A Message Sharing System based on Task and Roles Characteristics in Mobile Environment

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Abstract

Recent years have seen a meteoric rise in mobile devices and mobile communication technologies, both of which have had profound effects on our day-to-day lives. The opportunity for people to work together is enormous thanks to these technological advancements. Multiple people and entities are involved in a joint effort. Therefore, there is a problem with communication or sharing of knowledge inside the group. There has to be a method to verify messages and identify all applicable recipients to prevent SPAM and lost communications. In this work, we offer a system with a service-oriented design that addresses this issue. The receivers' corresponding tasks are identified using a project-based task analysis and an authority-recognition model. As a result, participants don't have to deal with SPAM or miss out on any vital communications while sharing information inside the system.

Keywords:

mobile collaboration, mobile worker, message sharing and WBS.

Introduction

The rapid growth of Internet technologies creates great opportunities for modern business model, which includes not only electronic commerce, but also globalized collaboration. Due to the complexity of globalization, all stakeholders might not be at the same place at the same time. Communication becomes an issue. To solve the problem, network communication is necessary. The stability and flexibility of Internet can respond to most questions. Therefore, people who are actually geographically distributed can work in the same project for the same purpose. To ensure that "out of sight" does not cause "out of sync" is an issue(Hinds & Bailey, 2003). To coordinate work, information must be correctly transferred to related participants and communication has to be adequately understood (Maier, Eckert, & Clarkson, 2006). Some applications achieve the requirements by means of "fully sharing". Therefore, every message is publicly announced on a bulletin board or privately received in his/her message-box for every participant (Tseng, 2011). The former solution might cause message lost-reading if the messages are too many to read through, and the latter method might disrupt users' work because of irrelevant or unimportant message (SPAM) coming too often. None of them is a perfect solution. In order to achieve "adequately understood" transmission, "who to receive" and "when to receive" must be considered. Two aspects are usually considered for message transmission. The first one is based on the message flow and the latter choice is regarding the size of receivers group. Considering how information is transferred between two users, "push" and "pop" are two different methods (Fig. 1). "Push" is the method to allow information producers to send the messages to the receivers. On the other hand, "pop" shows the receivers' control over when/what messages to retrieve. For instance, an advertisement provider sending an email promotion is using the "push" method. A user capturing a QRCode with his smart phone and visiting a website is the "pop" flow direction. Therefore, who initiates the conversation is the key point

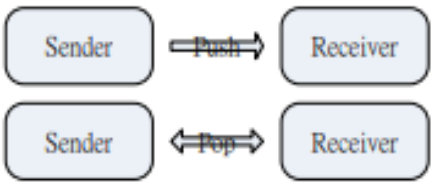

Fig. 1. Message Flow

Another consideration might be based on what kinds of group to receive the messages. "Broadcast" is used for mass communication, so everyone in the system will be included. The text-based advertisement is one example. A "grouped message" would send the same message to a pre-defined group of members, such as an event invitation. An "individual" message means every user should get a personal message, which is customized, such as a telegram. When people work as a group from distanced places, they can only communicate through mobile devices or cellular phones. They can phone each other, which is an "individual" communication. Alternatively, they can send a group message to "broadcast" to everyone. Although a group message is also possible by

selecting specific receivers manually, the sender must know who should or should not receive the message. It might not be easy

RELATED LITERATURE REVIEW

Mobile Network Technologies

Mobile network technology has been making significant progress in the recently years. Mobile network technology generally uses digital cellular phone networks to enable mobile devices to access the Internet, allowing users to maintain access to Internet information while traveling outside. Currently, the digital phone system is used in cellular network technology. A cellular network has to meet certain criteria including (GSM, 2010): 1. Good subjective speech quality. 2. Low terminal and service cost. 3. Support for international roaming. 4. Ability to support mobile terminals. 5. Support for a range of new services and facilities. 6. Spectral efficiency. 7. Integrated Services Digital Network (ISDN) (Everhart, Mamakos, & Ullmann, 1990), compatibility. A cellular network requires voice-oriented and data-oriented technologies. The stages of development of cellular networks are introduced next. The First Generation Mobile (1G) systems were based on analogue signalling designed for voice transmission, rather than data delivery. The main drawbacks were low service quality, long call setup time and inefficient use of bandwidth. Furthermore, the 1G system was susceptible to interference and supported only insecure transmission. The Second Generation Mobile (2G) systems used digital modulation techniques and call processing methods. Most 2G systems combined Time Division Multiple Access (TDMA) and Frequency Division Multiple Access (FDMA) techniques to increase the number of channels. The Global System for Mobile Communication (GSM) (3GPP, 1997), systems were the most popular 2G system worldwide. In contrary to the 1G system, the 2G system provides better service quality and more efficient bandwidth. Thus, it is able to support data, speech and image services. It can also combine advanced encryption mechanisms. However, its main drawbacks are low data transmission rates and are unsuitability to cooperate with the current Internet.

The System requirements

In this section, the requirements of the system are presented. In order to send a proper message to a proper user to avoid SPAM and work interruption, the system must "know" users who are relevant. Therefore, a process authority matrix is used to clarify authorities of tasks and WBS is used to recognize the relationship between tasks.

Model Definition

In the definition of ITIL, a process has an input as a trigger and a deliverable or product as an output. To produce the output, there might be a series of tasks required during the process execution (Fig. 2). Some tasks might be further divisible and the others might require concurrent or sequential execution.

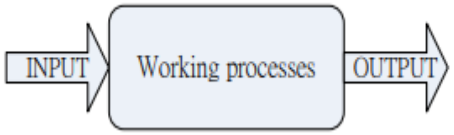

Fig. 2. Process structure

Eventually, the working processes are divided into terminal tasks based on different responsibilities, functionalities, participants or other characteristics. In order to recognize the stakeholders of each task, the work breakdown structure is used to classify the authorities and relationships between stakeholders and tasks.

Conceptual Model

Conceptually, the system is composed of several roles: a process, several tasks, several users and their authorities, and messages. A user must have a user identity (ID), a password to be authenticated, and a series of personal information. A process can be divided into tasks or other processes. It might be composed of a task and followed by another process. It is also possible to be a task and another process, which should be processed in parallel. A task is actually a terminal task if it cannot be further delegated. A task must be assigned to one and only one user, who is accountable for the task. "tID" is a task identity, which is unique in this project. "Description" is a memo to describe the details of the task. "Accountable ID" is a user ID (uID) to show who is in charge. Finally, "duration" shows how many working units, such as hours or days, are required to finish the task. Since each task might have many related participants, who might be responsible, consulted, or should be kept in the loop, there is a rule-base to keep all relationships up to date. A rule is a triplex, including a task ID, a user ID, and an authority. Finally, an authority might be anyone from responsibility, consulted and informed roles to show the authority of the user in the task. A message should be sent by a sender and associated with a task. Therefore, a message can be represented by a triplex as (uID, tID, content). uID is the identity of message sender. tID is the linked task identity. And content is the message essence. The Backus-Naur Form for definition is shown in Fig. 3.

```
User      ::=<uID>, <password>, <details>
Process ::=<Task>, <Process>
          | <Task> || <Process>
          | <Task>
Task      ::=<tID>, <accountable id>, <description>, <Duration>
Rule      ::= (tID, uID, Authority)
Authority ::= Responsibilily | Consulted | Informed
Message ::= (uID, tID, content)
```

Fig. 3. BNF (Backus–Naur Form)

The System Design

The system is designed based on cloud computing architecture. In this section, the system detail is briefed.

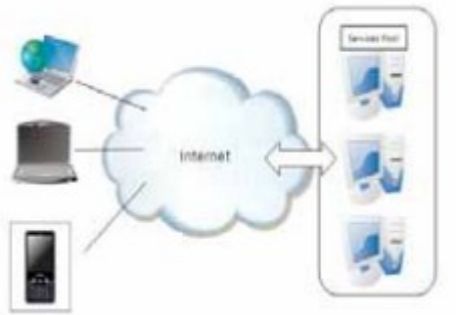

Fig. 4.System Architecture-1

System Architecture

There might be two kinds of devices in the system. The first is a service pool, which might be composed of powerful servers. The second kind of device is called clients, which usually possess mobility, such as cellular phones, laptops or PDAs (personal digital assistant) (Fig. 4). The server in the service pool is a service provider, which is a WWW server with a series of web services installed (Fig. 5). Since mobile devices might possess less computing ability, lightweight client applications are suggested. In the system, RIA (Rich Internet Application) and mobile applications are chosen to build a thinner client. Message transmission between users (devices) must pass through the central server. The system architecture is designed to be centralized as a cloud computing structure.

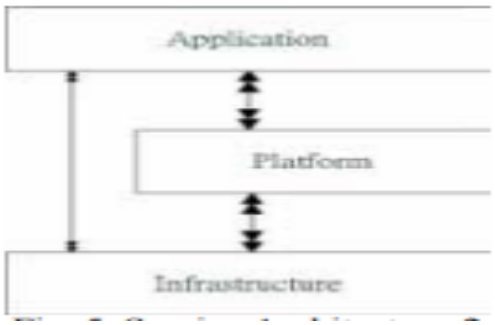

Fig. 5. Service Architecture-2

In Fig. 5, infrastructure layer is based on the wireless communication environment within the system. Mostly, co-workers might not be in the same area. Therefore, cellular phone communication is assumed to be used for testing. Platform stands for both web based and mobile based applications for clients and servers. Applications are the software and web services proposed in the system. In the system, there are two kinds of interfaces on the centralized server. The first is a web-based interface, so people can access to the system using browsers on any operating systems. The other interface is designed to be a mobile application with built in service-oriented architecture. Thus, web services can be installed and enabled on the servers. However, the installed services would not occupy any computing resources unless it is invoked. A serious disadvantage of central systems is possible bottleneck on the server. In this system, messages happen only when related tasks are performed. Therefore, the corresponding users and messages are partial.

Portal Service

The portal service acts like a gatekeeper to authenticate credentials of users. Only credential holders are authorized to use further services, “Task Manager” and “Message manager”. Currently, credentials are simply implemented as a pair of username and password. In order to secure the system, the passwords are encrypted ant then stored in the database. Presumably, a user is using a “Media Access Control (MAC)” address or “subscriber identification module (SIM)” enabled device. Since the MAC address and SIM should be unique, a “single sign-on” mechanism is initiated. The authentication state of the current user can be remembered. However, if a mobile device, such as a cellular phone, is considered to be a personal private device, it should be secured to keep a signed credential on the device. An attribute X.509 certificate can be used for future development

Conclusion

For instance, in 201, plans were made for a commencement ceremony celebration. There were 30 students in the working group, and they were broken up into "subgroups" that dealt with things like food and drink, entertainment, paperwork, money and publicity. There was a total of 120 graduates invited, and there were 20 faculty members. The time allotted for preparation was 4 months. More than fifty separate communications were exchanged throughout the four group sessions held during preparation. Assume that all announcements, such as those about staffing changes, student promotions, and commencement

exercises, were sent by mass email. More than 8000 mails need to be sent. In contrast, the suggested framework has the potential to decrease the number of sent messages from 10,000 in the example scenario to only 1,000. Less spam is being sent now. The system is intended to be a project-based message management system in its present form. Each phase of the project culminates in a single job. Think of the people who are informed about the assignment as readers of a daily newspaper. The technique for disseminating messages may be simply adapted for use as an online publishing platform. As a result, the approach is thought to be applicable in a variety of settings.

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