

Project 4 (Part 1)

Group Members

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Description

In this project, we are tasked with implementing a Reddit Clone and a client tester/simulator.

The current task is to build an engine that will be paired up with REST API/WebSockets to provide full functionality.

Dependencies

Before proceeding, please ensure proper installation of Pony by following the guidelines posted here: <https://github.com/ponylang/ponyc>.

Usage

Compilation:

- Client: Using terminal, navigate to the Client folder and run `ponyc`
- Server: Using terminal, navigate to the Server folder and run `ponyc`

Running the Reddit Server:

- Within the Server Folder run `./Server <Num_Clients_To_Spawn>`
- The Server will start up and listen on localhost port 8989
- Upon binding, the server will then spawn the specified number of clients.
- Clients will then be set to run the simulation and interact using the reddit engine.

Running the Dedicated Client:

- Within the Client Folder run `./Client <username>`
- The dedicated client allows for an individual to interact with the reddit engine and the simulation.
- The user can perform all tasks that the simulated clients can perform (send messages, post, create subreddits, etc.) with the additional capability of printing metrics from the simulation.

What is Currently Working

- Reddit-like engine:
 - ☒ Register account (Clients provide only usernames for simplicity right now)
 - ☒ Create & join sub-reddit; leave sub-reddit (Clients can create/join/leave subreddits)

- ☒ Post in sub-reddit. Make the posts just simple text. No need to support images or markdown. (Clients can currently post simple randomized text in subreddits)
- ☒ Comment in sub-reddit. Keep in mind that comments are hierarchical (i.e. you can comment on a comment) (Clients can currently comment simple randomized text on posts and comments within subreddits)
- ☒ Upvote+downvote + compute Karma (Clients can upvote and downvote, karma is computed, achievements are also assigned but not fully fleshed out yet.)
- ☒ Get feed of posts (Clients can get a current feed of the subreddits they subscribe to)
- ☒ Get list of direct messages; Reply to direct messages (Clients can send messages and reply to messages)
- Tester/Simulator
 - ☒ Simulate as many users as you can
 - ☒ Simulate periods of live connection and disconnection for users (Users will go offline/online)
 - ☒ Simulate a Zipf distribution on the number of sub-reddit members. For accounts with a lot of subscribers, increase the number of posts. Make some of these messages re-posts
- Other considerations:
 - ☒ The client part (posting, commenting, subscribing) and the engine (distribute posts, track comments, etc) 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 (This is currently done with the dedicated client)

Additional Functionalities for Future

- Getting feed based on hot, subreddit, new, etc. currently works but needs to be implemented into the client better. Right now the client feed option just uses the default of showing a feed of the subreddits the client is subscribed to.

Running Tests

- Simulations were left to run for 10 minutes and resulting metrics were recorded.
- RAM usage was tracked for 10,000 and 100,000 users.
- Due to modeling behavior through probabilities, we can expect tracked interaction metrics to increase with the number of users.

100 Initial Users (Baseline)

```
=== Reddit System Metrics ===
Posts created: 327
Comments made: 973
Total votes: 3441
Content reposts: 214
Direct messages: 456
Simulated users online: 82
Simulated users offline: 86
```

```
Hourly Rates:
-----
Posts/hour: 1962
```

Comments/hour: 5838
Votes/hour: 20646

- 68 new users created accounts over 10 minutes
- 51% of users were offline after 10 minutes

1,000 Initial Users (Increase of 10x over baseline)

```
=== Reddit System Metrics ===  
Posts created: 3318  
Comments made: 9807  
Total votes: 34460  
Content reposts: 1893  
Direct messages: 4847  
Simulated users online: 496  
Simulated users offline: 557
```

Hourly Rates:

Posts/hour: 19809
Comments/hour: 58549.3
Votes/hour: 205731

- 53 new users created accounts over 10 minutes
- 53% of users were offline after 10 minutes
- All tracked metrics saw roughly a 10x increase due to the increased number of users

10,000 Initial Users (Increase of 100x over baseline)

```
=== Reddit System Metrics ===  
Posts created: 32266  
Comments made: 99967  
Total votes: 349213  
Content reposts: 19198  
Direct messages: 49790  
Simulated users online: 5070  
Simulated users offline: 4993
```

Hourly Rates:

Posts/hour: 193596
Comments/hour: 599802
Votes/hour: 2.09528e+06

- 63 new users created accounts over 10 minutes
- 49% of users were offline after 10 minutes
- All tracked metrics saw roughly a 100x increase due to the increased number of users
- 975.9MiB RAM peak usage

100,000 Initial Users (Increase of 1,000x over baseline)

```
=== Reddit System Metrics ===  
Posts created: 303642  
Comments made: 930587  
Total votes: 3264380  
Content reposts: 179574  
Direct messages: 466233  
Simulated users online: 49704  
Simulated users offline: 50349
```

Hourly Rates:

Posts/hour: 1.84647e+06

Comments/hour: 5.65898e+06

Votes/hour: 1.9851e+07

- 53 new users created accounts over 10 minutes
- 50% of users offline after 10 minutes.
- All tracked metrics saw roughly a 1000x increase due to the increased number of users
- 9.7GiB RAM peak usage

1,000,000 Initial Users (Increase of 10,000x over baseline)

- Using this many users crashed terminal due to memory usage
- Tests run on gaming/performance oriented Laptop with 16GB of system RAM

How to Use/Example Usage

SERVER SETUP

1. Starting Server

```
./Server 100
Starting Reddit Engine Simulation with 100
Created subreddit: programming
Created subreddit: news
Created subreddit: funny
Created subreddit: science
Created subreddit: gaming
Created subreddit: movies
Created subreddit: music
Created subreddit: books
Created subreddit: technology
Created subreddit: sports
Created subreddit: cats
Created subreddit: pics
Created subreddit: cars
Created subreddit: memes
Created subreddit: politics
Created subreddit: history
Created subreddit: jokes
Created subreddit: math
Created subreddit: music
Created subreddit: stocks

Simulation initialization complete!
Created 100 initial users
Use the simulation timer to generate ongoing activity.

Simulation initialization complete!
Use the simulation timer to generate ongoing activity.
Listening on ::1:8989
```

- Server starts (in given example, the simulation starts with 100 users - more will spawn/join reddit over time).
- The server will start with 20 default subreddits with more added by users overtime.

2. Simulated users will start to act out simulation

```

mkTAiIYkDA9fct5X created a post in sports: Post about sports 1732630004
Simulation: mkTAiIYkDA9fct5X created a post in sports
WIBbqgd30uk43kT1 created a post in politics: Post about politics 1732630005
Simulation: WIBbqgd30uk43kT1 created a post in politics
Jlnw3r9dEKu9bh5K created a post in music: Post about music 1732630006
Simulation: Jlnw3r9dEKu9bh5K created a post in music
bfz8rKVOFhubFE1A created a post in memes: Post about memes 1732630009
Simulation: bfz8rKVOFhubFE1A created a post in memes
6AzPrv8PR5KZfgS5 commented on post 0
Simulation: 6AzPrv8PR5KZfgS5 commented on post 0 in music
6GMg1Jaqnw5V3jpJ created a post in music: Post about music 1732630012
Simulation: 6GMg1Jaqnw5V3jpJ created a post in music
Simulation: MarfpuZGn7Qr3GtK created a post in history
1X2coQxpPft7xqHy sending message to 5FVbGlcFomshDqNL
Simulation: 1X2coQxpPft7xqHy messaged 5FVbGlcFomshDqNL about post 2
Simulation: New user registered: User_1732630028
Simulation: New subreddit created: Subreddit_1732630028
Simulation: qLqZMLL1RhIOK9vv joined new subreddit Subreddit_1732630028
Simulation: g0rPZkxZOdbad64e joined new subreddit Subreddit_1732630028
Simulation: vbkwagVweQavNR7g joined new subreddit Subreddit_1732630028
7f24sZCuk5yN3UIP sending message to MarfpuZGn7Qr3GtK
Simulation: 7f24sZCuk5yN3UIP messaged MarfpuZGn7Qr3GtK about post 0
Simulation: New subreddit created: Subreddit_1732630030
Simulation: ziEHYR5bAYVDCrgA joined new subreddit Subreddit_1732630030
hAjkiEleenr2MZsx created a post in stocks: Post about stocks 1732630033
Simulation: hAjkiEleenr2MZsx created a post in stocks

```

- The simulation can be monitored from the server terminal.
- Example usage shows users creating posts, commenting, messaging each other, creating subreddits, and joining/leaving subreddits.

INTERACTING WITH SIMULATION VIA PROVIDED CLIENT

- All interaction is done by typing the number next to the action in the menu you would like to perform.

1. Login to Reddit:

```

./Client conrad
Connected to Reddit server
Sent login request for user: conrad
Successfully logged in!

```

```

=== Reddit Menu ===
1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit

```

Enter your choice:

- **Server acknowledges login:**

Server received: LOGIN conrad
Login attempt from: conrad
Login successful for: conrad

2. Before making a post or commenting, Join a subreddit:

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit

Enter your choice:

9

Enter subreddit name to join:

cats

Successfully joined subreddit: cats

- **Server acknowledges joining subreddit cats**

Server received: JOIN_SUBREDDIT cats

3. Create a post in a subreddit:

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment

18. Exit

Enter your choice:

2

Enter subreddit name:

cats

Enter post title:

I love cats

Enter post content:

I really love cats

Post created successfully!

- Server acknowledges that user has created a post in cats

Server received: POST cats I_love_cats I_really_love_cats

conrad created a post in cats: I love cats

Post created by: conrad

4. You can list both the subreddits that you have joined and all the available subreddits:

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit

Enter your choice:

7

=== Available Subreddits ===

1. cats

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics

16. Vote on Post
17. Vote on Comment
18. Exit

Enter your choice:

6

=== Available Subreddits ===

1. jokes
2. Subreddit_1732633012
3. Subreddit_1732633023
4. Subreddit_1732632964
5. gaming
6. Subreddit_1732632941
7. Subreddit_1732632945
8. Subreddit_1732633007
9. news
10. history
11. Subreddit_1732632970
12. Subreddit_1732632900
13. Subreddit_1732632934
14. Subreddit_1732632963
15. music
16. funny
17. Subreddit_1732632974
18. technology
19. programming
20. movies
21. science
22. sports
23. Subreddit_1732632907
24. cats
25. politics
26. cars
27. memes
28. Subreddit_1732632980
29. stocks
30. pics
31. Subreddit_1732632962
32. Subreddit_1732633025
33. Subreddit_1732633000
34. Subreddit_1732632906
35. Subreddit_1732632928
36. Subreddit_1732632996
37. math
38. books
39. Subreddit_1732633011

5. You can view your feed

Enter your choice: 8

=== Posts ===

Post #0

Title: Post about cats 1732640955

Author: gbBQyXJq9gi0aWeD

Content: Sharing thoughts about cats

Post #1

Title: Post about cats 1732640960

Author: hYWsFa3MsFyE0Zjm

Content: Sharing thoughts about cats

Post #2
Title: [Repost] [Repost] Post about stocks 1732640884
Author: jPUWGmeK5y2rCylY
Content: Sharing thoughts about stocks

Original by u/l6edU7pyv28HhK2Q in r/stocks

Original by u/HL6iVi6ZWELiY7Ot in r/science

Post #3
Title: I love cats
Author: conrad
Content: I really love cats

6. You can also upvote/downvote posts/comments

=== Posts ===

Post #0
Title: i love cats
Author: conrad
Content: cats are great

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit

16

Enter subreddit name:

cats

Enter post index:

0

Enter vote type (up/down):

up

Vote recorded successfully!

7. Send/View/Reply to Messages

• Send

=== Reddit Menu ===

1. Create Subreddit
2. Create Post
3. List All Posts

```
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit
12
Enter recipient username:
conrad
Enter message content:
this is a message to conrad
Message sent successfully!
```

- View

```
=== Reddit Menu ===
1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit
11

=== Your Messages ===

Message ID: 1732647790_conrad
From: conrad
Content: this is a message to conrad
Sent at: 1732647790
---
```

- Reply

```
=== Reddit Menu ===
1. Create Subreddit
2. Create Post
3. List All Posts
4. Add Comment
5. View Comments
6. List All Subreddits
7. List My Subreddits
8. View My Feed
```

9. Join Subreddit
10. Leave Subreddit
11. View Messages
12. Send Message
13. Reply to Message
14. View My Profile
15. View Metrics
16. Vote on Post
17. Vote on Comment
18. Exit
13
Enter message ID to reply to:
1732647790_conrad
Enter reply content:
this is a reply
Message sent successfully!

7. You can view your profile

Enter your choice: 14

=== User Profile ===
Username: conrad
Bio:
Join Date: 1732640873
Post Karma: 1
Comment Karma: 0
Total Karma: 1
Subreddit Karma: cats:1

8. You can also view simulation/reddit metrics

Enter your choice: 15

=== Reddit System Metrics ===
Posts created: 71
Comments made: 25
Total votes: 23
Content reposts: 21
Direct messages: 16
Simulated users online: 86
Simulated users offline: 73

Hourly Rates:

Posts/hour: 478.652
Comments/hour: 168.539
Votes/hour: 155.056