

## Reddit Simulator - Configuration Analysis Report

This report analyzes the performance and activity metrics of the Reddit clone simulator across different input configurations.

### CONFIGURATION COMPARISONS

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#### Configuration 1: Small Scale Test

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Users: 25

Subreddits: 25

Duration: 15 seconds

##### Activity Metrics:

Posts: 425

Comments: 250

Votes: 250

Direct Messages: 825

Subreddit Joins: 525

Subreddit Leaves: 525

##### Performance:

Total Actions: 2,800

Actions/sec: 186

#### Configuration 2: Medium Scale Test

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Users: 100

Subreddits: 10

Duration: 30 seconds

##### Activity Metrics:

Posts: 3,400

Comments: 6,400

Votes: 6,100

Direct Messages: 5,100

Subreddit Joins: 4,300

Subreddit Leaves: 4,100

Performance:

Total Actions: 29,400

Actions/sec: 980

Configuration 3: Large Scale Test (HIGHEST USER COUNT)

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Users: 150 (HIGHEST)

Subreddits: 10

Duration: 30 seconds

Activity Metrics:

Posts: 5,100

Comments: 9,900

Votes: 9,750

Direct Messages: 7,800

Subreddit Joins: 6,600

Subreddit Leaves: 6,150

Performance:

Total Actions: 45,300 (HIGHEST)

Actions/sec: 1,510 (HIGHEST)

**KEY FINDINGS**

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**1. SCALABILITY ANALYSIS**

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The highest user count configuration (150 users) demonstrates excellent scalability:

- 50% more users than Configuration 2 (100 users)
- Resulted in 54% more total actions (45,300 vs 29,400)
- Maintained higher throughput: 1,510 actions/sec vs 980 actions/sec

The linear scaling suggests the actor-based architecture handles increased concurrency effectively without significant degradation.

## 2. ACTIVITY PATTERNS

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With 150 users (highest count):

- Posts: 5,100 (1.5x more than 100-user config)
- Comments: 9,900 (1.55x more than 100-user config)
- Votes: 9,750 (1.6x more than 100-user config)
- Direct Messages: 7,800 (1.53x more than 100-user config)
- Subreddit Joins: 6,600 (1.53x more than 100-user config)
- Subreddit Leaves: 6,150 (1.5x more than 100-user config)

Activity scales approximately proportionally with user count, indicating consistent behavior per user across configurations with a 1.07 Zipf distribution.

## 3. SUBREDDIT INTERACTION ANALYSIS

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In the highest user count configuration (150 users, 10 subreddits):

- Join/Leave ratio:  $6,600 \text{ joins} / 6,150 \text{ leaves} = 1.07$
- This near-1:1 ratio indicates healthy connection/disconnection cycling
- Users are properly leaving subreddits when going offline

Comparison with 100-user config:

- Join/Leave ratio:  $4,300 \text{ joins} / 4,100 \text{ leaves} = 1.05$
- Similar ratios across scales show consistent behavior

## 4. THROUGHPUT PERFORMANCE

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Actions per second by configuration:

- 25 users: 186 actions/sec
- 100 users: 980 actions/sec (5.3x increase for 4x users)
- 150 users: 1,510 actions/sec (1.54x increase for 1.5x users)

The 150-user configuration achieved the highest throughput, processing 1,510 actions per second, demonstrating the system's ability to handle increased load efficiently.

## 5. USER ACTIVITY DENSITY

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Average actions per user (over 30-second duration for comparable configs):

- 100 users: 294 actions/user (9,800 actions/user/minute)
- 150 users: 302 actions/user (10,066 actions/user/minute)

Higher user count configuration shows slightly increased per-user activity, potentially due to:

- More interaction opportunities
- Better network effects from more concurrent users
- More diverse subreddit interactions

## OBSERVATIONS

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1. The 150-user configuration demonstrates the highest scalability and throughput. The system appears capable of handling even higher user counts with better hardware specs.
2. The near 1:1 join/leave ratio confirms that the offline/online cycling mechanism is working correctly, with users properly leaving subreddits when disconnecting.
3. The actor-based architecture scales well, showing linear performance improvements with increased user count without significant bottlenecks.

## CONCLUSION

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The highest user count configuration tested (150 users) demonstrates:

- Highest total activity (45,300 actions)
- Highest throughput (1,510 actions/sec)
- Proportional scaling from lower configurations

- Healthy subreddit join/leave cycling
- Consistent per-user activity levels

The simulator shows excellent scalability characteristics, suggesting it can handle production-like workloads effectively.