

Project 2 - Usage & Test Cases

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Introduction

This is an advanced version of project 1 which provides:

- High Available
- Eventually Consistency

NOTE: Our implementation for delivering activity to client is synchronous, so that you may need to wait a period of time before you can actually receive an activity (default period is 1 second)

How to compile this project

You need maven for this build:

```
cd $project_folder
./build.sh
```

Two jar files will be generated under `$project_folder`.

System User Guide

System Set Up

There are two JAR files in source code package, `ActivityStreamerClient.jar` and `ActivityStreamerServer.jar`.

Jar file usage:

Server startup

```
usage: ActivityStreamer.Server [-a <arg>] [-activity_check_interval <arg>]
                               [-lh <arg>] [-lp <arg>] [-rh <arg>] [-rp <arg>] [-s <arg>]
                               [-sync_interval <arg>] [-time_before_reconnect <arg>]
An ActivityStream Server for Unimelb COMP90015
```

| | |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-a <arg></code> | announce interval in milliseconds |
| <code>-lh <arg></code> | local hostname |
| <code>-lp <arg></code> | local port number |
| <code>-rh <arg></code> | remote hostname |
| <code>-rp <arg></code> | remote port number |
| <code>-s <arg></code> | secret for the server to use |
| <code>-sync_interval <arg></code> | Provide the interval (in milliseconds, 5000 by default) to sync data among servers. |
| <code>-time_before_reconnect <arg></code> | Provide the time (in milliseconds, 0 by default) to wait before reconnect if a server crashes, mainly for testing eventually consistency |
| <code>-activity_check_interval <arg></code> | Provide the interval (in milliseconds, 1000 by default) to check whether there is new activity coming in. |

Client startup

```
usage: ActivityStreamer.Client [-rh <arg>] [-rp <arg>] [-s
                               <arg>] [-u <arg>]
An ActivityStream Client for Unimelb COMP90015
-rh <arg>  remote hostname
-rp <arg>  remote port number
-s <arg>   secret for username, if not provided, run "register" process
-u <arg>   username, if not provided, login as "anonymous".
```

Test Scenario

Per projectspecification, this system is supposed to achieve following functions:

- High Availability: system can reconnect automatically after network partition
- Clients can join (register/login) and leave (logout) the network at any time, Servers can join the network at any time
- Unique Register: a given username can only be registered once over the server network
- Message ensure: a message sent by a client can reach all clients that are connected to the network at the time
- Message order: all activity messages sent by a client are delivered in the same order at each receiving client

- Load balancing: clients are evenly distributed over the servers

Our implementation for delivering activity to clients is synchronous, so you may need to wait a period of time before you can actually receive an activity, default period is 1 second.

Six scenarios have been designed for test case.

NOTE: All test screenshot shown below are using our new version client which is more useful for debug. If you want to test the last version client (client of project1), change the command to use `ActivityStreamerClient-old.jar` as the client jar package. The old version also passed all these test cases.

High Available

Test Case

1. Start 4 servers

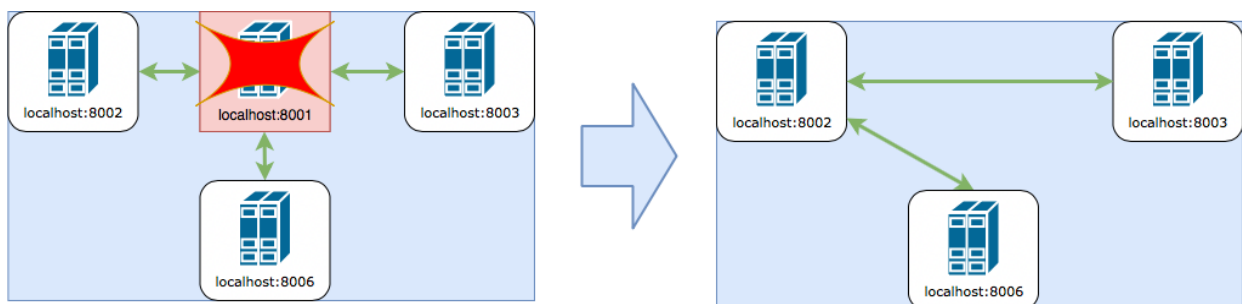
```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh
localhost -rp 8001
java -jar ActivityStreamerServer.jar -lh localhost -lp 8003 -s abc -rh
localhost -rp 8001
java -jar ActivityStreamerServer.jar -lh localhost -lp 8006 -s abc -rh
localhost -rp 8001
```

2. Force quit server 8001

Click **Close** icon in server UI or press **CTRL+C** in command line

Expected Result

After that you will see server 8002, 8003, 8006 will automatically connect. The picture shows a successful situation (the one, 8002, that takes 8001's place may vary).



Screenshot:

After 4 servers were started:

| | | | | | | | |
|----------------------------|--------|------------------|--------|----------------------------|-------------|------------------|--------|
| Server:(172.48.5.219:8001) | | | | Server:(172.48.5.219:8002) | | | |
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | Host | Port |
| 172.48.5.219 | 8002 | 172.48.5.... | 8003 | 0 | 12:11:46 | 172.48.5.... | 8003 |
| 172.48.5.219 | 8003 | 172.48.5.... | 8002 | 0 | 12:11:45 | 172.48.5.... | 8002 |
| 172.48.5.219 | 8006 | 172.48.5.... | 8001 | 0 | 12:11:45 | 172.48.5.... | 8001 |
| | | 172.48.5.... | 8006 | 0 | 12:11:44 | 172.48.5.... | 8006 |

| | | | | | | | |
|----------------------------|--------|------------------|--------|----------------------------|-------------|------------------|--------|
| Server:(172.48.5.219:8003) | | | | Server:(172.48.5.219:8006) | | | |
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | Host | Port |
| 127.0.0.1 | 8001 | 172.48.5.... | 8003 | 0 | 12:13:31 | 172.48.5.... | 8003 |
| | | 172.48.5.... | 8002 | 0 | 12:13:30 | 172.48.5.... | 8002 |
| | | 172.48.5.... | 8001 | 0 | 12:13:30 | 172.48.5.... | 8001 |
| | | 172.48.5.... | 8006 | 0 | 12:13:29 | 172.48.5.... | 8006 |

After force quit server 8001:

| | | | |
|-------------------------------------------|--------|-----------------------------|--------|
| Server:(10.10.4.212:8002) | | | |
| Users Registered at this server | | Users Logged in this server | |
| Username | Secret | Username | Secret |
| Servers directly connected to this server | | Server Loads | |
| Host | Port | IP | Port |
| 10.10.4.212 | 8006 | 10.10.4.2... | 8006 |
| 10.10.4.212 | 8003 | 10.10.4.2... | 8002 |
| | | 10.10.4.2... | 8003 |

Testing Result:

As expected.

Client can join and leave any time

Test case

1. Start the very first server

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
```

2. Register a user at 8001 and **remember** its secret

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
```

- Quit client of last step (close GUI or press CTRL+C in terminal)
- Start a new server and connect it to 8001

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh localhost -rp 8001
```

- Login user1 at new server 8002 (replace `$secret` by actual secret)

```
java -jar ActivityStreamerClient.jar -u user1 -s $secret -rp 8002 -rh localhost
```

Expected Result

User1 should login on new server 8002 successfully, and all data of 8002 should be consistent with 8001.

Screenshot

Register success and auto login with given secret

```
2018-05-24 13:57:20 [main] INFO clientLogger - send register to server with user=user1 secret=25b82teejoe4457rof13au20fb
2018-05-24 13:57:20 [Thread-1] DEBUG clientLogger - Receive data {"command":"REGISTER_SUCCESS","info":"register success for user1"}
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Register successfully to server localhost:8001
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Close client and login with parameters:
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - -u user1 -s 25b82teejoe4457rof13au20fb -rh localhost -rp 8001
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Login automatically after register success, according to head tutor's comment
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - send login to server with user=user1 secret=25b82teejoe4457rof13au20fb
2018-05-24 13:57:20 [Thread-1] DEBUG clientLogger - Receive data {"command":"LOGIN_SUCCESS","info":"login successfully as user [user1]"}
er [user1]"}

```

User1 relogin on 8002 (user1 login successfully, 8001 and 8002 is consistent)

| Server:(10.12.228.158:8001) | | | | Server:(10.12.228.158:8002) | | | |
|-----------------------------|-------------------------|------------------|-------------------------|-----------------------------|-------------------------|------------------|-------------------------|
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| user1 | 25b82teejoe4457rof13... | user1 | 25b82teejoe4457rof13... | user1 | 25b82teejoe4457rof13... | user1 | 25b82teejoe4457rof13... |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Host | Port | IP | Port |
| 10.12.228.158 | 8002 | 10.12.22... | 8001 | 127.0.0.1 | 8001 | 10.12.22... | 8001 |
| | | 10.12.22... | 8002 | | | 10.12.22... | 8002 |
| | | | Load | | | | Load |
| | | | Update Time | | | | Update Time |
| | | | 0 | | | | 0 |
| | | | 02:04:12 | | | | 02:04:37 |
| | | | 1 | | | | 1 |
| | | | 02:04:11 | | | | 02:04:36 |

Testing Result

Result as expected.

Server can join at any time

Test case

1. start the very first server

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
```

2. register a user at this server and remember its secret.

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
```

3. Quit client of step 2

4. start a new server connecting to server 8001

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh  
localhost -rp 8001
```

5. Login user1 at the new server (8002) by replace `$secret` of below script

```
java -jar ActivityStreamerClient.jar -u user1 -s $secret -rp 8002 -rh  
localhost
```

Expected Result

- user1 should login successfully at new server (8002) and all data of 8002 should be synced with 8001
- From test case [Message ensure](#) we can also see that:

user A is online at the time T, when a activity is sent by some other user B and A loses its connection it can receive this message.

When user A reconnects to any server of this system, it can also receive this lost message.

Screenshot:

Snapshot of register success and auto login with given secret

```
2018-05-24 13:57:20 [main] INFO clientLogger - send register to server with user=user1 secret=25b82teejoe4457rof13au20fb
2018-05-24 13:57:20 [Thread-1] DEBUG clientLogger - Receive data {"command":"REGISTER_SUCCESS","info":"register success for user1"}
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Register successfully to server localhost:8001
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Close client and login with parameters:
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - -u user1 -s 25b82teejoe4457rof13au20fb -rh localhost -rp 8001
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - Login automatically after register success, accrodg to head tutor's comment
2018-05-24 13:57:20 [Thread-1] INFO clientLogger - send login to server with user=user1 secret=25b82teejoe4457rof13au20fb
2018-05-24 13:57:20 [Thread-1] DEBUG clientLogger - Receive data {"command":"LOGIN_SUCCESS","info":"login successfully as user [user1]"}
er [user1]"}
```

Snapshot of user1 relogin on 8002 (user1 login successfully, 8001 and 8002 is consistent)

The figure displays four terminal windows arranged in a 2x2 grid, showing the output of a network tool (likely Nmap) for two different servers. The top row shows the output for 'Server: (10.12.228.158:8001)' and 'Server: (10.12.228.158:8002)'. The bottom row shows the output for 'Server: (10.12.228.158:8001)' and 'Server: (10.12.228.158:8002)'. Each terminal window contains the following information:

- Registered User List:** A table with columns 'Username' and 'Secret'. The output shows 'user1' with a secret '25b82teejoe4457rof13...'.

| Username | Secret |
|----------|-------------------------|
| user1 | 25b82teejoe4457rof13... |
- Online User List:** A table with columns 'Username' and 'Secret'. The output shows 'user1' with a secret '25b82teejoe4457rof13...'.

| Username | Secret |
|----------|-------------------------|
| user1 | 25b82teejoe4457rof13... |
- Neighbor Servers:** A table with columns 'Host' and 'Port'. The output shows '10.12.228.158' on port '8002'.

| Host | Port |
|---------------|------|
| 10.12.228.158 | 8002 |
- Server Loads:** A table with columns 'IP', 'Port', 'Load', and 'Update Time'. The output shows two entries for '10.12.228.158' on port '8001' with loads of '0' and '1' and update times of '02:04:12' and '02:04:11'.

| IP | Port | Load | Update Time |
|---------------|------|------|-------------|
| 10.12.228.158 | 8001 | 0 | 02:04:12 |
| 10.12.228.158 | 8002 | 1 | 02:04:11 |

Testing Result

Result as expected.

Unique Register

Test case

1. start several servers, say 3

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh
localhost -rp 8001
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh
localhost -rp 8001
```

1. register user1 at server 8001

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
```

1. try to register user1 at another server, say 8002

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8002 -rh localhost
```

Expected Result

- the registration of step 3 (server 8002) will fail with error like "user already exists".

Screenshot

Snapshot of 3 servers' GUI

[illegible]

Snapshot of error message (user1 already exists in server)

```

2018-05-24 14:13:25 [main] DEBUG activystreamer.Client - Set remote host to localhost
2018-05-24 14:13:25 [main] DEBUG activystreamer.Client - Set remote port to 8002
2018-05-24 14:13:25 [main] INFO activystreamer.Client - starting client
2018-05-24 14:13:25 [main] INFO activystreamer.Client - Username is provided [user1] but secret is not, try to register...
2018-05-24 14:13:25 [main] INFO activystreamer.Client - First generate the secret as: [3s8461nvcihjc5666ei0e2qvtq]
2018-05-24 14:13:25 [main] INFO clientLogger - send register to server with user=user1 secret=3s8461nvcihjc5666ei0e2qvtq
2018-05-24 14:13:25 [Thread-1] DEBUG clientLogger - Receive data {"command":"AUTHENTICATION_FAIL","info":{"User [user1] exists in this server"}}
2018-05-24 14:13:25 [Thread-1] INFO clientLogger - Cannot send activity as username or secret is not correct or you are an anonymous
2018-05-24 14:13:25 [Thread-1] INFO clientLogger - Connection will be closed
2018-05-24 14:13:25 [Thread-1] INFO clientLogger - Connectionlocalhost/127.0.0.1:8002 closed by remote server.
panv1rudMacBook-Air:~$ DistributedSystem panv1rus

```

Testing Result

Result as expected.

Message ensure

Test case

In order to simulate message loss case, let us start servers with a parameter to ***delay*** the reconnection function.

1. Start 4 servers with `time_before_reconnect=10000` (10 seconds)

```
# start the very first server, which will be terminated
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
# start other servers
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh
localhost -rp 8001 -time_before_reconnect 10000
java -jar ActivityStreamerServer.jar -lh localhost -lp 8003 -s abc -rh
localhost -rp 8001 -time_before_reconnect 10000
java -jar ActivityStreamerServer.jar -lh localhost -lp 8006 -s abc -rh
localhost -rp 8001 -time before reconnect 10000
```

2. Connect 3 clients to 3 different servers

Note: Please record the secret of user1 for future use

```
# Kept the secret after register successfully
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
# you can just run below 2 clients and no need to record their secrets
java -jar ActivityStreamerClient.jar -u user2 -rp 8002 -rh localhost
java -jar ActivityStreamerClient.jar -u user3 -rp 8003 -rh localhost
```

1. Terminate server 8001 and send a message from user2 within 10 seconds

- Click **Close** icon in server UI or press **CTRL+C** in command line (user 1 will lose connection)
- Send message `{"a":1}` from user2.
- Wait for reconnection happens (10 seconds)

4. Reconnect user1 to any working server, let's say 8006

Replace `$secret` of below script with the secret from step 2.

```
java -jar ActivityStreamerClient.jar -u user1 -s $secret -rp 8006 -rh
localhost
```

Expected Result

- user3 will receive the activity of user2 after reconnection is done (about 10 seconds after disconnection)
- user1 will receive the activity of user2 after relogin to server 8006

user A is online at the time T, when a activity is sent by some other user B and A loses its connection it can receive this message.

When user A reconnects to any server of this system, it can also receive this lost message.

Screenshot

clients login on 8001,8002, 8003 respectively

| | | | | | | | |
|-----------------------------|--------------------------|------------------|--------------------------|-----------------------------|--------------------------|------------------|--------------------------|
| Server:(10.12.228.158:8001) | | | | Server:(10.12.228.158:8006) | | | |
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... |
| user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... |
| user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | IP | Port |
| 10.12.228.158 | 8002 | 10.12.22... | 8003 | 1 | 02:34:01 | 10.12.22... | 8003 |
| 10.12.228.158 | 8003 | 10.12.22... | 8001 | 1 | 02:34:03 | 10.12.22... | 8001 |
| 10.12.228.158 | 8006 | 10.12.22... | 8002 | 1 | 02:34:00 | 10.12.22... | 8002 |
| | | 10.12.22... | 8006 | 0 | 02:34:02 | 10.12.22... | 8006 |
| | | | | | | | |
| Server:(10.12.228.158:8002) | | | | Server:(10.12.228.158:8003) | | | |
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... | user1 | iSee5tpthmk2cfqape6n... |
| user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... | user2 | k57ge305rsvlomkbrf3ll... |
| user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... | user3 | sftev05ftp7ejkp4cksqo... |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | IP | Port |
| 127.0.0.1 | 8001 | 10.12.22... | 8003 | 1 | 02:34:51 | 10.12.22... | 8003 |
| | | 10.12.22... | 8001 | 1 | 02:34:48 | 10.12.22... | 8001 |
| | | 10.12.22... | 8002 | 1 | 02:34:50 | 10.12.22... | 8002 |
| | | 10.12.22... | 8006 | 0 | 02:34:47 | 10.12.22... | 8006 |
| | | | | | | | |

clients after reconnection(user1, user2, user3 all received activity from user2)

The image displays three screenshots of a network client application interface, arranged in a grid. Each screenshot represents a different user session: User1, User2, and User3. Each interface is divided into several sections: a title bar with window controls and a connection status, a 'JSON output, received from server' section, a 'Backup Servers' table, a 'JSON input, to send to server' section, and a 'Messages received from server' section. The 'JSON output' and 'Messages received' sections contain JSON data. The 'JSON input' section has a 'Send' button. The 'Backup Servers' table has columns for 'host' and 'port'. The 'Messages received' section shows a sequence of messages, including a login success message and an activity broadcast message. The 'JSON input' section is empty in the first two screenshots but contains a JSON object in the third. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. The 'Backup Servers' table is empty in all three screenshots. The 'JSON output' section contains a JSON object in all three screenshots. The 'Messages received' section contains a single message in the first two screenshots but contains a sequence of messages in the third screenshot. The 'JSON input' section contains a JSON object in the third screenshot. The 'Send' button is highlighted in the third screenshot. The 'Disconnect' button is present in all three screenshots. 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Testing Result

Result as expected.

Message order

In order to simulate message disorder case, let us use a **telnet session** to simulate a **server** and make the order checking period a littler longer with `activity_check_interval=10000`. Fake messages will be broadcasted by the telnet server with a hooker "**backTime**" to set the send time of fake messages to be a time in the past.

'timeBack' field is a back door used for this kind of testing. If that field exists in an ActivityBroadcast message, then set the `sendTime` of this activity to `currentTimeInMillis() - timeBack`

Operations

1. Start 1 server with `activity_check_interval=10000` (10 seconds)

```
java -jar ActivityStreamerServer.jar -activity_check_interval 10000 -lh localhost -lp 8001 -s abc
```

2. Start a normal client connecting to server 1

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
```

3. Start a terminate and using telnet to simulate a client in following steps

- start telnet session

```
telnet localhost 8001
```

- paste below string to authenticate this "server" with server 8001

```
{"command":"AUTHENTICATE","serverId":"serverId01","secret":"abc","host":"localhost","port":8002}
```

- Broadcast 2 "fake" activities (**within 10 seconds**) by pasting below 2 string **separately(one by one)** into telnet session to simulate disordered message.

You can ignore the message telnet session receives. All of them are used by real server to sync data.

Message 1: a "fake" message that was sent 0 second ago

```
{"id":0,"activity":{"message_num":2,"authenticated_user":"user2"},"isDelivered":false,"command":"ACTIVITY_BROADCAST","timeBack":0}
```

Message 2: a "fake" message that was sent 10 seconds ago, which is early than previous one.

```
{"id":0,"activity":  
{"message_num":1,"authenticated_user":"user2"},"isDelivered":false,"command  
":"ACTIVITY_BROADCAST","timeBack":10000}
```

Expected Result

- After waiting **10-20** seconds, user1 (normal client with GUI) will receive 2 activities in order (message_num=1 first and then message_num=2) separately.

In real server, this order checking period can be relatively shorter, like 0.5 or 1 second.

Screenshot

Telnet session input (in white, you can ignore other information, they are sync message from server)

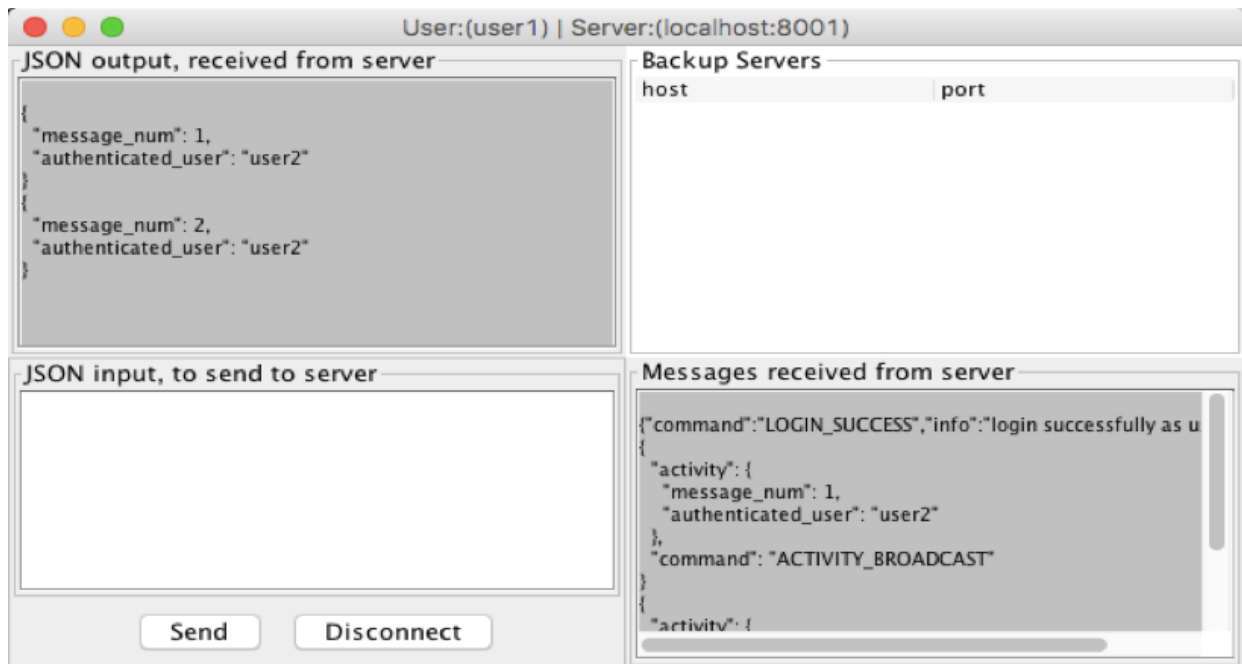
The 3rd white block shows the ordered message list, in which the first is the one with message_num=1

```

└─$ telnet localhost 8001
Trying ::1...
Connected to localhost.
Escape character is '^]'.
{"command":"AUTHENTICATE","serverId":"serverId01","secret":"abc","host":"localhost","port":8002}
{"command":"AUTHENTICATION_SUCC","serverId":"7utq617o557582uljcelliduej","server_list":[{"serverId":"7utq617o557582uljcelliduej","load":1,"ip":"10.10.4.212","port":8001,"online":true,"updateTime":1527295312416,"action":"UPDATE_OR_INSERT"}],"user_list":[{"username":"user1","secret":"1j4kcf06eg90mj25957atsses9","online":true,"updateTime":1527295294727}],"activity_entity":[]}
{"command":"BACKUP_LIST","servers":[{"serverId":"serverId01","host":"localhost","port":8002}]}
{"serverId":"7utq617o557582uljcelliduej","load":1,"ip":"10.10.4.212","port":8001,"online":true,"updateTime":1527295317422,"action":"UPDATE_OR_INSERT","command":"SERVER_ANNOUNCE"}
{"command":"USER_SYNC","user_list":[{"username":"user1","secret":"1j4kcf06eg90mj25957atsses9","online":true,"updateTime":1527295294727}]}
{"command":"ACTIVITY_SYNC","activity_entity":[]}
{"id":0,"activity":{"message_num":2,"authenticated_user":"user2"},"isDelivered":false,"command":"ACTIVITY_BROADCAST","timeBack":0}
{"command":"BACKUP_LIST","servers":[{"serverId":"serverId01","host":"localhost","port":8002}]}
{"serverId":"7utq617o557582uljcelliduej","load":1,"ip":"10.10.4.212","port":8001,"online":true,"updateTime":1527295322424,"action":"UPDATE_OR_INSERT","command":"SERVER_ANNOUNCE"}
{"command":"USER_SYNC","user_list":[{"username":"user1","secret":"1j4kcf06eg90mj25957atsses9","online":true,"updateTime":1527295294727}]}
{"command":"ACTIVITY_SYNC","activity_entity":[{"owner":"user1","activity_list":[{"id":724739964,"activity":{"message_num":2,"authenticated_user":"user2"},"updateTime":1527295320533,"sendTime":1527295320533,"isDelivered":false}]}]}
{"id":0,"activity":{"message_num":1,"authenticated_user":"user2"},"isDelivered":false,"command":"ACTIVITY_BROADCAST","timeBack":10000}
{"id":373940027,"activity":{"message_num":1,"authenticated_user":"user2"},"updateTime":1527295324721,"sendTime":1527295313665,"isDelivered":true,"owner":"user1","command":"ACTIVITY_UPDATE"}
{"command":"BACKUP_LIST","servers":[{"serverId":"serverId01","host":"localhost","port":8002}]}
{"serverId":"7utq617o557582uljcelliduej","load":1,"ip":"10.10.4.212","port":8001,"online":true,"updateTime":1527295327432,"action":"UPDATE_OR_INSERT","command":"SERVER_ANNOUNCE"}
{"command":"USER_SYNC","user_list":[{"username":"user1","secret":"1j4kcf06eg90mj25957atsses9","online":true,"updateTime":1527295294727}]}
{"command":"ACTIVITY_SYNC","activity_entity":[{"owner":"user1","activity_list":[{"id":373940027,"activity":{"message_num":1,"authenticated_user":"user2"},"updateTime":1527295324721,"sendTime":1527295313665,"isDelivered":true}, {"id":724739964,"activity":{"message_num":2,"authenticated_user":"user2"},"updateTime":1527295320533,"sendTime":1527295320533,"isDelivered":false}]}]}

```

Messages user1 received (message_num1 is before message_num 2)



Testing Result

Result as expected.

Load balancing

Operations

1. start 2 servers

```
java -jar ActivityStreamerServer.jar -lh localhost -lp 8001 -s abc
java -jar ActivityStreamerServer.jar -lh localhost -lp 8002 -s abc -rh
localhost -rp 8001
```

2. Register and login 2 clients both to server 8001

```
java -jar ActivityStreamerClient.jar -u user1 -rp 8001 -rh localhost
java -jar ActivityStreamerClient.jar -u user2 -rp 8001 -rh localhost
```

Expected Result

- user2 will be redirected to server 8002

Screenshot

Starting 2 servers

| Server:(172.48.1.162:8001) | | | | Server:(172.48.1.162:8002) | | | |
|----------------------------|--------|------------------|--------|----------------------------|-------------|------------------|--------|
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | Host | Port |
| 172.48.1.162 | 8002 | 172.48.1.... | 8002 | 0 | 07:28:22 | 127.0.0.1 | 8001 |
| | | 172.48.1.... | 8001 | 0 | 07:28:23 | | |

After two clients login(load of each server has been changed to 1)

| Server:(172.48.1.162:8001) | | | | Server:(172.48.1.162:8002) | | | |
|----------------------------|---------------------------|------------------|---------------------------|----------------------------|---------------------------|------------------|---------------------------|
| Registered User List | | Online User List | | Registered User List | | Online User List | |
| Username | Secret | Username | Secret | Username | Secret | Username | Secret |
| user1 | nrmusd05tppm0scfj5d... | user1 | nrmusd05tppm0scfj5d... | user1 | nrmusd05tppm0scfj5d... | user1 | nrmusd05tppm0scfj5d... |
| user2 | ffnn0idirpdbhr6viqcdsc... | user2 | ffnn0idirpdbhr6viqcdsc... | user2 | ffnn0idirpdbhr6viqcdsc... | user2 | ffnn0idirpdbhr6viqcdsc... |
| Neighbor Servers | | Server Loads | | Neighbor Servers | | Server Loads | |
| Host | Port | IP | Port | Load | Update Time | Host | Port |
| 172.48.1.162 | 8002 | 172.48.1.... | 8002 | 1 | 07:31:02 | 127.0.0.1 | 8001 |
| | | 172.48.1.... | 8001 | 1 | 07:30:58 | | |

Testing Result

Result as expected.