

MP1: A Tiny Social Network Service

Features:

- Users can follow any other logged in user
- Users will be able to unfollow anyone they have previously followed
- Users will be able to see the posts of the people they follow in timeline mode
- Users will be able to make their own posts in timeline mode
- Users can see all of the logged in users during a server session and all of their followers

System spec:

- Using gRPC library along with Google Protocol Buffer IDL (Interface Definition Language) to set up client-server communication
 - Define five services: Login, Follow, Unfollow, List, Timeline
 - The client and server will interact through this interface
 - Define four data structures: ListReply, Request, Reply, Message
 - The client and server will format their communication to fit these structures
- Server will store the list of all connected clients and use it to verify procedure calls and login attempts
- Post history and user feeds will be stored locally in text files written to in a standardized format
- The client will take user input and return server output through a command line interface
 - Users simply input one of the four user-facing commands: List, Follow, Unfollow, or Timeline
 - Corresponding server response is output to the user's terminal
- The Timeline command puts the terminal in a special state that cannot be returned from
 - i.e. once in timeline mode, user cannot go back, only way to exit is to quit the application
 - In Timeline mode, a user will be shown the 20 latest posts of all of the people they follow
 - Then, they will be free to make any post they would like, and they will see the posts of anyone they follow in real time as well

LIST, FOLLOW, UNFOLLOW and LOGIN (init command):

List:

- Client-side function takes no arguments, and sends the server a List request through its stub containing the client's user information

- Server-side function returns the list of all currently logged in users and a list of all the users that follow the user that requested the list

Follow:

- Client-side function takes a username as an argument. This argument is the target of the follow request. Through its stub, the client sends this request to the server along with client's user information
- Server-side function takes the target's information and the requestor's information and checks to make sure the request is valid
 - Both requestor and target must exist
 - Requestor cannot follow themselves
 - Requestor cannot follow a target they are already following

Unfollow:

- Client-side function takes a username as an argument. This argument is the target of the unfollow request. Through its stub, the client sends this request to the server along with client's user information
- Server-side function takes the target's information and the requestor's information and checks to make sure the request is valid
 - Both requestor and target must exist
 - Requestor cannot unfollow themselves
 - Requestor cannot unfollow a target they already do not follow

Login:

- Login is an implicitly called rpc that executes when the user starts the SNS client
- Client-side function takes no arguments, sends server a login request through its stub using the client's user information
- Server-side function uses the user information contained in the request and checks the validity of the request
 - If the user is already logged in/has already logged in (by virtue of having a single client database that is not mutated aside from adding users, each unique username can only login once to a given server) they cannot log in again
 - Otherwise, new user is added to user list

TIMELINE:

Server side:

- Server blocks while reading from its bi-directional stream for messages from the client
- On reception, the server takes and stores the client's user data, along with the message itself. With the user data, the server identifies the user in the database and assigns an object corresponding to that user
 - If the message is the initial hello message, the server shows sends back the last 20 posts from that user's following list to the client
 - Otherwise, the server takes the client's message as a post from the user and distributes it to the user's followers in two ways

- Appends the post to the followers' "following" files (post history from every person a user follows)
- Writes the message to all of the user's followers' streams

Client side:

- Client uses stub to make a Timeline request to the server
 - This actually returns a reader-writer object (bi-directional stream) that will be used on the client side to write to and receive messages from the server
- Client begins by writing a hello message to the server through the bi-directional stream to begin the connection
- Client spawns a writer worker thread which stays in an infinite loop, pulling input from the client terminal and sending to the server through the stream
- Client blocks in an infinite loop that reads server responses from the server on the stream and outputs to the terminal

TEST CASE OUTPUTS:

Test 0:

```

csce438@c7a3fdcdfeb2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd>

csce438@c7a3fdcdfeb2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...connection failed: -1
csce438@c7a3fdcdfeb2:~/mp1_skeleton$
  
```

Test 1:

```

csce438@c7a3fdcdfeb2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> follow u1
Input username already exists, command failed
Cmd> follow u2
Command completed successfully
Cmd> follow u3
Command completed successfully
Cmd> follow u4
Command failed with invalid username
Cmd>

csce438@c7a3fdcdfeb2:~/mp1_skeleton$ ./tsc -u u2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> follow u1
Command completed successfully
Cmd> follow u2
Input username already exists, command failed
Cmd> follow u3
Command completed successfully
Cmd> follow u4
Command failed with invalid username
Cmd>

csce438@c7a3fdcdfeb2:~/mp1_skeleton$ ./tsc -u u3
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> follow u1
Command completed successfully
Cmd> follow u2
Command completed successfully
Cmd> follow u3
Input username already exists, command failed
Cmd> follow u4
Command failed with invalid username
Cmd>
  
```

Test 2:

```
csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u2
Command completed successfully
Cmd> follow u3
Command completed successfully
Cmd> unfollow u1
Command failed with invalid username
Cmd> unfollow u2
Command completed successfully
Cmd> unfollow u3
Command completed successfully
Cmd> unfollow u4
Command failed with invalid username
Cmd>

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u1
Command completed successfully
Cmd> follow u3
Command completed successfully
Cmd> unfollow u1
Command completed successfully
Cmd> unfollow u2
Command failed with invalid username
Cmd> unfollow u3
Command completed successfully
Cmd> unfollow u4
Command failed with invalid username
Cmd>

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u3
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u1
Command completed successfully
Cmd> follow u2
Command completed successfully
Cmd> unfollow u1
Command completed successfully
Cmd> unfollow u2
Command completed successfully
Cmd> unfollow u3
Command failed with invalid username
Cmd> unfollow u4
Command failed with invalid username
Cmd>
```

Test 3:

```
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u2
Command completed successfully
Cmd> follow u3
Command completed successfully
Cmd> unfollow u1
Command failed with invalid username
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> unfollow u2
Command completed successfully
Cmd> unfollow u3
Command completed successfully
Cmd> unfollow u4
Command failed with invalid username
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers: u2,
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers: u3,
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd>

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers: u1,
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> follow u1
Command completed successfully
Cmd> follow u3
Command completed successfully
Cmd> unfollow u1
Command completed successfully
Cmd> unfollow u2
Command failed with invalid username
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> unfollow u3
Command completed successfully
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers: u3,
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd>

UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers: u2,
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> follow u1
Command completed successfully
Cmd> follow u2
Command completed successfully
Cmd> unfollow u1
Command completed successfully
Cmd> unfollow u2
Command completed successfully
Cmd> unfollow u3
Command completed successfully
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd> unfollow u4
Command failed with invalid username
Cmd> list
Command completed successfully
All users: u1, u2, u3,
Followers:
Cmd>
```

Test 4:

```
csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u2
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
p1
p2
p3
p4
p5
p6
p7
p8
p9
p10
p11
p12
p13
p14
p15
p16
p17
p18
p19
p20
p22
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u1
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
u1 (Thu Jan 1 00:00:00 1970) >> p22
u1 (Thu Jan 1 00:00:00 1970) >> p2
u1 (Thu Jan 1 00:00:00 1970) >> p20
u1 (Thu Jan 1 00:00:00 1970) >> p19
u1 (Thu Jan 1 00:00:00 1970) >> p18
u1 (Thu Jan 1 00:00:00 1970) >> p17
u1 (Thu Jan 1 00:00:00 1970) >> p16
u1 (Thu Jan 1 00:00:00 1970) >> p15
u1 (Thu Jan 1 00:00:00 1970) >> p14
u1 (Thu Jan 1 00:00:00 1970) >> p13
u1 (Thu Jan 1 00:00:00 1970) >> p12
u1 (Thu Jan 1 00:00:00 1970) >> p11
u1 (Thu Jan 1 00:00:00 1970) >> p10
u1 (Thu Jan 1 00:00:00 1970) >> p9
u1 (Thu Jan 1 00:00:00 1970) >> p8
u1 (Thu Jan 1 00:00:00 1970) >> p7
u1 (Thu Jan 1 00:00:00 1970) >> p6
u1 (Thu Jan 1 00:00:00 1970) >> p5
u1 (Thu Jan 1 00:00:00 1970) >> p4
u1 (Thu Jan 1 00:00:00 1970) >> p3
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u3
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u1
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
u1 (Thu Jan 1 00:00:00 1970) >> p22
u1 (Thu Jan 1 00:00:00 1970) >> p2
u1 (Thu Jan 1 00:00:00 1970) >> p20
u1 (Thu Jan 1 00:00:00 1970) >> p19
u1 (Thu Jan 1 00:00:00 1970) >> p18
u1 (Thu Jan 1 00:00:00 1970) >> p17
u1 (Thu Jan 1 00:00:00 1970) >> p16
u1 (Thu Jan 1 00:00:00 1970) >> p15
u1 (Thu Jan 1 00:00:00 1970) >> p14
u1 (Thu Jan 1 00:00:00 1970) >> p13
u1 (Thu Jan 1 00:00:00 1970) >> p12
u1 (Thu Jan 1 00:00:00 1970) >> p11
[]

./tsc mp1_sk...
./tsc mp1...
./tsc mp1...
```

Test 5:

```
csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u2
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
p1
p2
p3
p4
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u1
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
u1 (Fri Feb 14 01:54:55 2025) >> p1
p2
u1 (Fri Feb 14 01:55:16 2025) >> p3
p4
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u3
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u4
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
p5
u4 (Fri Feb 14 01:55:35 2025) >> p6
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u4
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u5
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
p6
u5 (Fri Feb 14 01:55:38 2025) >> p7
[]

csce438@c7a3fcdcf2b2:~/mp1_skeleton$ ./tsc -u u5
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> follow u3
Command completed successfully
Cmd> timeline
Command completed successfully
Now you are in the timeline
u3 (Fri Feb 14 01:55:31 2025) >> p5
p7
[]

./tsc mp1_sk...
./tsc mp1...
./tsc mp1...
./tsc mp1...
./tsc mp1...
./tsc mp1...
./tsc mp1...
```

