Twitter Engine Part 2 - COP 5615

Youtube video link - https://www.youtube.com/watch?v=G37cUMv1F-k

Group members -

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Project Description

Part 1 Recap

Implement a Twitter-like engine with the following functionality: Register account Send tweet. Tweets can have hashtags (e.g. #COP5615isgreat) and mentions (@bestuser) Subscribe to user's tweets Re-tweets (so that your subscribers get an interesting tweet you got by other means) Allow querying tweets subscribed to, tweets with specific hashtags, tweets in which the user is mentioned (my mentions) If the user is connected, deliver the above types of tweets live (without querying) Implement a tester/simulator to test the above Simulate as many users as you can Simulate periods of live connection and disconnection for users Simulate a Zipf distribution on the number of subscribers. For accounts with a lot of subscribers, increase the number of tweets. Make some of these messages re-tweets Other considerations: The client part (send/receive tweets) and the engine (distribute tweets) have to be in separate processes. Preferably, you use multiple independent client processes that simulate thousands of clients and a single-engine process You need to measure various aspects of your simulator and report performance More detail in the lecture as the project progresses.

Project 4 Extensions (Part 2)

This is a continuation of Project 3 where the actor model calls are now replaced with WebSocket API calls. The added functionality is listed below:

1. Designed a JSON based API that represents all messages and their replies (including errors)
2. Re-written parts of the engine using WebSharper to implement the Web-Socket interface
3. Re-written parts of the client to use WebSockets.

BONUS PART

1. A user after registration provides a public key.
2. When the user re-connects via the websocket to request for any service, the engine sends a randomized mathematical challenge to the user, for example, 2 + 5, this is a 256 bit challenge and if the user fails to answer

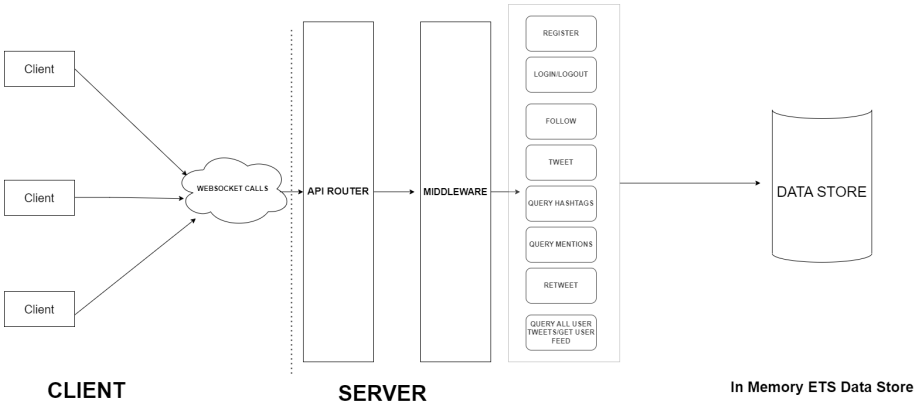
correctly, the websocket connection is terminated and the user has to retry. When the client sends a reply for the challenge, it is digital signed with the time included. The engine sends an acknowledgment if the answer is right or an error if it is not. The challenge is randomized evey time it is called and hence it is not cached.

3. The user establishes a secret key with the engine using HMAC which signs every message sent in the JSON Format.

Steps to Run the project

- Our choice of IDE for the project is IntelliJ IDEA. Build the project and run it using the erlang console run configuration in IntelliJ IDEA with just default (zero) arguments and default settings.
- Use the command "make run" in the console to the run the application.

Twitter High Level Architecture



File Structure and Application Details

The main functionalities of the twitter clone are handled by various handlers which implement websockets to listen to the user's requests. The description of each file is given below -

1) **dosp_app.erl**

An opaque dispatch rules value is returned. This value must be given to Cowboy as a middleware environment value, and calls the respective handlers.

2) **"handler" files**

Decodes/parses the payload and sends the parsed value to the server for business logic execution.

3) **middleware.erl**

Authenticates payloads sent from the dosp_app.erl and routes them to the server.erl

4) **server.erl**

Initializes all tables and implements all business logic, then sends it back to the handler to send the result back to the client through the websockset.

The requests to the client can be sent using the following commands -

Zip F Distribution -

Here, the no.of tweets that a user makes is determined using ZIP F Distribution. The user with maximum no.of followers sends the "maximum no.of tweets". The second most popular user will perform "maximum no.of tweets / 2" tweets. The third most popular user will perform "maximum no.of tweets / 3" tweets and so on. The parameter "maximum no.of tweets" is taken as an input from the user.

Periods of Live Connection and Disconnection

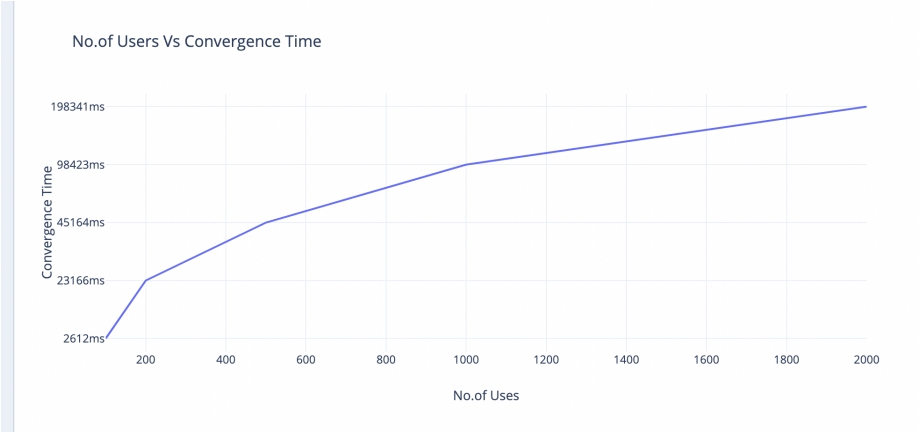
Depending upon the parameter "percentage of users to disconnect", the users are periodically disconnected. This is taken as an input from the user. **Please note that, the no.of users that will be disconnected will always be less than "percentage of users to disconnect".**

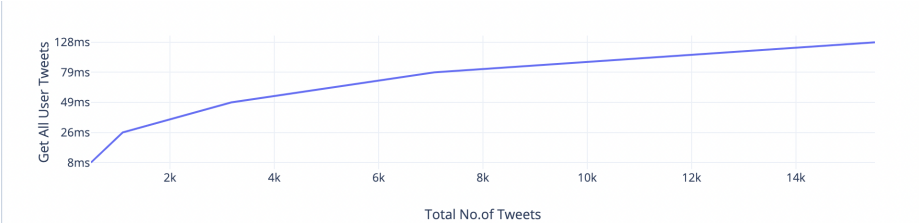
Performance Graphs -

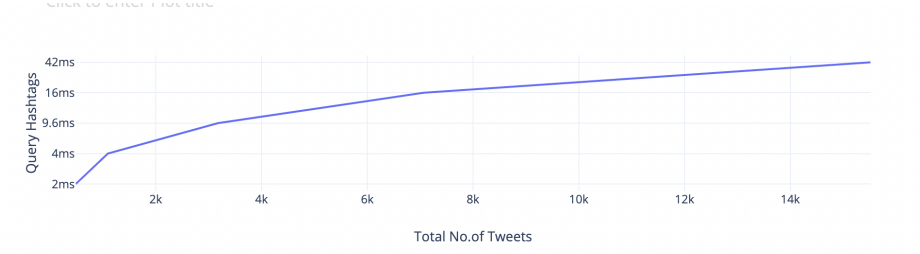
No.of Tweets	Max no.of subscribe	Convergence Time	Total Tweets	Total Retweets	Query Hashtag	Get All User Tweets	Query Mentions
100	99	2612ms	487	26	2ms	8ms	3ms
200	199	23166ms	1096	65	4ms	26ms	4ms
500	499	45164ms	3178	198	9.6ms	49ms	11 ms
1000	999	98423ms	7068	504	16ms	79ms	19ms
2000	1999	198340ms	15517	1294	42ms	128ms	44ms

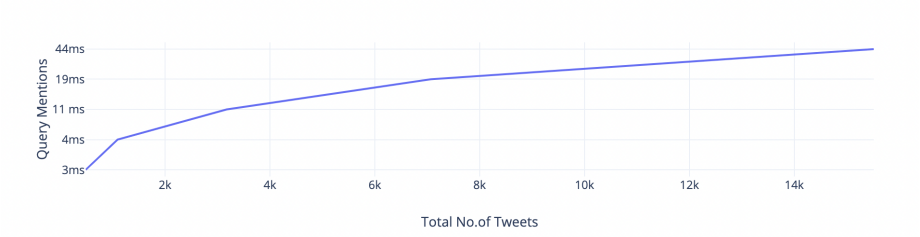
The performance results are taken for the parameter - "no.of users to disconnect" = 0. This means that all the users in the system are active and the tweets will be delivered to all online users. The performance results will be much faster, when the "**no.of users to disconnect > 0**" as the tweets will not have to be delivered to every subscribed user.

The logic to distribute the work is on the server side. For our testing purposes, we are running both the client and server on the same system. We were able to test for a maximum of 2000 users, but we are confident that, in a real life scenario our system can scale up to 100x depending on the CPU power of the server,

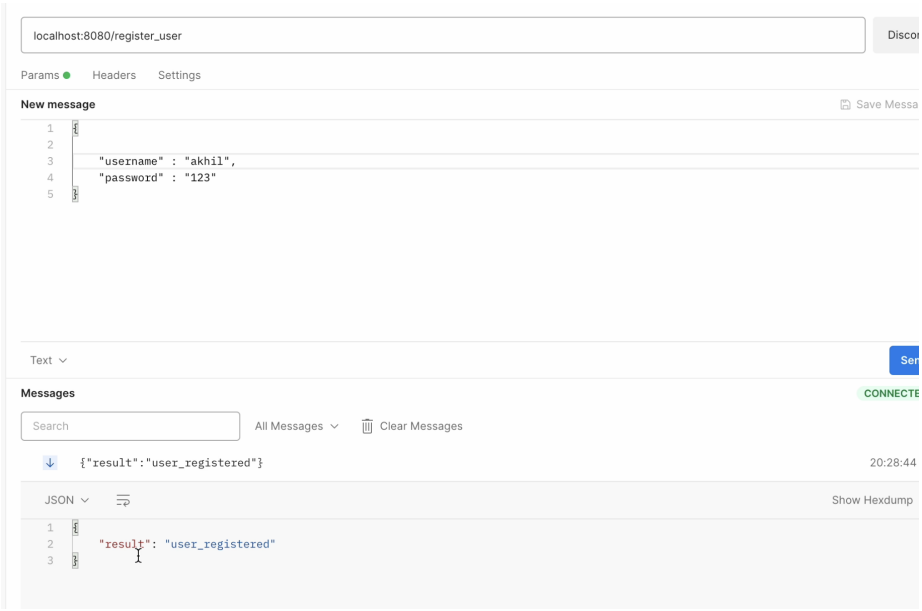


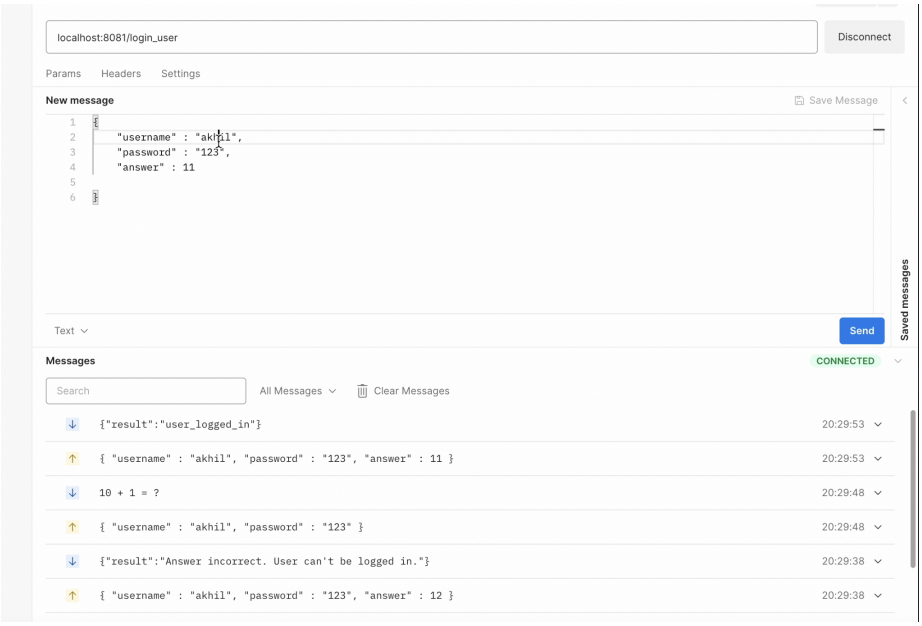


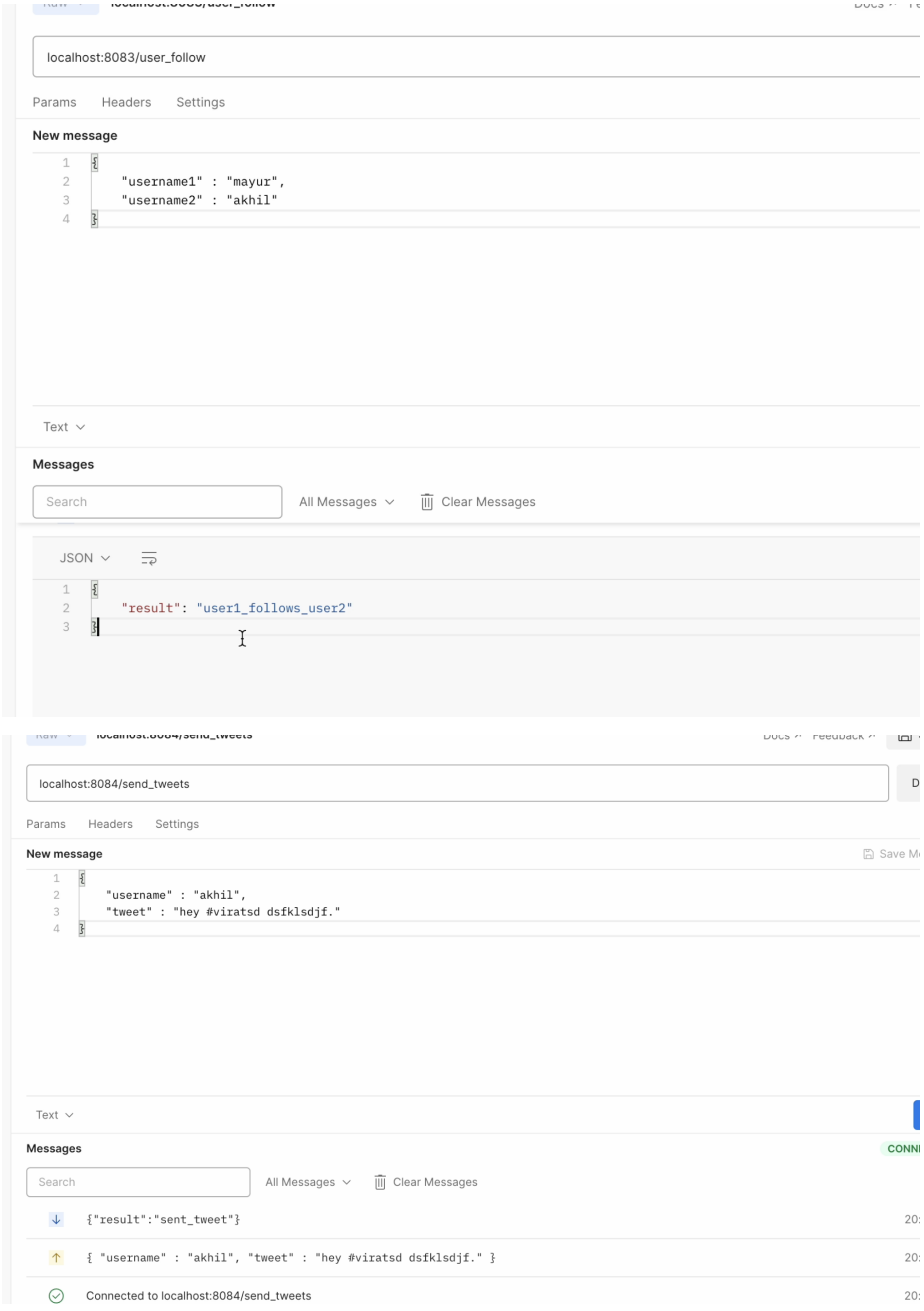


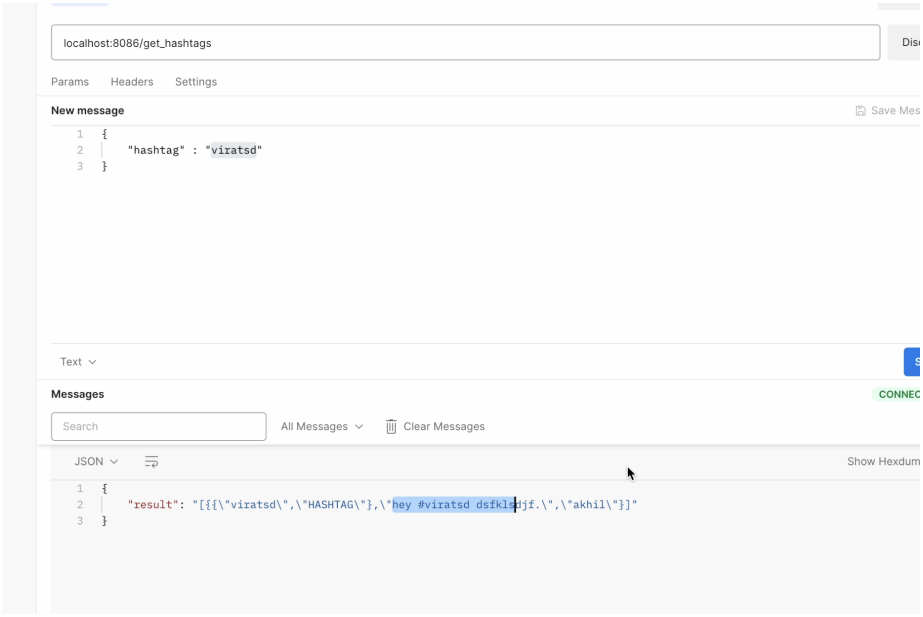


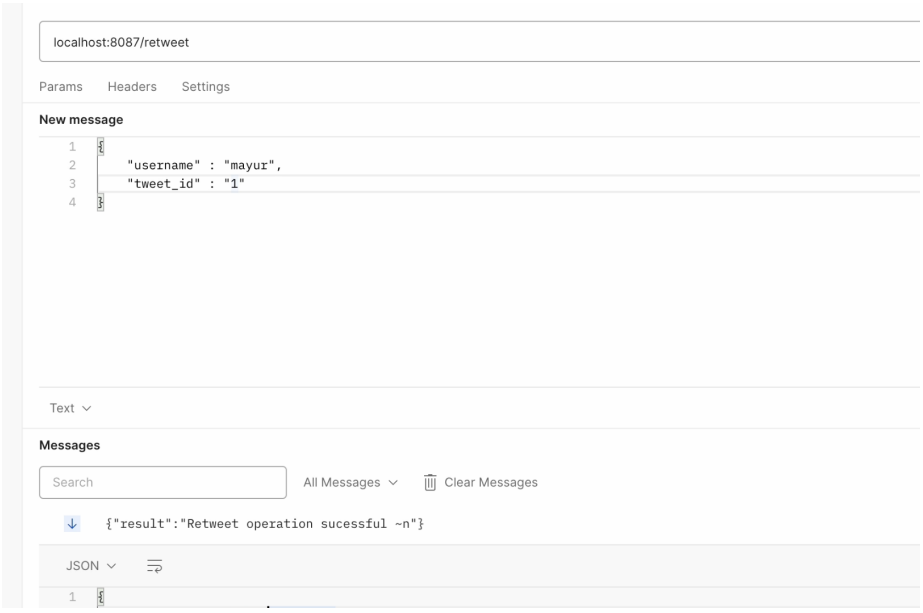
Some Samples of Request/ Response -

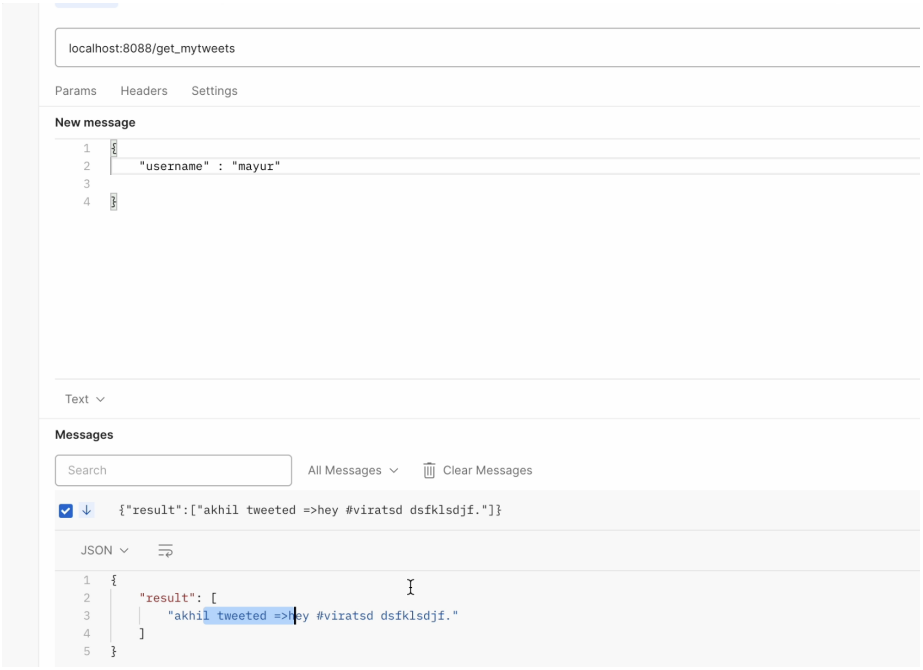

localhost:8080/register_user
Disco
Params
Headers
Settings
New message
Save Messa
{
"username" : "akhil",
"password" : "123"
}
Text
Ser
Messages
CONNECTE
Search
All Messages
Clear Messages
{"result":"user_registered"}
20:28:44
JSON
Show Hexdump
{
"result": "user_registered"
}


localhost:8081/login_user
Disconnect
Params
Headers
Settings
New message
Save Message
{
"username" : "akhil",
"password" : "123",
"answer" : 11
}
Text
Send
Saved messages
Messages
CONNECTED
Search
All Messages
Clear Messages
{"result":"user_logged_in"}
20:29:53
{ "username" : "akhil", "password" : "123", "answer" : 11 }
20:29:53
10 + 1 = ?
20:29:48
{ "username" : "akhil", "password" : "123" }
20:29:48
{"result":"Answer incorrect. User can't be logged in."}
20:29:38
{ "username" : "akhil", "password" : "123", "answer" : 12 }
20:29:38


localhost:8083/user_follow
Params
Headers
Settings
New message
{
"username1" : "mayur",
"username2" : "akhil"
}
Text
Messages
Search
All Messages
Clear Messages
JSON
{
"result": "user1_follows_user2"
}
localhost:8084/send_tweets
Params
Headers
Settings
New message
{
"username" : "akhil",
"tweet" : "hey #viratsd dsfklsdjf."
}
Text
Messages
Search
All Messages
Clear Messages
{"result":"sent_tweet"}
{ "username" : "akhil", "tweet" : "hey #viratsd dsfklsdjf." }
Connected to localhost:8084/send_tweets


localhost:8086/get_hashtags
Params
Headers
Settings
New message
{
"hashtag" : "viratsd"
}
Text
Messages
Search
All Messages
Clear Messages
JSON
Show Hexdum
{
"result": "[{{\"viratsd\",\"HASHTAG\"},\"hey #viratsd dsfklsdjf.\",\"akhil\"}]"
}


localhost:8087/retweet
Params
Headers
Settings
New message
{
"username" : "mayur",
"tweet_id" : "1"
}
Text
Messages
Search
All Messages
Clear Messages
{"result":"Retweet operation sucessful ~n"}
JSON


localhost:8088/get_mytweets
Params
Headers
Settings
New message
{
"username" : "mayur"
}
Text
Messages
Search
All Messages
Clear Messages
{"result":["akhil tweeted =>hey #viratsd dsfklsdjf."]}
JSON
{
"result": [
"akhil tweeted =>hey #viratsd dsfklsdjf."
]
}