

COMP208 - Group Software Project

Ballmer Peak

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Part I

Project Proposal

1

Introduction

The proposed project is a simple, privacy oriented social network, which demands zero security knowledge on behalf of its users. In order to ensure security and privacy in the face of nation state adversaries the system must be unable spy on its users even if it wants to or server operators are ordered to.

We feel that obscuring the content of messages isn't enough, because suspicion may, and often does, fall upon people not for what they say, but to whom they are speaking. Our system will therefore not merely hide the content of messages, but the recipient of messages too. Hiding the fact that an IP address sent a message is out of scope, but hiding which user/keypair did so is in scope.

The system will provide the following functionality:

- A user may add friends
- A user may IM with fellow users
- A user may IM anonymously with fellow users
- A user may post messages to all their friends on their wall (think FB)
- A user may request to post messages to all of a friend's friends on a friend's page (think FB wall, permission is required because a user cannot know who their friend (or anyone) is friends with)

The server operator will have access to the following information:

- Which IP uploaded which message (although they will be ignorant of its content)
- Which IPs are connecting to the server as clients
- What times a specific IP connects ¹

A third party logging all traffic between all clients and a server will have access to the following information:

¹While this will aid in tying an IP address to a person, it is deemed acceptable because it is not useful information unless the person's private key is compromised.

citation needed

Talk about TLS, end-to-end crypto

- Who connects to the server, whether they upload or download information ²

The benefits we feel this system provides over current solutions are the following:

- Server operators can not know who talks with whom
- Server operators can not know the content of messages
- Server operators can not know which message is intended for which user
- Server operators can not know who is friends with whom
- Third parties sniffing the connections can not know anything the server operator cannot know (this isn't unique, but is worth stating).

In order to ensure nobody can tell who is talking with whom we will base our security model on the idea of shared mailboxes, as seen in practice at `alt.anonymous.messages` ³. In this model one posts a message by encrypting it using the public key of the recipient, and posting it in a public location. In this model one reads a message by downloading all messages from that location, and attempting to decrypt them all using ones private key. Our protocol will build atop this simple premise, and the the server will be a mere repository of messages, the real work occuring wholly in the client.

²size correlation attacks could be used here if the message content is known

³<https://groups.google.com/forum/#!forum/alt.anonymous.messages>

2

Summary of protocol

Creating an account is done by generating an RSA keypair, and choosing a name. An unencrypted (but signed) message is then posted to the server associating that keypair with that name. In this way, by knowing the public key of someone, you may discover their name in the service, but not vice versa.

pretty dataflow diagrams

Connecting for the first time Every unencrypted message stored on the server is downloaded (signed nicknames and nothing more) ¹ (if someone retroactively grants you permission to view something they publish it as a new message with an old timestamp). At this time the local database contains only signed messages claiming usernames. The public keys are not provided, these are of use only when you learn the public key behind a name. The rationale for not providing public keys is provided in the section regarding adding a friend. Messages posted after your name was claimed will require downloading too, as once you claim a name people may send you messages.

Connecting subsequently The client requests every message from the last time they connected (sent by the client, not stored by the server) up to the present. Decryptable messages are used to update the local DB, others are discarded.

Continued connection During a session the client requests updates from the server every 1-5 seconds (configurable by the user).

Adding a friend is performed by having a friend email (or otherwise transfer) you their public key. This is input to the client, and it finds their name (via public posting that occurred when registering). You may now interact with that person. They may not interact with you until they receive your public key.²

¹clients use bittorrent to lighten server load?

²This is the one part that will be difficult for normal users, however any protocol by which the server stores and serves public keys is entirely unsuitable as a MitM would be trivial on behalf of the server operators

Talking with a friend or posting on your wall is achieved by writing a message, signing it with your private key, and encrypting one copy of it with each of the recipients public keys before posting it to the server. The client prevents one from posting a message to someones public key, if they have not claimed a nickname.

Posting to a friends wall may be requested by sending a specially formatted message to that friend (all handled by the GUI, like much else here), when that friend logs in they will receive your request to post on their wall and may confirm or deny it. If they confirm then they take your (signed) message and transmit it to each of their friends as previously described (authentication is entirely based on crypto signatures, so it doesn't matter who posts the message).³

³This is required because it is impossible for one to know who their friends friends are.

3

Tasks and Challenges

What would need to be done:

- Server
 - stores messages sent to it by clients
 - sends stored messages to clients at request (either the whole lot, or messages from within a certain timeframe)
- Client
 - handle decryption/encryption
 - sends data to the server
 - maintains a local DB built from decrypted messages
 - displays a nice GUI that hides everything from the user

3.1 Data Flow to Clients and Required Server Storage

A estimate is hereafter given as to the size of all stored messages, and the amount of data which would need downloading by each client when it is started. The following assumptions are used:

- A users avarage message posted to their wall is 200 characters
- A users avarage number of messages posted to their wall per day is 10
- A users avarage number of friends is 100 (each and every friend represents one key exchange)
- A users avarage private message (to single user) is 50 characters
- A users avarage number of private (to single user) messages per day is 300

With these generous estimates, each user would generate $(200*10*100)+(50*300*1)$ bytes of raw data per day. Assuming a 10% protocol overhead we would see 236,500 bytes of data per day per user.

The storage space required for a server is therefore 86MB per year per user. On a server with 50,000 users that has been running for 3 years, there would be just 1.3TB of data.

Every time a client connects, it must download all messages posted since it last connected to the server. To mitigate this we may run as a daemon on linux, or a background process in windows, that starts when the user logs in. If we can expect a computer to be turned on for just 4 hours a day then 20 hours of data must be downloaded. $((236,500*\text{no_of_users})/24)*\text{hours_off_per_day}$ bytes must be downloaded when the users computer is turned on.

The following table shows the delays between the computer turning on, and every message having been downloaded (assuming a download speed of 500KB/second, and a network of 1000 users).

| Hours off per day | Minutes to sync |
|-------------------|-----------------|
| 0 | 0 |
| 4 | 1.3 |
| 10 | 3.2 |
| 12 | 3.9 |
| 16 | 5.2 |
| 20 | 6.5 |

Table 3.1: Hours a computer is turned off per day vs minutes to sync

To mitigate this, posts will be downloaded in reverse order, so that more recent posts are downloaded first. We feel that waiting 2-5 mins is an acceptable delay for the degree of privacy provided. Once the user is synced after turning their computer on, no further delays will be incurred until the computer is shut down.

Due to the inherently limited network size (<1500 users of one server is practical) we recommend a number of smaller servers, each serving either a geographic location, or a specific interest group.

While this latency could be avoided, and huge networks (>1,000,000) used, it would come at the cost of the server operator being able to learn that somebody is sending or receiving messages, and also who those messages are sent to/from (although they couldn't know what the messages said).

4

Task Partitioning

- D. Breslin
 - Task 1
 - Task 3
- L. Thomas
 - Task 2
 - Task 4

Replace task partitioning
placeholders

5

Proposed Tools

Git, with a central (private) repository hosted on github will be used for version control. The language used has yet to be decided...

choose programming language

Talk more about tools, specifically about communication between group members

6

Deliverables

- Protocol documentation for developers writing third party clients
- Windows and Linux executable: client
- Windows and Linux executable: server
- Full source for server, client, and any associated works

update with names of associated works as project continues

Part II

Requirements

7

Anticipated Software

Description of anticipated software

- ensure optimal security, when passing messages, viewing profile
- ensure server will not be able to detect any activities between the users of the system
- users can share posts only to specific people
- users to keep their own data and only friends with users as well
- users to pass public key with any type of medium they prefer to other users

The purpose of this system is to emphasise on the security measures of a social media by encrypting user details such as profile information, messages which are used to pass to other users, and posts which are only designated for specific users to read.

The system is to have strict security measures implemented. It is able to encrypt messages with the use of RSA and AES. The only way for the other user to decrypt the data is if it was encrypted using their public key; which is given from the recipient to the sender via whichever medium he prefers, e.g. email.

Server capabilities are strongly limited as its only function is to handle the traffic of the encrypted data between different users.

this was missing from the original commit too

8

Case Study: Facebook

8.1 User

this text is about what the user account can do , and what it need to resgiter the user account, and what to do if user forgot the password.

Different beteew user and non user This section is about what user funtion is doing in facebook , the retrsiger have to be done before the user want to use the funtion.

the funtioncan that non-user can use:

- search friends whose in facebook;
- can be able to check on the user's post(if the user allows the non-user to visit)

the funtioncan that user can use:

- Posting on wall
- Friends list
- Account Manage
- Live chating with friends

user Name register(signing up) non-User have to sign up some presonal information to become a user,The information can be use to reset the poss-word,Or display for other user (depends on have the user set the information as public) .

the information have given:

- email
- SureName
- LastName

- UserName
- Password
- irthday
- Sex
- user have to agree the terms and data Use Policy, including there cookie use.

User login in

The user can login in by given following information on www.facebook.com or apps that connect to facebook :

- e-mail or phone number
- Password

there might be some checking to the user. For example ,Once the user login in, the facebook AI will check on the userIP , if the IP shows the location is to far from last login IP , the facebook might need to confirm the user by asking whats the friend's name on the photo that user had tap .Nevertheless, If the user forgotten the password,ask for Email, Phone, Username or Full Name to help the user to get the password

8.2 Post

facebook allows user post text, video, image on there wall or friend's wall(if they are the facebook user.). This section is to clarify what the user can post and what the other user can do on what the user post.

type of post

- Message Posting
- picture Posting
- video posting
- Message and Picture posting
- video and Message posting

8.2.1 Post funtion(text Only)

post manage (poster)

- delete the post
- rewrite the post

- setting privacy(who can read the post)
- cancel comment funtion

post manage(reader)

- set Noticfication
- hide the post
- unfollow the poster

post contain

- poster Name(the user who post the information)
- the text from user post
- the video and image (not must be)
- sharing funtion
- comment funtion
- like funtion

8.2.2 Post funtion(image and video Only)

post manage (poster)

- delete the post
- rewrite the message
- setting privacy(who can read the post,who can tag the post)
- cancel comment funtion
- tag the image

post manage(reader)

- set Noticfication
- hide the post
- unfollow the poster
- report the image or video to facebook team (for example:the post is offensive)

post contain

- poster Name(the user who post the information)

- the text from user post
- the video and image (not must be)
- sharing funtion
- comment funtion
- like funtion

8.2.3 sharing

Firstly confirm is he user really wants to share than get in to the share function, the post will post on the user's wall and refance whose the origian user. **share function**

- allow user post other user's post to his friend (by posting to the users wall)
- allow user to share the post on third-party web(e.g. YouTube, steam information)
- user can input message which to sharing type post

8.2.4 comment

is a funtion that other user to comment the post.the following funtion is what poster and reader can do on commend.

comment function

- user can write comment on the post.
- user can like the comment.
- user can hide the comment.
- user can report the comment(e.g. sexualt explicit content...).
- User can give feed back to the user who give comment.
- comment can be block(reader only).

8.2.5 Like

the user can like the post , and the name of the user who like the post will be on the list who liked the post.

- user can like on the post.
- user can like on the shared post.
- user can like the the comment.
- user can cancel the like .

8.3 Friend

the sever will store the inforamtion of which user is friend which other user by a simple processe .

the process to bcoming friend:

- the userA have to sent a friend request to userB.
- UserB have to accept the requset .
- user A and user B have friend relationship now .

after the process, the userA and UserB have both of there name stored in firmed list. **Funtion after become friend**

- friend's post will update on News Feed.
- friends will be added in Chat funtion.

8.4 Personal Information

User can manage there account , what presonal information they want to show to public . all the presonal information, that user wants to show will contain on "About".User have option to hide all the information .

following information will contain in "About"

- Work and education
- PLece Lived
- Relationship
- Basic Information
 - Birthday
 - Relaionship
 - Status
 - Anniversary
 - Languages
 - Religious
 - Political
 - Family
 - Contact Information
- photo
 - all the photo have user's tagged

- Friends
 - what friend user had
- Note
 - What Notes user dropped and uploaded to facebook .
- Groups
 - What group have user join.
- Events
 - what Events user have.
- Likes
 - what page(unknow type) user liked.
- Apps
 - what apps user have.
- Books
 - what books page user liked/follow.
- TV programmes
 - what TV page user liked/follow.
- Films
 - What Films page user Liked/follow.
- Music
 - what Music(or stars) user liked/ follow.
- Sports
 - -what sport page user liked.
- Place
 - -where's the place that user had been .

8.5 wall

users wall

New feeds

User walls(TimeLine(facebook.ver)) Wall store all the post of the user posted since the account was created and the information about the user. other user can view the user's wall by clicking the name of the user. Other user can post on friends wall as well. In this case, both can delete the post. rather than that, the only one can delete the post is the user or manage. sorted by time.

wall contain : (middle part) all the post that friends posted to user all the post that friends mention user's name* all the post the user posted user profile picture change

(left hand side) About Photo Friend Place Sport Music

right hand side ad(can cancel by Ad block) time line

8.6 Chat System

allows user to chat with friends , there's different state of friends shows on the screen, and the system will record the time of when user offline, and have the user read the message .

state of friends :

- online
- offline
- using mobile login

function of user can do in chat room:

- add more friends to chat room
- video calling
- sending files
- sending image
- mute conversation
- clear window
- report as spam link

Setting of chat system:

- Chat Sounds on/off
- user can allow specify friends see his online
- user can choose the state as "offline"

Appendices

Appendix A

Deadlines

- **2014-01-31** topic and team
- **2014-02-14** requirements
- **2014-03-14** design
- **2014-05-09** portfolio & individual submission

Appendix B

Licence

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Choose a licence

Todo list

| | |
|--|----|
| citation needed | 4 |
| Talk about TLS, end-to-end crypto | 4 |
| pretty dataflow diagrams | 6 |
| Replace task partitioning placeholders | 10 |
| choose programming language | 11 |
| Talk more about tools, specifically about communication between group members | 11 |
| update with names of associated works as project continues | 12 |
| this was missing from the original commit too | 14 |
| Choose a licence | 24 |