MULTI-DOMAIN CLOUD SOCIAL NETWORK SERVICE PLATFORM SUPPORTING ONLINE COLLABORATIONS ON CAMPUS

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Abstract: With the dazzling success that public social network services like Facebook, Twitter, and YouTube etc. have achieved during the past few years, a variety of specialized social network services, enterprise social network services, and campus social network services for colleges and universities have emerged and developed in recent years. Campus social network services orient at users on the same campus and focus on providing information sharing, knowledge sharing and especially online collaboration services. We propose the design of a multi-domain social network service platform supporting information communication, knowledge sharing and especially online collaborations in different aspects of colleges and universities including teaching, learning and research in the form of cloud service. The platform provides multi-level pre-defined and user defined groups in independent social domains. By this way, we can not only achieve a more natural convergence between user behavior patterns in the real world environment and that in the online environment provided by campus social network services; but also realize the sharing of management and service responsibilities of campus social network service between management sectors and IT sectors in colleges and universities.

Keywords: Social network service; Multi-Domain; Online collaborations; Cloud service; Multi-level groups

1 Introduction

After the launch of public social network services like Facebook, Twitter, and YouTube etc. in 2006, public social network services have gained the favor of hundreds of millions of Internet users in just a few years. Social network services, also called social network sites or social network systems is defined as web-based services that allow users to construct a public or semi-public profile within a bounded system, articulate a list of other users whom they share a connection, and view and traverse their list of connections and those made by others within the system [1].

On one hand, public social network services encourage users to use their real names and build connections with their real world friends like classmates, colleagues, and family members etc. By this way, its users are considered as more reliable compared with users in traditional BBS systems. On the other hand, most public social network services incorporate News Feed feature which can facilitate users to read messages from their friends and get the up-to-date status of their friends with only small cost. If search engines represented by Google are regarded as providing the service of access useful information effectively from the Internet using PageRank as the core idea of its search algorithm [2], then public social network services represented by Facebook have changed the Internet uses’ way of sharing information from active sharing to passive sharing through reliable connections between real name users and News Feed using these connections. As a result, public social network services not only have reduced the cost of maintaining and extending personal connections for Internet users greatly, but also have changed the way of information dissemination in the Internet and users’ habit of getting information from the Internet [3].

With the rapid development and growing popularity of public social network services, a variety of specialized social network services such as LinkedIn in U.S. and TianJi in China for professionals [4], and enterprise social network services such as Beehive in IBM have emerged and developed in recent years [5]. During the same period, as campus users of colleges and universities including students, faculty members and staff members are the most active users of Internet services, especially emerging services including social networking services; they have an increasingly strong requirement to use campus social network services in supporting information communication, knowledge sharing and online collaborations in teaching, learning, and research activities on campus [6].

Different from public social network services and specialized social network services which orient at Internet users from all around the world and focus on providing information communication and dissemination services, campus social network services and enterprise social network services orient at users on the same campus or in the same enterprise and focus on providing information sharing, knowledge sharing and especially online collaboration services. Moreover, since people need to maintain independent social
spheres, that is, they usually play different role, build connections and communicate with different people, and join different groups in their daily life; technological features of news feed based on the entire friend list in most current social network services may bring their social spheres in conflict and bring online tension to them [7].

Based on the above considerations, we design a multi-domain cloud social network service platform supporting information communication, knowledge sharing and especially online collaborations in different aspects of colleges and universities including teaching, learning and research in the form of cloud service. The platform provides multi-level pre-defined and user defined groups in independent social domains [8, 9]. By this way, we can not only achieve a more natural convergence between user behavior patterns in the real world environment and that in the online environment provided by campus social network services; but also realize the sharing of management and service responsibilities of campus social network service between management sectors and IT sectors in colleges and universities. That is, IT sectors are responsible for platform operation and maintenance, and management sectors are responsible for the management and service of its corresponding social domains.

2 Collaborations on multi-domain cloud social network service platform

The majority of activities of campus users in colleges and universities can be categorized as teaching, learning, and research. Most of these activities are non-process and people engaged in it are usually organized as groups. In teaching and learning activities, a group may be a course group including teacher, TAs and students of the same course. Collaborative learning organized as groups can lead to deeper level learning, critical thinking, shared understanding, and long term retention of learned material [10]. In research activities, a group may consists of teachers and students in the same research institute or group. Furthermore, as teachers and students communicate and collaborate with different groups of people while engage in different types of activities, they usually have several different and independent social spheres.

Multi-domain cloud social network service platform provide campus users with multi-level groups in different independent social domains in order to support their online collaborations in different aspects of colleges and universities including teaching, learning and research etc. [11]. The platform provides group members with online collaboration tools including micro-blog, blog, album, voting, activity, shared space within the scope of their group, within the scope of their group. Specifically, the platform also has added support for short message services and e-mail. Group members can forward all kinds of news in group to all or selected members when they post micro-blogs, blogs, photos, and documents in the group. By this way, the platform can adapt to users of different ages, professional backgrounds, and IT skills etc.; thus making it more useful and popular.

2.1 Multi-domain for campus users

As shown in Figure 1, teacher A is a typical user of our multi-domain cloud social network service platform. He/she is a faculty member of the department of computer science and technology in the school of information science and technology. Teacher A teaches data mining course and computer architecture course in this semester. He/she is member of data mining research group and mobile computing research group, and has participated in two research projects in data mining research group.

In multi-domain cloud social network service platform, teacher A has three social domains including teaching and learning social domain, research social domain, and management social domain. In teaching and learning social domain, he/she is the administrator of data mining course group and computer architecture course group. Because there course projects in data mining course, students set up several child groups of data mining course group for their course projects. In research social domain, teacher A is a member of data research group.
mining research group and mobile computing research group. He/she is also a member of two child groups of data mining research group for two research projects. In management social domain, teacher A is a member of groups for school of information science and technology, and department of computer science and technology respectively. In each social domain, teacher A has also set his/her personalized profile and builds connections with other users. So he can concentrate on dealing with teaching, research and management issues in corresponding domains and do not need to be worried about possible conflicts in his/her different social spheres.

2.2 Multi-level groups supporting online collaborations

In real world, there are always various kinds of connections between different groups. For example, basketball club group and football club group belong to the same category of sports club; data mining group and machine learning group have a lot of members in common; and group for a college is the parent groups for its departments. We incorporate support for multi-level groups in multi-domain cloud social network service platform through multi-level pre-defined and user defined groups in independent social domains to support online collaborations of campus users in different aspect of colleges and universities.

In order to set up a new child group for an existing group, a member of the group should first submit an application to the administrators of the group. After one of the administrators of the existing group approves the application, the child group is formally established. The user who submits the application will be the first administrator of the child group. After establishment, the child group is independent of its parent group and has the same privileges as its parent group. Although parent group and its child group are independent of each other, they usually have closer link than any two randomly selected groups. On one hand, there will be links of its child groups in the space of the parent group and vice versa. On the other hand, in order to provide more convenient service to the members of both parent group and its child group in online collaborations, multi-domain cloud social network service platform has designed and implemented mechanisms for information and resource sharing between the parent group and its child group.

3 Design of multi-domain cloud social network service platform

As shown in Figure 2, multi-domain cloud social network service platform consists of six parts: data space, domain manage, basic services, core services, application services, and open platform services.

![Figure 2: Architecture of multi-domain cloud social network service platform](image)

3.1 Data space

Data space keeps user data and system data in multi-domain cloud social network service platform. Data space consists of two parts: logical data space and physical data space. Physical data space contains common data space for all social domains and independent domain data spaces for each social domain. It’s noteworthy that domain data spaces for different social domains have the same structure and different content.

3.2 Domain manager

Domain manager is responsible for the management of access to the data space, maintenance of data in data space, and modification of database scheme in data space. It consists of three services: data access scheduling service, data maintenance service, and database schema management service. Data access service receives access requests to logical data space, and transforms access requests to logical data space to access requests to physical data space. Data maintenance service processes changes to data in logical
data space into changes to data in physical data space. Database schema management service is responsible for the management of modifications to database schema. For example, when we want to add a new field to an existing table in logical data space, this request will be sent to database schema management service. The service will firstly decide whether the table belongs to common data space or domain data space in physical data space. Then it will add a field to a single table when the target table is in common data space or multiple tables when the target table is in domain data space.

3.3 Basic services
Basic components provide services to core services. They are the common components of information systems similar to social network service platform. These components deals with essential matters of most information systems including accounts and authentication, application access control, system log and system operation monitoring; and special matters of social network services including traffic statistics and user behavior analysis.

3.4 Core services
Core services provide services to applications services. They contain the most important six services of multi-domain cloud social network service platform. Three of them including user management service, relationship management service, and group management service are responsible for the management of the three core elements of the platform including users, user relationships and groups. Resource management service is responsible for the management of the storage, access control, and metadata of various kinds of digital resources and its value-added information such as tags, comments, and recommendation information in the platform.

3.5 Application services
Application services consist of service container and individual application services. Campus users will spend considerable part of their time on application services when they stay in multi-domain cloud social network service platform. As a result, useful and well-designed application services are important to attract more users and keep maintain high user loyalty. There two categories of application services in the platform. The first category of application services including micro-blog service, blog service, album service, video service, document service etc. belong to the platform. The second category of application services are provided by third-party service providers and integrated into the platform through open platform services. It’s noteworthy that application services should be registered in application container before they can be provided to users.

3.6 Open platform services
Open platform services connect multi-domain cloud social network service platform with other parts in digital campus of colleges and universities. They not only make the platform to be the relationship and online collaboration center in digital campus, but also allow people independent of the R&D team of multi-domain cloud social network service platform to design and implement new application services freely. Open platform services include four services: account authentication service, content sharing service, data sharing service and widget service. The first three services deal with authentication, content sharing, and data sharing matters. Widget service provides pre-designed widgets with single functions to other parts in the digital campus in a simple and convenient way.

4 Conclusions
In this paper, we discuss the design of a multi-domain social network service platform supporting information communication, knowledge sharing and especially online collaborations on campus of colleges and universities. The platform has three key features. Firstly, it provides campus users with different independent social domain to support their collaborations in different aspects of colleges and universities including teaching, learning and research. Secondly, the platform provides multi-level pre-defined and user defined groups with collaboration tools including micro-blog, blog, album, voting, activity, shared space within the scope of their group to support their online collaborations. Finally, the platform can provide campus social network services in all aspects of a college or university in the form of cloud service. With these designs, we can not only achieve a more natural convergence between user behavior patterns in the real world environment and that in the online environment, but also realize the sharing of management and service responsibilities of campus social network service between management sectors and IT sectors in colleges and universities.

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