

Privacy Management for Online Social Networks

Gorrell P. Cheek, Mohamed Shehab
 College of Computing and Informatics
 University of North Carolina at Charlotte
 Charlotte, NC
 gcheek, mshehab@uncc.edu

ABSTRACT

We introduce a privacy management approach that leverages users' memory and opinion of their friends to set policies for other similar friends. We refer to this new approach as Same-As Privacy Management. To demonstrate the effectiveness of our privacy management improvements, we implemented a prototype Facebook application and conducted an extensive user study. We demonstrated considerable reductions in policy authoring time using Same-As Privacy Management over traditional group based privacy management approaches. Finally, we presented user perceptions, which were very encouraging.

Categories and Subject Descriptors

D.4.6 [Security and Protection]: Access Controls; H.5.3 [Information Interfaces and Presentation]: Group and Organizational Interfaces

General Terms

Security, Human Factors

Keywords

Privacy, Access Control, Policy, Social Network

1. INTRODUCTION

The large amount of content online coupled with the significant number of users makes maintaining appropriate levels of privacy very challenging [1]. We believe that tools need to be placed in the hands of users to aid them in managing their privacy. We aim to provide an improved approach for managing access to user profile data/content in online social networks. Our contribution is two-fold: First, we introduce a privacy management approach for online social networks that leverages users' memory and opinion of their friends to set policies for other similar friends, which we refer to as Same-As Privacy Management. Using a visual policy editor that takes advantage of friend recognition and minimal task interruptions, Same-As Privacy Management demonstrated improved performance and user perceptions over traditional group based privacy management approaches. Second, we implemented a prototype Facebook application and

conducted an extensive user study evaluating our improvements to privacy management in online social networks.

2. SAME-AS POLICY MANAGEMENT

In group based privacy management, the user must first group their friends. After which, they must select group permissions (setting the group policy). Finally, friend-level exceptions to the group policy are set. The user's attention (mental model) is focused on multiple areas. Whereas, in Same-As Privacy Management, the user's attention is focused on a specific friend. The user leverages their memory and opinion of a friend to set policies for other like friends. In essence, we use a friend recognition approach, with minimal task interruptions, to aid the user in setting policies [2]. A representative friend is selected (Same-As Example Friend), profile object permissions are assigned to this example friend and other similar friends (Same-As Friends) are associated with the same set of object permissions. Figure 1 illustrates our model. In the figure, the Same-As Example Friend is depicted in front of the user's other similar friends who have been assigned the same set of object permissions.

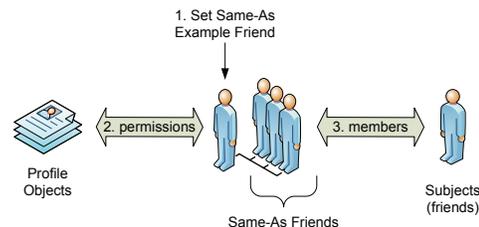


Figure 1: Same-As Privacy Management Model

First, the user selects a friend (Same-As Example Friend) that is representative of a subset of their friend set. The notion is that we all have subsets of friends that have similar levels of trust. The user selects one easy to remember friend from each subset as its respective representative.

Second, using our visual policy editor, the user assigns the appropriate object permissions for each object within their profile to this Same-As Example Friend. For the purposes of our prototype, we presented three profile object categories: *Albums*, *About Me* and *Education and Work*. Within each profile object category, objects are presented. For example, *About Me* includes Birthday, Status, Current City, email, etc, see Figure 2. The user can allow or deny access to any profile object or object category by simply clicking on the object or object category. For example, if the user doesn't want the Same-As Example Friend to have access to a spe-

cific photo album, they merely click on that album and the object permission is set to deny. The selected photo album will be grayed out. Or, for example, if the user doesn't want to allow access to any of their education and work information, they click on the object category *Education and Work* and the entire object category will be grayed out, thus effectively setting the permissions to deny for each profile object within that category. Any permutation of permissions are allowed.

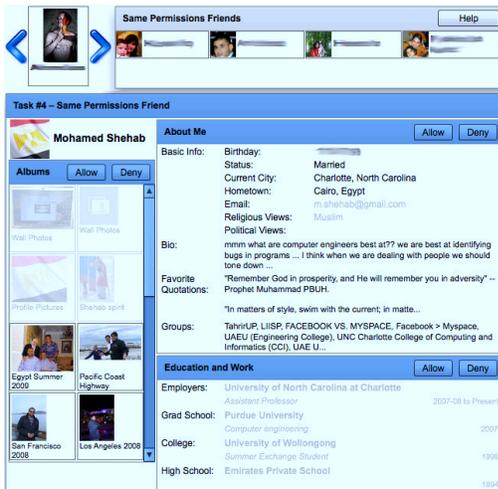


Figure 2: Visual Policy Editor

Third, after the permissions are set for the Same-As Example Friend, other like or similar friends (Same-As Friends) are assigned to the policy. The visual policy editor presents to the user their friend set, where the user can associate a friend to an already defined Same-As Example Friend. Or, the user can designate a friend as a new Same-As Example Friend, thereby setting a new policy which would be assigned to other similar friends.

3. STUDY RESULTS

We compared the policy authoring times between Group Based Privacy Management and Same-As Privacy Management. In analyzing these results, we found that there is statistical significance across all Westin user categories [3], i.e., Unconcerned Users ($p = 0.036$), Pragmatists ($p < 0.001$) and Fundamentalists ($p < 0.001$). Overall, Same-As outperformed Group Based in policy authoring time. Across the board, we observed more than a two-fold decrease in the amount of time it took a user to author their policy. One factor attributing to this reduction is the steps involved in authoring a policy. Group Based approaches have three distinct steps: 1) group friends, 2) set group policy and 3) assign friend-level exceptions. Using this approach, the user first focuses on the friend's relationship in order to group them appropriately. Next, the user switches their attention to the group in order to set the group policy. Finally, the user switches their attention back to the friend in order to set any friend-level exceptions to the group policy. Whereas, using our Same-As approach, the user simply leverages their memory and opinion of a friend to set policies for other similar friends. As a result, users can author policies in less time and thus ease the burden associated with managing their online privacy settings.

We measured Policy Openness relative to a user's profile object (i.e., email address) and found, for Unconcerned Users, no statistical significance between Group Based and Same-As ($p = 0.596$). Unconcerned Users have "little problem with supplying their personal information" to others in either approach. However, we do see statistical significance between Group Based and Same-As for Pragmatists ($p = 0.006$), Fundamentalists ($p = 0.022$) and for the population as a whole ($p = 0.002$). Using Group Based, users associate the policy with a group. Whereas, using Same-As, users associate the policy with a friend and in doing so have the friend in the forefront of their mind. This allows users to be more selective and careful in assigning permissions. Users are thinking of people, not groups. In addition, as would be expected, our results show that Fundamentalists write more conservative policies than Pragmatists and Unconcerned Users.

Overall, users found Same-As easier to use than Group Based, 5.97 versus 5.38 on a 7 point Likert-scale, where 7 is Strongly Agree. We found statistical significance in our comparison ($p = 0.007$). Using Same-As over Group Based, we observed statistical significance and improved Ease of Use ratings for Unconcerned Users ($p = 0.045$) and Pragmatists ($p = 0.008$). We attribute the improved ratings to reasons similar to what was discussed with regard to the reduction in policy authoring time: reduced number of steps for authoring policies, our visual policy editor and consistent focus with limited memory interruption. However, from an Ease of Use perspective, there was no statistical significance for Fundamentalists ($p = 0.604$). One possible reason is that fundamentalists are very concerned about privacy and may consider privacy "hard" to attain regardless of the approach.

Users found Same-As to be substantially more readable than Group Based. There is statistical significance across all user categories. We attribute these high ratings to the simplicity of the Same-As approach. Users could easily understand who had access to what profile object. Users found the organization of the information on the screen to be decipherable and ease to read. Using Same-As, a user need only to recall their opinions of their friends in order to set access control policies. This was accomplished all on one screen. Whereas, the Group Based approach was more complex with multiple steps and screens.

4. CONCLUSION

We introduced Same-As Privacy Management, which leverages a user's memory and opinion of their friends to set policies for other similar friends. Our visual policy editor uses friend recognition and minimal task interruption to obtain substantial reductions in policy authoring times. In addition, Same-As Privacy Management was positively perceived by users over traditional group based approaches.

5. REFERENCES

- [1] J. Bonneau and S. Preibusch. The privacy jungle: On the market for data protection in social networks. In *WEIS'09*, 2009.
- [2] S. T. Iqbal and B. P. Bailey. Investigating the effectiveness of mental workload as a predictor of opportune moments for interruption. In *CHI'05*, 2005.
- [3] P. Kumaraguru and L. F. Cranor. Privacy indexes: A survey of westin's studies. *ISRI Technical Report*, 2005.