



San Jose State University

Project Report on,



Simulation of Reddit Using Distributed Enterprise Technologies

Under guidance of,
Prof. Simon Shim

CMPE 273 Enterprise Distributed Systems
Spring, 2021

:Team 02:

Alihussain Ladiwala,
Danesh Vijay Dhamejani,
Geetika Kapil,
Karan Pinakinbhai Jariwala
Sai Nikhil Yandamuri
Yusuf Juzar Soni

Contributions:

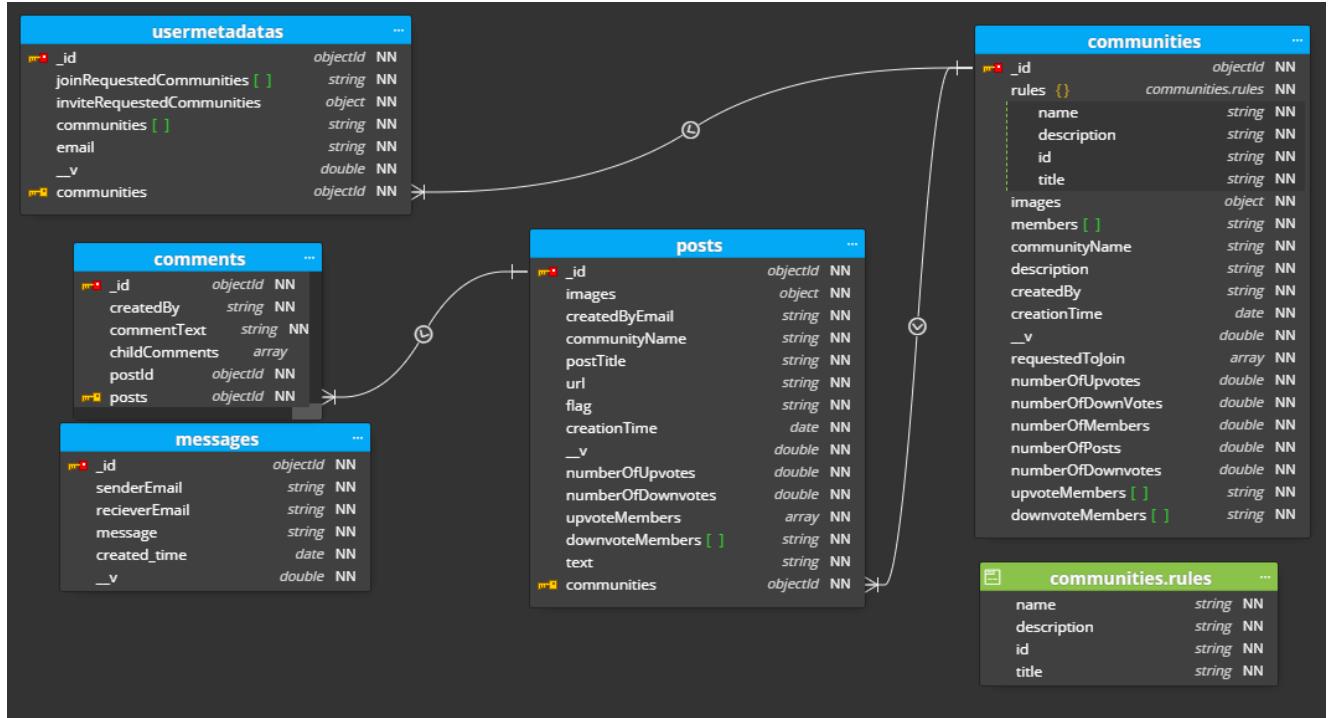
- **Alihussain Ladiwala**
 - Implemented Redis Client for the application, we are caching the messages for fetching products. If the product search query is present in the cache, then the results are fetched from the cache.
 - Contributed to DB Design, UI Design
 - Created myCommunity Page
 - Contributed to UI utils such as redux, routing, code structuring for the UI
 - Created Account Page
 - Assisted with the chat functionality
 - Assisted with Moderation Page, List communities Page
 - Assisted with Deployment
 - Assisted with Kafka setup for the project.
- **Danesh Vijay Dhamejani**

Implemented the product search and filter, product view for individual product

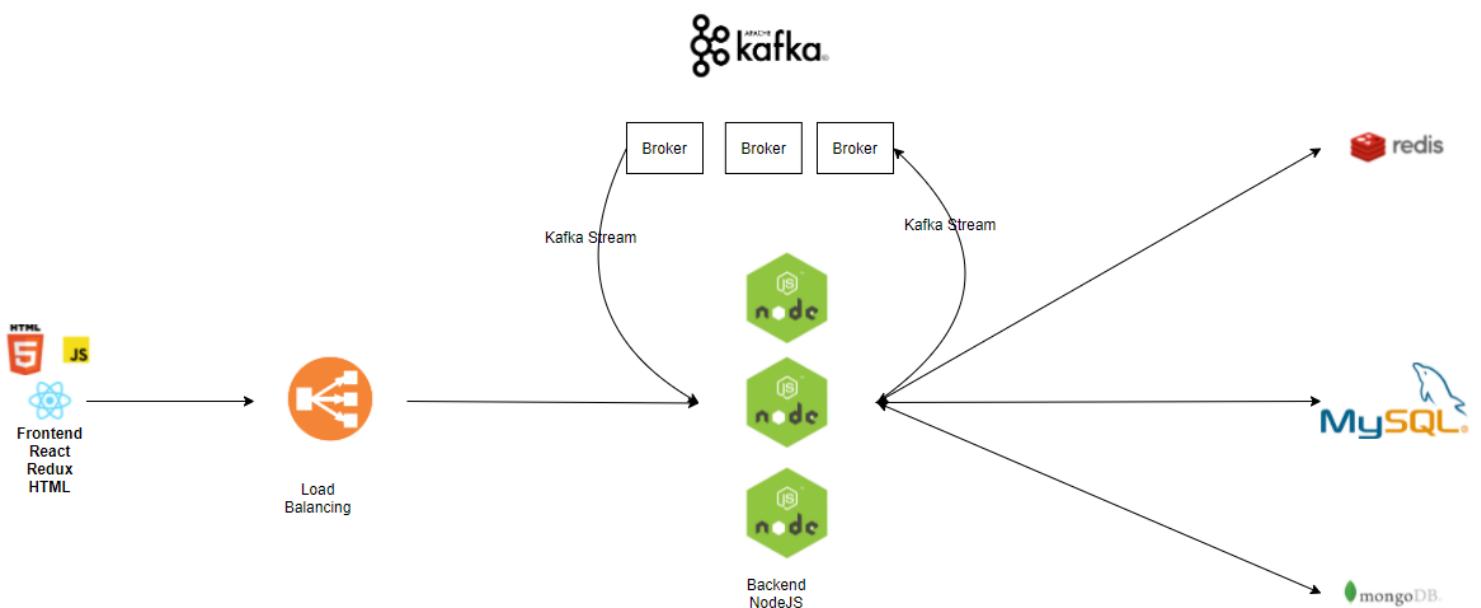
 - Implemented API's for Analytics page.
 - Implemented all API's pertaining to SQL.
 - Created MongoDB and SQL models.
 - Implemented multiple image functionalities
 - Implemented backend testing using Chai and Mocha.
- **Geetika kapil**
 - Implemented search community page
 - Implemented moderation page
 - Added sorting features in my community page
 - Application deployment
 - Assisted with Deployment
 - Assisted with Kafka setup for the project.
 - Worked extensively to integrate the above mentioned UI components with their respective backend components.
 - Report
- **Karan Pinakinbhai Jariwala**
 - Implemented all API's for Post in reddit.
 - Implemented all API's for Comments in reddit.

- Setup initial Kafka requirements.
 - Implemented API's for message.
 - Created Analytics page with graphs implementations.
 - Assisted in writing other API's and some bug fixes in the final iteration.
 - Backend API Testing in chai,mocha
- **Sai Nikhil Yandamuri**
 - Chat with other users functionality was implemented with usage of socket.io.
 - The Invitation Acceptance page was implemented in UI and backend.
 - Was integral in designing the database and security management throughout the application.
 - Assisted with deployment.
 - Developed API's required for My Communities and Search Community pages.
 - Developed API's required for Messages in chat application.
 - Assisted in writing other multiple API's.
- **Yusuf Juzar Soni**
 - Took active part in discussions during the Database and Architecture design phase of the project.
 - Helped interpret and identify key functionalities from given requirement documents and brainstormed on possible ways to implement the same.
 - Developed the UI for the Home (Dashboard Page) of the application using a combination Material UI, React Bootstrap and HTML 5 technologies.
 - Developed the UI for Create Post and View Post using the above mentioned technologies.
 - Developed UI for the Comments components in the View Post Page
 - Worked extensively to integrate the above mentioned UI components with their respective backend components.
 - Carried out extensive manual testing to validate and verify whether all assigned components were working smoothly.
 - Helped with debugging of minor errors and corner cases.
 - Tried to implement input validation in all components assigned for development.

Database Schema:



System Architecture Design diagram:



Notes:

Your object management policy:

Backend

- The dynamic objects like comments, messages, posts, communities etc are stored in mongodb as they are used frequently. The user credentials are stored in MySQL along with the user topics.
- MongoDB fetches the data with higher throughput making it feasible to do read and write operations on a large amount of data. These objects require scaling.
- The most sensitive information of the user is stored in MySql.
- Large images are stored on the Amazon S3 Bucket. For data retrieval, these images are stored on different cloud instances

Frontend:

- **Reusability** : By using functional components and props we were able to reuse the data fetched from the backend.
- **Redux**: To make the information readily available across application redux store were used. It was used to store login data for our application. It provided the feature of plug and play so that it is easy to use hooks for fetching the state of objects.

Heavyweight Resource Handling:

Connection Pooling:

- To achieve better system performance, we are using connection pooling. We used it as it makes it easy for us when application scales up and it helps to increase system performance.

Redis Caching:

- For faster retrieval of the messages from the database we used redis cache. It aids to optimize application performance.

Denormalized Data in MongoDB:

- MongoDB helped us to execute queries on the database without using complex joins. It helps us when

Kafka Messaging Queue:

- Real time messaging systems were possible due to kafka. It helped when the number of posts created by the user increased. It provide fault tolerance and scalability to our project

Database write policies:

MySQL:

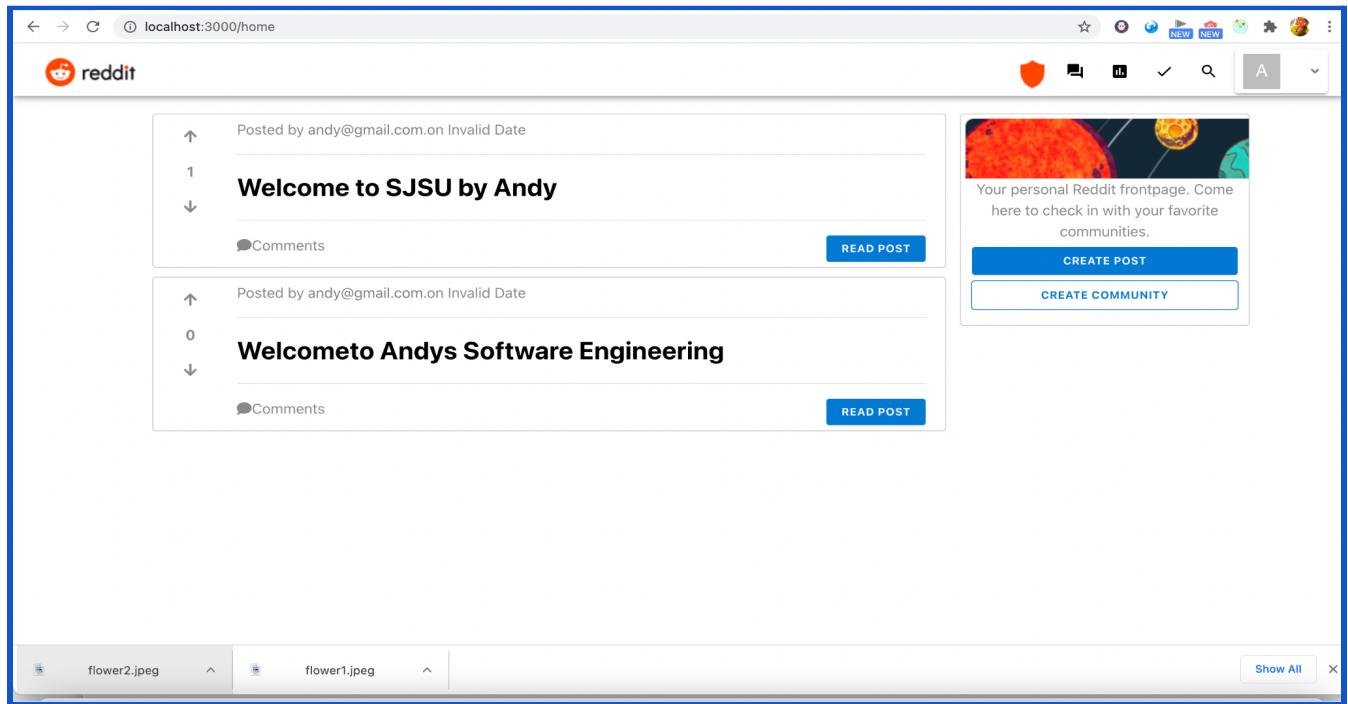
- For data protection, we have stored the personal data of users in MySQL. It helps to structure our data.

MongoDB:

- As mongodb is schema less database its structure is not defined. We are storing posts,comments, messages,communities in Mongodb for faster retrieval
- Auto sharding and scaling helps to increase the performance of the application.

Screen Captures of Application:

Home Page:



Create Posts

localhost:3000/createpost

Reddit

Create a Post

Andy's SJSU

Post Images Links

Title

Paragraph B I 0 WORDS POWERED BY TINY

This domain is not registered with Tiny Cloud. Please see the [quick start guide](#) or [create an account](#).

Posting to Reddit

1. Remember the human
2. Behave like you would in real life
3. Look for the original source of content

POST

Community moderation page

The screenshot shows a Reddit community moderation interface. A modal window titled "Select users to invite" is open, listing two email addresses: "andy@gmail.com" and "bob@gmail.com". Each email has a checkbox next to it. Below the list is a button labeled "Invite". The background shows a list of posts in the community, with the first post by "Andys Software" visible. The interface includes standard browser controls at the top and a file viewer at the bottom.

localhost:3000/community/moderation

reddIt

2 ▾

Your Community

Search Community Name

andy@gmail.com
Andy

bob@gmail.com
Bob

Invite

Andys Software
submitted on May 14, 2021

Approve Invite

Andys SJSU
submitted on May 14, 2021 by andy@gmail.com

Approve Invite

Next Previous

flower2.jpeg

flower1.jpeg

Show All

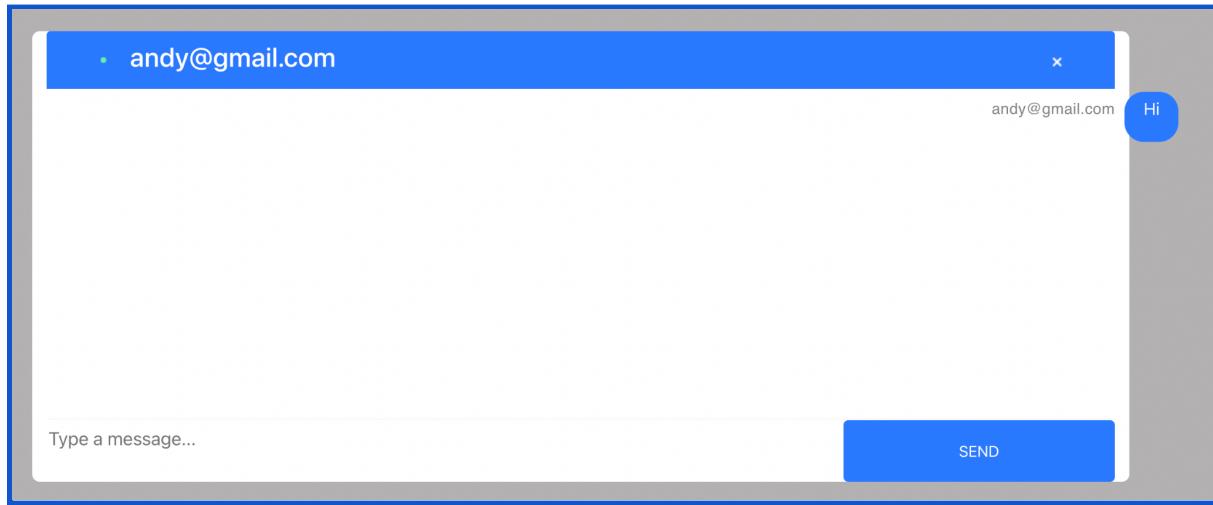
A screenshot of a web browser window titled "localhost:3000/communitymoderation". The page is titled "Your Community" and features a search bar for "Search Community Name". Below the search bar are two items listed in a grid:

- Andys Software Engineering**
submitted on May 14, 2021 by andy@gmail.com
Buttons: Approve, Invite
- Andys SJSU**
submitted on May 14, 2021 by andy@gmail.com
Buttons: Approve, Invite

At the bottom of the page are "Next" and "Previous" navigation buttons. The browser's address bar shows "localhost:3000/communitymoderation". The status bar at the bottom indicates "flower2.jpeg" and "flower1.jpeg".

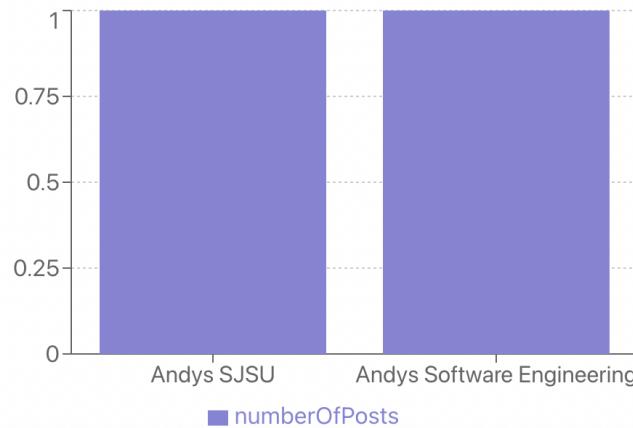
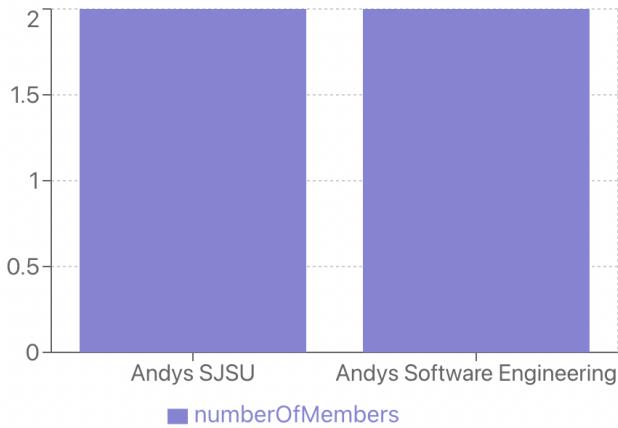
Chat page

A screenshot of a "Start Chat" page. The page has a large title "Start Chat" at the top. Below it is a search input field labeled "User Search" with a dropdown arrow icon. At the bottom of the page is a large blue button with the text "START CHAT" in white capital letters.



Analytics page

ANALYTICS PAGE



OTHER STATISTICS

- Most Upvoted Post is **Welcome to SJSU** by **Andy** from community **Andys SJSU**
- Maximum Number of Post Created by: **andy@gmail.com**
- Community with maximum posts: **Andys SJSU**

[Search community page](#)

The screenshot shows a list of community posts. At the top, there are filters for 'Created at' and a dropdown set to '2'. A search bar is also present. Below the header, two posts are listed:

- Andys Software Engineering**
submitted on May 14, 2021 by andy@gmail.com from Coding assignment collaborations
0 likes
- Andys SJSU**
submitted on May 14, 2021 by andy@gmail.com from School related posts
1 like

At the bottom right of the list area, there are 'Previous' and 'Next' buttons.

Create Community

The modal dialog has the following fields:

- Name**: An input field for the community name.
- Topics**: A section with "Add topics" and a dropdown menu.
- Add rules**: A section with "title" and "description" input fields, and minus and plus buttons.
- Description**: A text area for the community description.
- Choose Files**: A file upload button with "No file chosen".
- CANCEL** and **CREATE COMMUNITY** buttons at the bottom.

Code Listing of security and session objects:

```
"use strict";
var JwtStrategy = require("passport-jwt").Strategy;
var ExtractJwt = require("passport-jwt").ExtractJwt;
const passport = require("passport");
```

```

const { secret } = require("./config");
const pool = require("./mysqlConnection");

// Setup work and export for the JWT passport strategy
function auth() {
  var opts = {
    jwtFromRequest: ExtractJwt.fromAuthHeaderWithScheme("jwt"),
    secretOrKey: secret,
  };
  passport.use(
    new JwtStrategy(opts, (jwt_payload, callback) => {
      const email = jwt_payload.email;
      const getUserQuery = "select name,email from User where email=?";

      pool.query(getUserQuery, [email], (err, sqlResult) => {
        if (err) {
          return callback(err, null);
        }
        if (sqlResult) {
          callback(null, sqlResult);
        } else {
          callback(null, false);
        }
      });
    })
  );
}

exports.auth = auth;

```

config files

```

"use strict";
const mysql = require("mysql");
const {
  mysqlHost,
  mysqlUser,
  mysqlPassowrd,
  myqlDatabase,
  mysqlPort,

```

```
} = require("./config");

const pool = mysql.createPool({
  connectionLimit: 100,
  host: mysqlHost,
  user: mysqlUser,
  port: mysqlPort,
  password: mysqlPassowrd,
  database: myqlDatabase,
}) ;
```

Code Listing of Main Server Code:

```
app.use("/api", createCommunity);
app.use("/api", searchCommunity);
app.use("/api", addMessages);
app.use("/api", getMessages);
app.use("/api", createPost);
app.use("/api", getPost);
app.use("/api", requestedToJoinCommunity);
app.use("/api", inviteToJoinCommunity);
app.use("/api", acceptInvitationByUser);
app.use("/api", getCommunity);
app.use("/api", getProfile);
app.use("/api", updateProfile);
app.use("/api", imageUpload);
app.use("/api", acceptRequestToJoinCommunity);
app.use("/api", checkApprovedStatus);
app.use("/api", votingForPost);
app.use("/api", votingForCommunity);
app.use("/api", CommunitiesListByUser);
```

```
const mongoose = require("mongoose");
const Post = require("../model/Post");
const Community = require("../model/Community");
```

```
async function handle_request(msg, callback) {
  console.log("123");
  const createdByEmail = msg.createdByEmail;
  const communityName = msg.communityName;
  const postTitle = msg.postTitle;
  const flag = msg.flag;
  const images = msg.images;
  const url = msg.url;
  const text = msg.text;
  console.log("inside create abcd");
  console.log(flag);

  if (flag === "image") {
    const post = new Post({
      createdByEmail: createdByEmail,
      communityName: communityName,
      postTitle: postTitle,
      images: images,
      flag: flag,
    });
    console.log(post);
    await post.save(function (err, result) {
      if (err) {
        console.log(err);
      } else {
        Community.findOneAndUpdate(
          { communityName },
          { $inc: { numberOfPosts: 1 } },
          function (err, doc) {
            if (err) {
              callback(null, err);
            } else {
              callback(null, { message: "Post added" });
            }
          }
        );
      }
    });
  }
}
```

```
    } else if (flag === "url") {
      const post = new Post({
        createdByEmail: createdByEmail,
        communityName: communityName,
        postTitle: postTitle,
        url: url,
        flag: flag,
      });

      console.log(post);
      await post.save(function (err, result) {
        if (err) {
          console.log(err);
        } else {
          Community.findOneAndUpdate(
            { communityName },
            { $inc: { numberOfPosts: 1 } },
            function (err, doc) {
              if (err) {
                callback(null, err);
              } else {
                callback(null, { message: "Post added" });
              }
            }
          );
        }
      });
    } else if (flag === "text") {
      const post = new Post({
        createdByEmail: createdByEmail,
        communityName: communityName,
        postTitle: postTitle,
        text: text,
        flag: flag,
      });

      console.log(post);
      await post.save(function (err, result) {
        if (err) {
          console.log(err);
        }
      });
    }
  }
}
```

```

    } else {
      Community.findOneAndUpdate(
        { communityName },
        { $inc: { numberOfPosts: 1 } },
        function (err, doc) {
          if (err) {
            callback(null, err);
          } else {
            callback(null, { message: "Post added" });
          }
        }
      );
    }
  });

exports.handle_request = handle_request;

```

Database Access and Connections:

```

"use strict";
const mysql = require("mysql");
const {
  mysqlHost,
  mysqlUser,
  mysqlPassowrd,
  myqlDatabase,
  mysqlPort,
} = require("./config");

const pool = mysql.createPool({
  connectionLimit: 100,
  host: mysqlHost,
  user: mysqlUser,
  port: mysqlPort,
  password: mysqlPassowrd,
  database: myqlDatabase,
});

pool.getConnection((err) => {
  if (err) {
    throw "Error Occured: " + err;
  } else {
    console.log("MySQL Database Connected");
  }
});
module.exports = pool;

```

Mocha Test Screenshots:

The screenshot shows a terminal window within a code editor interface, displaying the output of a Mocha test run. The terminal tab is active, showing the following test results:

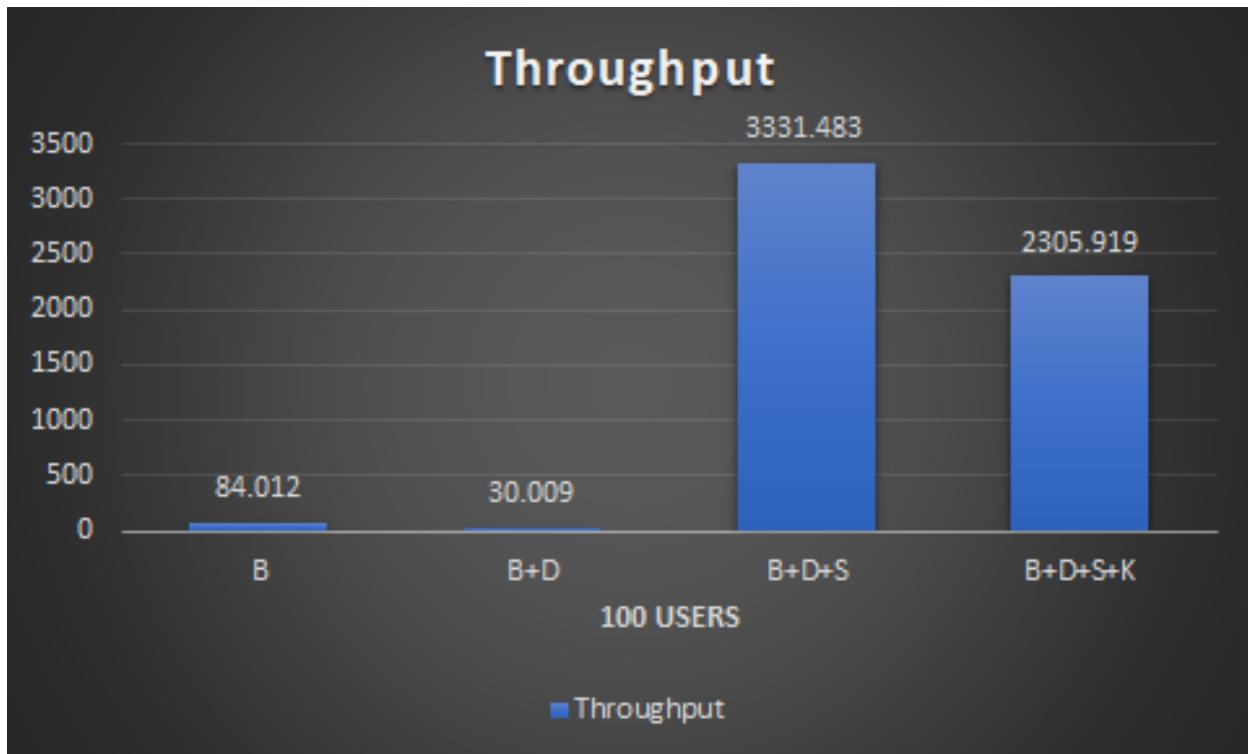
```
Reddit
  Login Test
    ✓ Incorrect Password
(node:41491) [MONGODB DRIVER] Warning: Top-level use of w, wtimeout, j, and fsync is deprecated. Use writeConcern instead.
(node:41491) [MONGODB DRIVER] Warning: Current Server Discovery and Monitoring engine is deprecated, and will be removed in a future version. To use the new Server Discover and Monitoring engine, pass option { useUnifiedTopology: true } to the MongoClient constructor.
  Analytics Test
    ✓ Most upvoted Post
  1
  returning next
    Community Max Post
      ✓ Community with Max Posts
    No of Posts
      ✓ No of Posts
    client ready!
      user with max posts
        ✓ Max Post User
  MySQL Database Connected
    No of Posts per community
      ✓ Posts per community
    Sign Up
      ✓ Testing sign up
    Search User
      ✓ User's Communities
    Request to join community
      ✓ Request to join community
    Search community
      ✓ Search community

  10 passing (467ms)
```

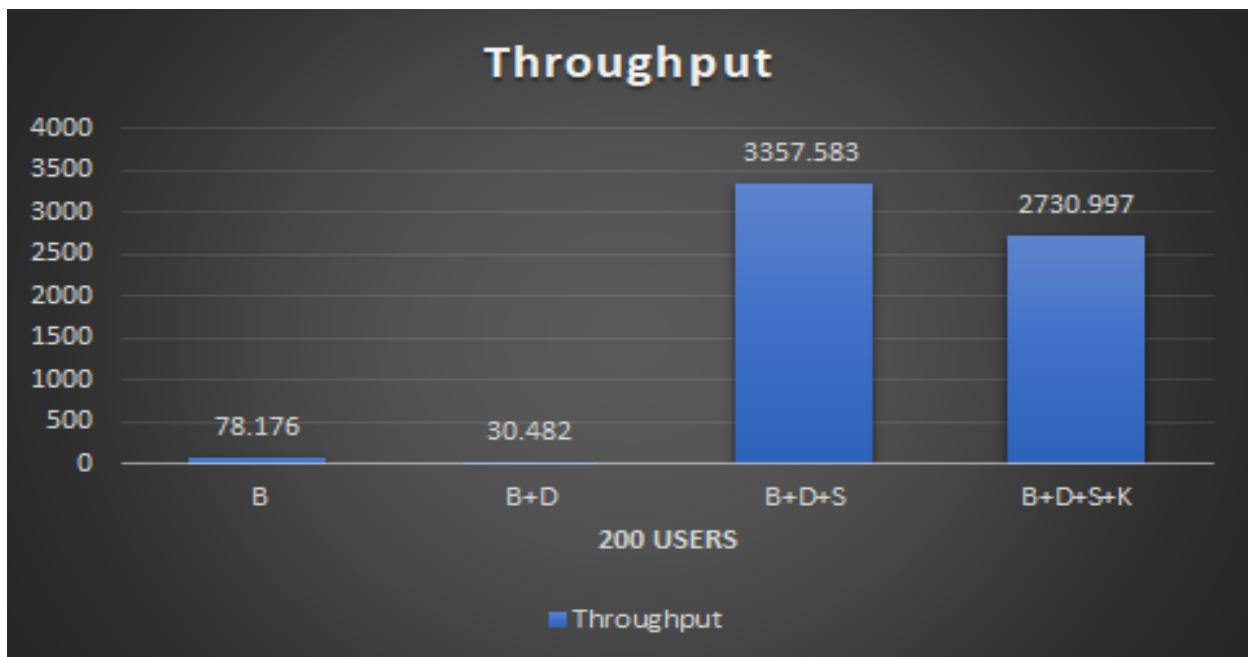
The terminal also displays several MongoDB driver deprecation warnings at the top. At the bottom of the terminal window, there is a status bar with the following information: Ln 164, Col 31, Spaces: 4, UTF-8, LF, JavaScript, ✓ Prettier.

Performance Graphs:

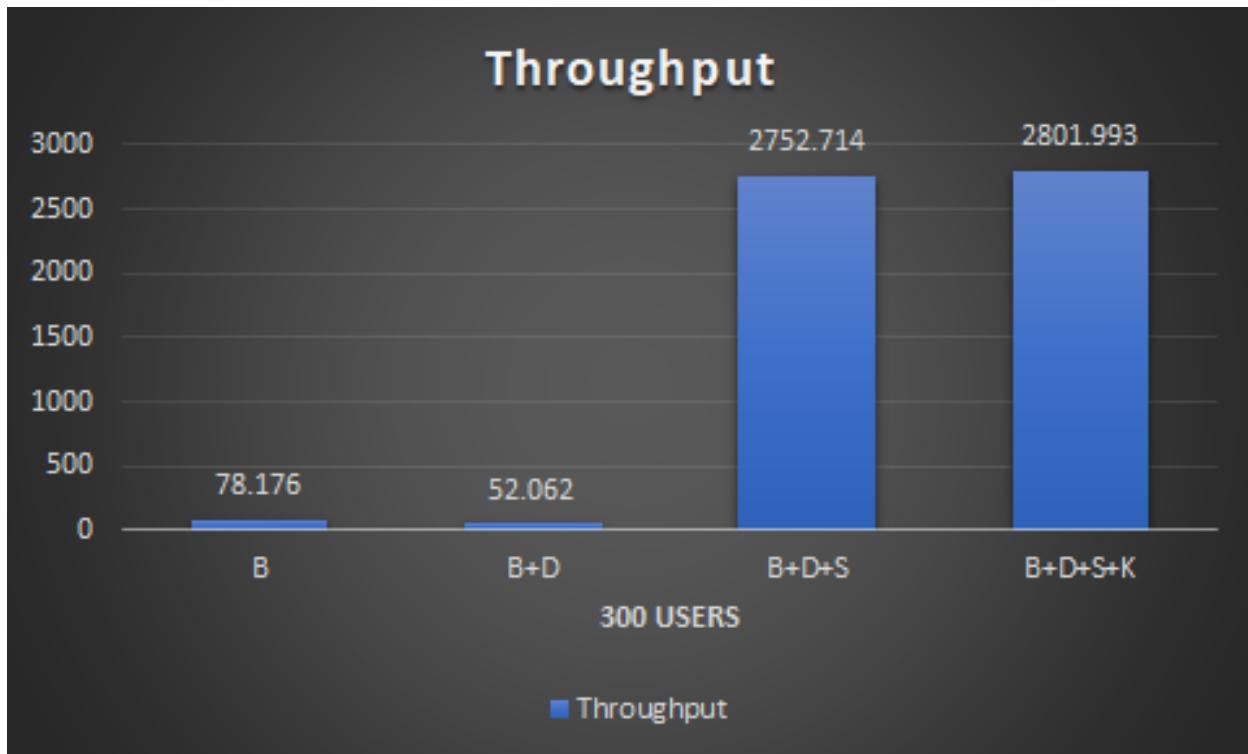
100 users :



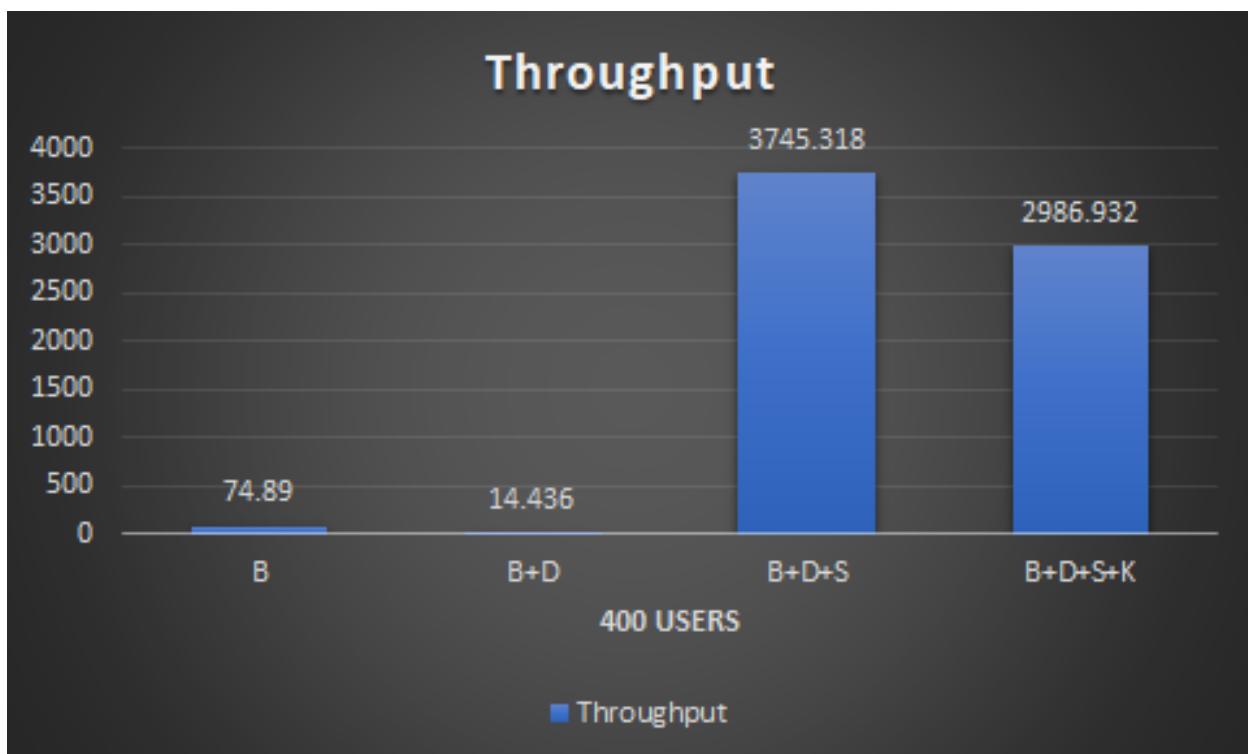
200 users:



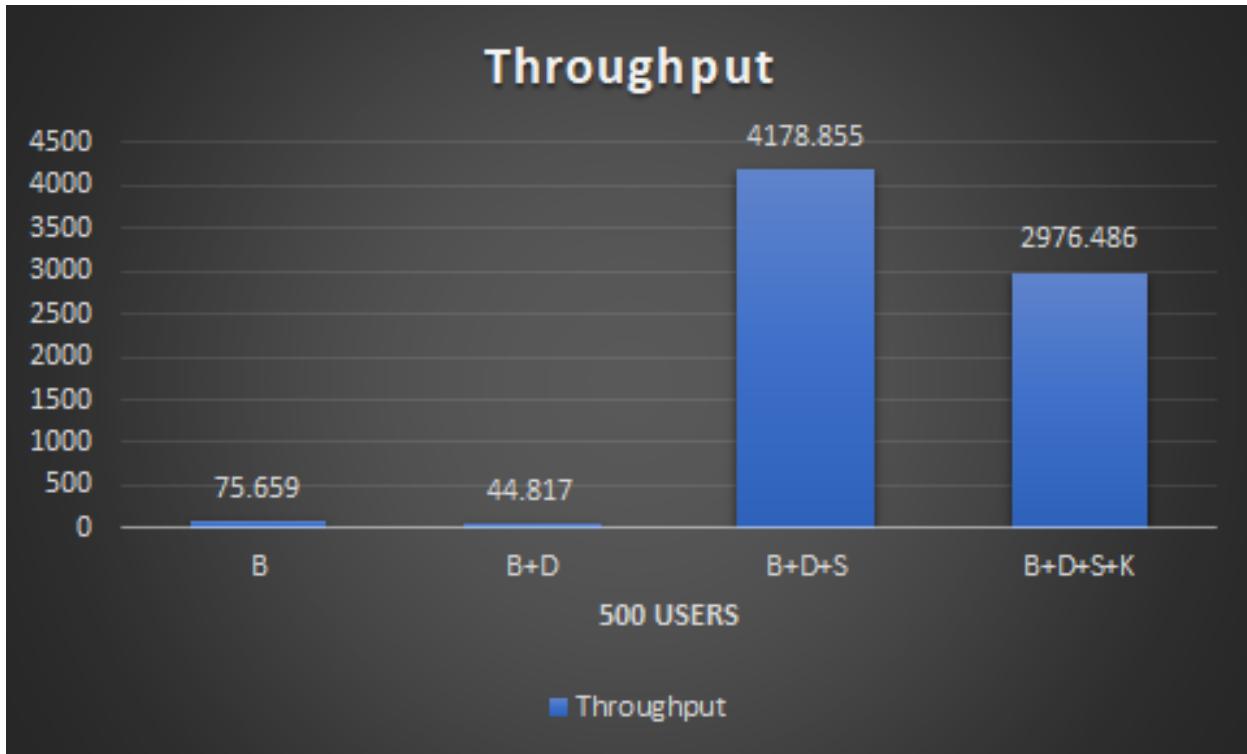
300 users:



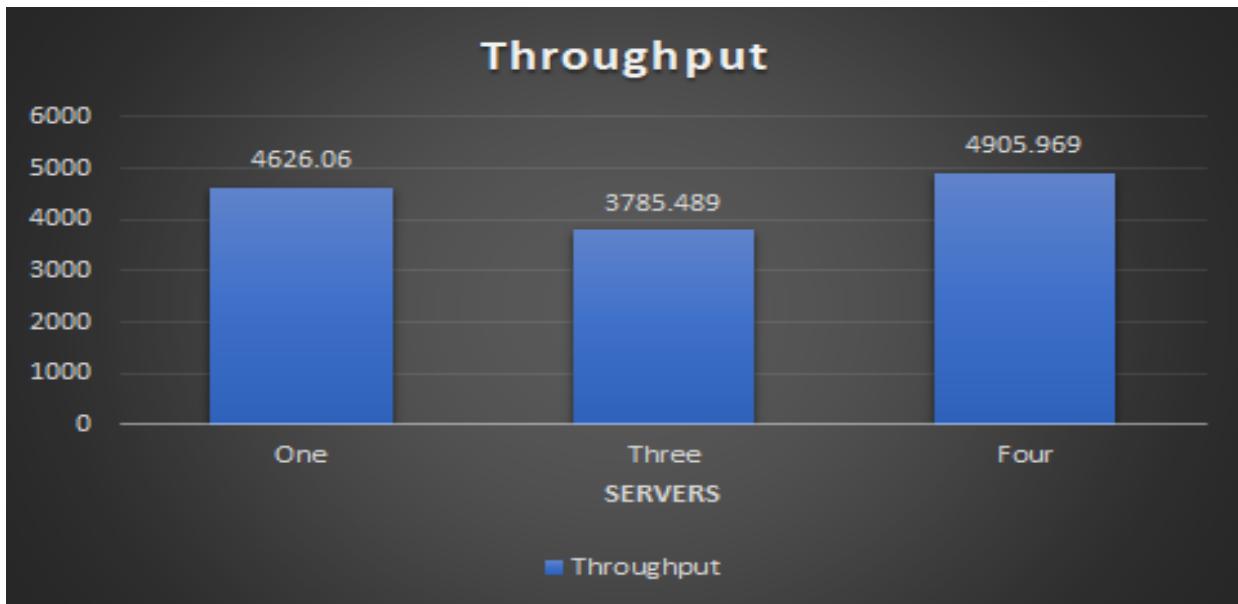
400 users:



500 users :



Performance on Load Balancing:



Performance Analysis and Comparison:

We populated the database with 10,000 messages to test various distributed system strategies. We have tested the getMessages API with the approaches mentioned in the document.

From the above graphs we can conclude the following

- There is a significant improvement in performance as soon as caching is introduced in the mix.
- Approaches with and without kafka (strategy 3&4) have small differences in performance. Although kafka impacts performance it provides benefits of scalability and high availability.

Code can be found at this github link:

<https://github.com/SaiNikhilYandamuri/simulation-of-reddit>