

Online Social Networks: Privacy Challenges and Proposed Security Framework for Facebook

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Abstract- Social networking sites facilitate and develops a virtual community for people to share their thoughts, interest activities or to increase their horizon of camaraderie. With the advancement in Social networking sites or we can refer it as with online social networks the user can connect to each other. With all these options available on Social Networking sites it creates a virtual world for the users. Social Networking sites go upwards because of all these reasons. In recent years indicates that for many people they are now the mainstream communication technology. Social networking sites come under few of the most frequently browsed categories websites in the world. Nevertheless Social Networking sites are also vulnerable to various problems threats and attacks such as disclosure of information, identity thefts etc. Privacy practices in social networking sites often appear convoluted as information sharing stands in discord with the need to reduce disclosure-related abuses. Facebook is one such most popular and widely used Social Networking sites which has its own robust set of Privacy policies. Yet they are also prone to various privacy issues and attacks. In this work we examine the currently existing privacy policies of Facebook since 2013 and then provide with certain new policies that enhance and strengthen the existing ones. We conclude with a discussion of how these educts may be integrated into the design of Facebook like Social Networking sites systems to facilitate interaction while enhancing the individual privacy.

Index Terms—Social networking sites (SNS's), Cyber Stalking, Cyber Bullying.

I. INTRODUCTION

A social networking service is an online service, platform, or site that focuses on fascinating the building of social relations among people who, for example, activities, share interests, background, or real-life connections[7].

Advancement on Online Social Networks the user can connect with their friends very easily. They can share data or view pictures, Videos of each other. Because of all these reasons growth of SNS in recent years indicates that they are now a mainstream communications technology for many people [8]. The people who are using social networking sites see them as fun and easy leisure activities. By enhancing their social circle, users have the opportunity to commune with people who have the same interests. In today's scenario Social networking site are most widely used websites in world, with Facebook being the second most visited site on internet world wide first being Google. As on July 2013, Facebook has more than 1.20 billion active users[1] and the revenue generated by Facebook alone is 3.91(approx) million dollars[1].

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Facebook is good for engaging consumers and consequently gaining valuable momentum of oral communication. The main way to get involved is to make a fan page that offers something valuable to the consumer like interesting group conversations, tools or casual games for convenience. The end-goal for gaining oral communication value is to get consumers to "like" your fan page. When they do, it's announced on their feed to all their friends and the fan gets regular updates from the brand. While brand can do much more on the Facebook platform than on Twitter and Youtube. In the end most successful initiatives have been driven by promotions, similar to Twitter. Here privacy is an important possession. We find it difficult to stifle our curiosity about others [10]. Today Social networking site is just not an entertainment websites, but one of the most important communication medium in today's world. Nonetheless there have been always a privacy and secrecy concerns about misusing the crucial information by internet perpetrators. Also Social networking site are a perfect platform for virus authors to spread their malwares faster than traditional methods.

Facebook scams recently hits the headlines in the Internet fraud world. The Wall Street Journal [10] released an alarming reported, sending several into a frenzy regarding the privacy of their Facebook profiles. What WSJ found is that several Facebook apps are sending user Ids to third parties, like advertising networks. Facebook issued a statement for these privacy concerns saying "This is a more complicated technical challenge addressed last spring on facebook.com. So from all these secrecy issues and discussion privacy is in apex. By providing a set of privacy policies we can control the access of the information content that is available. While studying and exploring various privacy issues related to SNS's, we found that the current preventive measures suggested or applied on Facebook are still vulnerable and probably not sufficient for the user to control the access of their data.

In this research paper we have surveyed the existing privacy policies of Facebook and found some vulnerability on these policies. Additionally we have proposed some new privacy policies to strengthen the existing ones. As a conclusion we have integrated our policies into a Facebook like SNS's system for enhancing individual privacy.

II. BACKGROUND

Social networking service [7] is a platform, online service or site that focuses on facilitating the building of social networks and relations among people who can share their interests, activities, real life

connections. A social network service consists of a representation of each users profile, his/her social links, and a variety of additional services. Social network service usually means an individual-centered service whereas online community services are group centered. Geocities was the first web-based social networking site develop in 1994. In 1995 THEGLOBE.COM emerged allowing users to publish their content and interact with the other users sharing same interests. In 1997 AOL INSTANT MESSANGER was launched which popularized the concept of instant messaging. SIXDEGREES.COM was also launched in the same year which allowed users to create their individual profiles and listing friends.

Friendstar was the real breakthrough in the field of social networking. Launched in 2002, Friendstar was the pioneer of using the concept of online networking between the real friends. In 2003 MYSPACE was launched which was a Friendstar clone at the initial phase but still popular in those years. In 2004, Harvard University launched as a way of connecting all the U.S. college students launch FACEBOOK.

Many type of Social networks available. This fact sheet examines privacy and security implications of using a few of them. While this fact sheet does not address every type of social networks, many of the security and privacy recommendations are applicable to other type of networks.

- Personal Networks-This networks permit users to create detailed online profiles and connect with other users. These involve users to share one's gender, age, employment, personal contact information as well as file and links to music, photos, videos where sharing person is authorized or not.
- Status Update Networks- These are designed to permit users to post short status updates in order to communicate with other users rapidly. For example, Google Buzz Twitter. There may be privacy settings to restrict access to status updates.
- Location Networks- With the advent of GPS-enabled cellular phones, location based networks are gaining popularity. These networks are designed to broadcast one's real-time location, either public information or as an update viewable to authorized contacts. Some examples include Brightkite, Foursquare, Loopt and Google Latitude.
- Content -Sharing Networks- This is a sharing based social networks which is designed to share music, photograph, videos. When these websites introduce the ability to create personal profiles, establish contacts and interact with other users, they become social networks. Some popular content sharing networks are Flickr, Youtube, thesixtyone.
- Shared-Interest Networks- Some social networks are built for a common interest for specific group of people. These are slanted toward a common subset of individual, such as those having common hobbies. Educational backgrounds, religious views, political affiliations, sexual orientations or other defining interests. Examples include LinkedIn, Goodreads Black Planet and Gay.com.

III. PRIVACY ISSUES IN SOCIAL NETWORKING SITES

Social networking sites can control accessing users to their own profile but they cannot control what others may represent about them. Friends can sometimes disclose more information about the users than they should, hence we can say them untrustworthy. Concept of third party application in today's SNS's also pose severe privacy threat. Without allowing the permission to access all of their public and private data, SNS's users cannot add an application to their profile. Facebook additionally gives third parties second degree access, for example when Robert installs a third party application it can also request information about his friends and network members. It is shown that only 9.3% of Facebook application require access to private data[3]. Advertising is the main source of income in most of the SNS's including Facebook. These SNS's allow merchants and third parties to take advantage of user information without their agreement. Some important privacy issues in Social networking sites are[1]

- SNS's currently available today does not aware use of the risks of revealing their personal information
- The privacy tool are very complex to understand and to use them due to which people feed up and they end up doing nothing.
- Users can control who can access what in their profile but cannot control what others reveal about you.
- Privacy tools or options can provide options with "Friends" ," Friends of Friends" or "Everyone", with Facebook providing much more facility to customize number of options according to which friends can access particular part of the data, but it is not yet simplified[3].
- With the third party integration it becomes more risky that your information is being shared among various marketers i.e. they may collect your email address from these sites to target you as an audience for their product.[2]

These were few of the privacy issues related to SNS's. By identifying these issues and studying the existing solutions we proposed a privacy framework that will cover most of the points which are not mentioned in the previous research work and yet not implemented in the Social networking sites.

A. Privacy Threats

According to Bonneau et al. [6], SNS's with enhanced privacy policy have better functionality as well as higher growth rate. They also observed that long time standing SNS's have more extensive privacy methods as compare to newer ones. So it can be concluded that people are more interested in joining SNS's having extensive privacy policy. Threats regarding privacy issues are classified as follows:

- **Browsing User Activities-** Public personal information on users profile is vulnerable to be downloaded by third parties such as search engines and social network aggregators and simultaneously there is a risk of developing history record of each user over time. Furthermore information about user's online behaviour like visited

profiles and also the specification of network settings such as IP address of user's machine may be monitored and logged by Internet Service Provider(ISP) and other similar third parties.

- **Disclosing User's Identity-** SNS's encourages users to share a profile image. As a result there is a risk that technologies like Content Based Image Retrieval(CBIR) by inspecting the specification of an image could reveal details such as place from which the image was taken. Many people may not be aware of the usage of their personal images or videos by other users within SNS's. As in most SNS's users are able to share any images or videos regardless of who is in the images or videos. Therefore there is a high risk of exposing user identity and location even sometimes without their knowledge.
- **Cyber-Stalking, Cyber-bullying, harassing, Slandering-** The most ideal privacy level is sharing information to only user's friend or group of users. This rule is however vulnerable to cybercriminals who pretend themselves as a friend using fake name and gain access to all information shared by nave users. Many participants desire to be connected to more users and groups which make them insecure to cyber stalking, cyber bullying, harassing.
- **Eavesdropping-** Millions of users everyday connect to SNS's from mobile devices. It is also expected that many users connect to the Internet from public places through vulnerable wireless access points. Most current SNS's provides insecure communication layer and as a result of these vulnerabilities there is a risk of capturing the transmitted data by sniffing tools.

B. Requirements in Privacy

Crutz defines privacy as a due that enables users to have 1. Control of disclosures 2. Control of personal data 3. The right of being left alone. Additionally Cutillo et al[12] state that an ideal SNS's should fulfil the following privacy requirements[12]:

- **End-To-End Confidentiality-** All interactions are needed to be confidential and only sender and receiver should have access to the data.
- **Privacy-** Personal information of a user should not be disclosed to any party apart from these explicitly mentioned by the user.
- **Access Control-** User should be able to manage access control of their profiles as well as attributes of their profiles.
- **Authentication-** For satisfying the previous requirement receiver of a message should be able to authenticate the sender of the message.
- **Data Integrity-** For each swapped message whether it is a response or a request, original authentication and also modification detection are needed to be performed.
- **Availability-** Public data has to be always accessible and all messages should be delivered in time.

IV. PROPOSED TECHNIQUES

To best of our knowledge, the current researches do not solve all the privacy risks in SNS's. The focus is on interaction and sharing information between users and concern about users privacy. Solution provide the complete

privacy framework that is not applicable to the existing SNS's but are applicable when someone builds a new Social Networking Site, then we can use those privacy policies. Based on the above discussion of threats in SNS's our research is on three things:

1. Exploring Facebook existing privacy policies.
2. Finding vulnerability in existing privacy policy.
3. Proposed enhanced privacy policies that will compete with the existing ones as best as possible.

The enhanced privacy policies that we have proposed and implemented is discussed in the next subsection:

A. Proposed Privacy Policies

Here we propose certain privacy policies that serve as a resolution for the privacy issues identified in previous section

Policy number 1-If a person tags a user on his/her image then user has two options viz. like or unlike. As per new policy, if a user likes the tag then it will appear on user's profile and if he unlike the tags then the tag will completely removed from SNS's like Facebook i.e, no other user will be able to see it.

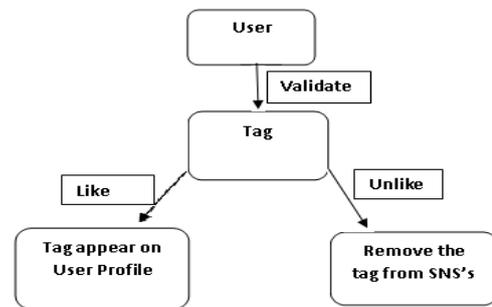


Fig.3.1 Image Tagging Policy

Reason:- User can control the information or access to his data but cannot control what other reveal about him.

Policy number 2- Disable right click on the image

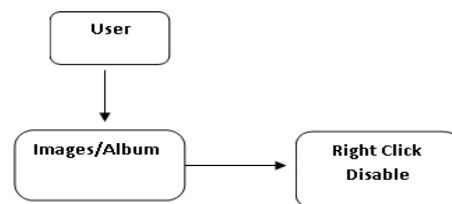


Fig 3.2 Right Click Disable policy

Reason:- The reason for above point is that today we have many tools for editing images. If a user uploads an image and an intruder or friends downloads the image and edit it into something inappropriate then they will harm the reputation of the particular user.

Policy number 3-Provide the user with an option to customize on "Who can post on a user's wall and from whom he/she want to get updates".

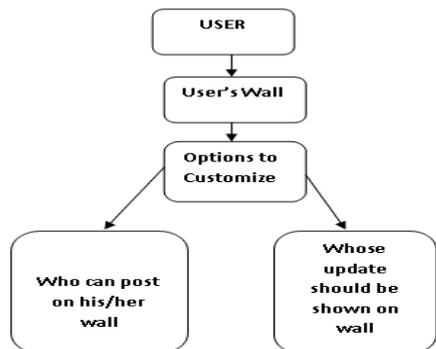


Fig 3.3 Wall Post and Updates Policy

Reason:- Today's SNS's like Facebook provides many options to customize Privacy settings however within that it does not provide the facility to customize, who can post on a user's wall and from whom he/she want to get the updates. There may be people who can post inappropriate content on a user's profile, which needs to be controlled.

Policy number 4- If there is an application which needs our E-mail address to be used, then we should get a warning/notification before proceedings forward so that if we want to proceed we can say Yes otherwise No.

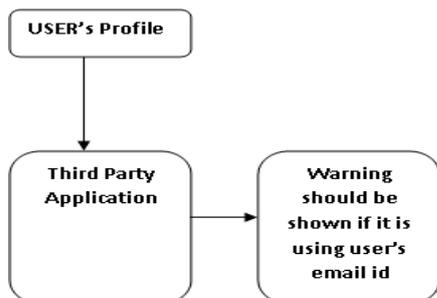


Fig 3.4 Third Party Application Policy

Reason:- Having the third party integration it becomes difficult to identify that any App is using which part of our data and we blindly allow access to these kinds of Apps. As it's aftermath our private information may get disclosed. Email address is considered as one of the critical data which many business require, to target a specific audience and to increase their productivity.

Policy Number 5- Wall Post screening/ filtering for contents being posted by friends is currently not an option for any Facebook user however it becomes a critical and needful requirement in certain scenarios

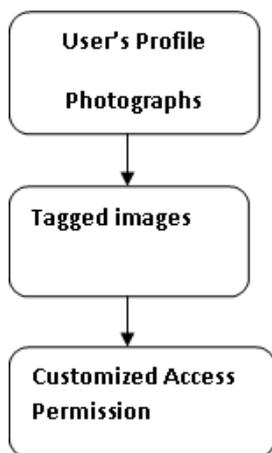


Fig 3.7 Visibility of Post policy

Reason:- When we post any message on a user's wall then the visibility of that post is governed as per the privacy policies of the user on

Fig 3.5 Access Customization on Tagged Images Policy

Reason:- By accepting a person as a friend we allow them to post contents on our wall. However there may be casual friends of a user in his/her profile who may not be trusted. There may be occasions when they may post something which is abusive or obscene, inappropriate. To overcome this problem we propose to use a pool of certain keywords that should be used to screen any content posted by a friend on user's wall.

Policy number 6- Option to customize the visibility of comments on the post.

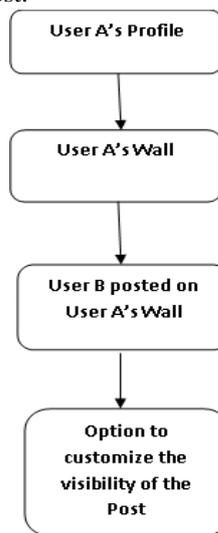


Fig 3.6 Visibility of Comment Policy

Reason:- The friends who are not friends with each other should not be able to view each other's comments on a post updated by their common friend.

Policy number 7- Option to customize the visibility of post on other user's wall.

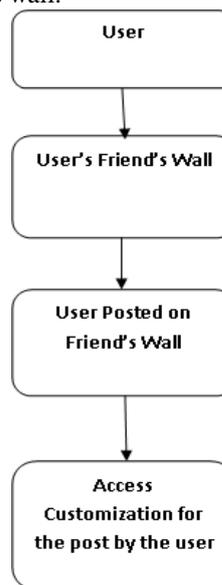


Fig 3.7 Visibility of Post policy

Reason:- When we post any message on a user's wall then the visibility of that post is governed as per the privacy policies of the user on

whose wall we posted. However in some situations user who is posting may want to control who among our common friends can view that post. This policy enables us to allow/disallow users among our common friends to view our post.

V. IMPLEMENTATION

In this section the privacy policies (proposed in section 4) have been implemented in a Social Networking Sites like Facebook prototype which is developed in php technology. We run this prototype in a UNIX environment having the Xamp Apache Server. This prototype website is not completely mirror image of Facebook but we have tried to make it more similar like Facebook The prototype website is categorized into three major module on which user can interact

1. User Module
2. Front Module
3. Back Module

User Module- The main purpose of designing this module is to handle all the user related detail.

- Login Page
- Registration Page
- Forgot password Page

Front Module- The main purpose of this module is to implement all the proposed privacy policies which we have discussed in the earlier sections. The module covers the related detail.

- Chat Module
- Wall Module

Back Module- The purpose of designing this module is to edit the basic user information like basic information, contact information etc. The module covers the related details.

- User Profile
- Cookies

VI. CONCLUSION AND FUTURE WORK

The conclusion of our work includes the survey of the existing privacy policies of Social Networking Sites and focuses on the Facebook. And we have proposed some new privacy polices framework and implemented three of the policies on a Facebook prototype which we have developed.

Future work includes the implementation of all the proposed privacy policies in this Facebook prototype. Apart from this still there is a lot of research work is required in the field of privacy of SNS's.

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