# COP5615 DOSP Project 4- Part 1

## Twitter Clone and a client tester/simulator

### Team Members:

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### Problem Statement:

Implementation of a Twitter Clone and a client tester/simulator in Erlang.

The main functionalities of this Twitter-like engine are:

- Register
- Send tweets
- Subscribe to user tweets
- Re-tweets
- Query tweets by the subscribed user.
- Query tweets by Hashtag
- Query tweets by Mentions
- Deliver tweets live (if possible)

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.

### Steps to Run the Project:

1) Compile the below-mentioned files:
    a) c(twitterhandler).
    b) c(twitterclient).
    c) c(twitterengine).
2) Get Supervisor Id
    a) serverId = twitterengine:fetchserverid().
3) Generate Users
    a) listofusers = twitterhandler:fetchusernames(1000,[],serverId).

## Architecture:

### Client side:

Each client can perform the following functionalities:

1) Register: Before submitting any queries, each client must register with the server.

2) Subscribe: Any client can sign up for another. When we implemented subscription, we kept the Zipf distribution in mind, so that clients who are more well-liked have more subscribers and clients who are less well-liked have fewer subscribers.

3) Tweet: Only a predetermined number of tweets per input of tweets are allowed from each client. These tweets continue to follow the Zipf distribution, demonstrating that more well-liked people tweet. Random user mentions (shown by the @ sign) and hashtags (indicated by the # sign) may appear in tweets.

4) Retweet: Each client gets some tweets that can be retweeted. Retweets begin with "rt:," but otherwise they are communicated to the server in the same way as ordinary tweets. The Zipf distribution is also used to calculate the retweet frequency of a tweet. The more popular it is, the more frequently the client will retweet.

5) Query my mentions: Each client can choose to search for tweets that include their name. The 100 most recent tweets regarding them are available upon request.

6) Query hashtags: Any client can look up any hashtag. They will receive the 100 most recent tweets that contain those hashtags if they request them.

7) Disconnect: Each user is free to disconnect from Twitter at any time. When it disconnects, it no longer receives live tweets. Furthermore, it is unable to run hashtags or mention searches. While simulating disconnect times, we have maintained the Zipf distribution, meaning that less popular clients are disconnected for a shorter time.

8) Connect: After being disconnected, the client can be reconnected. Upon reconnecting, the client immediately receives every tweet that was sent while it was disconnected. After then, things can resume as normal.

### Handler-side:

Tweet Handler: The tweet handler will send the tweets to all the subscribers.

Hashtag Handler: The hashtag handler filters hashtags from every tweet and returns the same to the server.

Get Usernames Handler: The get username handler will fetch the usernames from the list and return the same.

Mentions Handler: The mentions handler will extract the mentions from the tweets and return the same.

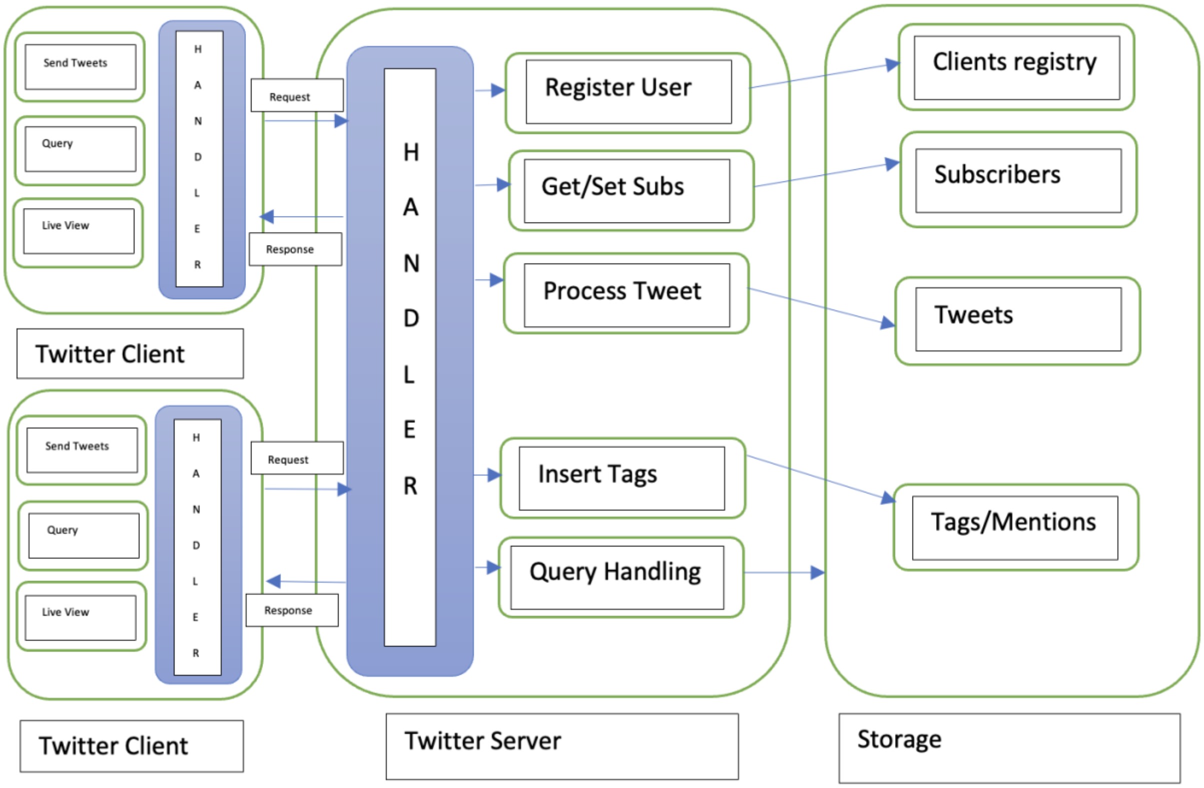


Fig 1.

### Zipf Distribution:

Each customer is ranked from 1 to N, where N represents all the clients that the simulator has simulated. Each client will send the server 1/rank requests per millisecond. Please refer to fig. 1 to observe how client activity is distributed based on rank. The relationship between each client's rank and the number of followers is inverse.

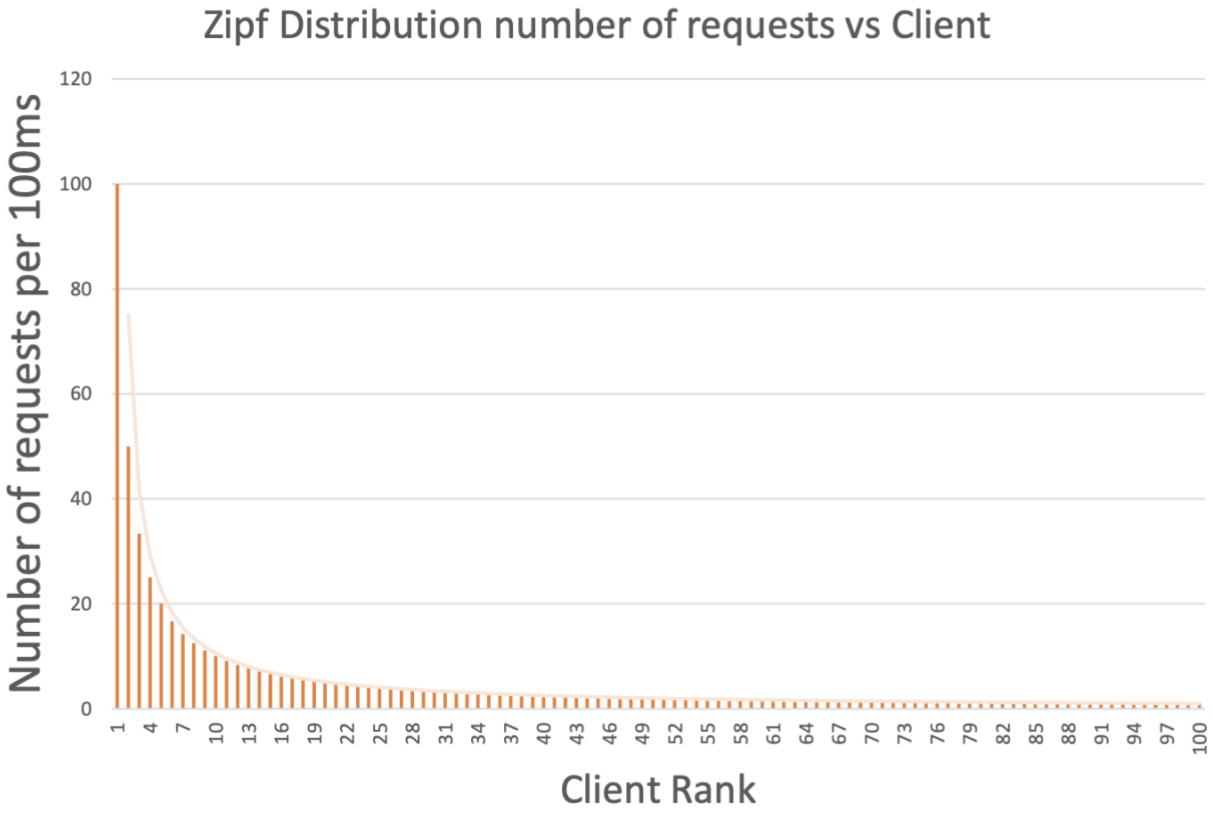
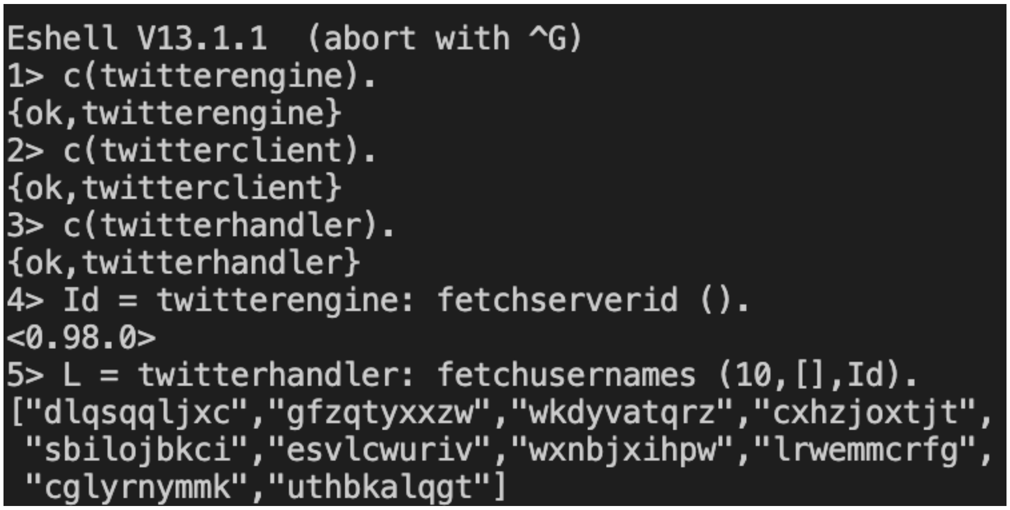
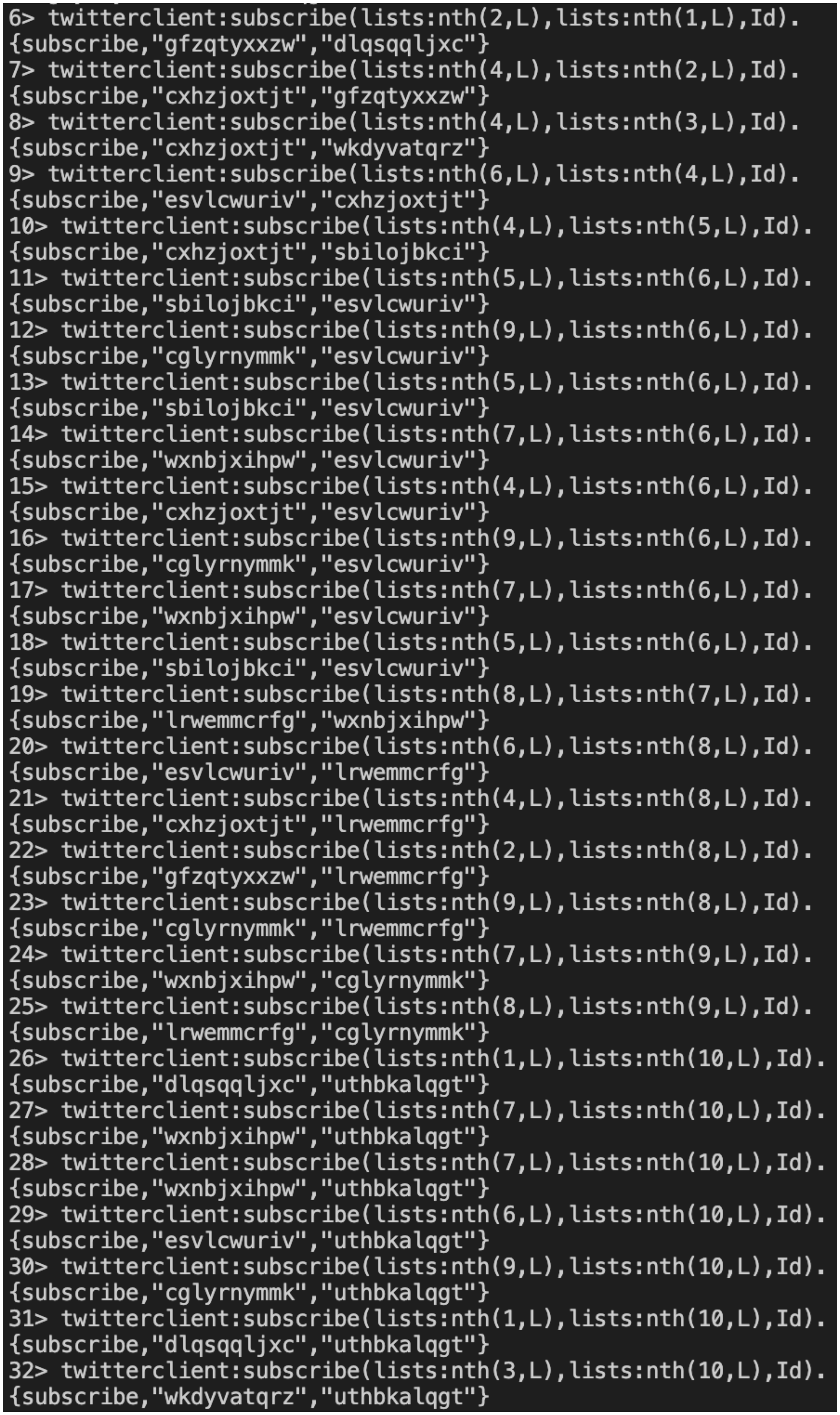


Fig 2.

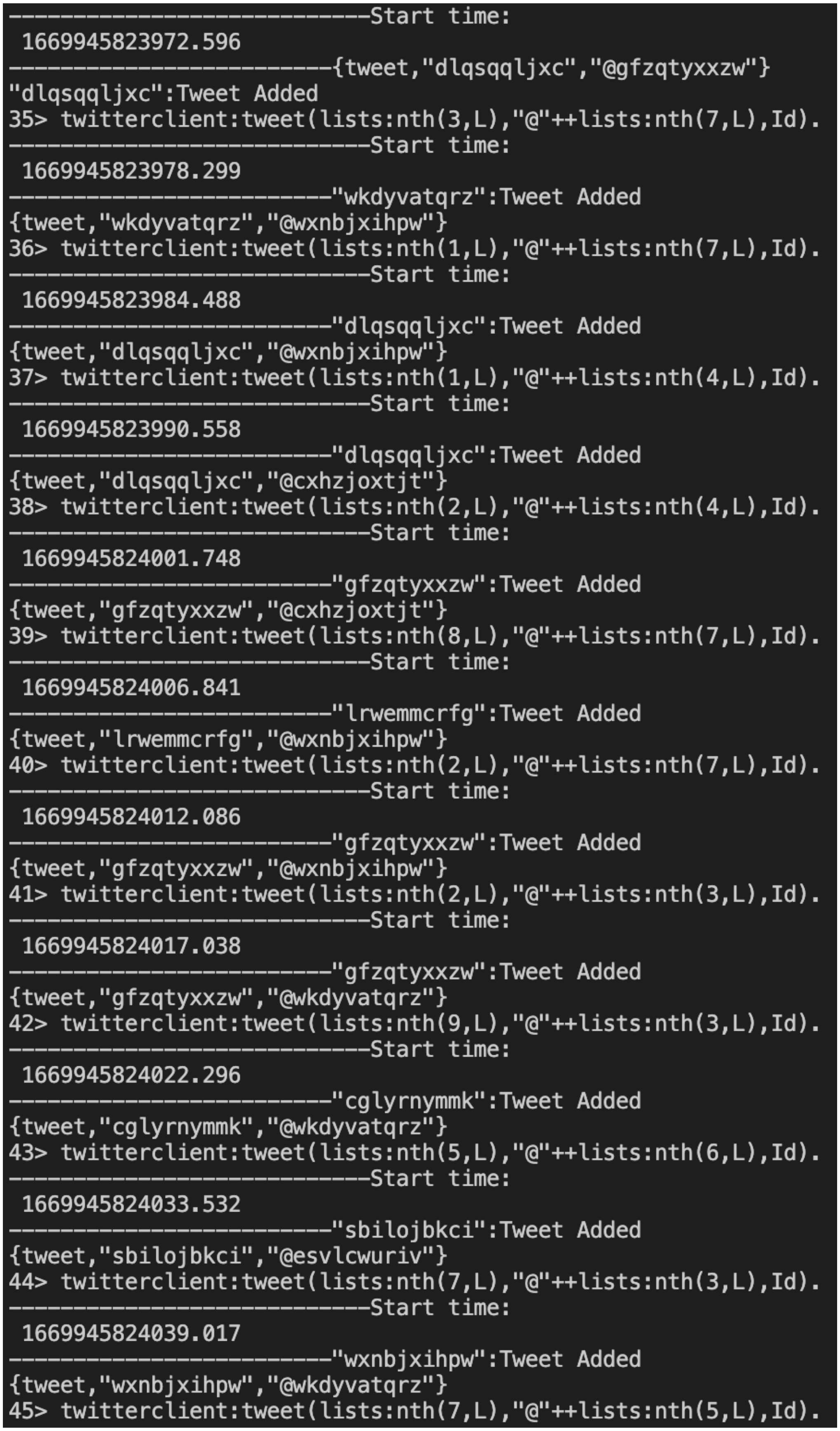
**Output:**



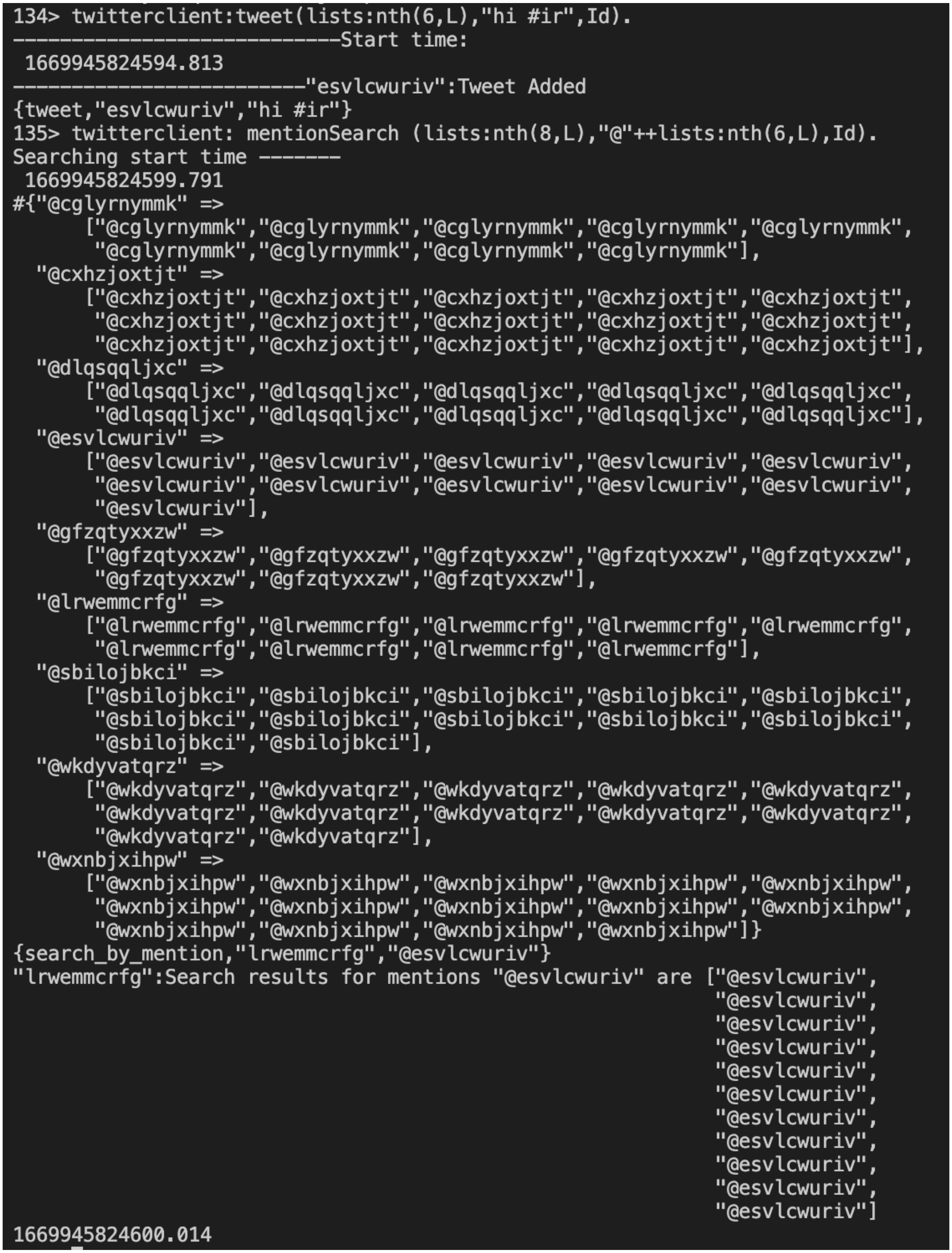
```
Eshell V13.1.1  (abort with ^G)
1> c(twitterengine).
{ok,twitterengine}
2> c(twitterclient).
{ok,twitterclient}
3> c(twitterhandler).
{ok,twitterhandler}
4> Id = twitterengine: fetchserverid ().
<0.98.0>
5> L = twitterhandler: fetchusernames (10,[],Id).
["dlqsqqljxc","gfzqtyxxzw","wkdyvatqrz","cxhzjoxtjt",
 "sbilojbkci","esvlcwuriv","wxnbjxihpw","lrwemmcrfg",
 "cglyrnymmk","uthbkalqgt"]
```



```
6> twitterclient:subscribe(lists:nth(2,L),lists:nth(1,L),Id).
{subscribe,"gfzqtyxxzw","dlqsqqljxc"}
7> twitterclient:subscribe(lists:nth(4,L),lists:nth(2,L),Id).
{subscribe,"cxhzjoxtjt","gfzqtyxxzw"}
8> twitterclient:subscribe(lists:nth(4,L),lists:nth(3,L),Id).
{subscribe,"cxhzjoxtjt","wkdyvatqrz"}
9> twitterclient:subscribe(lists:nth(6,L),lists:nth(4,L),Id).
{subscribe,"esvlcwuriv","cxhzjoxtjt"}
10> twitterclient:subscribe(lists:nth(4,L),lists:nth(5,L),Id).
{subscribe,"cxhzjoxtjt","sbilojbkci"}
11> twitterclient:subscribe(lists:nth(5,L),lists:nth(6,L),Id).
{subscribe,"sbilojbkci","esvlcwuriv"}
12> twitterclient:subscribe(lists:nth(9,L),lists:nth(6,L),Id).
{subscribe,"cglyrnymmk","esvlcwuriv"}
13> twitterclient:subscribe(lists:nth(5,L),lists:nth(6,L),Id).
{subscribe,"sbilojbkci","esvlcwuriv"}
14> twitterclient:subscribe(lists:nth(7,L),lists:nth(6,L),Id).
{subscribe,"wxnbjxihpw","esvlcwuriv"}
15> twitterclient:subscribe(lists:nth(4,L),lists:nth(6,L),Id).
{subscribe,"cxhzjoxtjt","esvlcwuriv"}
16> twitterclient:subscribe(lists:nth(9,L),lists:nth(6,L),Id).
{subscribe,"cglyrnymmk","esvlcwuriv"}
17> twitterclient:subscribe(lists:nth(7,L),lists:nth(6,L),Id).
{subscribe,"wxnbjxihpw","esvlcwuriv"}
18> twitterclient:subscribe(lists:nth(5,L),lists:nth(6,L),Id).
{subscribe,"sbilojbkci","esvlcwuriv"}
19> twitterclient:subscribe(lists:nth(8,L),lists:nth(7,L),Id).
{subscribe,"lrwemmcrfg","wxnbjxihpw"}
20> twitterclient:subscribe(lists:nth(6,L),lists:nth(8,L),Id).
{subscribe,"esvlcwuriv","lrwemmcrfg"}
21> twitterclient:subscribe(lists:nth(4,L),lists:nth(8,L),Id).
{subscribe,"cxhzjoxtjt","lrwemmcrfg"}
22> twitterclient:subscribe(lists:nth(2,L),lists:nth(8,L),Id).
{subscribe,"gfzqtyxxzw","lrwemmcrfg"}
23> twitterclient:subscribe(lists:nth(9,L),lists:nth(8,L),Id).
{subscribe,"cglyrnymmk","lrwemmcrfg"}
24> twitterclient:subscribe(lists:nth(7,L),lists:nth(9,L),Id).
{subscribe,"wxnbjxihpw","cglyrnymmk"}
25> twitterclient:subscribe(lists:nth(8,L),lists:nth(9,L),Id).
{subscribe,"lrwemmcrfg","cglyrnymmk"}
26> twitterclient:subscribe(lists:nth(1,L),lists:nth(10,L),Id).
{subscribe,"dlqsqqljxc","uthbkalqgt"}
27> twitterclient:subscribe(lists:nth(7,L),lists:nth(10,L),Id).
{subscribe,"wxnbjxihpw","uthbkalqgt"}
28> twitterclient:subscribe(lists:nth(7,L),lists:nth(10,L),Id).
{subscribe,"wxnbjxihpw","uthbkalqgt"}
29> twitterclient:subscribe(lists:nth(6,L),lists:nth(10,L),Id).
{subscribe,"esvlcwuriv","uthbkalqgt"}
30> twitterclient:subscribe(lists:nth(9,L),lists:nth(10,L),Id).
{subscribe,"cglyrnymmk","uthbkalqgt"}
31> twitterclient:subscribe(lists:nth(1,L),lists:nth(10,L),Id).
{subscribe,"dlqsqqljxc","uthbkalqgt"}
32> twitterclient:subscribe(lists:nth(3,L),lists:nth(10,L),Id).
{subscribe,"wkdyvatqrz","uthbkalqgt"}
```



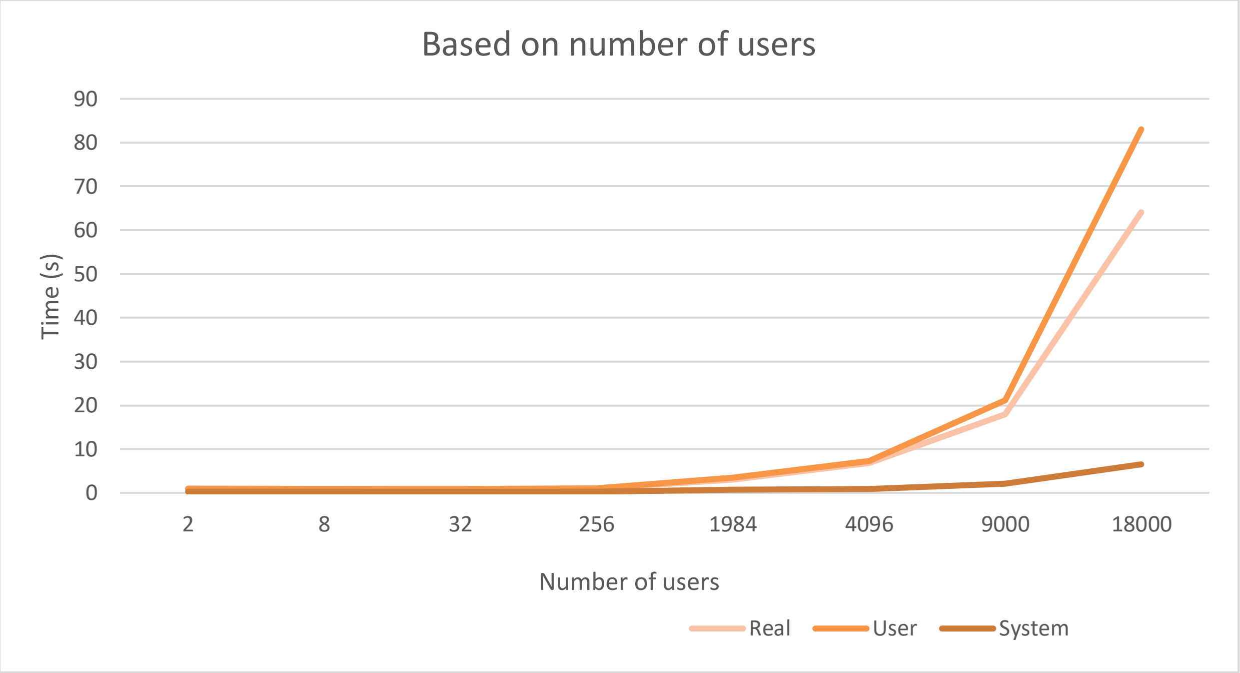
```
----------------------------Start time:
 1669945823972.596
-------------------------{tweet,"dlqsqqljxc","@gfzqtyxxzw"}
"dlqsqqljxc":Tweet Added
35> twitterclient:tweet(lists:nth(3,L),"@"++lists:nth(7,L),Id).
----------------------------Start time:
 1669945823978.299
-------------------------"wkdyvatqrz":Tweet Added
{tweet,"wkdyvatqrz","@wxnbjxihpw"}
36> twitterclient:tweet(lists:nth(1,L),"@"++lists:nth(7,L),Id).
----------------------------Start time:
 1669945823984.488
-------------------------"dlqsqqljxc":Tweet Added
{tweet,"dlqsqqljxc","@wxnbjxihpw"}
37> twitterclient:tweet(lists:nth(1,L),"@"++lists:nth(4,L),Id).
----------------------------Start time:
 1669945823990.558
-------------------------"dlqsqqljxc":Tweet Added
{tweet,"dlqsqqljxc","@cxhzjoxtjt"}
38> twitterclient:tweet(lists:nth(2,L),"@"++lists:nth(4,L),Id).
----------------------------Start time:
 1669945824001.748
-------------------------"gfzqtyxxzw":Tweet Added
{tweet,"gfzqtyxxzw","@cxhzjoxtjt"}
39> twitterclient:tweet(lists:nth(8,L),"@"++lists:nth(7,L),Id).
----------------------------Start time:
 1669945824006.841
-------------------------"lrwemmcrfg":Tweet Added
{tweet,"lrwemmcrfg","@wxnbjxihpw"}
40> twitterclient:tweet(lists:nth(2,L),"@"++lists:nth(7,L),Id).
----------------------------Start time:
 1669945824012.086
-------------------------"gfzqtyxxzw":Tweet Added
{tweet,"gfzqtyxxzw","@wxnbjxihpw"}
41> twitterclient:tweet(lists:nth(2,L),"@"++lists:nth(3,L),Id).
----------------------------Start time:
 1669945824017.038
-------------------------"gfzqtyxxzw":Tweet Added
{tweet,"gfzqtyxxzw","@wkdyvatqrz"}
42> twitterclient:tweet(lists:nth(9,L),"@"++lists:nth(3,L),Id).
----------------------------Start time:
 1669945824022.296
-------------------------"cglyrnymmk":Tweet Added
{tweet,"cglyrnymmk","@wkdyvatqrz"}
43> twitterclient:tweet(lists:nth(5,L),"@"++lists:nth(6,L),Id).
----------------------------Start time:
 1669945824033.532
-------------------------"sbilojbkci":Tweet Added
{tweet,"sbilojbkci","@esvlcwuriv"}
44> twitterclient:tweet(lists:nth(7,L),"@"++lists:nth(3,L),Id).
----------------------------Start time:
 1669945824039.017
-------------------------"wxnbjxihpw":Tweet Added
{tweet,"wxnbjxihpw","@wkdyvatqrz"}
45> twitterclient:tweet(lists:nth(7,L),"@"++lists:nth(5,L),Id).
```



```
134> twitterclient:tweet(lists:nth(6,L),"hi #ir",Id).
----------------------------Start time:
 1669945824594.813
-------------------------"esvlcwuriv":Tweet Added
{tweet,"esvlcwuriv","hi #ir"}
135> twitterclient: mentionSearch (lists:nth(8,L),"@"++lists:nth(6,L),Id).
Searching start time -------
 1669945824599.791
#{"@cglyrnymmk" =>
      ["@cglyrnymmk","@cglyrnymmk","@cglyrnymmk","@cglyrnymmk","@cglyrnymmk",
       "@cglyrnymmk","@cglyrnymmk","@cglyrnymmk","@cglyrnymmk"],
  "@cxhzjoxtjt" =>
      ["@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt",
       "@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt",
       "@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt","@cxhzjoxtjt"],
  "@dlqsqqljxc" =>
      ["@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc",
       "@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc","@dlqsqqljxc"],
  "@esvlcwuriv" =>
      ["@esvlcwuriv","@esvlcwuriv","@esvlcwuriv","@esvlcwuriv","@esvlcwuriv",
       "@esvlcwuriv","@esvlcwuriv","@esvlcwuriv","@esvlcwuriv","@esvlcwuriv",
       "@esvlcwuriv"],
  "@gfzqtyxxzw" =>
      ["@gfzqtyxxzw","@gfzqtyxxzw","@gfzqtyxxzw","@gfzqtyxxzw","@gfzqtyxxzw",
       "@gfzqtyxxzw","@gfzqtyxxzw","@gfzqtyxxzw"],
  "@lrwemmcrfg" =>
      ["@lrwemmcrfg","@lrwemmcrfg","@lrwemmcrfg","@lrwemmcrfg","@lrwemmcrfg",
       "@lrwemmcrfg","@lrwemmcrfg","@lrwemmcrfg","@lrwemmcrfg"],
  "@sbilojbkci" =>
      ["@sbilojbkci","@sbilojbkci","@sbilojbkci","@sbilojbkci","@sbilojbkci",
       "@sbilojbkci","@sbilojbkci","@sbilojbkci","@sbilojbkci","@sbilojbkci",
       "@sbilojbkci","@sbilojbkci"],
  "@wkdyvatqrz" =>
      ["@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz",
       "@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz","@wkdyvatqrz",
       "@wkdyvatqrz","@wkdyvatqrz"],
  "@wxnbjxihpw" =>
      ["@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw",
       "@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw",
       "@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw","@wxnbjxihpw"]}
{search_by_mention,"lrwemmcrfg","@esvlcwuriv"}
"lrwemmcrfg":Search results for mentions "@esvlcwuriv" are ["@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv",
                                                            "@esvlcwuriv"]
1669945824600.014
```

**Performance Results**:
To perform our first analysis, we kept the number of tweets being sent per user constant and exponentially increased the number of users. The graph showing the real, user, and system time is below as well as a chart.

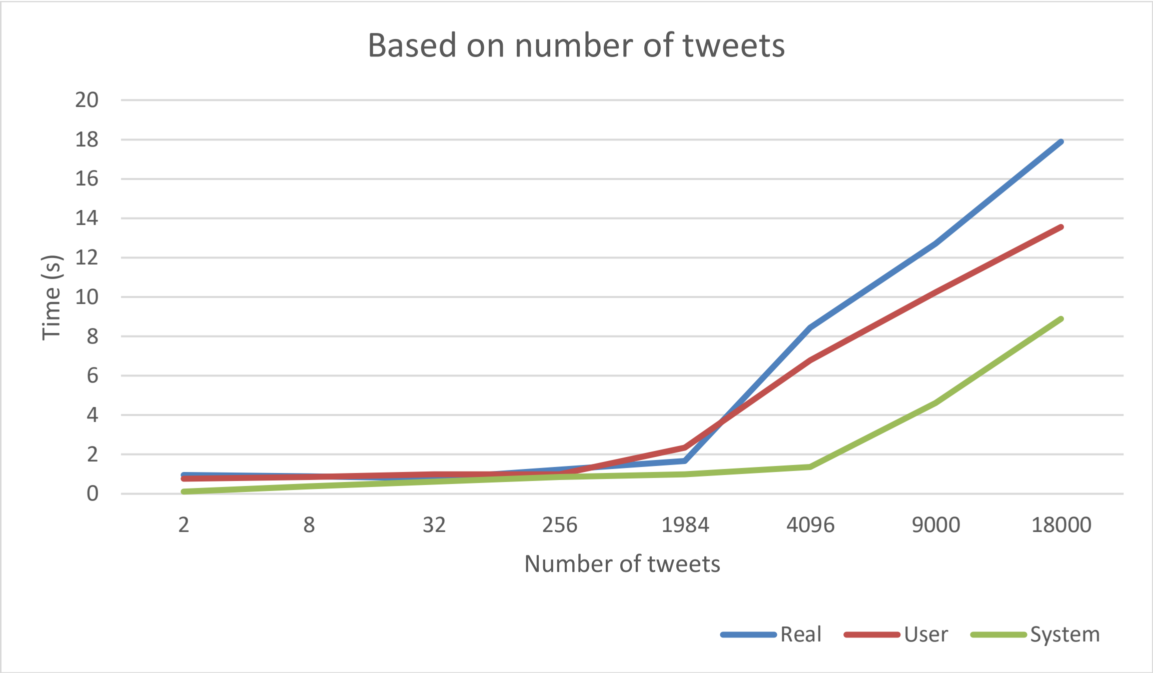
| Num of Users | Real | User | System |
|---|---|---|---|
| 2 | 0.988 | 0.866 | 0.118 |
| 8 | 0.821 | 0.897 | 0.246 |
| 32 | 0.786 | 0.909 | 0.245 |
| 256 | 1.067 | 1.095 | 0.308 |
| 1948 | 2.988 | 3.443 | 0.707 |
| 4096 | 6.747 | 7.286 | 0.895 |
| 9000 | 17.892 | 21.083 | 2.022 |
| 18000 | 64.099 | 83.033 | 6.513 |



We kept the total number of users sending tweets constant while growing it exponentially in order to conduct our second analysis. A graph of the real (blue), user (red), and system times is shown below (yellow).

| Num of Tweets | Real | User | System |
|---|---|---|---|
| 2 | 0.967 | 0.766 | 0.111 |
| 8 | 0.888 | 0.838 | 0.367 |
| 32 | 0.785 | 0.976 | 0.629 |
| 256 | 1.222 | 0.999 | 0.868 |
| 1948 | 2.678 | 2.333 | 0.989 |
| 4096 | 8.434 | 6.788 | 1.345 |

| | | | |
|---|---|---|---|
| 9000 | 12.698 | 10.242 | 4.624 |
| 18000 | 17.888 | 13.555 | 8.888 |


Based on number of tweets
Time (s)
Number of tweets
Real
User
System