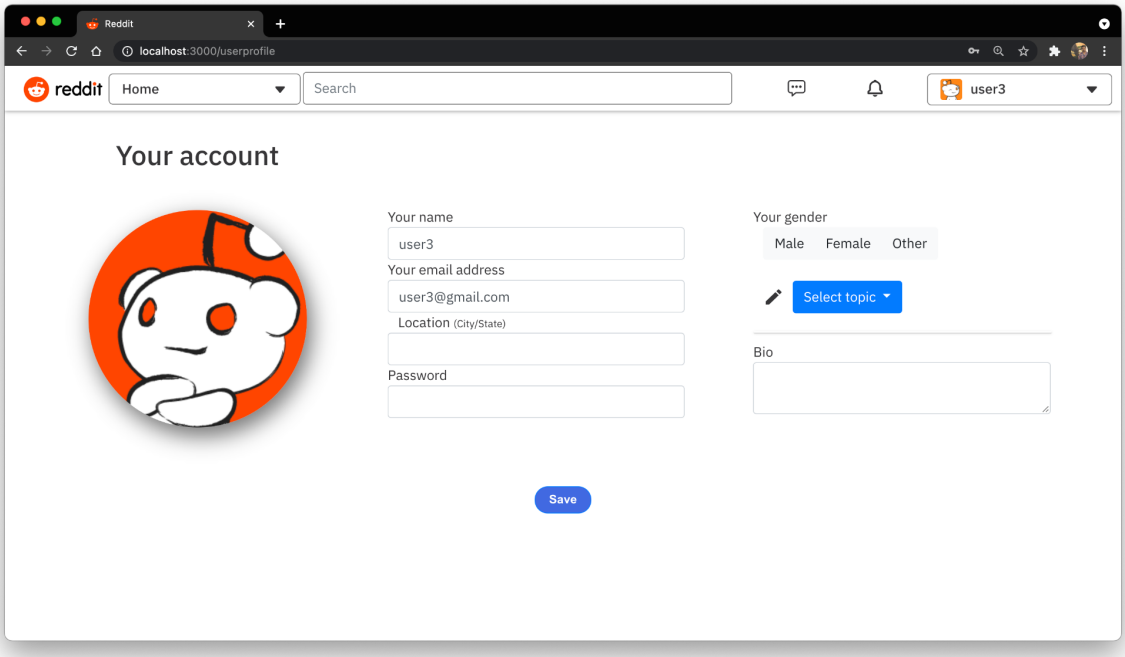
Landing Page:

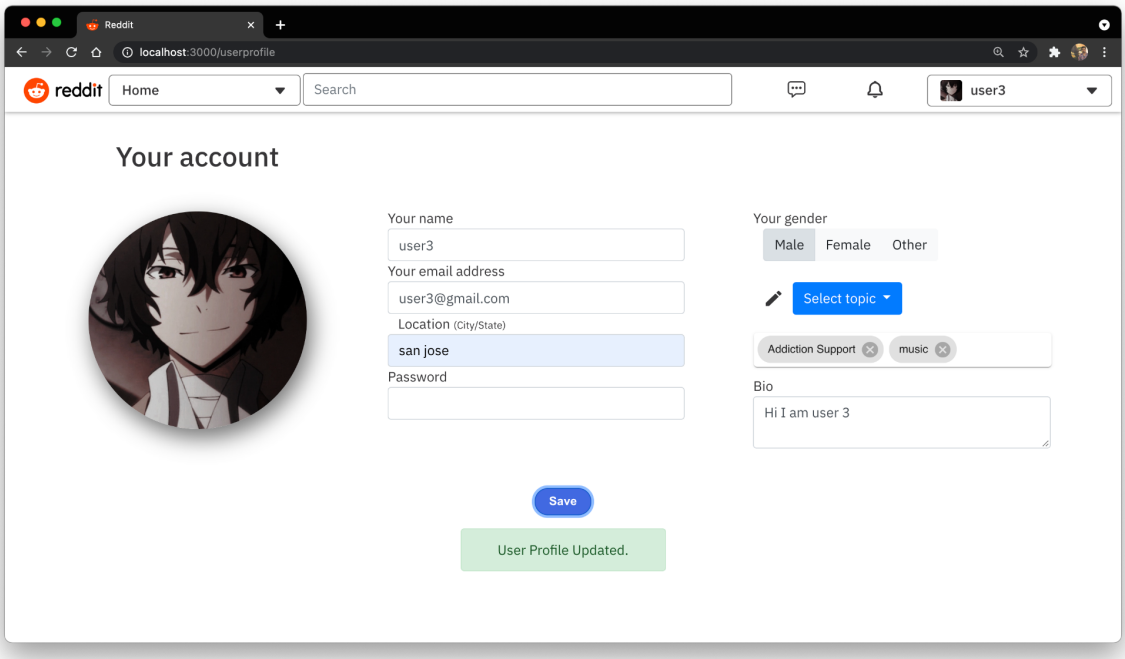


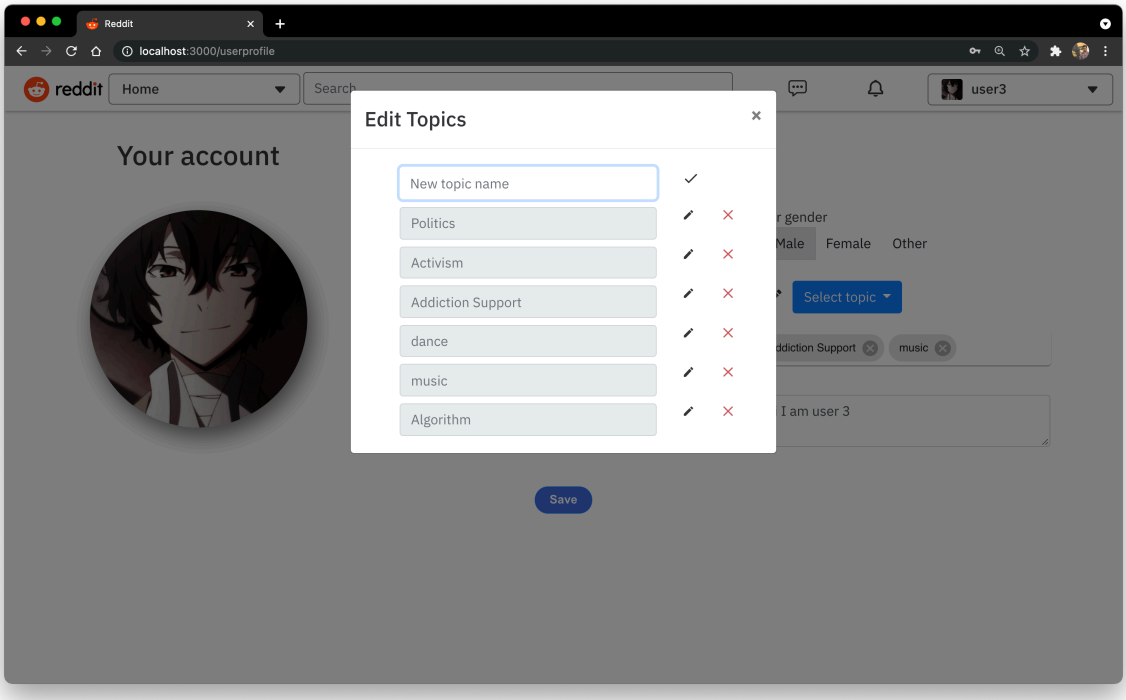
Sign up & Login Page:



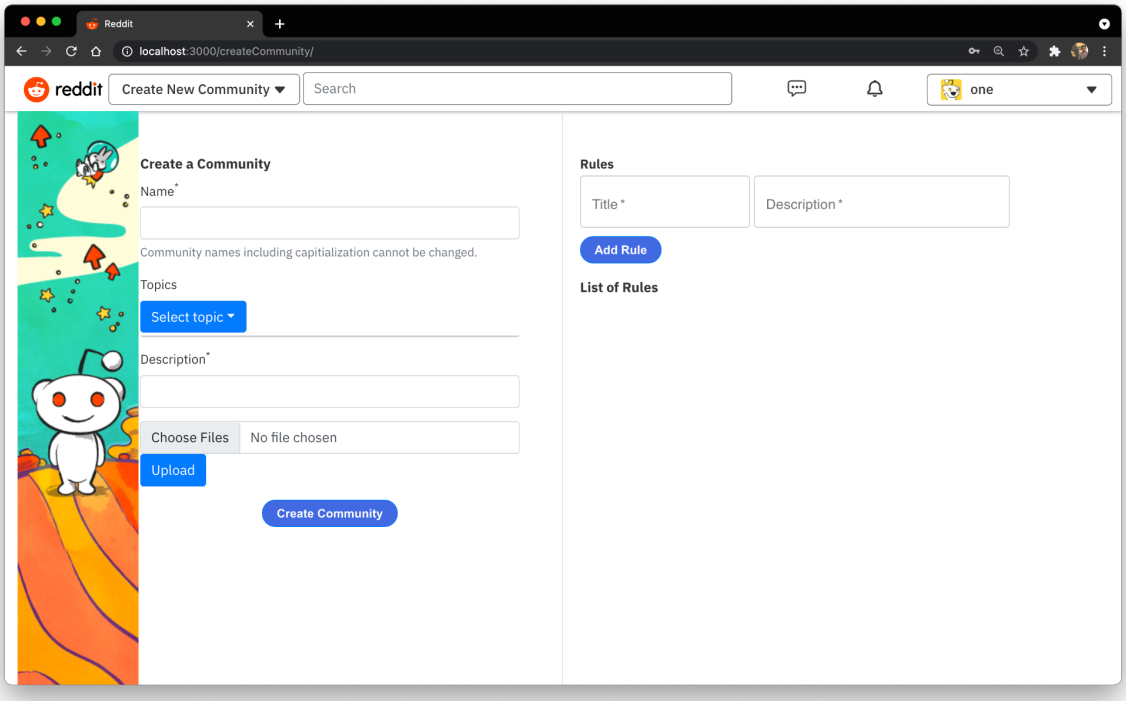
My Profile Page:

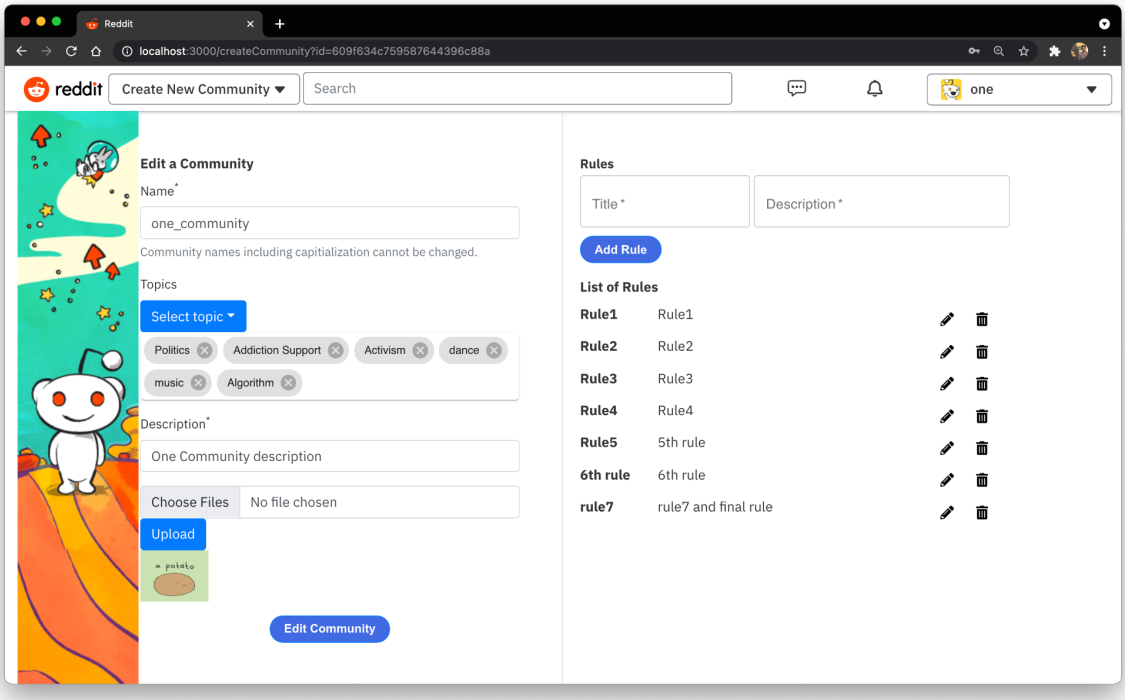

Reddit
localhost:3000/userprofile
reddit
Home
Search
user3
Your account
Your name
user3
Your email address
user3@gmail.com
Location (City/State)
Password
Your gender
Male
Female
Other
Select topic
Bio
Save


Reddit
localhost:3000/userprofile
reddit
Home
Search
user3
Your account
Your name
user3
Your email address
user3@gmail.com
Location (City/State)
san jose
Password
Your gender
Male
Female
Other
Select topic
Addiction Support
music
Bio
Hi I am user 3
Save
User Profile Updated.

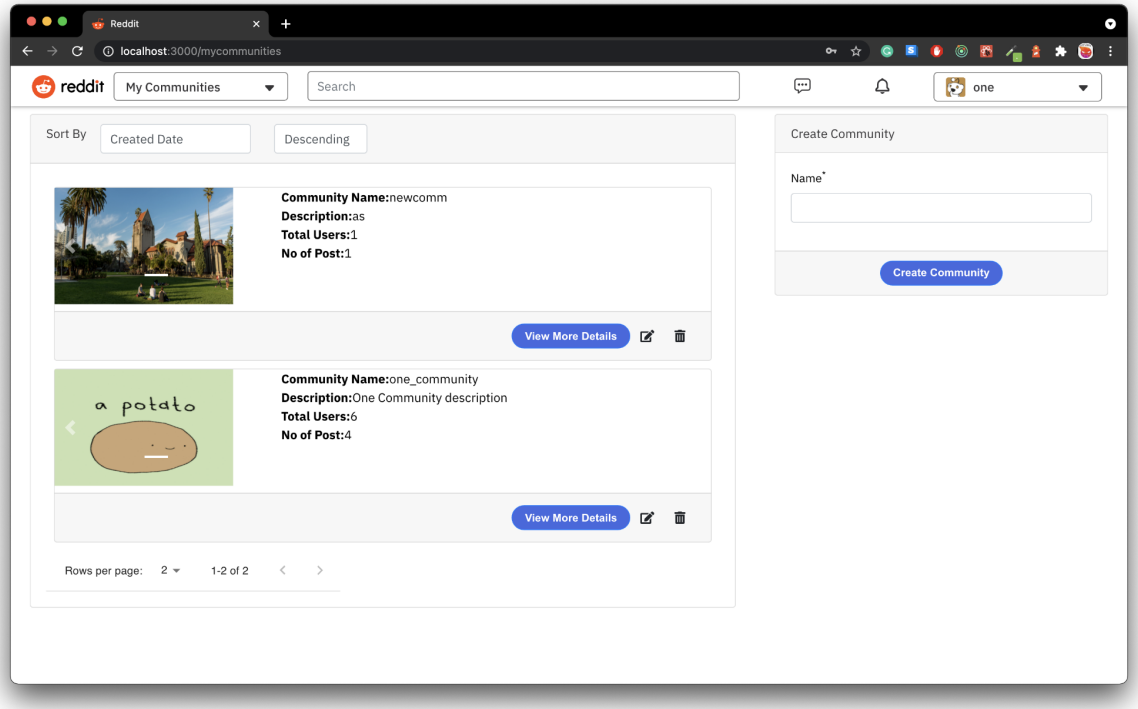


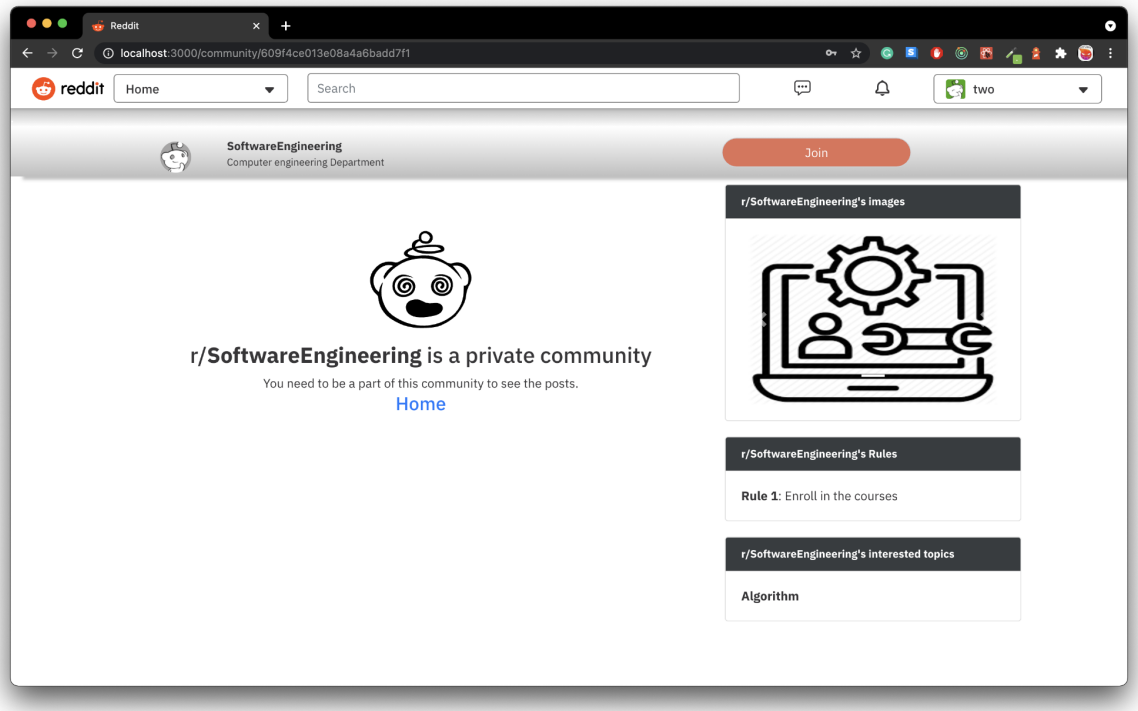
Create Community Page

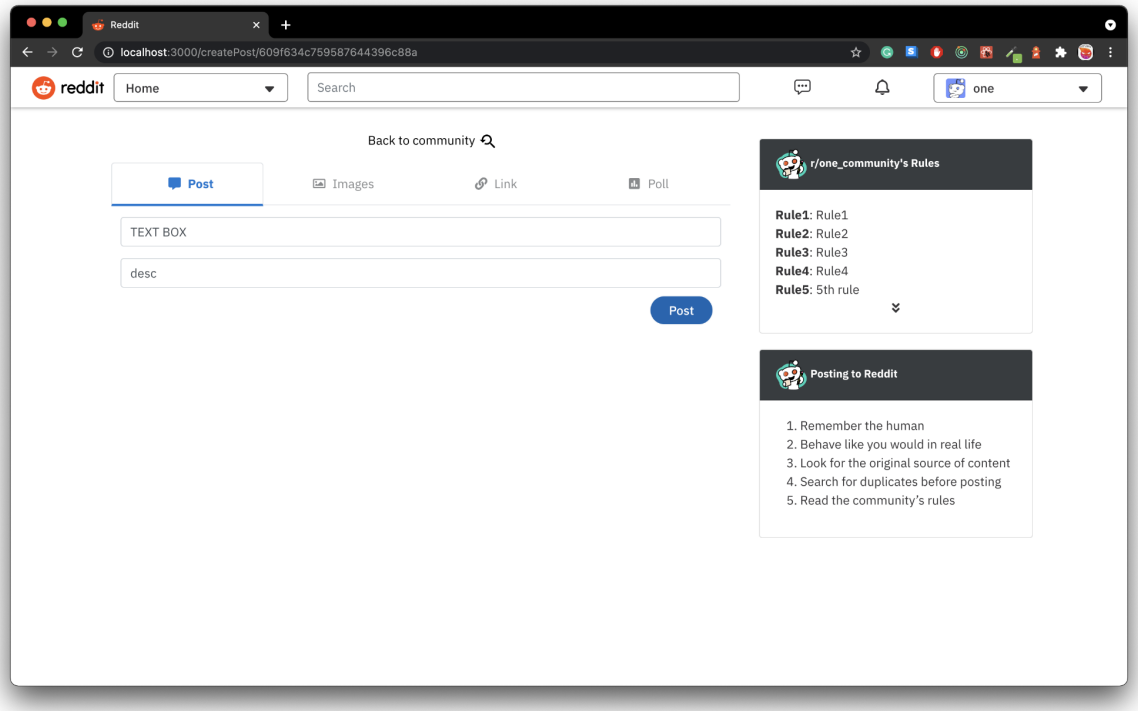


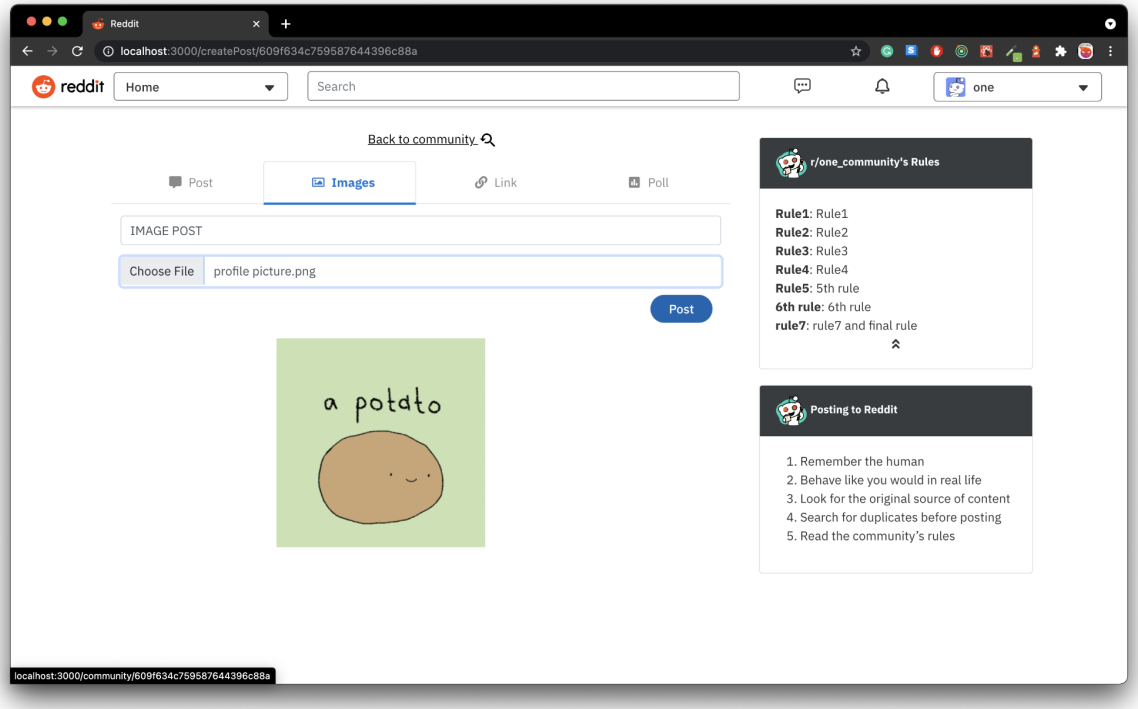


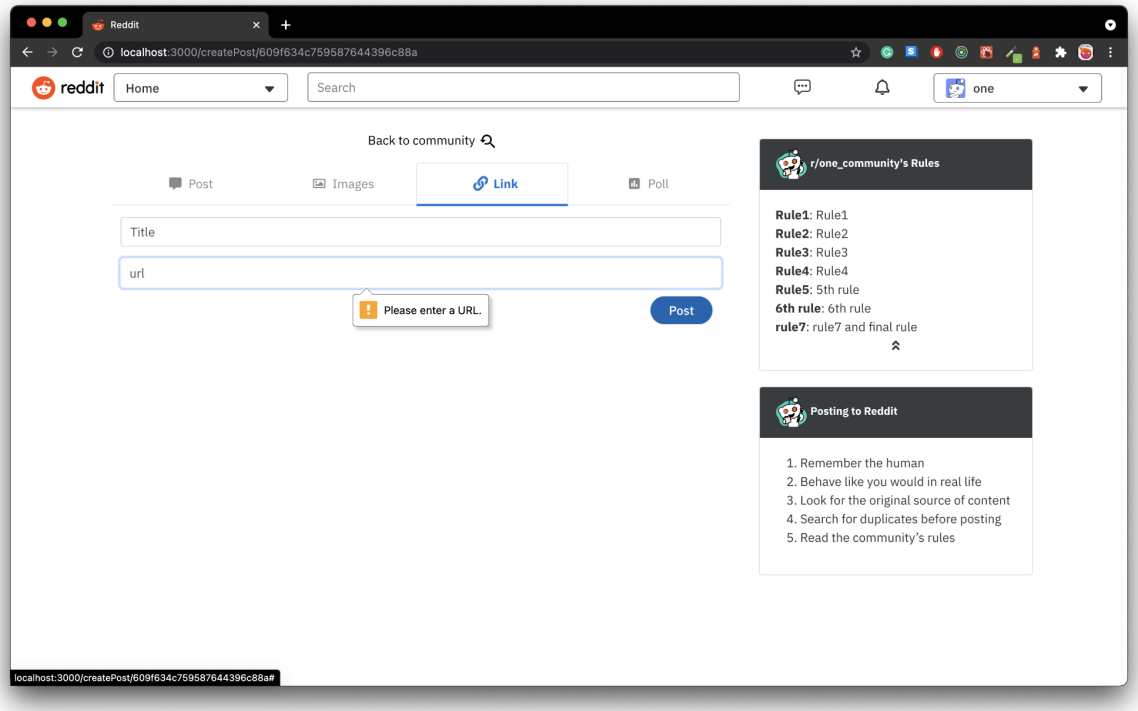
My Communities Page:

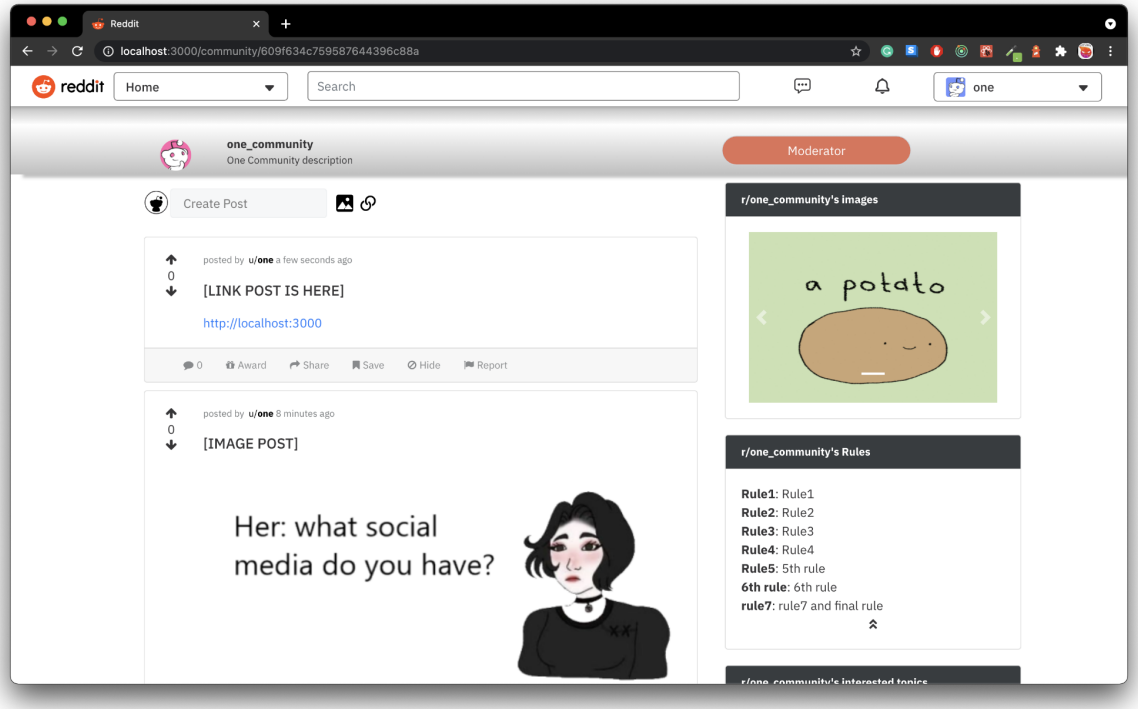


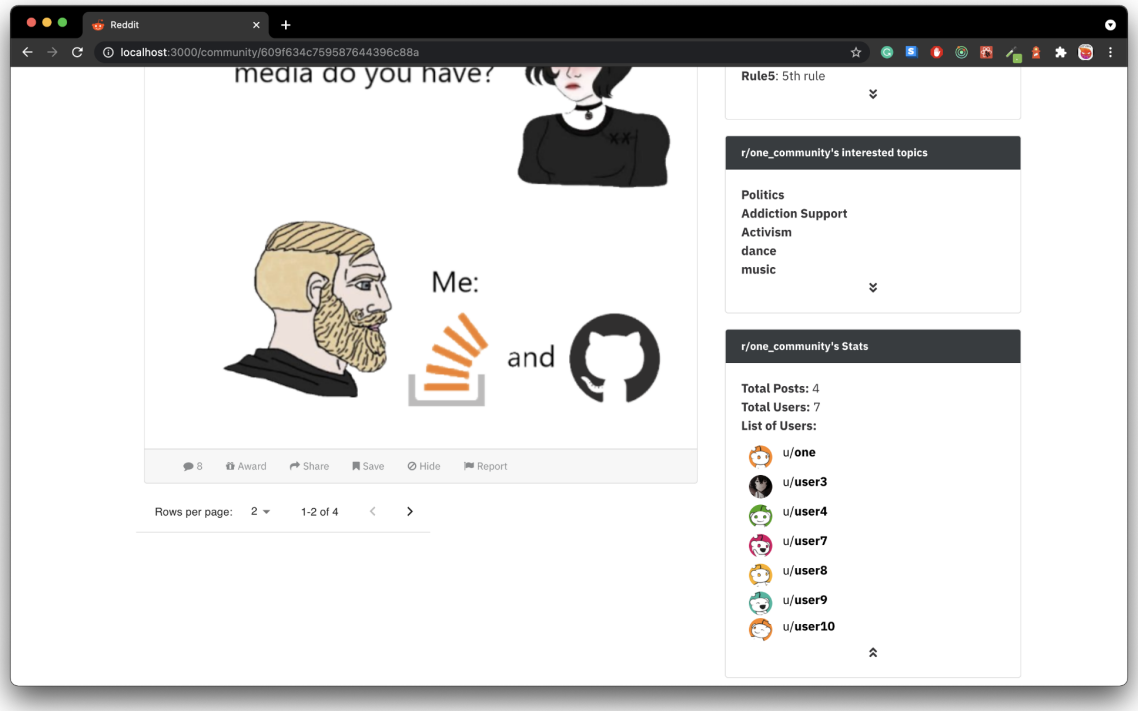

Reddit
localhost:3000/community/609f4ce013e08a4a6badd7f1
reddit
Home
Search
two
SoftwareEngineering
Computer engineering Department
Join
r/SoftwareEngineering is a private community
You need to be a part of this community to see the posts.
Home
r/SoftwareEngineering's images
r/SoftwareEngineering's Rules
Rule 1: Enroll in the courses
r/SoftwareEngineering's interested topics
Algorithm

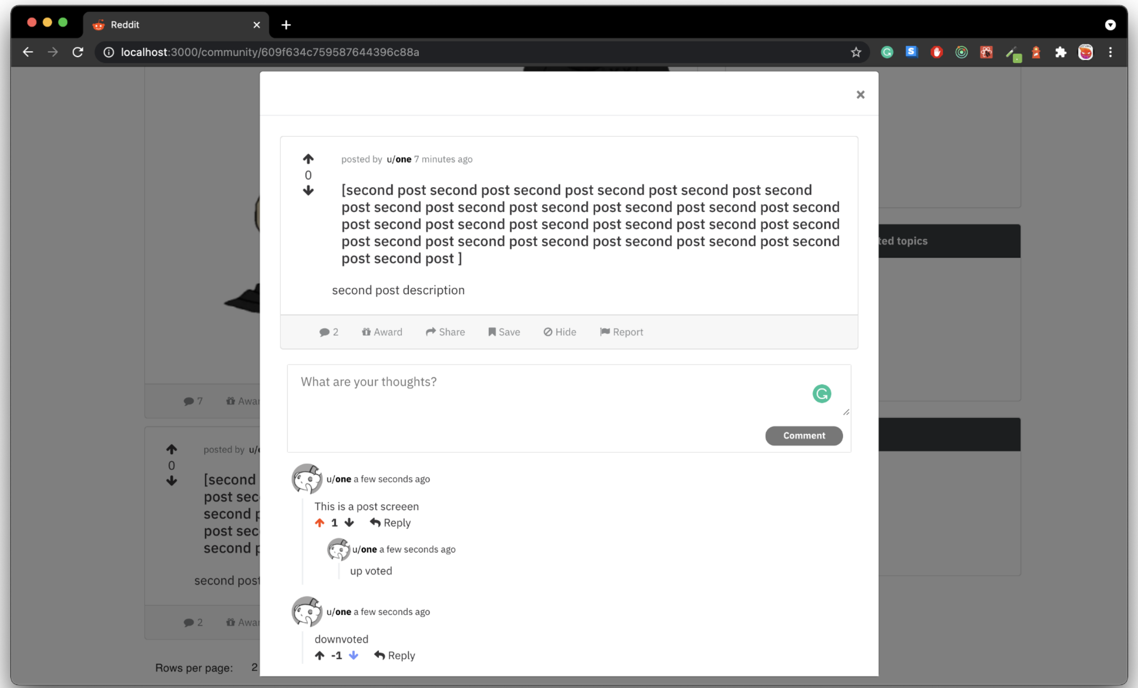

Reddit
localhost:3000/createPost/609f634c759587644396c88a
reddit
Home
Search
one
Back to community
Post
Images
Link
Poll
TEXT BOX
desc
Post
r/one_community's Rules
Rule1: Rule1
Rule2: Rule2
Rule3: Rule3
Rule4: Rule4
Rule5: 5th rule
Posting to Reddit
1. Remember the human
2. Behave like you would in real life
3. Look for the original source of content
4. Search for duplicates before posting
5. Read the community's rules

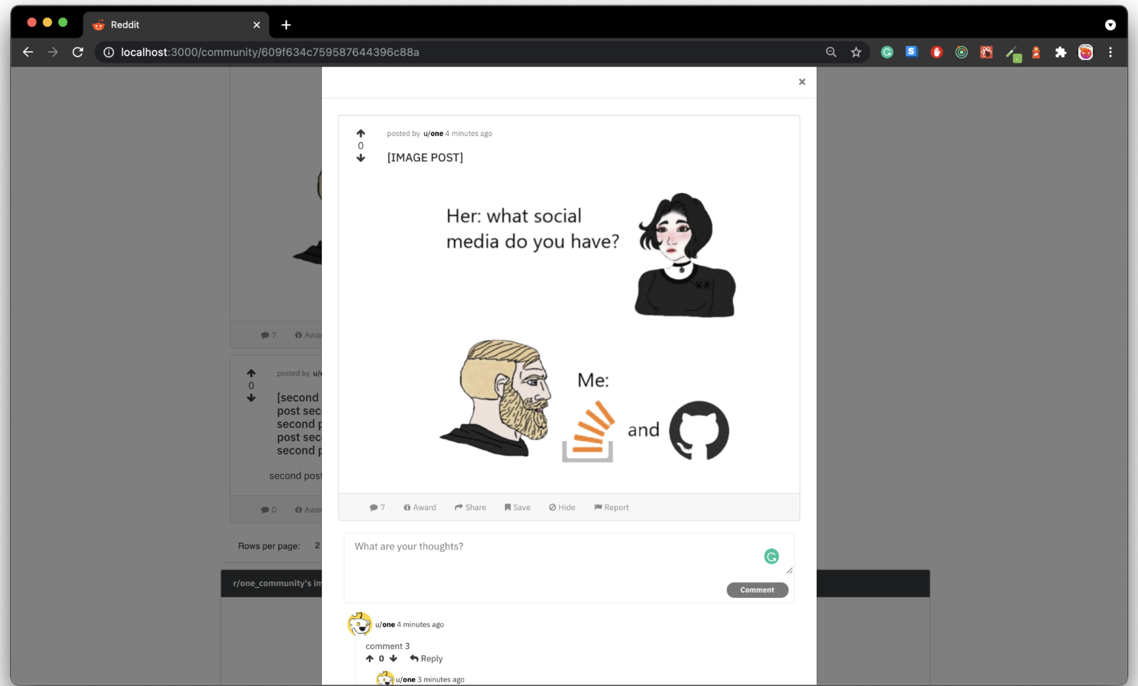

Reddit
localhost:3000/createPost/609f634c759587644396c88a
reddit
Home
Search
one
Back to community
Post
Images
Link
Poll
IMAGE POST
Choose File
profile picture.png
Post
a potato
r/one_community's Rules
Rule1: Rule1
Rule2: Rule2
Rule3: Rule3
Rule4: Rule4
Rule5: 5th rule
6th rule: 6th rule
rule7: rule7 and final rule
Posting to Reddit
1. Remember the human
2. Behave like you would in real life
3. Look for the original source of content
4. Search for duplicates before posting
5. Read the community's rules
localhost:3000/community/609f634c759587644396c88a

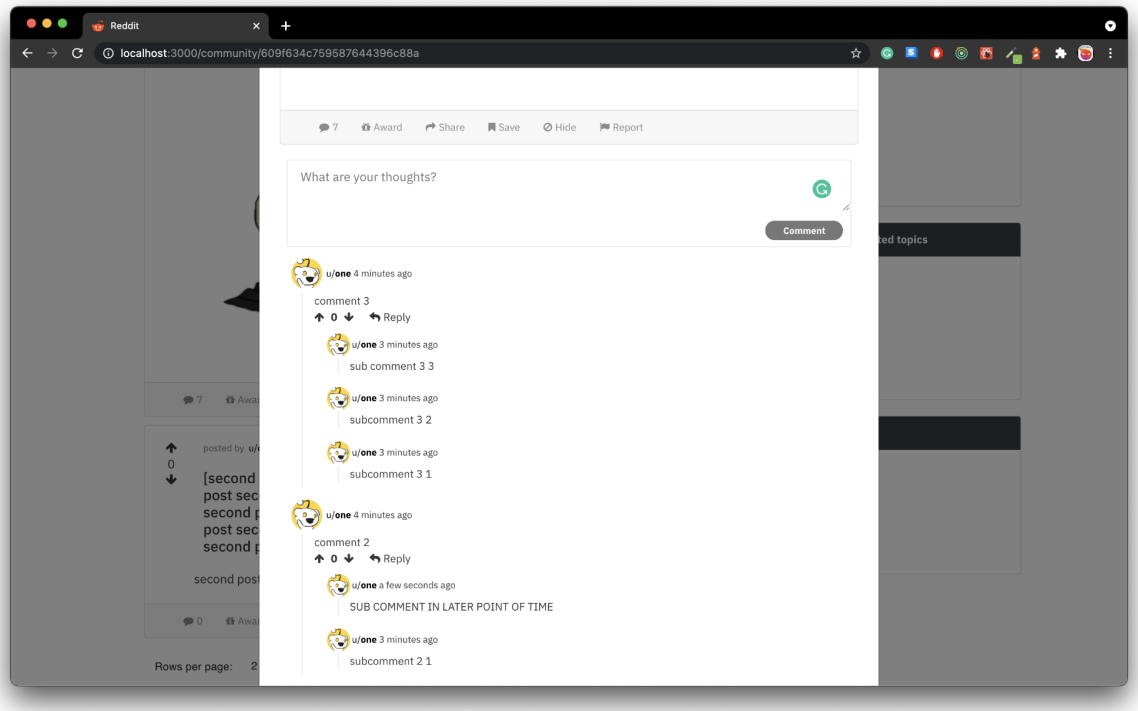

Reddit
localhost:3000/createPost/609f634c759587644396c88a
reddit
Home
Search
one
Back to community
Post
Images
Link
Poll
Title
url
Please enter a URL.
Post
r/one_community's Rules
Rule1: Rule1
Rule2: Rule2
Rule3: Rule3
Rule4: Rule4
Rule5: 5th rule
6th rule: 6th rule
rule7: rule7 and final rule
Posting to Reddit
1. Remember the human
2. Behave like you would in real life
3. Look for the original source of content
4. Search for duplicates before posting
5. Read the community's rules
localhost:3000/createPost/609f634c759587644396c88a#


Reddit
localhost:3000/community/609f634c759587644396c88a
reddit
Home
Search
one
one_community
One Community description
Moderator
Create Post
posted by u/one a few seconds ago
0
[LINK POST IS HERE]
http://localhost:3000
0 Award Share Save Hide Report
posted by u/one 8 minutes ago
0
[IMAGE POST]
Her: what social media do you have?
r/one_community's images
a potato
r/one_community's Rules
Rule1: Rule1
Rule2: Rule2
Rule3: Rule3
Rule4: Rule4
Rule5: 5th rule
6th rule: 6th rule
rule7: rule7 and final rule

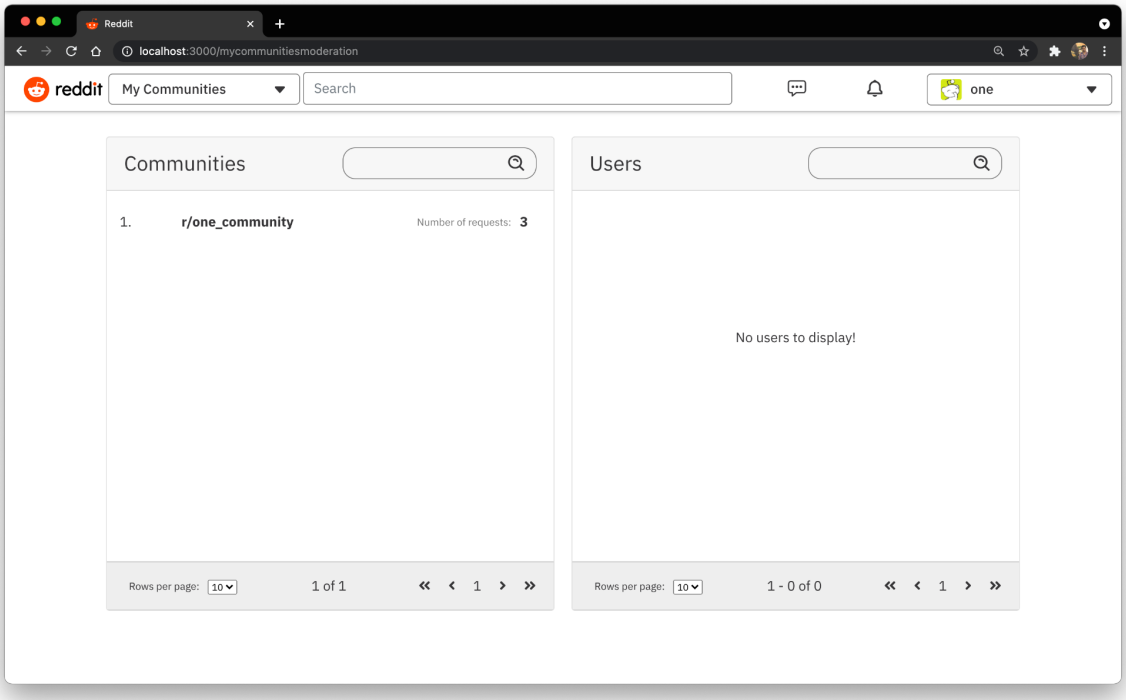

Reddit
localhost:3000/community/609f634c759587644396c88a
media do you have?
Me:
and
8 Award Share Save Hide Report
Rows per page: 2
1-2 of 4
Rule5: 5th rule
r/one_community's interested topics
Politics
Addiction Support
Activism
dance
music
r/one_community's Stats
Total Posts: 4
Total Users: 7
List of Users:
u/one
u/user3
u/user4
u/user7
u/user8
u/user9
u/user10

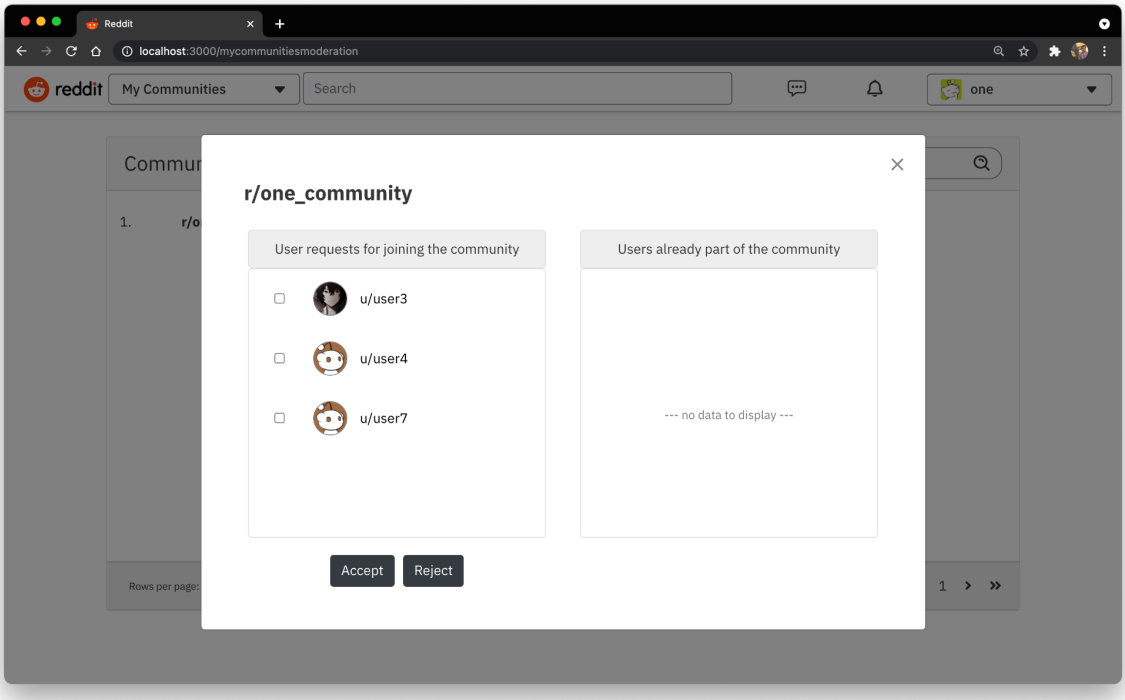

Reddit
localhost:3000/community/609f634c759587644396c88a
posted by u/one 7 minutes ago
0
[second post]
second post description
2 Award Share Save Hide Report
What are your thoughts?
Comment
u/one a few seconds ago
This is a post screeen
1 Reply
u/one a few seconds ago
up voted
u/one a few seconds ago
downvoted
-1 Reply
Rows per page:

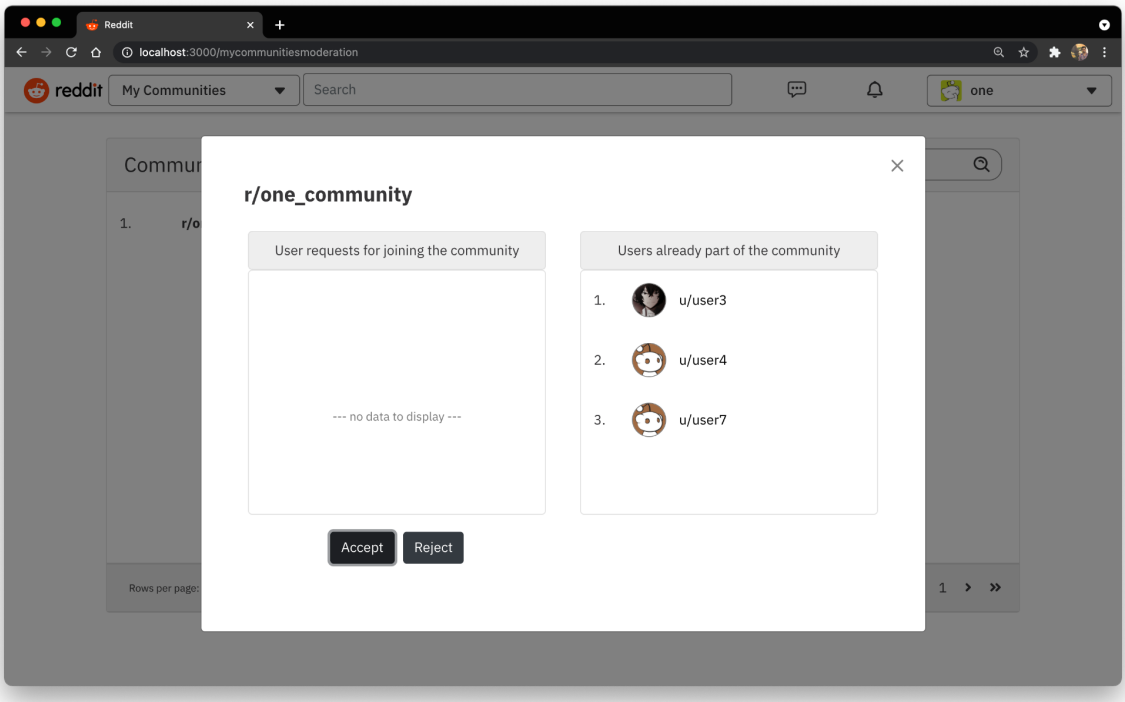

Reddit
localhost:3000/community/609f634c759587644396c88a
posted by u/one 4 minutes ago
0
[IMAGE POST]
Her: what social media do you have?
Me:
and
7 Award Share Save Hide Report
What are your thoughts?
Comment
u/one 4 minutes ago
comment 3
0 Reply
u/one 3 minutes ago
Rows per page:

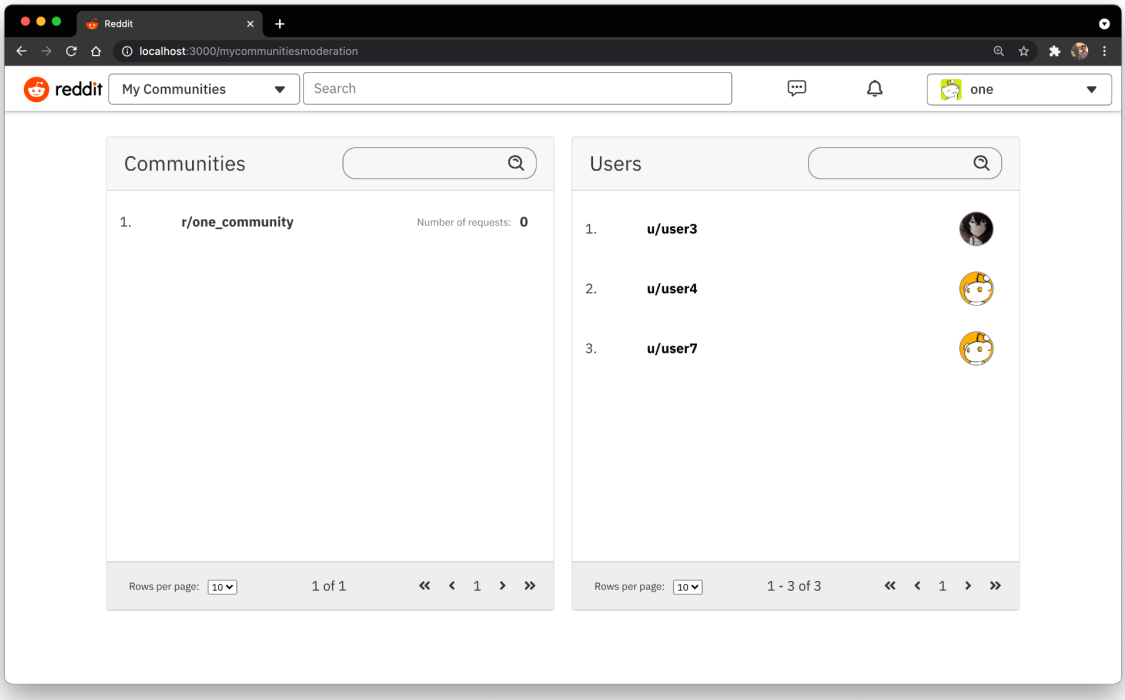


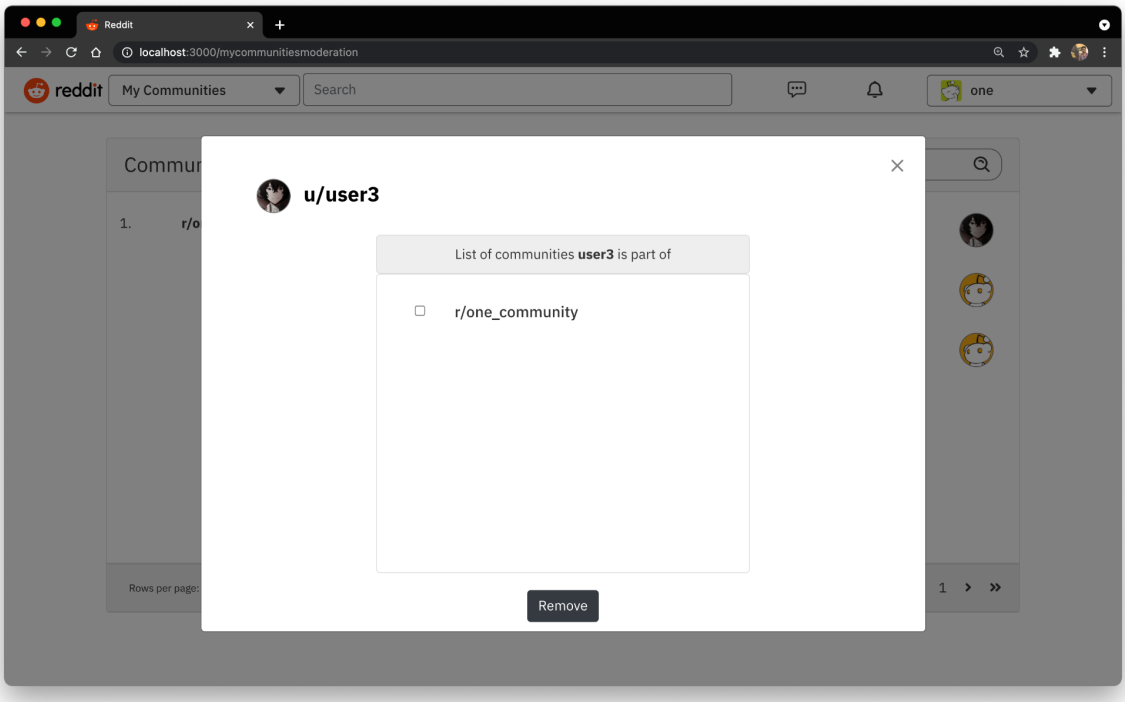
My Communities Moderation Page:

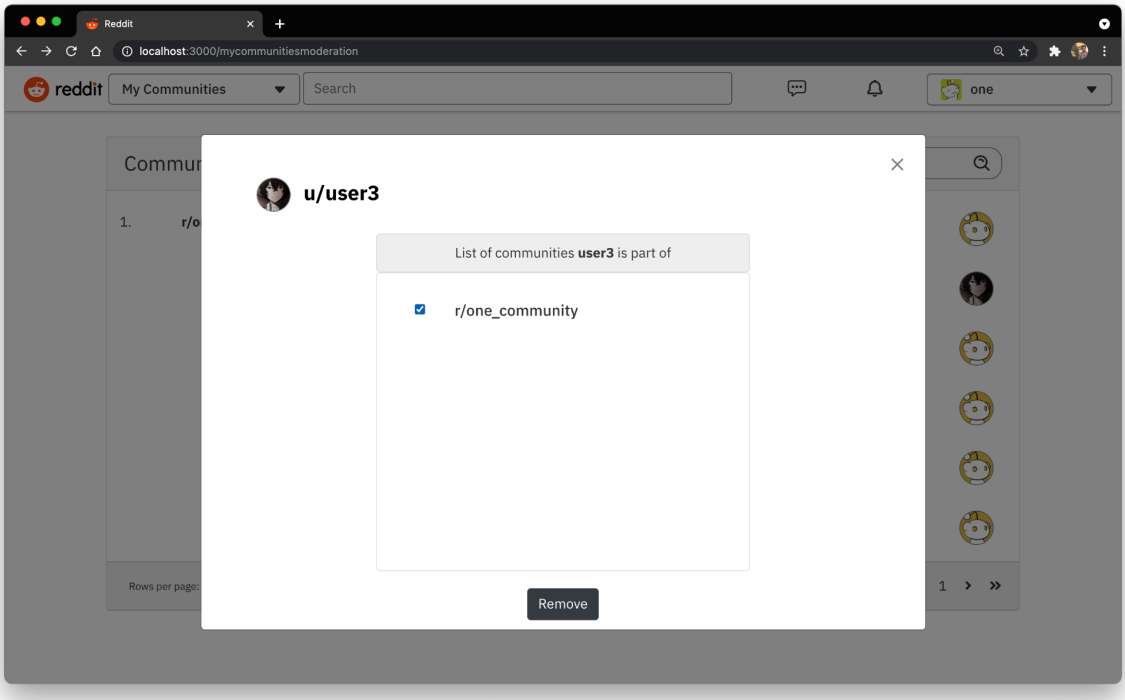


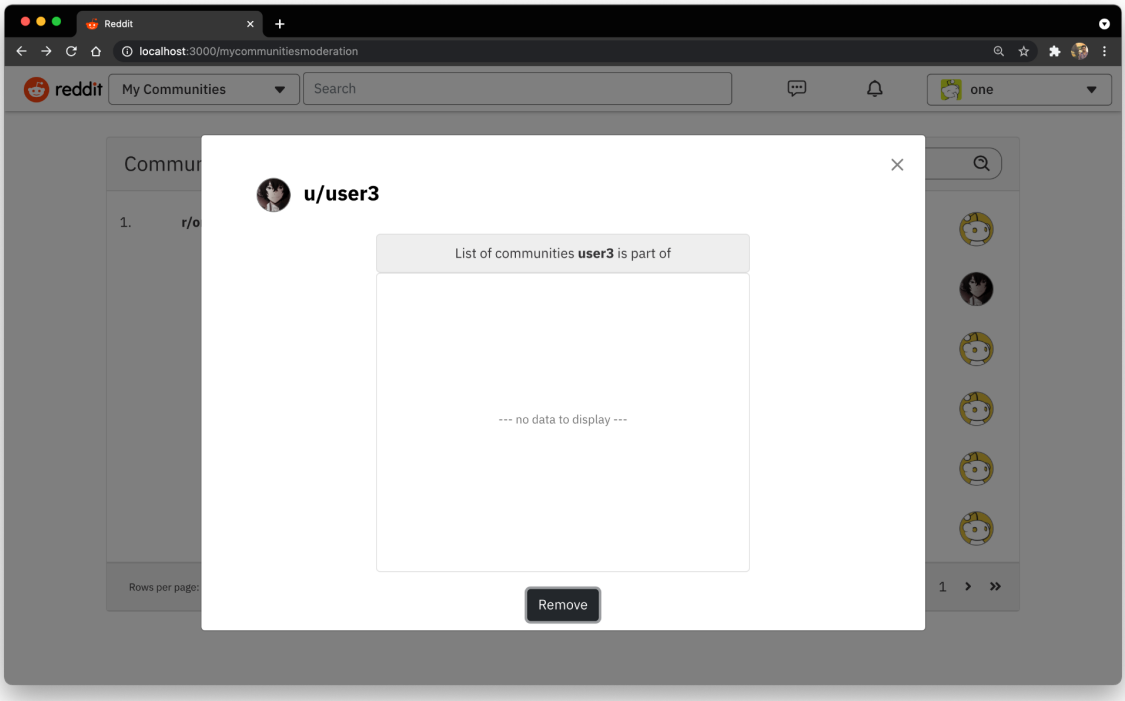

Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
r/one_community
User requests for joining the community
Users already part of the community
u/user3
u/user4
u/user7
--- no data to display ---
Accept
Reject

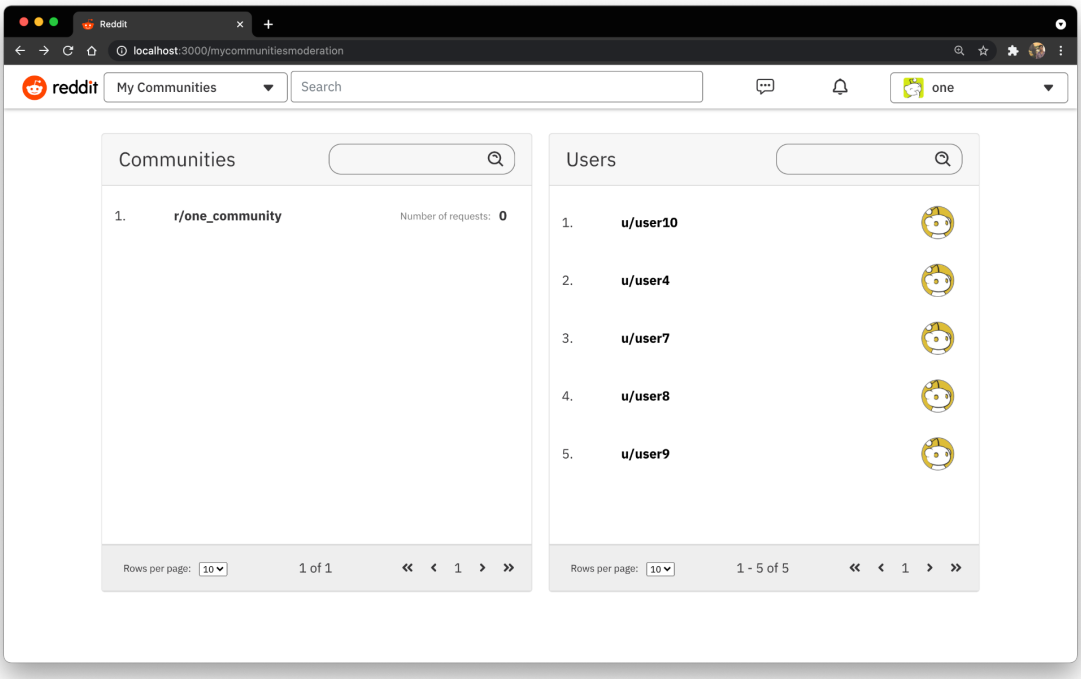

Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
r/one_community
User requests for joining the community
Users already part of the community
--- no data to display ---
1. u/user3
2. u/user4
3. u/user7
Accept
Reject


Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
Communities
1. r/one_community Number of requests: 0
Rows per page: 10
1 of 1
1
Users
1. u/user3
2. u/user4
3. u/user7
Rows per page: 10
1 - 3 of 3
1

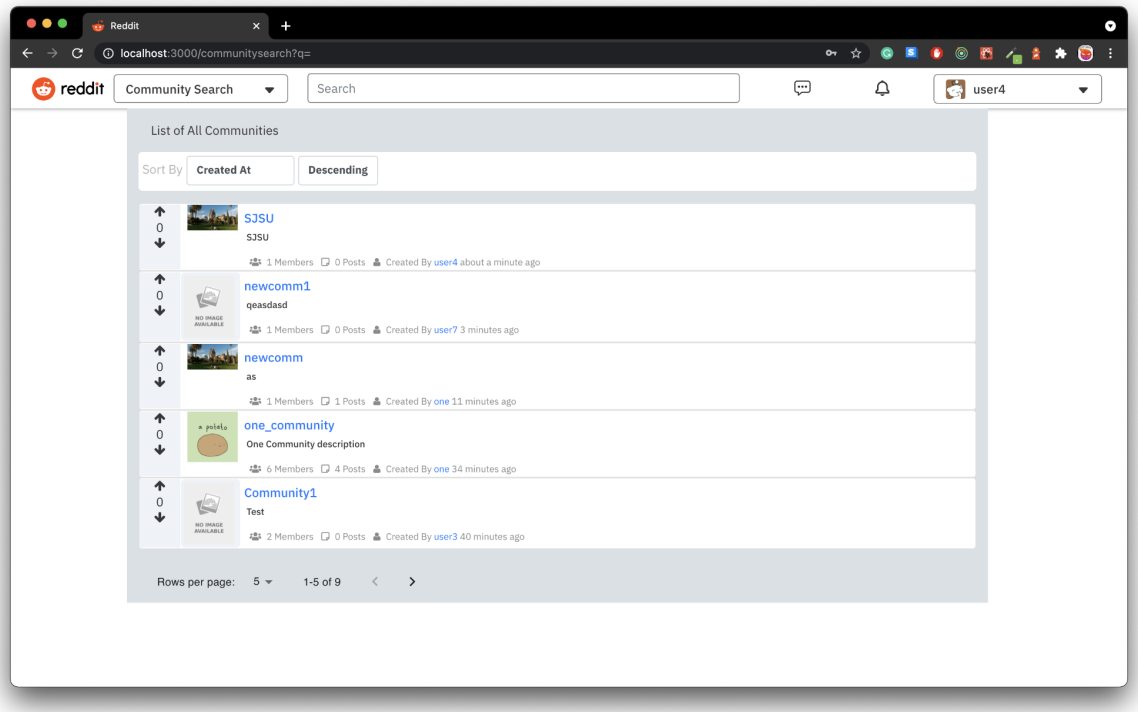

Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
u/user3
List of communities user3 is part of
r/one_community
Remove

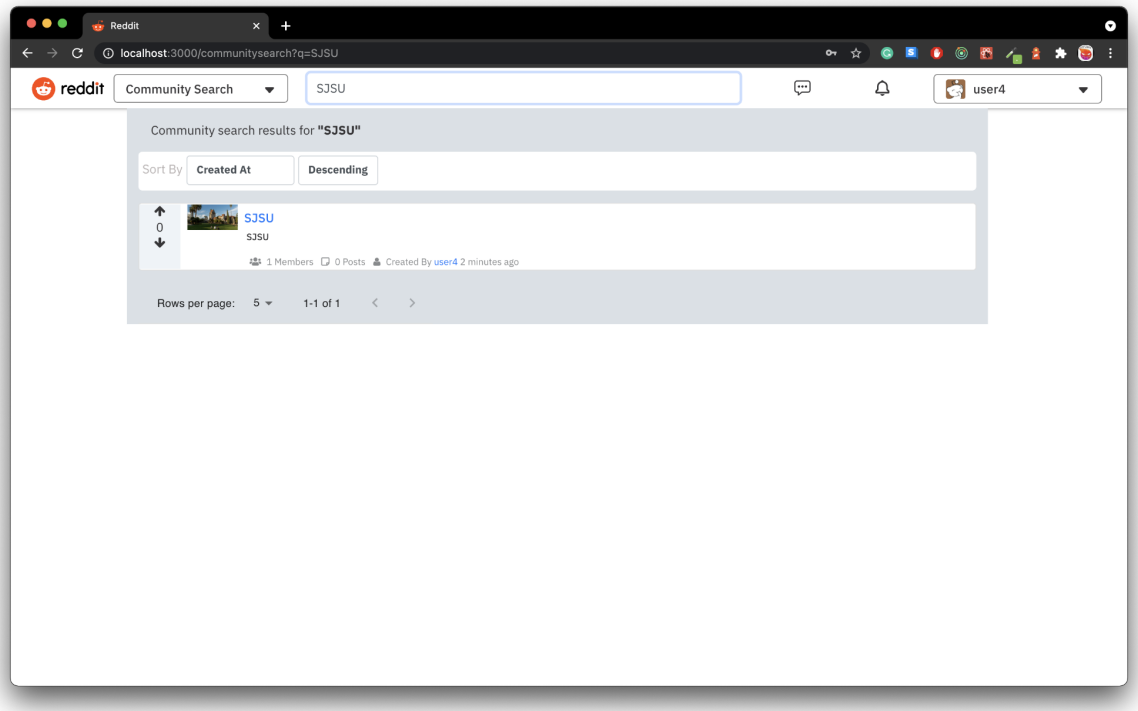

Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
u/user3
List of communities user3 is part of
r/one_community
Remove


Reddit
localhost:3000/mycommunitiesmoderation
reddit
My Communities
Search
one
u/user3
List of communities user3 is part of
--- no data to display ---
Remove

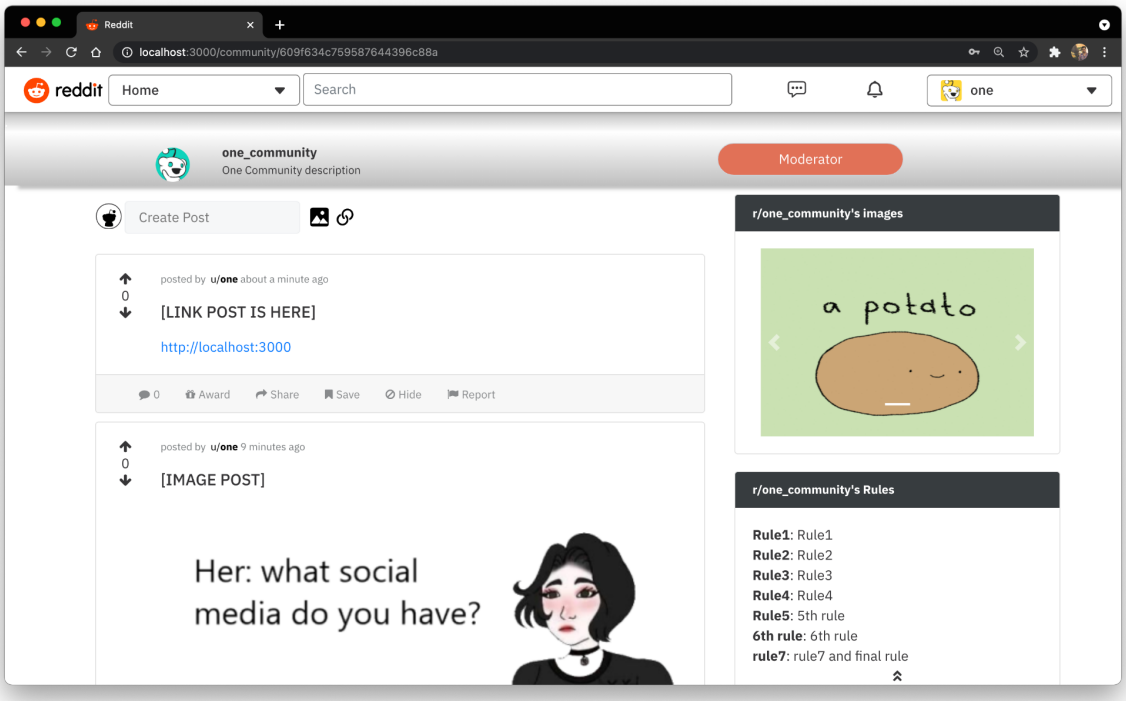


Community Search Page:

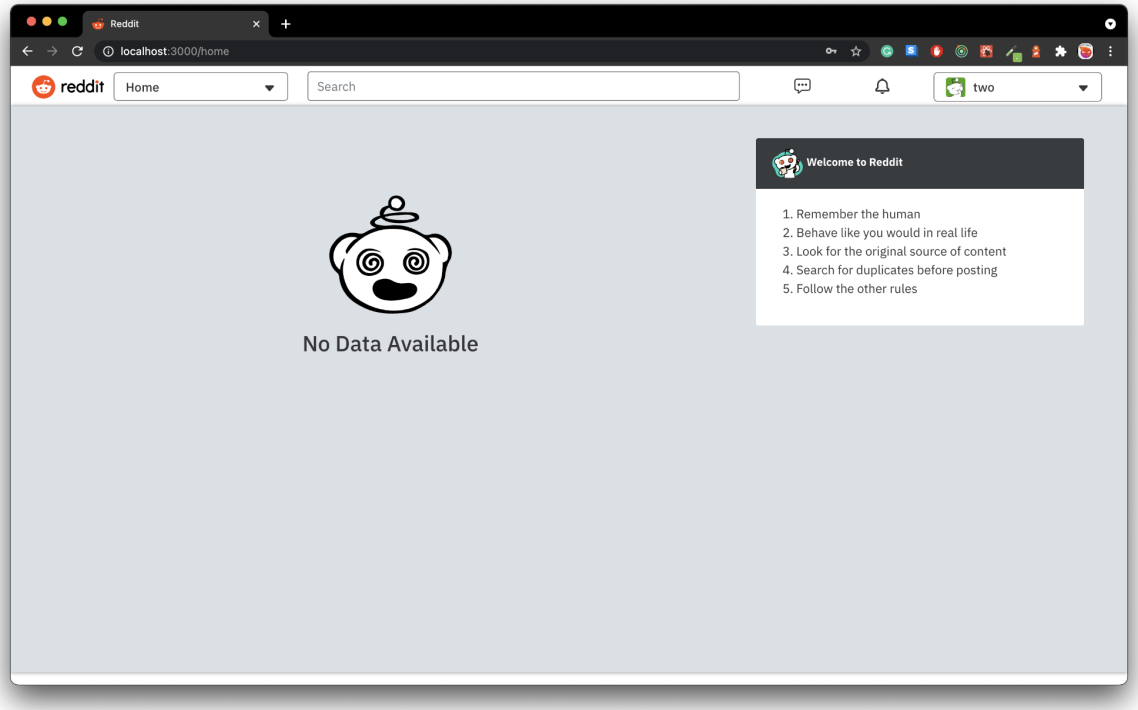


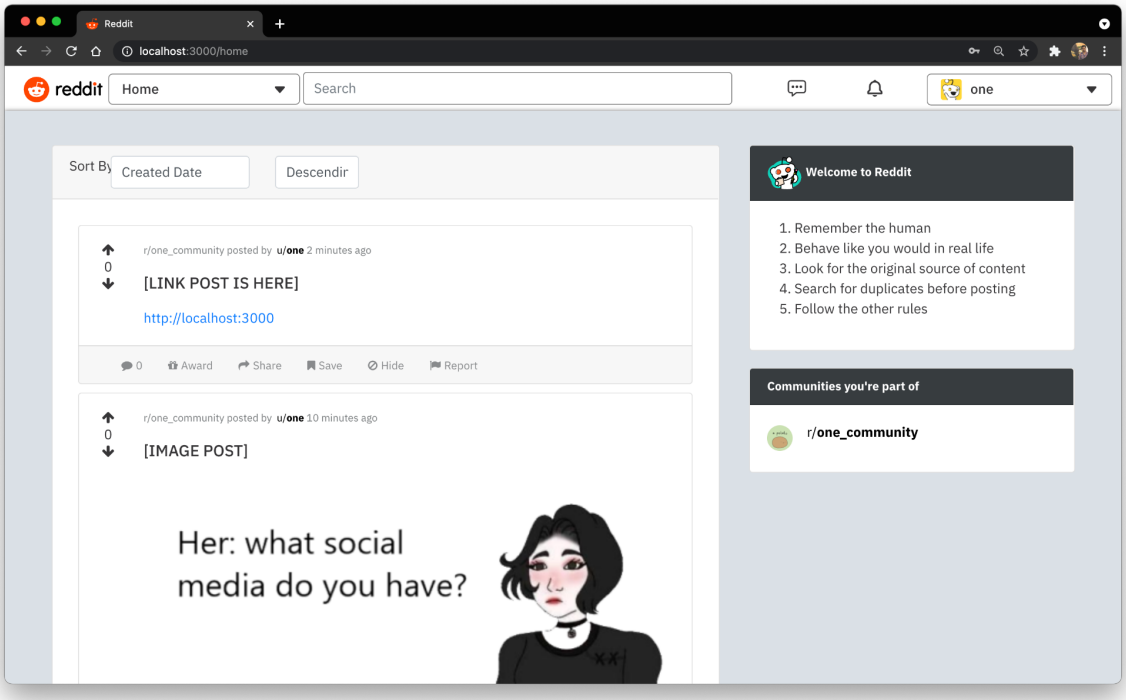


Community Home Page:

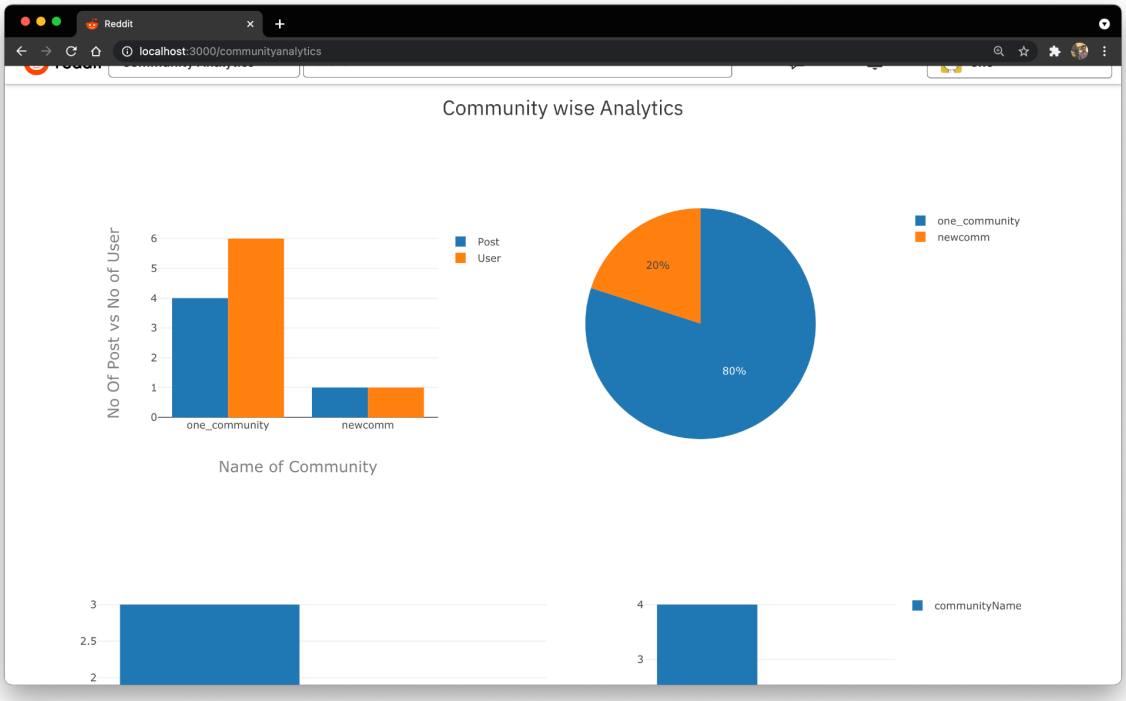


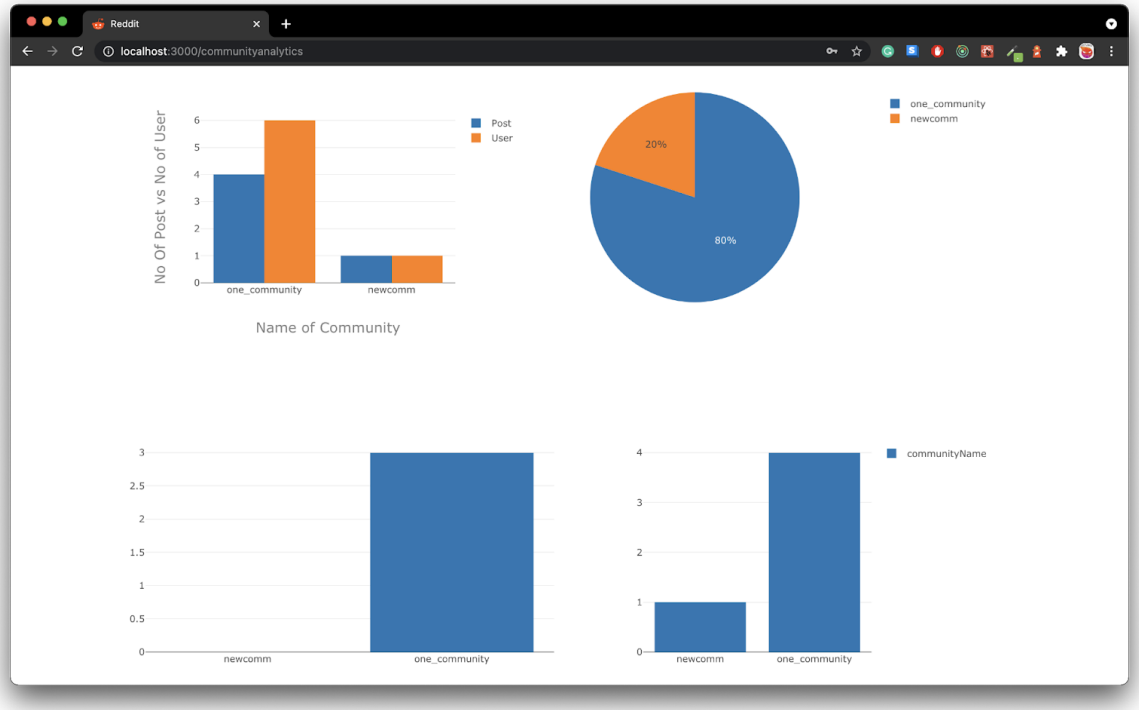
My Dashboard Page:



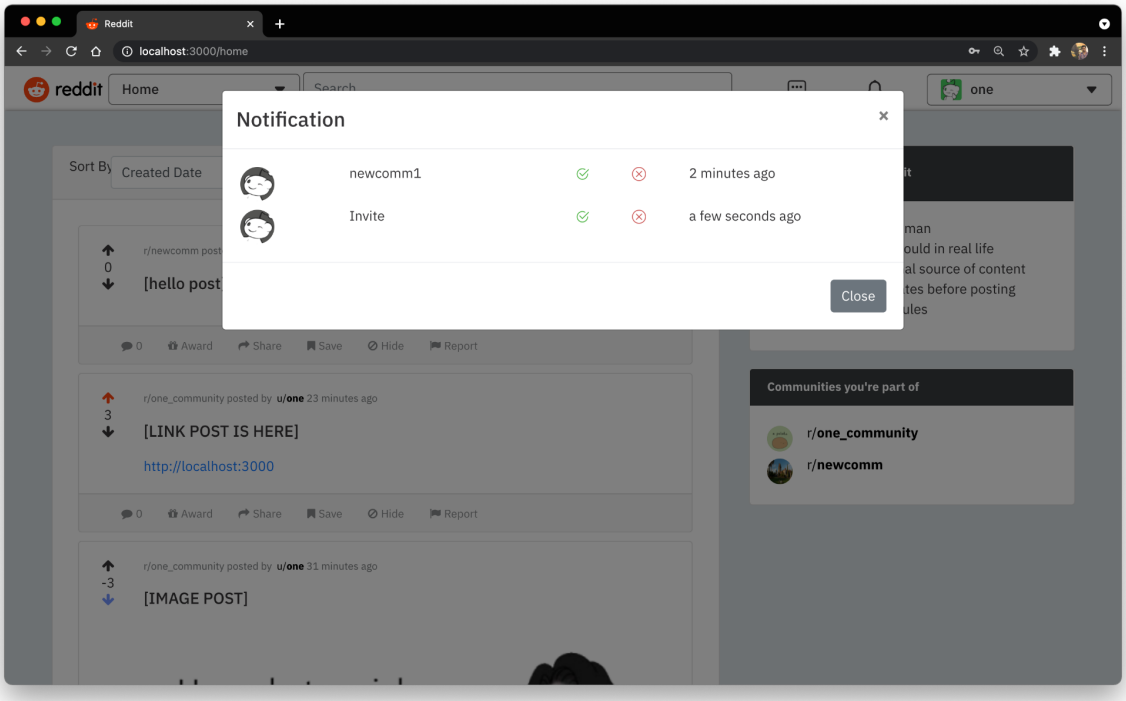


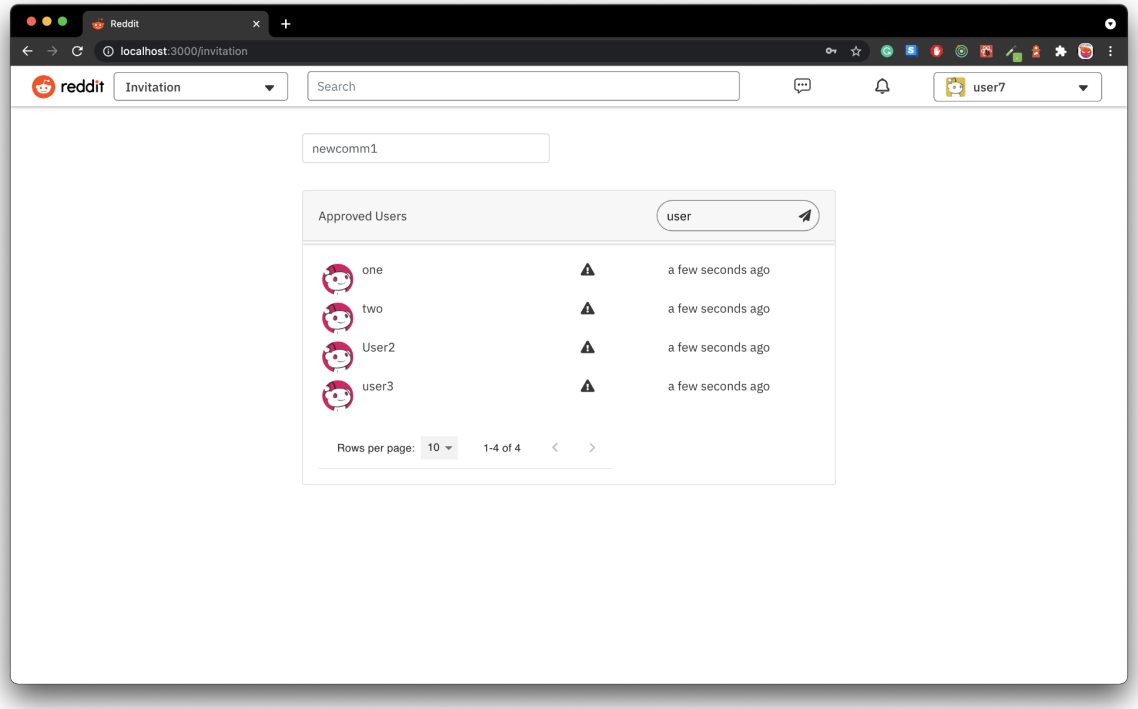
My Communities Analytics Page:

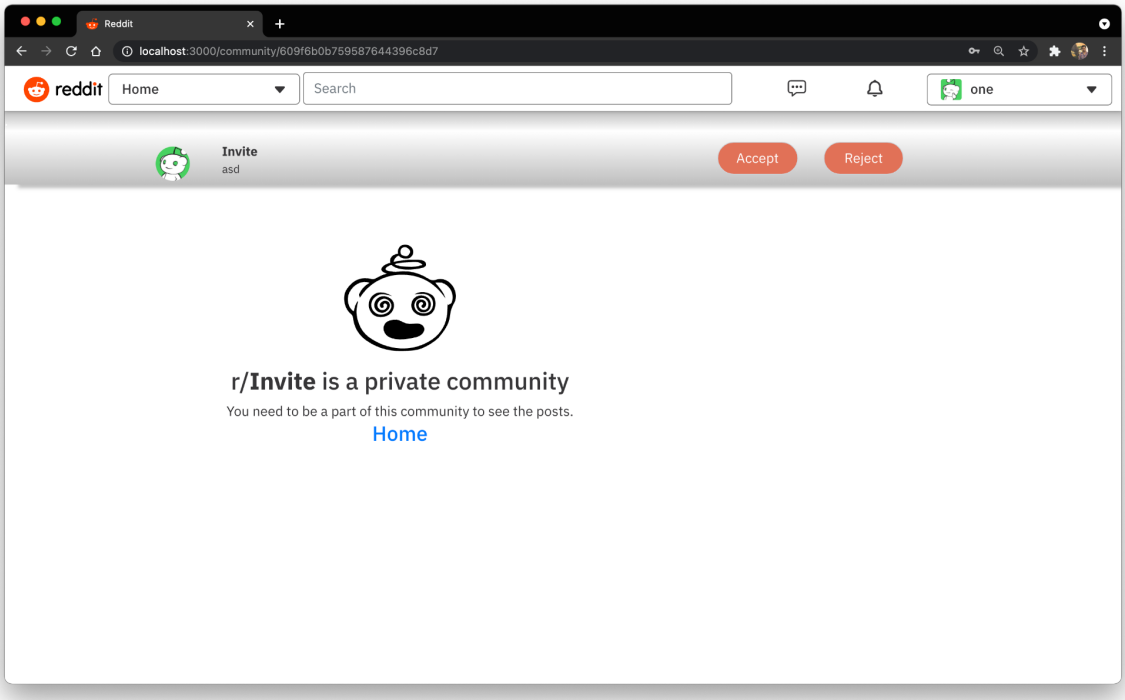




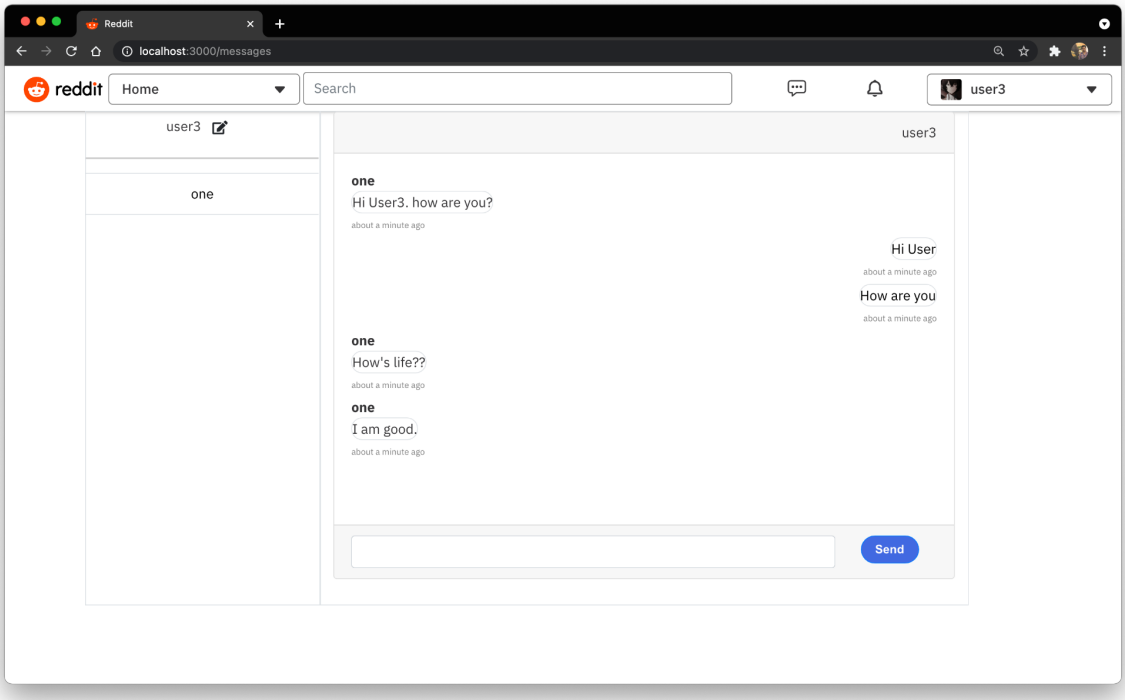
Invitation:


Reddit
localhost:3000/home
reddit
Home
Search
one
Notification
newcomm1
2 minutes ago
Invite
a few seconds ago
Close
Sort By
Created Date
[hello post
Award
Share
Save
Hide
Report
r/one_community posted by u/one 23 minutes ago
[LINK POST IS HERE]
http://localhost:3000
r/one_community posted by u/one 31 minutes ago
[IMAGE POST]
Communities you're part of
r/one_community
r/newcomm

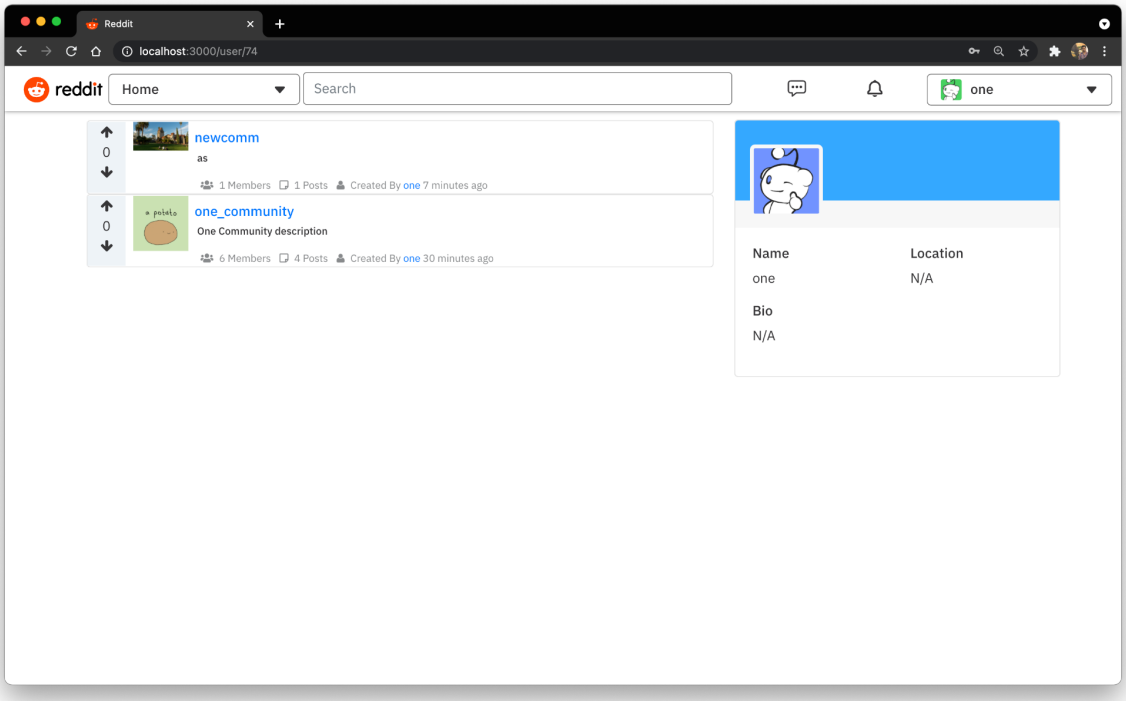

Reddit
localhost:3000/invitation
reddit
Invitation
Search
user7
newcomm1
Approved Users
user
one
a few seconds ago
two
a few seconds ago
User2
a few seconds ago
user3
a few seconds ago
Rows per page:
10
1-4 of 4


Reddit
localhost:3000/community/609f6b0b7595876443 96c8d7
reddit
Home
Search
one
Invite
asd
Accept
Reject
r/Invite is a private community
You need to be a part of this community to see the posts.
Home

My Messages:


Reddit
localhost:3000/messages
reddit
Home
Search
user3
user3
one
user3
one
Hi User3. how are you?
about a minute ago
Hi User
about a minute ago
How are you
about a minute ago
one
How's life??
about a minute ago
one
I am good.
about a minute ago
Send

User Profile Page:



Code listing of entity objects:

Comment:

```
const mongoose = require("mongoose");
const Schema = mongoose.Schema;
const CommentSchema = new mongoose.Schema(
  {
    communityID: { type: Schema.Types.ObjectId, ref: "Community" },
    postID: { type: Schema.Types.ObjectId, ref: "Post" },
    description: { type: String, required: true },
    parentCommentID: { type: Schema.Types.ObjectId, ref: "Comment" },
    userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
    upvotedBy: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
      },
    ],
    downvotedBy: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
      },
    ],
    score: { type: Number, default: 0 },
    parentCommentID: { type: Schema.Types.ObjectId, ref: "Comment" },
    isParentComment: { type: Boolean, defaultValue: true },
  },
  {
    timestamps: true,
  }
);

module.exports = mongoose.model("Comment", CommentSchema);
```

Community:

```
const mongoose = require("mongoose");
const mongooseAggregatePaginate = require("mongoose-aggregate-paginate-
v2");

const Schema = mongoose.Schema;
const CommunitySchema = new mongoose.Schema(
  {
    communityName: { type: String, required: true, unique: true },
    communityDescription: { type: String },
    imageURL: [
      {
        url: { type: String },
      },
    ],
    topicSelected: [
      {
        topic: { type: String },
      },
    ],
    listOfUsers: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
        isAccepted: { type: Number, default: 0 },
        isModerator: { type: Boolean, defaultValue: false },
      },
    ],
    ownerID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
    NoOfPost: { type: Number },
    upvotedBy: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
      },
    ],
    downvotedBy: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
      },
    ],
    score: { type: Number, default: 0 },
    sentInvitesTo: [
      {
        userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
```

```
        isAccepted: { type: Number, default: 0 },
        dateTime: { type: Date, default: Date.now },
      },
    ],
    rules: [
      {
        title: { type: String },
        description: { type: String },
      },
    ],
  },
  {
    timestamps: true,
  }
);

CommunitySchema.plugin(mongooseAggregatePaginate);

module.exports = mongoose.model("Community", CommunitySchema);
```

Message:

```
module.exports = (sequelize, DataTypes) => {
  const Message = sequelize.define("Message", {
    message_id: {
      type: DataTypes.INTEGER,
      allowNull: false,
      autoIncrement: true,
      primaryKey: true
    },
    message: {
      type: DataTypes.STRING(255),
      allowNull: false
    }
  });

  Message.associate = models => {
    Message.belongsTo(models.User, {
      as: "sentByUser",
      foreignKey: {
        allowNull: false,
        name: "sent_by"
```

```
      }
    }),
      Message.belongsTo(models.User, {
        as: "sentToUser",
        foreignKey: {
          allowNull: false,
          name: "sent_to"
        }
      });
  };

  return Message;
};
```

Post:

```
const mongoose = require("mongoose");
const Schema = mongoose.Schema;
const PostSchema = new mongoose.Schema(
  {
    communityID: { type: Schema.Types.ObjectId, ref: "Community" },
    userID: { type: Schema.Types.ObjectId, ref: "UserProfile" },
    type: {
      type: Number,
      required: true,
    },
    link: { type: String }, // if post type is link, save link
otherwise save url of image if post type is image
    postImageUrl: { type: String },
    description: { type: String },
    NoOfComments: { type: Number },
    score: { type: Number, default: 0 },
    title: { type: String, required: true },
  },
  {
    timestamps: true,
  }
);

module.exports = mongoose.model("Post", PostSchema);
```

UserProfile:

```
const mongoose = require("mongoose");
const Schema = mongoose.Schema;
const UserProfileSchema = new mongoose.Schema({
  userIDSQL: {
    type: String,
    required: true,
    unique: true
  },
  name: {
    type: String,
    required: true
  },
  email: {
    type: String,
    required: true,
    unique: true
  },
  gender: {
    type: String
  },
  location: {
    type: String
  },
  bio: {
    type: String
  },
  profile_picture_url: {
    type: String
  },
  listOfTopics: [
    {
      topic: { type: String }
    }
  ],
  communityInvites: [
    {
      communityID: {
        type: Schema.Types.ObjectId,
        ref: "Community"
      },
```

```
      isAccepted: {
        type: Boolean,
        defaultValue: false
      },
      invitedBy: {
        type: Schema.Types.ObjectId,
        ref: "UserProfile"
      },
      dateTime: { type: Date, default: Date.now }
    }
  ]
});

module.exports = mongoose.model("UserProfile", UserProfileSchema);
```

Vote:

```
const mongoose = require("mongoose");
const Schema = mongoose.Schema;
const VoteSchema = new mongoose.Schema(
  {
    entityId: { type: Schema.Types.ObjectId, ref: "Community" },
    userId: { type: Schema.Types.ObjectId, ref: "User" },
    voteDir: { type: Number },
  },
  {
    timestamps: true,
  }
);

module.exports = mongoose.model("Vote", VoteSchema);
```

Topic:

```
module.exports = (sequelize, DataTypes) => {
    const Topic = sequelize.define('Topic', {
        topic_id: {
            type: DataTypes.INTEGER,
            allowNull: false,
            autoIncrement: true,
            primaryKey: true,
        },
        topic: {
```

```
            type: DataTypes.STRING(150),
            allowNull: false,
            unique: true
        }
    });
    return Topic;
}
```

User:

```
module.exports = (sequelize, DataTypes) => {
  const User = sequelize.define("User", {
    user_id: {
      type: DataTypes.INTEGER,
      allowNull: false,
      autoIncrement: true,
      primaryKey: true
    },
    email: {
      type: DataTypes.STRING(150),
      allowNull: false,
      unique: true
    },
    password: {
      type: DataTypes.STRING(200),
      allowNull: false
    },
    name: {
      type: DataTypes.STRING(150),
      allowNull: false
    },
    profile_picture_url: {
      type: DataTypes.STRING(255)
    }
  });

  User.associate = models => {
    User.hasMany(models.Message, {
      onDelete: "cascade",
      foreignKey: {
        allowNull: false,
        name: "sent_by"
      }
```

```
    }),
      User.hasMany(models.Message, {
        onDelete: "cascade",
        foreignKey: {
          allowNull: false,
          name: "sent_to"
        }
      });
  };

  return User;
};
```

Code listing of the security and session objects:

Authentication using JWT-Token:

```
const db = require("./../models/sql");

const jwtAuthHandler = async (msg, callback) => {
  res = {};
  try {
    console.log(msg, "msg");
    db.User.findOne({ where: { user_id: msg.user_id } }).then(result =>
{
      res.status = 200;
      res.data = result;
      callback(null, res);
    }).catch(err => {
      res.status = 404;
      res.data = err;
      callback(null, res);
    });
  } catch (err) {
    res.status = 500;
    callback(null, res);
  }
};

handle_request = (msg, callback) => {
  if (msg.path === "jwt-auth") {
    jwtAuthHandler(msg, callback);
```

```
  }
};

exports.handle_request = handle_request;
```

Hashing user Password:

```
const db = require("../../models/sql");
const passwordHash = require('password-hash');

const login = async (msg, callback) => {
  res = {};
  db.User.findOne({
    where: {
      email: msg.email
    }
  })
    .then(user => {
      if (user === null) {
        res.status = 404;
        callback(null, res);
      } else {
        if (passwordHash.verify(msg.password, user.password)) {
          user.password = "";
          res.status = 200;
          res.data = user;
          callback(null, res);
        } else {
          res.status = 401;
          callback(null, res);
        };
      }
    })
    .catch(err => {
      res.status = 500;
      callback(null, res);
    });
};

exports.login = login;
const db = require("../../models/sql");
const passwordHash = require('password-hash');
```

```
const signUp = async (msg, callback) => {
  msg.password = passwordHash.generate(msg.password)
  db.User.create({
    email: msg.email,
    password: msg.password,
    name: msg.name
  })
    .then(user => {
      callback(null, user);
    })
    .catch(err => {
      callback(err, null);
    });
};

exports.signUp = signUp;
```

Main Server Code:

```
const path = require("path");
const cookieParser = require("cookie-parser");
const logger = require("morgan");
const express = require("express");
const cors = require("cors");
const app = express();
const { frontEnd } = require("./Util/config");
// DB connection
// require("./dbConnection");

// view engine setup
app.set("views", path.join(__dirname, "views"));
app.set("view engine", "ejs");
app.use(logger("dev"));
app.use(express.json());
app.use(express.urlencoded({ extended: false }));
app.use(cookieParser());
app.use(express.static(path.join(__dirname, "public")));

const session = require("express-session");

// use session to store user data between HTTP requests
app.use(
```

```
  session({
    secret: "cmpe273_kafka_passport_mongo",
    resave: false,
    saveUninitialized: true,
    duration: 60 * 60 * 1000, // Overall duration of Session : 30
minutes : 1800 seconds
    activeDuration: 5 * 60 * 1000,
  })
);

app.set("view engine", "ejs");

// use cors to allow cross origin resource sharing
app.use(
  cors({
    origin: frontEnd,
    credentials: true,
  })
);

// Allow Access Control
app.use(function (req, res, next) {
  res.setHeader("Access-Control-Allow-Origin", frontEnd);
  res.setHeader("Access-Control-Allow-Credentials", "true");
  res.setHeader(
    "Access-Control-Allow-Methods",
    "GET,HEAD,OPTIONS,POST,PUT,DELETE"
  );
  res.setHeader(
    "Access-Control-Allow-Headers",
    "Access-Control-Allow-Headers, Origin,Accept, X-Requested-With,
Content-Type, Access-Control-Request-Method, Access-Control-Request-
Headers"
  );
  res.setHeader("Cache-Control", "no-cache");
  next();
});

// error handler
app.use(function (err, req, res, next) {
  // set locals, only providing error in development
  res.locals.message = err.message;
  res.locals.error = req.app.get("env") === "development" ? err : {};
```

```
  // render the error page
  res.status(err.status || 500);
  res.render("error");
});

module.exports = app;
```

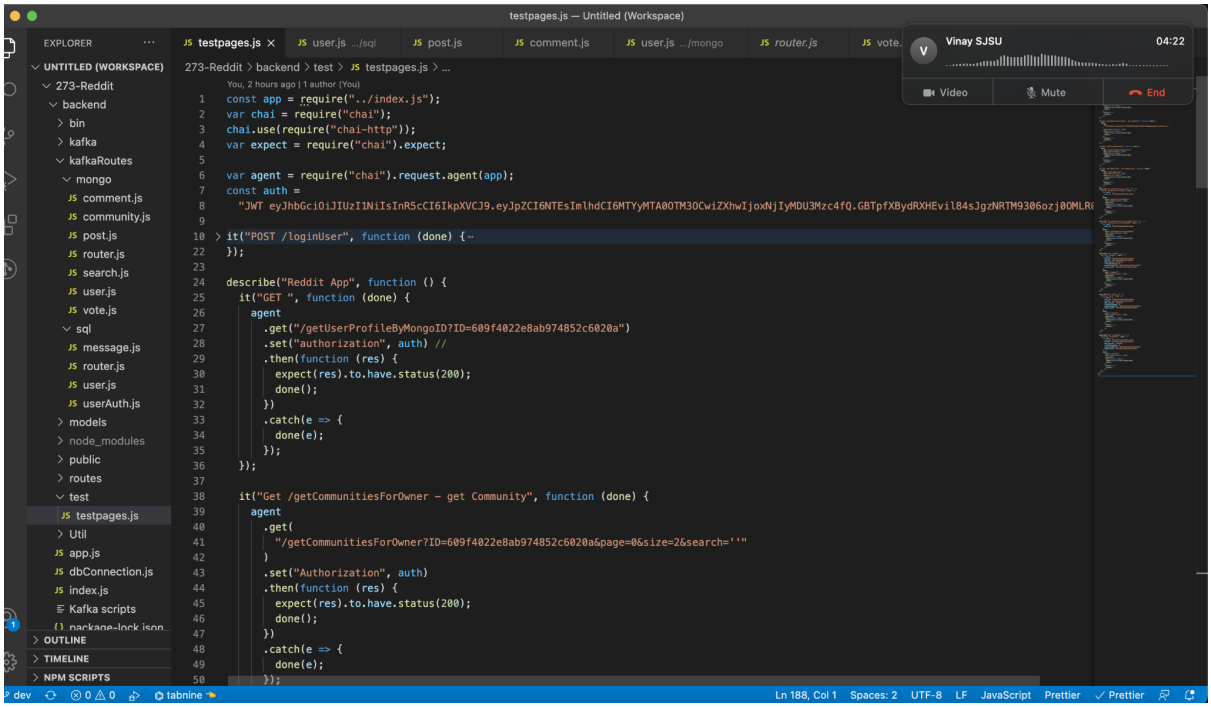
Kafka backend server:

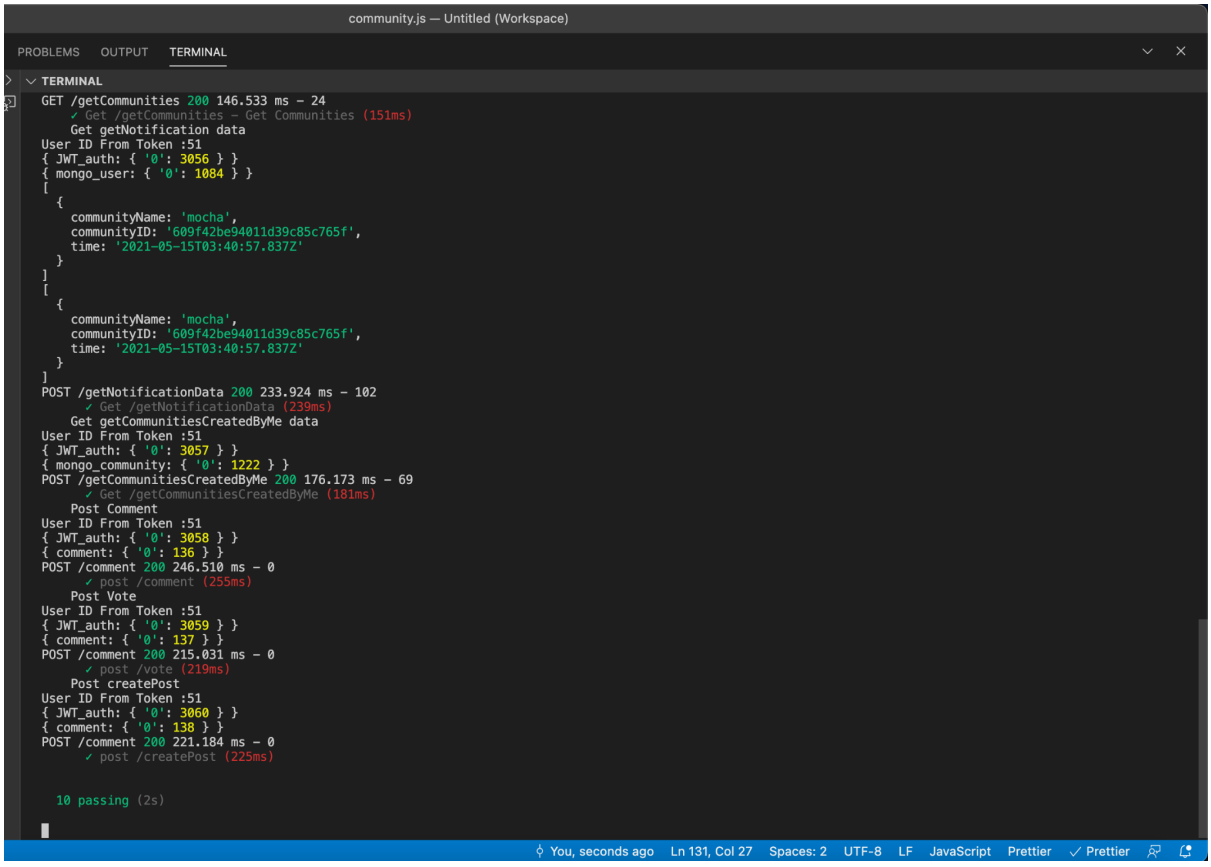
```
var connection = new require("./kafka/connection");
//const messageSQL = require("./services/Message/message_sql");
const message = require("./services/Message/topicMapping");
const user_info = require("./services/userSQL/topicMapping");
const jwt_auth = require("./services/jwt_auth");

const search_mongo = require("./services/search_mongo");

const user_mongo = require("./services/userMongo/topicMapping");
const userAuth_sql = require("./services/userAuth/topicMapping");
const vote_mongo = require("./services/Vote/topicMapping");
const community_mongo = require("./services/community/topicMapping");
const manage_community =
require("./services/community/manageCommunity/topicMapping");
const community_analytics =
require("./services/community/communityAnalytics/topicMapping");
const getTopic = require("./services/getTopic");
const post = require("./services/post/topicMapping");
const comment = require("./services/comment/topicMapping");
const community_user =
require("./services/community/communityUser/topicMapping");
const topic_sql = require("./services/Topic/topicMapping");

require("./dbConnection");
const sqldb = require("./models/sql");
sqldb.sequelize.sync().then(() => {
  console.log("sequelize is running");
});

function handleTopicRequest(topic_name, fname) {
  var consumer = connection.getConsumer(topic_name);
  var producer = connection.getProducer();
```

```
  console.log("Kafka Server is running ");
  consumer.on("message", function (message) {
    console.log("Message received for " + topic_name);
    var data = JSON.parse(message.value);

    fname.handle_request(data.data, function (err, res) {
      console.log("HANDLED", err, res);
      var payloads = [
        {
          topic: data.replyTo,
          messages: JSON.stringify({
            correlationId: data.correlationId,
            data: res,
          }),
          partition: 0,
        },
      ];
      producer.send(payloads, function (err, data) {
        console.log("payload sent:", data);
      });
      return;
    });
  });
}

handleTopicRequest("sql_message", message);
handleTopicRequest("JWT_auth", jwt_auth);
handleTopicRequest("mongo_user", user_mongo);
handleTopicRequest("sql_user_auth", userAuth_sql);
handleTopicRequest("search_mongo", search_mongo);
handleTopicRequest("mongo_community", community_mongo);
handleTopicRequest("user_info", user_info);
handleTopicRequest("manage_community", manage_community);
handleTopicRequest("community_analytics", community_analytics);
handleTopicRequest("get_topic", getTopic);
handleTopicRequest("post", post);
handleTopicRequest("comment", comment);
handleTopicRequest("community_user", community_user);
handleTopicRequest("vote_mongo", vote_mongo);
handleTopicRequest("manage_topic", topic_sql);
```

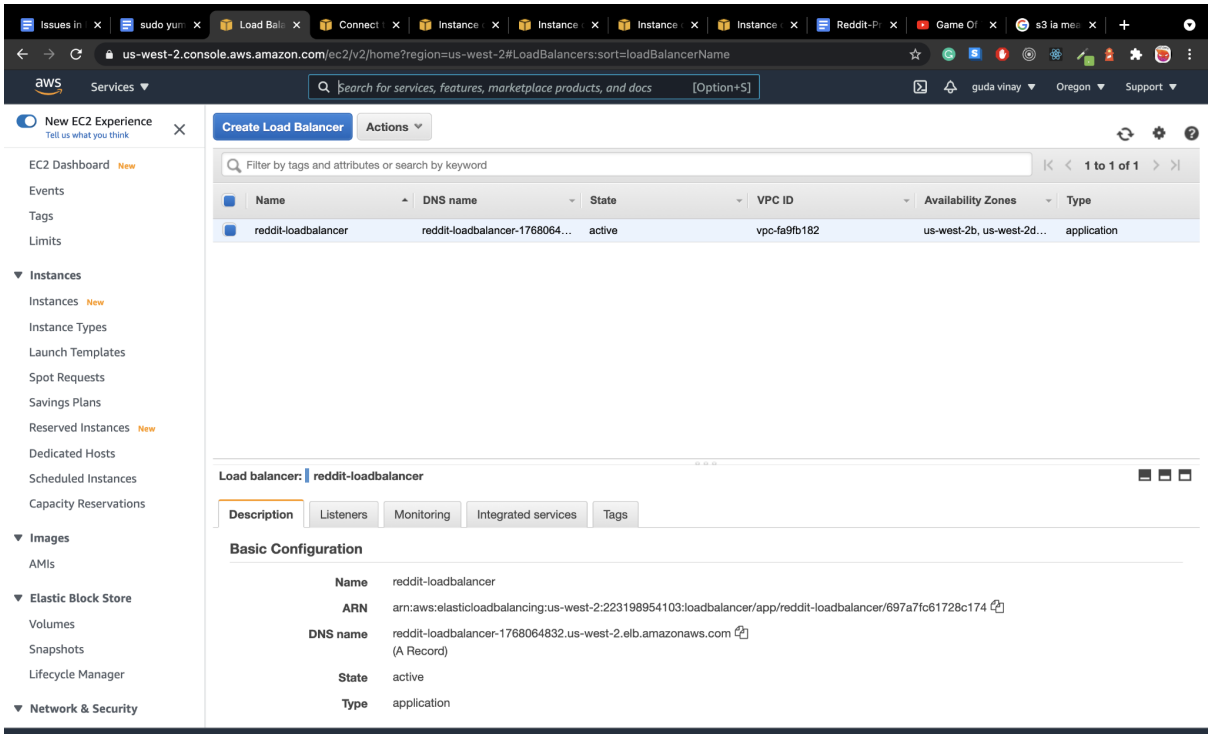
Database Connection code:

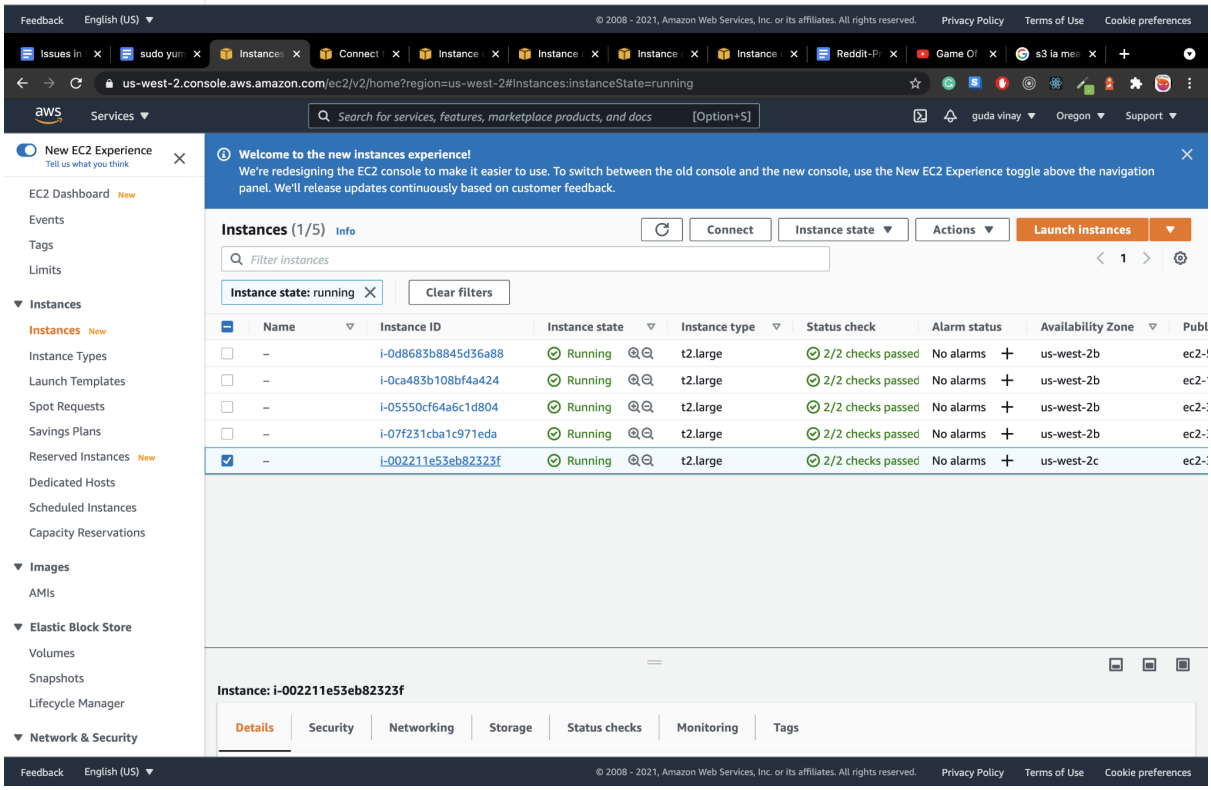
```
const {
  SQLdb,
  SQLusername,
  SQLpassword,
  SQLhost,
  mongoURI,
} = require("./Util/config");
const mongoose = require("mongoose");

mongoose.connect(mongoURI, {
  useNewUrlParser: true,
  useUnifiedTopology: true,
  useCreateIndex: true,
});
const connection = mongoose.connection;
console.log("MongoDB Connected !!");

// SQL Connection
const Sequelize = require("sequelize");
const sqldb = new Sequelize(SQLdb, SQLusername, SQLpassword, {
  host: SQLhost,
  dialect: "mysql",
  pool: {
    max: 5,
    min: 0,
    acquire: 1000000,
    idle: 10000,
  },
});

sqldb
  .authenticate()
  .then(() => {
    console.log("SQL Connection has been established successfully.");
  })
  .catch((err) => {
    console.error("Unable to connect to the SQL database:", err);
  });

module.exports = sqldb;
```

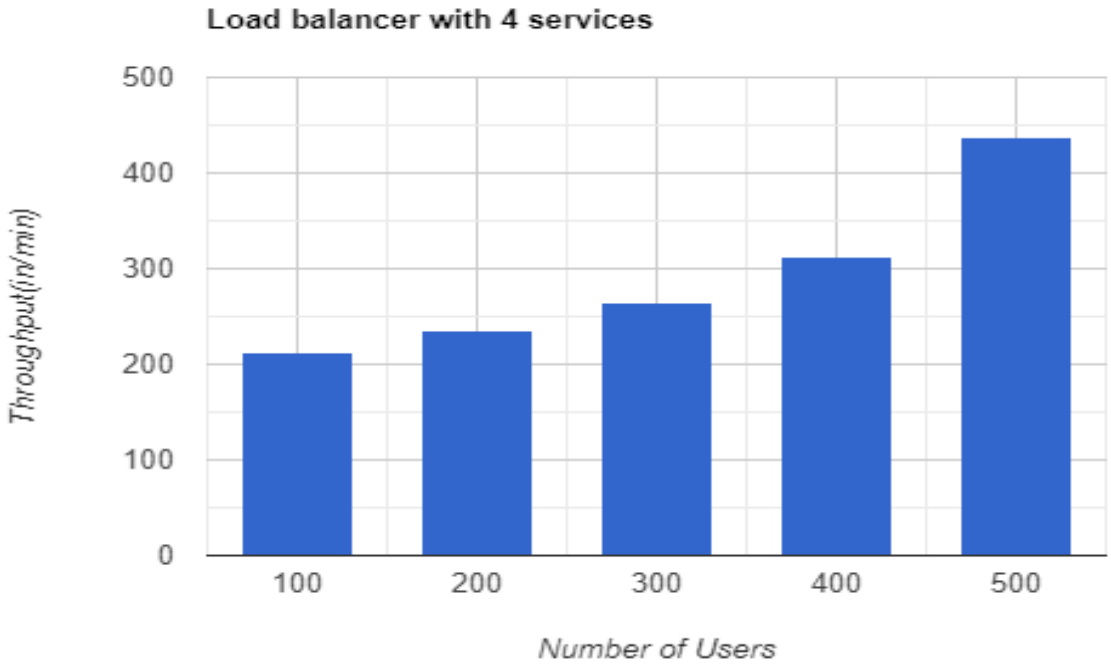

testpages.js — Untitled (Workspace)
Vinay SJSU
04:22
Video
Mute
End
const app = require("../index.js");
var chai = require("chai");
chai.use(require("chai-http"));
var expect = require("chai").expect;
var agent = require("chai").request.agent(app);
it("POST /loginUser", function (done) {
describe("Reddit App", function () {
it("GET ", function (done) {
agent
.get("/getUserProfileByMongoID?ID=609f4022e8ab974852c6020a")
.set("authorization", auth) //
.then(function (res) {
expect(res).to.have.status(200);
done();
})
.catch(e => {
done(e);
});
});
it("Get /getCommunitiesForOwner - get Community", function (done) {
agent
.get(
"/getCommunitiesForOwner?ID=609f4022e8ab974852c6020a&page=0&size=2&search=''"
)
.set("Authorization", auth)
.then(function (res) {
expect(res).to.have.status(200);
done();
})
.catch(e => {
done(e);
});


community.js — Untitled (Workspace)
PROBLEMS
OUTPUT
TERMINAL
GET /getCommunities 200 146.533 ms - 24
✓ Get /getCommunities - Get Communities (151ms)
Get getNotification data
User ID From Token :51
{ JWT_auth: { '0': 3056 } }
{ mongo_user: { '0': 1084 } }
[
{
communityName: 'mocha',
communityID: '609f42be94011d39c85c765f',
time: '2021-05-15T03:40:57.837Z'
}
]
[
{
communityName: 'mocha',
communityID: '609f42be94011d39c85c765f',
time: '2021-05-15T03:40:57.837Z'
}
]
POST /getNotificationData 200 233.924 ms - 102
✓ Get /getNotificationData (239ms)
Get getCommunitiesCreatedByMe data
User ID From Token :51
{ JWT_auth: { '0': 3057 } }
{ mongo_community: { '0': 1222 } }
POST /getCommunitiesCreatedByMe 200 176.173 ms - 69
✓ Get /getCommunitiesCreatedByMe (181ms)
Post Comment
User ID From Token :51
{ JWT_auth: { '0': 3058 } }
{ comment: { '0': 136 } }
POST /comment 200 246.510 ms - 0
✓ post /comment (255ms)
Post Vote
User ID From Token :51
{ JWT_auth: { '0': 3059 } }
{ comment: { '0': 137 } }
POST /comment 200 215.031 ms - 0
✓ post /vote (219ms)
Post createPost
User ID From Token :51
{ JWT_auth: { '0': 3060 } }
{ comment: { '0': 138 } }
POST /comment 200 221.184 ms - 0
✓ post /createPost (225ms)
10 passing (2s)

Load balancer:







Observations for different deployment configurations

- **Caching** It delivers the best performance since it has a O(1) look up time. APIs that involve looking up heavy queries or heavy computing can be cached to enhance performance. However, caching is expensive since it requires a large amount of RAM. Cache busting using time to live simplifies the problem but suffers from data consistency.

- **Load balancing** significantly reduces response time by distributing load across autoscaling groups in AWS across multiple EC2 machines. Auto scaling helps to handle the load in ad hoc manner. Auto scaling services need to be built in a stateless fashion since they can be brought down or spawned at anytime

- **Message queues** (Kafka) help decouple services and help make them truly distributed. With message queues, services can communicate in an asynchronous fashion, services can be replaced, and communication is not impacted even if one of the services is temporarily down. Messages in message queues like Kaka can be potentially stored for an infinite time which help it double up as a durable database store. Moreover, running Kafka on clusters enhances durability and scalability.

- **Connection pooling** enhances performance since a pool of TCP connections is kept alive which can be reused for subsequent requests thus avoiding overhead of reserving resources and time to establish a new TCP connection. By default, mongoose gives a size of 5 and when we increase it up to in the range of 15-20, we can see a lot of improvement in the way the results are retrieved. However, a very large connection pool is counterproductive since it leads to unnecessary reservation of resources thus choking memory.