

Project: Reddit Clone

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Youtube Link Demo video : <https://www.youtube.com/watch?v=YrBR8fzMWEU>

Overview:

This project utilizes Go to implement an actor-based simulation system for efficiently managing concurrent tasks. It leverages lightweight actor entities to encapsulate state and behavior, ensuring scalability and fault tolerance. Each actor handles specific roles, streamlining communication and modularity.

This project utilizes Go to implement an actor-based simulation system for efficiently managing concurrent tasks. It leverages lightweight actor entities to encapsulate state and behavior, ensuring scalability and fault tolerance. Each actor handles specific roles, streamlining communication and modularity. The system's architecture supports user interaction through APIs, offering robust and user-friendly functionality.

Core modules include:

- **Engine Core:** Manages the lifecycle and orchestration of actors, ensuring seamless initialization, error handling, and diagnostic capabilities.
- **API Server:** Provides endpoints for functionalities such as user registration, subreddit and post management, comment handling, and statistics retrieval. It uses RESTful APIs with structured responses for effective client-server communication.
- **API Client:** Facilitates interaction with the server via HTTP requests, supporting tasks like creating posts, joining subreddits, and retrieving data.

Project Overview and Structure

New Files Overview

1. `api_client.go`

- **Purpose:** Provides a client-side implementation for interacting with the API server. This file simplifies user operations by abstracting HTTP request handling and formatting responses.
- **Key Features:**
 - Manages user registration, subreddit creation, post creation, and interactions with content like voting or commenting.
 - Implements helper methods for HTTP operations (GET, POST), streamlining client-side communication.
 - Supports dynamic configurations with features like optional parameters (e.g., usernames during registration).
 - Handles errors gracefully, providing informative responses for invalid API calls or data inconsistencies.
 - Provides abstractions for common operations such as creating subreddits, joining or leaving subreddits, and retrieving posts.

2. `api_server.go`

- **Purpose:** Serves as the server-side backbone for the application, processing API requests, managing data operations, and orchestrating responses.
- **Key Features:**
 - Uses the gorilla/mux package for defining RESTful routes and handling HTTP requests.
 - Handles critical operations such as:
 - User registration (with auto-generated usernames for optional fields).
 - Creation and management of subreddits, posts, comments, and direct messages.
 - Retrieval of user feeds, statistics, and structured comments.
 - Implements detailed response handling with clear distinction between success and error states.
 - Ensures thread safety using atomic counters for user IDs and locks for shared resources.
 - Supports detailed statistics, including user karma, subreddit count, post activity, and upvote/downvote metrics.
 - Integrates seamlessly with the engine to ensure accurate data persistence and workflow synchronization.

Design Principles and Insights

1. Modularity:

Each file encapsulates distinct functionality, ensuring a clear separation of concerns. This approach simplifies debugging and testing.

2. Scalability:

The actor-based model supports high concurrency, making the system suitable for large-scale simulations and real-time operations.

3. Resilience:

By isolating state and behavior in actors, the system is robust against failures, as individual components can recover independently.

4. Extensibility:

The modular design allows for easy addition of new actors or functionality without disrupting existing systems.

Instructions for Running the Program:

To run the program and execute the benchmarks for testing various functionalities, follow these steps:

1. Prerequisites

Ensure the following are installed on your system:

- Go: Version 1.18+ is recommended.
- Git: For dependency management.

2. Setting Up the Project

1. Initialize the Project: Create a new Go module:

- a. Command: `go mod init reddit-clone`

3. Install Dependencies: Use the following commands to fetch the required dependencies:

Command: `go get github.com/asynkron/protoactor-go@latest`

Command: `go get github.com/google/uuid@latest`

4. Tidy Up Dependencies: To clean up and ensure all necessary dependencies are downloaded:

Command: `go mod tidy`

5. 4. Run the Application: Start the main application:

Command: `go run .`

Curl Commands for API call

1. Register a User

you can register users in two ways:

Without specifying username (auto-generated):

```
curl -X POST -H "Content-Type: application/json" -d '{"password":"testpass"}'
http://localhost:8080/api/register
```

With specific username:

```
curl -X POST -H "Content-Type: application/json" -d
'{"username":"john_doe","password":"testpass"}' http://localhost:8080/api/register
```

2. Create a Subreddit

```
curl -X POST -H "Content-Type: application/json" -H "Username: user1" -d
'{"name":"testsubreddit","description":"A test subreddit"}' http://localhost:8080/api/subreddits
```

3. Join a Subreddit

```
curl -X POST -H "Username: user3" http://localhost:8080/api/subreddits/DOSP/join
```

4. Leave a Subreddit

```
curl -X POST -H "Username: user1" http://localhost:8080/api/subreddits/testsubreddit/leave
```

5. Create a Post

```
curl -X POST -H "Content-Type: application/json" -H "Username: user5" -d '{"title":"Test Post","content":"This is a test post","subreddit":"ISOM"}' http://localhost:8080/api/posts
```

6. Get Posts

```
curl -X GET -H "Username: user1" http://localhost:8080/api/posts
```

7. Vote on a Post

Upvote:

```
curl -X POST -H "Content-Type: application/json" -H "Username: user1" -d '{"upvote":true}' http://localhost:8080/api/posts/post_1734134592944019300/vote
```

Downvote:

```
curl -X POST -H "Content-Type: application/json" -H "Username: user1" -d '{"upvote":false}' http://localhost:8080/api/posts/post_1734134592944019300/vote
```

8. Add a comment to a Post

Commenting on a post:

```
curl -X POST -H "Content-Type: application/json" -H "Username: user6" -d '{"content":"This is a test comment"}' http://localhost:8080/api/posts/post_1734134594908443500/comments
```

Replying to a comment:

```
curl -X POST -H "Content-Type: application/json" -H "Username: user1" -d '{"content":"This is a reply to your comment","parent_comment_id":"comment_1734137103378599200"}' http://localhost:8080/api/posts/post_1734134594908443500/comments
```

9. Get comments for a Post

```
curl -X GET http://localhost:8080/api/posts/post_1734134594908443500/comments
```

10. Send a Direct Message

```
curl -X POST -H "Content-Type: application/json" -H "Username: user3" -d '{"to":"user5","content":"Hello! I am chitti"}' http://localhost:8080/api/messages
```

11. Get a Direct Message

```
curl -X GET -H "Username: user5" http://localhost:8080/api/messages
```

12. Get Performance Statistics

```
curl -X GET http://localhost:8080/api/stats
```

Output Screenshots:

```
PS C:\Users\krish\Desktop\rcproj\rcp\Reddit-clone> go run .
2024/12/13 19:03:07 Starting API server on :8080...
2024/12/13 19:03:08 Starting simulation...
Server and simulation running. Press Ctrl+C to stop...
2024/12/13 19:03:08 Registering users...
2024/12/13 19:03:08 Registered user9
2024/12/13 19:03:08 Registered user2
2024/12/13 19:03:08 Registered user10
2024/12/13 19:03:08 Registered user3
2024/12/13 19:03:08 Registered user8
2024/12/13 19:03:08 Registered user5
2024/12/13 19:03:08 Registered user7
2024/12/13 19:03:08 Registered user6
2024/12/13 19:03:08 Registered user1
2024/12/13 19:03:08 Registered user4
2024/12/13 19:03:08
Creating subreddits...
2024/12/13 19:03:08 Created subreddit: technology
2024/12/13 19:03:08 Created subreddit: science
2024/12/13 19:03:08 Created subreddit: gaming
2024/12/13 19:03:08 Created subreddit: movies
2024/12/13 19:03:08 Created subreddit: DOSP
2024/12/13 19:03:09 Created subreddit: CISE
2024/12/13 19:03:09 Created subreddit: UF
2024/12/13 19:03:09 Created subreddit: USA
2024/12/13 19:03:09 Created subreddit: books
```

```
2024/12/13 19:03:09
Users joining subreddits...
2024/12/13 19:03:09 user1 joined technology
2024/12/13 19:03:09 user1 joined DOSP
2024/12/13 19:03:09 user1 joined UF
2024/12/13 19:03:09 user1 joined gaming
2024/12/13 19:03:09 user2 joined USA
2024/12/13 19:03:09 user2 joined science
2024/12/13 19:03:10 user3 joined USA
2024/12/13 19:03:10 user3 joined books
2024/12/13 19:03:10 user3 joined science
2024/12/13 19:03:10 user4 joined books
2024/12/13 19:03:10 user4 joined UF
2024/12/13 19:03:10 user4 joined movies
2024/12/13 19:03:10 user4 joined gaming
2024/12/13 19:03:10 user5 joined technology
2024/12/13 19:03:10 user5 joined movies
2024/12/13 19:03:10 user5 joined UF
2024/12/13 19:03:11 user5 joined UF
2024/12/13 19:03:11 user6 joined CISE
```



```
2024/12/13 19:03:12
Creating posts...
2024/12/13 19:03:12 user1 created post in DOSP
2024/12/13 19:03:12 user1 created post in movies
2024/12/13 19:03:12 user2 created post in science
2024/12/13 19:03:13 user2 created post in CISE
2024/12/13 19:03:13 user2 created post in technology
2024/12/13 19:03:13 user2 created post in technology
2024/12/13 19:03:13 user3 created post in UF
2024/12/13 19:03:13 user3 created post in UF
2024/12/13 19:03:13 user3 created post in gaming
2024/12/13 19:03:13 user3 created post in USA
2024/12/13 19:03:13 user3 created post in science
2024/12/13 19:03:13 user4 created post in technology
2024/12/13 19:03:13 user4 created post in movies
2024/12/13 19:03:14 user4 created post in science
2024/12/13 19:03:14 user4 created post in movies
2024/12/13 19:03:14 user5 created post in movies
2024/12/13 19:03:14 user5 created post in UF
2024/12/13 19:03:14 user5 created post in CISE
2024/12/13 19:03:14 user6 created post in books
2024/12/13 19:03:14 user6 created post in technology
2024/12/13 19:03:14 user7 created post in CISE
2024/12/13 19:03:14 user7 created post in science
```

```
2024/12/13 19:03:15
Gathering posts for interaction...
2024/12/13 19:03:15
Simulating voting...
2024/12/13 19:03:15 user1 downvoted post post_1734134593252900000
2024/12/13 19:03:16 user1 upvoted post post_1734134593876361600
2024/12/13 19:03:16 user1 upvoted post post_1734134593149347400
2024/12/13 19:03:16 user1 upvoted post post_1734134593149347400
2024/12/13 19:03:16 user1 upvoted post post_1734134594288862200
2024/12/13 19:03:16 user2 upvoted post post_1734134594392581400
2024/12/13 19:03:16 user2 upvoted post post_1734134594702193500
2024/12/13 19:03:16 user2 upvoted post post_1734134593149347400
2024/12/13 19:03:16 user2 downvoted post post_1734134594702193500
2024/12/13 19:03:16 user2 downvoted post post_1734134595421381700
2024/12/13 19:03:16 user2 upvoted post post_1734134594599320200
2024/12/13 19:03:17 user3 upvoted post post_1734134593149347400
2024/12/13 19:03:17 user3 upvoted post post_1734134593252900000
2024/12/13 19:03:17 user3 upvoted post post_1734134595115022600
2024/12/13 19:03:17 user3 upvoted post post_1734134594702193500
2024/12/13 19:03:17 user3 upvoted post post_1734134593458677000
2024/12/13 19:03:17 user3 upvoted post post_1734134593355705900
2024/12/13 19:03:17 user3 upvoted post post_1734134594702193500
2024/12/13 19:03:17 user3 upvoted post post_1734134595524400500
2024/12/13 19:03:17 user4 upvoted post post_1734134594186283100
2024/12/13 19:03:18 user4 upvoted post post_1734134593670866800
2024/12/13 19:03:18 user4 downvoted post post_1734134594496042200
```



```
2024/12/13 19:03:22
Simulating comments on posts...
2024/12/13 19:03:22 user1 commented on post post_1734134594599320200: This needs more discussion.
2024/12/13 19:03:22 user1 commented on post post_1734134595011300500: This needs more discussion.
2024/12/13 19:03:22 user1 commented on post post_1734134594702193500: Not sure I agree, but interesting viewpoint.
2024/12/13 19:03:22 user1 replied to a comment on post post_1734134594702193500: This reminds me of something similar...
2024/12/13 19:03:22 user1 commented on post post_1734134593047585900: Looking forward to more posts like this!
2024/12/13 19:03:22 user1 commented on post post_1734134595421381700: Looking forward to more posts like this!
2024/12/13 19:03:22 user1 commented on post post_1734134595731096500: Not sure I agree, but interesting viewpoint.
2024/12/13 19:03:22 user1 replied to a comment on post post_1734134595731096500: Not sure I agree, but interesting viewpoi
t.
2024/12/13 19:03:23 user1 commented on post post_1734134595731096500: I disagree with some points here.
2024/12/13 19:03:23 user2 commented on post post_1734134594186283100: Thanks for sharing this information!
2024/12/13 19:03:23 user2 commented on post post_1734134595319022200: This needs more discussion.
2024/12/13 19:03:23 user2 commented on post post_1734134593149347400: Looking forward to more posts like this!
2024/12/13 19:03:23 user2 commented on post post_1734134594392581400: Thanks for sharing this information!
2024/12/13 19:03:23 user3 commented on post post_1734134594083430700: Could you elaborate more on this?
2024/12/13 19:03:23 user3 replied to a comment on post post_1734134594083430700: Very well written and explained.
2024/12/13 19:03:23 user3 commented on post post_1734134595524400500: Looking forward to more posts like this!
```

```
2024/12/13 19:03:29
Simulating users leaving subreddits...
LeaveSubreddit called for user: user7, subreddit: USA
2024/12/13 19:03:29 user7 left USA
LeaveSubreddit called for user: user10, subreddit: UF
2024/12/13 19:03:29 user10 left UF
2024/12/13 19:03:30
Simulation completed. Getting final user stats...
2024/12/13 19:03:31
Final Statistics:
2024/12/13 19:03:31
Getting posts with comments...
2024/12/13 19:03:31 Post post_1734134595731096500 has 7 comments:
2024/12/13 19:03:31   - user1: Not sure I agree, but interesting viewpoint.
2024/12/13 19:03:31   - : Reply: Not sure I agree, but interesting viewpoint. [Reply by user1]
2024/12/13 19:03:31   - user1: I disagree with some points here.
2024/12/13 19:03:31   - user4: Very well written and explained.
2024/12/13 19:03:31   - user6: Not sure I agree, but interesting viewpoint.
2024/12/13 19:03:31   - : Reply: Interesting perspective on this topic. [Reply by user6]
2024/12/13 19:03:31   - user7: Very well written and explained.
2024/12/13 19:03:31 Post post_1734134595626953600 has 1 comments:
2024/12/13 19:03:31   - user8: I disagree with some points here.
2024/12/13 19:03:31 Post post_1734134595319022200 has 2 comments:
2024/12/13 19:03:31   - user2: This needs more discussion.
2024/12/13 19:03:31   - user4: Could you elaborate more on this?
```


2024/12/13 19:03:31 ***** FINAL STATS OF ALL USERS *****

```
[
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 5,
    "subreddits": 4,
    "username": "user4"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 5,
    "subreddits": 3,
    "username": "user5"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 1,
    "subreddits": 2,
    "username": "user9"
  },
  {
    "created_at": "2024-12-13T19:03:08.5285514-05:00",
    "karma": 2,
    "subreddits": 4,
    "username": "user1"
  },
  {
    "created_at": "2024-12-13T19:03:08.5285514-05:00",
    "karma": 12,
    "subreddits": 3,
    "username": "user3"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 3,
    "subreddits": 3,
    "username": "user6"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 4,
    "subreddits": 3,
    "username": "user7"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 2,
    "subreddits": 2,
    "username": "user8"
  },
  {
    "created_at": "2024-12-13T19:03:08.5295989-05:00",
    "karma": -1,
    "subreddits": 2,
    "username": "user10"
  },
  {
    "created_at": "2024-12-13T19:03:08.5285514-05:00",
    "karma": 4,
    "subreddits": 2,
    "username": "user2"
  }
]
```

```
[
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 3,
    "subreddits": 3,
    "username": "user6"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 4,
    "subreddits": 3,
    "username": "user7"
  },
  {
    "created_at": "2024-12-13T19:03:08.5290771-05:00",
    "karma": 2,
    "subreddits": 2,
    "username": "user8"
  },
  {
    "created_at": "2024-12-13T19:03:08.5295989-05:00",
    "karma": -1,
    "subreddits": 2,
    "username": "user10"
  },
  {
    "created_at": "2024-12-13T19:03:08.5285514-05:00",
    "karma": 4,
    "subreddits": 2,
    "username": "user2"
  }
]
```