A Modelling Notation for Mobile Message Sharing based on Task and Roles

Sharon, Yih-Jiun, Lee
Dept. of Information Communication,
Chinese Culture University
Taipei, ROC
Lyj15@faculty.pccu.edu.tw

Kai-Wen Lien
Dept. of Information Management,
Chien-Kuo Technology University
Changhua, Taiwan, ROC
kwlien@ctu.edu.tw

***Abstract*—The rapid growth of mobile devices and mobile communication technologies in recent years has created a huge potential for enabling collaborative work. Usually, a collaborative work is usually composed of multiple tasks and participants. Therefore, messages or information sharing among the group is an issue. In order to avoid SPAM and missing messages, there should be a system to check the messages and recognize all relevant receivers. In this paper, a modeling notation is proposed to model and evaluate the relationship among tasks, users, and messages. A project-based task analysis and an authority-recognition model are used to identify receivers regarding their correspondent tasks. Therefore, members in the system can easily share information without being bothered by SPAM or worrying about missing any important messages.**

Keywords- mobile collaboration; message sharing; WBS

I. INTRODUCTION

The rapid growth of Internet technologies creates great opportunities for modern business model of electronic commerce and globalized collaboration. Globalization leads to complicated grouping, all stakeholders might not be at the same place at the same time. Communication is an issue and network technologies can answer most questions. Therefore, people who are actually geographically distributed can work in the same project. However, to coordinate work, information must be correctly transferred to related participants.

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. The receiver firstly requests and then gets response.

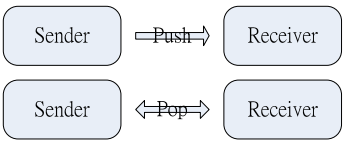

Fig. 1. Message Flow

Another classification is based on what kinds of group will 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 must receive the message. It might not be easy.

In this paper, the task-based message sharing system is presented. In order to recognize the relevant receivers, the relationships among messages, senders, receivers and tasks must be configured based on roles and tasks. Therefore, a task-linked message can only be forwarded to the proper receivers. This paper is structured as follows: Section II summaries the literature review and Section III and IV represent the modeling system. Finally, a set of discussions is concluded in the last section.

II. RELATED LITERATURE REVIEW

A. Computer Supported Collaborative Work

The term "computer supported cooperative work (CSCW)" was first originated by Irene Greif and Paul M. Cashman in 1984. It shows the possibility to support people in their work by means of technologies [1, 2]. In 1991, Wilson defined the terms of CSCW as "CSCW is a generic term, which combines the understanding of the way people work in groups with the enabling technologies of computer networking, and associated hardware, software, services and techniques" [3, 4]. CSCW can be classified into four groups based on co-location and synchronization [5]. They are co-located synchronous (face-to-face interaction), remote synchronous (video conference), co-located asynchronous (shift groupware) and remote asynchronous (Cloud workspace or blogs). The last group requires communication and coordination to succeed.

B. Process Based Work Breakdown and ARCI Model

In project management and system engineering, to identify and group detailed work elements is a necessary process to manage all possible sources. A Work Breakdown Structure

(WBS) is used to define the distinct work elements, also known as tasks [6, 7, 8, and 9]. The Work Breakdown Structure is a tree structure, which shows a subdivision of effort required to achieve an objective [10]. Each element (node) represents a terminal element (such as a product or a service) or another compound element [11]. A terminal element is the lowest element (activity or deliverable) and not dividable, so it can be used to estimate "cost".

Clear definition of accountability and responsibility is a critical success factor to all projects. Since WBS might be used to identify the accountability of terminal components, in conjunction with the ACRI model, the authority and relationship among participants and tasks can be classified.

The ARCI model is a powerful utility from IT Service Management (ITSM) [12]. The word "ARCI" stands for Accountability, Responsibility, Consulted, and Informed. According to [12], "accountability" can be assigned to one and only one person only. This person ultimately holds accountability for the overall success or failure of the identified task. "Responsibility" shows that each individual, who actually works for the task, is responsible for meeting specific timelines and producing deliverables. The word "consulted" specifies one or several individuals, who overlook the task, as consultants or advisers. They might hold organizational and subject matter knowledge and expertise critical to the task. The last one "informed" shows the person who might be (directly or indirectly) affected by the task-related situations and decisions to be notified.

III. MODELLING

To send a proper message to a proper user to avoid SPAM and work interruption, the system must "know" relevant users in referring to an ARCI authority matrix and the WBS.

A process can be breakdown into terminal tasks as earlier explanation.

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.

Table 1. Work Breakdown Structure(WBS)

Task id	description	duration	Pre-task id
T00	Design a cake	1 hour	-
T01	Grocery shopping	2 hours	T00
T02	Decoration Shopping	3 hours	T00
T03	Collect all materials	1 hour	T01, T02
T04	Mix the flour and eggs	1 hour	T03
T05	Pre-heat the oven	1 hour	T03
T06	Flavored the cake	0.5 hour	T04
T07	Bake the cake	2 hours	T05, T06

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.

For instance, Alice, Nancy and Jo want to bake a cake for their mother's birthday. Table 1 shows the terminal activities to bake a cake. Task Id (tID) is a unique identity for a terminal task and pre-task shows the preceding task prior to this one.

Table 2. ARCI Authority Matrix

Task id	Accountable	Responsible	Consulted	Informed
T00	Alice	Nancy, Jo	Dad	
T01	Alice	Nancy	Jo	
T02	Alice	Nancy		Jo
T03	Jo	Nancy		
…..				

Table 2 is the authority matrix. The differences of authorities have been detailed in the earlier section. Thus, a message "flavor: cinnamon or vanilla" linked to task "T01" might be sent by Nancy (the actual groceries shopper), to Jo (for a consultation) and Alice (she is in charge). Since, task T01 might affect the following task T03, every responsible and accountable worker in T03 might also be kept in a loop. Previous tables also show that T01 and T02 can run in parallel as long as they are processed by different users. In addition, T03 cannot be initiated until the success of T01 and T02.

The model is also user-oriented. Therefore, a user must have a user identity (ID), a password to be authenticated, and a series of personal information.

To sum up, the Backus-Naur Form (BNF) for definition is shown in Fig. 2.

```
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. 2. BNF (Backus–Naur Form)

IV. THE MESSAGE MODELLING

Once the message receivers are determined, the message is delivered to a Manager along with the receivers list (Fig. 3).

```
<message id="10112">
        <sender>John </sender>
        <tID> ta01 </tID>
        <receivers>
                <id right="R">Nancy</id>
                <id right="R">Bob</id>
                <id right="I">Calvin</id>
        </receivers>
        <Content>
        Lunch box will be late for approx. 10 minutes.
        </Content>
</message>
```

Fig. 3. Example of a message

The manager is a message manager, which works as mail

services for both incoming and outgoing messages. When a message is sent to the message manager, it is kept in storage and tagged. Once a user on the list is “logged on”, “MManager” compiles a following list (Fig. 4) for the user.

```
<MessageList>
        <message id="10112">
                <sender>John </sender>
                <tID> ta01 </tID>
                <Content>
                Lunch box will be late for approx. 10 minutes.
                </Content>
        </message>
        <message id="10113">
                <sender>Bob </sender>
                <tID> ta01 </tID>
                <Content>
                Offer coffee to guests
                </Content>
        </message>
</MessageList>
```

Fig. 4. A receiver's List

V. Conclusion and Future work

Supposed, a process can be divided into 100 terminal tasks and requires 20 participants. By means of grouping messages, all of the 20 participants are going to receive every message regardless the message is relevant or irrelevant. SPAM, unexpected and unimportant messages, might cause work interruption, which is really annoying. Conversely, to automatically and directly discard the incoming message, an important word might be forfeited. This research builds a model to test the feasibility of rule-based message sharing system based on tasks and user roles. The role-based analysis and work breakthrough structure are used to identify the persons in charge and terminal tasks. An ARCI authority matrix is involved to ensure all relevant receivers are included.

In the foreseeable future, a implementation of the mobile message sharing system will be built and tested. In the framework, the proper messages are only sent to proper receivers. Therefore, someone only gets the message from the system if it is necessary. It is believed that SPAM can be reduced.

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