Project 2: Reddit Clone in GO - Part 1

Course: COP5615 – Distributed Operating System Principles

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Overview:

This report presents a detailed overview of Project 4 - Reddit Clone in GO, developed for the COP5615 course. The project implements a Reddit-like engine with core functionalities and a client simulator, showcasing the application of concurrent programming principles using the Go programming language. The system demonstrates key features of a social media platform, including user registration, content creation, voting, and messaging, all implemented using the Actor model for concurrency.

Project Objectives:

The primary objectives of this project were to:

1. Implement a Reddit-like engine with core functionalities

2. Develop a client simulator to test the engine's performance

3. Demonstrate the application of concurrent programming techniques

4. Analyze system performance under various user loads

System Architecture:

The project is structured into three main components:

1. **Engine (Engine/engine.go)**: The core component implementing Reddit-like functionalities using the Actor model.

2. **Simulation (simulation/simulation.go)**: A module that simulates multiple concurrent users interacting with the engine.

3. **Main (main.go)**: The entry point that initializes the ActorSystem and orchestrates the simulation.

Key Features:

- User registration and management

- Subreddit creation, joining, and leaving

- Posting and commenting in subreddits

- Upvoting and downvoting posts

- Karma computation

- Direct messaging between users

Implementation Details:

Engine Module:

The engine is the main module of the system, handling all core functionalities:

// Key methods in the Engine module

RegisterUser()

SubredditSpecificOp()

CreatePost()

ReplyToComment()

SendDMtoUser()

ReplyToAllDMs()

UpvoteRandomPost()

DownvoteRandomPost ()

These methods implement the various features of the Reddit clone, managing user interactions, content creation, and voting mechanisms.

Simulation Module:

The simulation module creates multiple concurrent users who perform random actions on the Reddit clone:

// Main simulation function

SimulateUser(): This function orchestrates a series of random actions for each simulated user, including registering accounts, joining subreddits, creating posts, and sending messages.

Performance Analysis:

The system's performance was evaluated by simulating various numbers of concurrent users. The following table summarizes the key statistics:

Total Users	Total Posts	Total Subreddits	Total Messages	Total Simulation Time
10	131	106	113	40.5556424s
50	603	541	596	42.121259s
100	1186	1111	1141	43.4298415s
500	5407	5448	5323	44.0380639s
1000	10423	10779	10683	44.5763764s

Total Users	Total Posts	Total Subreddits	Total Messages	Total Simulation Time
5000	56089	56706	54101	45.0230307s

The results demonstrate the system's ability to handle increasing user loads with minimal impact on overall simulation time, showcasing the effectiveness of the concurrent design.

Conclusions and Future Work:

The project successfully demonstrates the implementation of a Reddit-like platform using Go's concurrency features. The system shows good scalability, handling thousands of simulated users with minimal increase in execution time.

Future Improvements: (In Part II)

1. Implement a REST API for web client integration

2. Add support for images and markdown in posts

3. Develop a more sophisticated karma system

4. Enhance the simulation to better mimic real-world usage patterns, including Zipf distribution for subreddit membership

These enhancements would further improve the system's realism and utility, potentially making it suitable for real-world deployment.

References:

1. Go Programming Language. https://golang.org/

2. Actor Model. https://en.wikipedia.org/wiki/Actor_model

3. Reddit. https://www.reddit.com/