A New Policy Enforcement Scheme for Utilizing Privacy and Security Policies in Facebook

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Abstract

Online social networks (OSNs) have tremendously increased number of user's attention in its growth in recent years and become a *web* portal for thousands of millions of Internet users. These social networking sites help us to maintain existing relationships between users nearby available and those who located far away with pictures and messages and greetings and establish new ones relations by reaching the people whom we never met before. It is also becoming a online community based portal for users to inform the users activities and movements to people who live around the world. In the online social networks like Facebook we create friendslist to classify easily the friends into own groups and also to assist or monitor users in controlling access to their information. In this paper, we mainly concentrate on the effectiveness of FF's from two aspects: Friend Management and Policy Patterns by examining how the facebook users build their individual own friendlists and to what extent they use them in their policy templates for preserving the information. For doing this we designed a new access control model to capture the essence of multiparty authorization requirements. In this OSN, we are also giving highest security for the Owner posted images in the form of comments and replies given by various Stakeholders and Accessors, which is not at all implemented in any Social networking sites till today.

Keywords

Online Social Network, Multiparty Access Control, Security Model, Policy, Access Control, Grouping, Privacy.

1. Introduction

Online social networks (OSNs) such as Facebook, Google+, and Twitter and a lot more sites are mainly created or designed to enable a lot of people to share their personal opinions and public information and make social connective relations with friends, family members, neighbors, coworkers, colleagues, childhood friends, and college mates. As it is vastly increasing its users registered in these sites, in recent days we have observed a tremendous, uncountable and unpredictable growth in the application of OSNs. Suppose, if we take facebook as example for online social network, which is one among the various social network sites, recently claims that it has more than 850 million active users who participate in facebook and over 35 billion pieces of application content (I.e. web links, news stories, blog posts, notes, photo albums, etc.), shared each and every month [1]. To give highest protection for the user data that is posted in that site, they proposed an access control mechanism as a major central feature of OSNs [2], [4].

In the OSNs like facebook, till the beginning of year 2007 there was no facility for organizing the FB users into groups or lists. So this feature was enabled in the year 2007 where FB users gained success in organizing their large friend community network into groups, Lists [3]. A recent study tells that, FB improved the FL feature by

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standardizing lists into the following three major categories:

- **Close Friends List:** This is mainly used for the facebook user to place his top priority friends in this list.
- **Acquaintances List:** This is mainly used for the ones that user keeps with a mute button pressed. Their updates will hardly appear in the homepage news feed. So such a kind of users is placed into this list.
- **Smart List:** This is mainly used for appearing with lightening icon and are automatically created and populated for each new workplace, city or school that the user adds to his profile based on his area of interests.

In each and every social network site there is a common facility for each and every user who registered in this OSN with a virtual space containing their profile information. This virtual space is also known as ***wall*** in the OSNs, where this is used to place his/her personal activities, events, wishes and a lot more updates. A user profile usually contains information like his/her birthday, area of interests, tastes, hobbies, gender, education and work history, and contact information. For example, in Facebook, users can allow *friends* [5], *friends of friends*, *groups* or *public* to access their posted data, depending on their personal authorization and privacy requirements.

In this paper, we collected real user profile data and photo privacy policies from online social network sites. We finally collected the control access policy data of several Facebookers through our FB survey application, which is permitted by our college Management. Using this research data, we analyze the effective usage of FLs from two aspects: 1) Friend management, 2) Usage in policy patterns for setting exceptions.

2. Background Work

Kelley et al. [6] who also did a lot of research work in the field of access policy settings in facebook have majorly done primary work towards identifying how users try to create individual friend groups in FB. He through his research work identified finally four different methods of friend grouping and their results show that the type of mechanism used, affects the groups created. His research study tells that 30% of the users had FLs out of which 40% did not use them to control privacy settings. Those who had FLs never updated them.

We discuss various typical sharing mechanisms occurring in OSNs, where different users may have different authorization requirements to a single resource based on their area of interests. We specifically analyze three different sharing mechanisms:

1. profile sharing mechanism,
2. relationship sharing mechanism and
3. content sharing mechanism

Profile Sharing Mechanism:

This profile sharing mechanism is one of the best sharing mechanisms among all, where a disseminator user can share the profile attributes of other's to access the information or both the owner and the disseminator of the FB can specify access control policies to restrict the sharing of profile attributes.

Relationship Sharing Mechanism:

This relationship sharing mechanism is also one of the best sharing mechanisms among all, it is used to show a relationship sharing mechanism where an owner, who has a relationship with another user of FB called stakeholder, shares the relationship with an accessor. In these types of scenarios, authorization requirements from both the owner and the stakeholder should be considered for accounting. Otherwise, the stakeholder's privacy concern may be violated.

Content Sharing Mechanism:

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This content sharing mechanism clearly tells that where the owner of content shares the information with other OSN members and the content information have multiple state holders who may also want to involve in the control of content sharing.

3. FB Data Collection

In order to test the application with various access policy patterns on real profile data and privacy policies, we developed a FB survey application using the FB APIs. The survey comprised of questions for gathering users' privacy concerns. Here in order to collect the data as a recruiter, we have collected data from various students who are studying in our college and we have selected some students as volunteers with permission from our college Head of Department of CSE Dept, Vizag Institute of Technology, for collecting data in and around our Visakhapatnam city. A total of more than 100 participants' profile and privacy policy data was collected. 63 out of these were male and 37 were females. 57% of them had ages in the range 15-25, 37% in the range 25-35 and 6% in the range 35-70.17.5% had post grad school as their highest education. 10% had college and 62.6% had high school as their highest education.

4. Data Analysis

This Section mainly deals with analysis of various metrics based on user collected FB data. Majorly we discuss on friend management and policy patterns for the Face Book.

4.1 Friend Management

In order to find how well the users manage their individual friendlists in their facebook or any social network applications, we set out to various statistics notations and finally determine how users build their Friend Lists:

4.1.1 Friend List Statistics Method

These friendlist statistics are mainly classified and determined by the following three metrics, which we have discussed below in brief.

- **Frequency w.r.t FL Type Metric:**

  In this first metric, we calculate the average number of FCFLs and UCFLs.

- **FL Size Metric:**

  Here in this metric, we measure the average list size. The total number of users that are present in the list is identified from this metric

- **Friend Coverage Metric:**

  In this metric, it clearly specifies how many of the user's friends fall in at least one FL and is defined as

$$\frac{No.\ of\ friends\ in\ FLs}{Total\ No.\ of\ friends}.$$

4.2 Policy Patterns

A policy pattern enforcement mechanism is in the form of binary condition where a combination of two possibilities like allows and denies rules for access to information by friends. It can range from being public access to moderately private access i.e., allowing all friends or denying specific FLs to extremely private i.e., allowing or denying specific users only. The collected privacy policies and FL membership information from various college students was used to extract the policy patterns. We divide these policy patterns into two categories: 1) Custom 2) Default.

5. Implementation Modules

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in giving the user, confidence that the

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new system will work and be effective. The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods. The proposed consists of totally five modules:

1) Owner Module
2) Contributor Module
3) Stakeholder Module
4) Disseminator Module
5) MPAC Module

1) Owner Module

In this Owner module let *d be* a data item in the space m of a user *u* in the social network. The user *u* is called the owner of *d*. The user *u* is called the contributor of *d*. In this module the owner and the disseminator can specify access control policies to restrict the sharing of profile attributes.

2) Contributor Module

In this Contributor module let *d* be a data item published by a user *u* in someone else's space in the social network. The contributor publishes content to other's space and the content may also have multiple stakeholders. The memory space for the user will be allotted according to user request for content sharing. A shared content is published by a contributor.

3) Stakeholder Module

In this Stakeholder module let *d* be a data item in the space of a user in the social network. Let *T* be the set of tagged users associated with *d*. A user *u* is called a stakeholder of *d*, if $u \in T$ who has a relationship with another user called *stakeholder*, shares the relationship with an *accessor*. A shared content has multiple stakeholders.

4) Disseminator Module

In this Disseminator module let *d* be a data item shared by a user *u* from someone else's space to his/her space in the social network. The user *u* is called a disseminator of *d*. A content sharing pattern where the sharing starts with an *originator* (*owner* or *contributor* who uploads the content) publishing the content, and then a disseminator views and shares the content. All access control policies defined by associated users should be enforced to regulate access of the content in disseminator's space.

5) MPAC Module

MPAC module is used to prove if our proposed access control model is valid. Our policy specification scheme is built upon the proposed MPAC model.

6. Experimental Results

In this section we mainly discuss the results of our analysis for each of the metrics described in the previous section.

A. Friend Management Result

Our new prototype application which is shown clearly in figure .1 enables multiple associated users to specify their authorization policies and privacy preferences to co-control a shared data item

B. Policy Patterns Result

We observed that the users in our study set the following access control policies over their photo albums. They are as follows

Custom

1) Allow some friendlists and deny none
2) Allow some friendlists and deny some friends
3) Allow some friendlists and deny some friendlists
4) Allow all friends and deny some friends
5) Allow all friends and deny some friendlists
6) Allow some friends and deny none

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7) Allow some friends and deny some friends

Default

1) Allow me only and deny none
2) Allow everyone (Public) and deny none
3) Allow friends only and deny none
4) Allow friends of friends (FoF) and deny none
5) Allow friends and networks and deny none

Also we observed that the users in our study set the following access control policies over their photo album user's comments and replies:

Custom

1) Allow all Stakeholders comments by OWNER.
2) Allow only comments posted by individual Stakeholder and deny others.
3) Allow only own replies of OWNER by Stakeholder and deny Other's replies.

Default

1) Allow all stakeholders comments by OWNER.
2) Allow user to view all comments posted by every Stakeholder and deny none.
3) Allow all replies of OWNER by Stakeholders, Accessor and deny none.

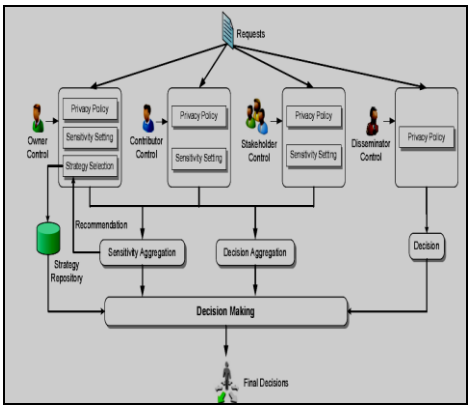

Fig. 1. System Architecture of Decision Making in MController

7. Conclusion and Future Work

In this paper, we have studied Facebook friendlists through the collection and analysis of various Facebook users' real profile information and photo privacy policies. After the research work done on various college students real profile information's, the effectiveness of Friendlists feature was analyzed from two aspects by the : 1) Organizing friends and 2) Setting exceptions in policies. A multiparty access control model was formulated, along with a multiparty policy specification scheme and corresponding policy evaluation mechanism. In addition, we have introduced an approach for giving security for posted comments for uploaded image by owner as well as replies that are posted by owner for the posted comments.

As part of future work, we are planning to investigate more comprehensive privacy conflict resolution approach and analysis services for collaborative management of shared data like audios and videos or any form of data in OSNs.

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