Impact of the social networking applications for health information management for patients and physicians

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Abstract. Most social network users hold more than one social network account and utilize them in different ways depending on the digital context. For example, friendly chat on Facebook[2], professional discussion on LinkedIn[3], and health information exchange on PatientsLikeMe[4]. Thus many web users need to manage many disparate profiles across many distributed online sources. Maintaining these profiles is cumbersome, time consuming, inefficient, and leads to lost opportunity. In this paper we propose a framework for multiple profile management of online social networks and showcase a demonstrator utilising an open source platform. The result of the research enables a user to create and manage an integrated profile and share/synchronise their profiles with their social networks. A number of use cases were created to capture the functional requirements and describe the interactions between users and the online services. An innovative application of this project is in public health informatics. We utilize the prototype to examine how the framework can benefit patients and physicians. The framework can greatly enhance health information management for patients and more importantly offer a more comprehensive personal health overview of patients to physicians.

Keywords. Social networking, eHealth, Decision making, Healthcare, Online profile, Health informatics

Introduction

Web-based social networking services have become increasingly important in recent years. The services are widely applied in fields such as education, business, and health. Web-based social services allow individuals to communicate or interact with others, promote business, share health information with other patients or physicians. However, to date there is no central controlled integrator for users to manage their social network accounts and distributed profiles. This thesis focuses on designing a platform named Multiple Profile Manager (MPM) that enables users to create and control their own single profile, and more importantly share partial aspects of the profile with various social networks in the Onesocialweb[5] (OSW) federation.

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[2] http://www.facebook.com
[3] http://www.linkedin.com
[4] http://www.patientslikeme.com
[5] http://onesocialweb.org OneSocialWeb is a platform aims to define the language to bridge all social network sites and make it easy for social networks to join [1].

1. Scenario

Consider Bob, a steam turbine engineer who was exposed to loud occupational noise for at least six months per year. Bob already has a Facebook account, and he uses Facebook to communicate with his friends and share pictures and words with his family. In the Facebook profile, in addition to his basic information, such as his name, email address, telephone number, and home address, he also has specified his social information like interests, favourite food, and best dance moves. (1) Now, Bob wants to create several new social network accounts and utilise them in different ways depending on the digital context. First, Bob intends to expand his professional network and look for more business opportunities through LinkedIn. The LinkedIn profile is able to store Bob's professional information such as his working environment, working time, previous employment, areas of expertise, working pressures and risks. Then, Bob would like to create PatientsLikeMe and Disaboom[6] accounts to share treatment and symptom information with other people online. By doing this, his private doctor can monitor the progress of Bob's medical situation. (2) Bob decided to change his email address, and he wanted to update the email address in all the social network sites (SNSs) that he has registered in. Not only this, but Bob's health information has also changed. As a result, he needs to update the changes to his HealthVault, PatientsLikeMe, and Disaboom profiles respectively. (3) Bob is a person with chronic heart disease, and whenever he goes to see his private doctor, he will be asked to provide personal information about his daily life, work conditions, interests, and dietary habits, in as much detail as he can. The doctor requires this comprehensive knowledge to suggest the right treatment.

Current Approach

Under the current platform, Bob has to type his personal information into the LinkedIn, PatientsLikeMe, and Disaboom profile repeatedly. The profile data in these SNSs can never be shared and the information is not interoperable. Another limitation of the current social network framework is that updating profiles stored in two or more social network sites is cumbersome. As recent SNSs are isolated from others, the connection between different social networks is mostly lost. This causes Bob to have to repeat the operation of profile creation and updates.

When Bob's private doctor wants to access Bob's HealthVault account to monitor his health condition, s/he is limited to viewing Bob's healthcare records rather than a complete set of information including his habits, hobbies, diet, and working environment. Some of these elements are related to Bob's health condition, and it is important for Bob's doctor to know about them. However, there is not yet a service available that enables users to print or export an integrated profile report. The report should include Bob's personal information in as much detail as possible.

2. Use cases

Now, imagine Bob's case in light of the MPM, a large online platform that stores users' complete information including social, working, and health information. The MPM use cases are based on four main scenarios (Creation, Update, Export, and Deletion) whose actors are the MPM users, and four secondary scenarios

[6] http://www.disaboom.com

(Authentication, Authorization, Synchronization, and MPA Management) whose actors are the MPM Server (see Figure 1).

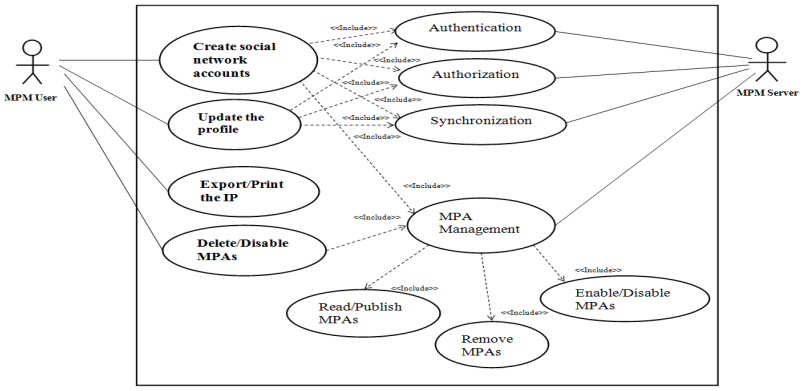

Figure 1. Multiple Profile Manager Use cases.

3. Prototype

3.1. Architecture

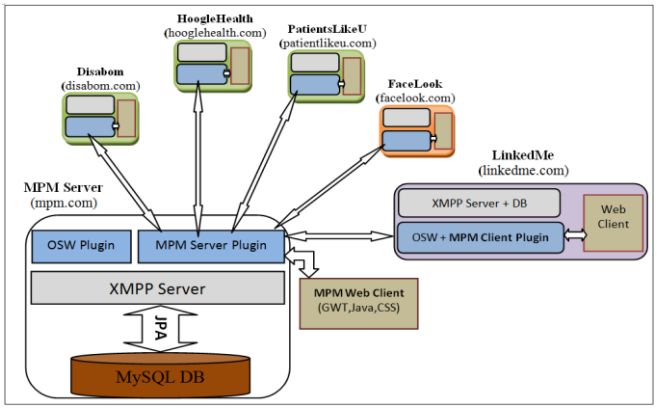

Figure 2. Multiple Profile Manager Prototype Architecture.

In line with the above scenario, we proposed a platform for overcoming the existing limitations in the management of the online profiles. To demonstrate the MPM platform, besides a Multiple Profile Manager Site (MPMS), five simulated social network sites (SNSs): FaceLook (facelook.com), LinkedMe (linkedme.com), HoogleHealth (hooglehealth.com), Disabom (disabom.com), and PatientsLikeU (patientlikeu.com) were established to replicate the five real SNSs: Facebook, LinkedIn, Google Health, Disaboom, and PatientsLikeMe respectively. These five simulated sites are able to cover the three SND in Figure 1.The architecture of the MPMS (mpm.com) and the five simulated sites are depicted in Figure 2, and detailed below.

The MPMS consist of two parts, the MPM Server for profile data storage and management; and the MPM Web Client for information request and display. The

structure of the MPM Server is composed of three main parts: the Database, XMPP [2] Server, and Server Plugin. In the middle layer, the MPM Server is based on the Extensible Message and Presence Protocol (XMPP) architecture. At the top layer the Server Plugin is made up of the OSW plugin enabling the OSW services on the MPM Server and the MPM Server Plugin which adds the MPM protocol support to the Server.

The other significant component of the MPMS is an http-based console interface for users, the MPM Web Client. It is coded in a browser-supported language JavaScript combining with the browser-rendered markup language HTML, and built with Google Web Toolkit (GWT).

3.2. Web Client Overview

The screenshots in Figure 3 present Bob's complete MPM Web Client. The MPM Web Client is a web-based application that enables users to execute the commands on the MPM Server. It allows users to create, edit, and save their Integrated Profile in the MPM Server, as well as activate, deactivate, and delete the Multiple Profile Accounts.

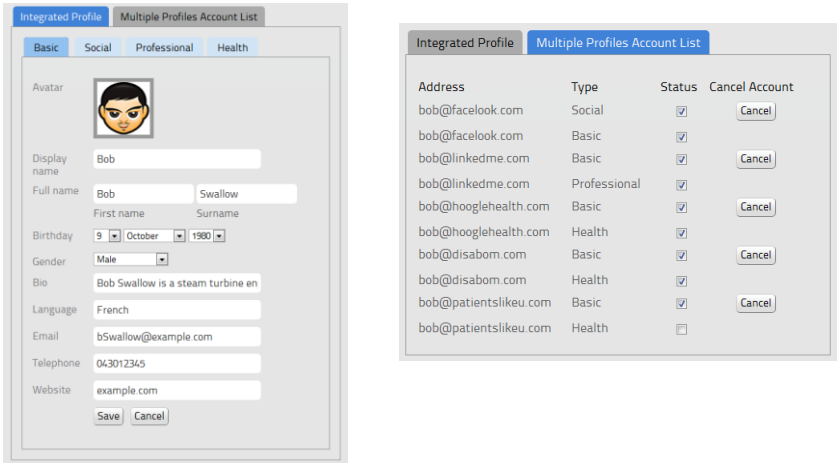

Figure 3. Prototype.

4. EHealth Scenario

Recently, the social-networking revolution came to the healthcare industry via online social networks that enable information sharing, collaboration and communication in the area of personal healthcare data [3]. However, most of the physician or patient social networks only pay attention to the user's healthcare profile which is stored in healthcare social networks. The healthcare profile stores users' health information like specific wellness, conditions, medicines, and allergies. However, factors, such as lifestyle, interests, exercise, interpersonal support, work environment, and job risk, could also be used to give a better understanding of a user's health background [4]. These factors are stored in the social profile of general social networks like Facebook and Hi5[7], and the professional profile of professional social networks such as LinkedIn

[7] http://www.hi5.com

and Jobster[8]. Consequently, health professionals may not be able to gain a total view of a person's health background because they do not have access to their patients' LinkedIn or Jobster sites.

Only an IP, which contains basic, professional, and health partial profiles together, could meet current online health informatics demands. For example, it is well known that high fat food may pose a serious threat of heart disease [5], but loud noises in the workplace doubles an individual's risk for heart disease [6]. Thus, for a patient with a chronic cardiac disease (e.g. Bob), an IP which includes complete personal information such as favourite foods, working conditions, life styles, health problems, and medications is able to provide a more comprehensive personal health overview for doctors than a single healthcare profile.

5. Discussion

Through the simulation, it can be concluded that the MPM can fit the actual requirements and be very valuable. The MPM facilitates the creation of new social network accounts by sharing profiles between these social networks, and simplifies the process of MP updates for users by profile synchronisation. The MPM has the ability to accelerate the development of web-based social networks.

The Multiple Profile Manger (MPM) propose in this research can be used as the integrator. The IP integrates a patient's medical profile (healthcare profile) into their complete private profile to provide a more comprehensive personal health overview for doctors. Poor patient data and incomplete personal information can impact on treatment and could possibly lead to a fatality. Using the new technology such as the OSW, semantic web, and XMPP to address the challenges of integrating multiple profiles is vital for the next generation of health informatics.

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