

Mobile and desktop based group messaging system

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Abstract— Communication is an essential factor in any activity and in any community. Sharing and transferring information in a group is needed in many instances addressing both personal and corporate usage. Many studies and applications have attempted to overcome this barrier with the usage of mobile communication which is a fast growing medium at present. Our solution is to have an integrated communication system using both mobile and desktop applications with security. The Android mobile application and desktop application connects to the Open Fire server of the organization and via the server groups can communicate simultaneously. A SMS gateway is connected to the server to notify the message to offline users. Encrypting mechanism implemented in this application ensures the safety of the data transmitted in the network. A survey was conducted among corporate and also among general public to identify their needs and issues in communication. From the survey it was highlighted that a secure group messaging system within the company is essential and employees are reluctant to use their own mobiles and prefer a company group communication system. Further this application was tested in real time corporate environment and was proven very user friendly and useful. This research paper describes the importance and necessity of such communication system for efficient and safe sharing of information between groups of people and provides a solution addressing integrated communication to overcome the existing barriers of communication.

Keywords— Corporate communication, Group messaging, Encryption

I. INTRODUCTION

Communication is one of the most important and sought after needs in the modern world. With the advancement of science and technology communication exists in many forms. People prefer highly efficient and effective systems of information sharing for safety and time saving. Amongst vivid communication methods, Mobile communication is one of the most used and popular methods. Calls, text messages are used by millions of people all around the world. Apart from one-to-one communication group communication has become one of the main features that people look for in a mobile application as there are many instances in both organizational and personal needs as

such. Sending a message and sharing responses within a group in a secured way is very much important for a better and reliable communication.

Usage of text and voice messages are not essentially useful tools when it comes to group communication and would not be encouraged to use in an office environment. E-mails are heavily used in today's corporate sector for communication however for that internet connection is essential and one may not be able to communicate effectively.

This is a highly demanded need in both personal and corporate engagements. Instant updates and response sharing plays a major role in efficient communication and also these systems should be secured in order to ensure the safety of the data that is being shared. Therefore Systems with secured data and information transmission are essential. Organizations are more concerned about this issue since loop holes in data transmission could result in unauthorized access and data manipulation.

To identify the communication needs and existing barriers in the actual business environment a survey was conducted among the corporate. This survey depicted that there is an extensive need for group messaging and 77.42% stated that message exchange should be secure. Use of SMS within an organization showed less interest whereas email was used frequently. However the main issue was to have a system to centralize communication and a secure system to protect data shared among multiple users.

The core issue addressed by this study is in availability of such systems, thus provides a solution of efficient and secures group communication system.

Detailed description of the issue is explained in the Section II where similar approaches and their features comparison is included. Addressing certain limitation of those other work Section III describes the approach taken in this study. Section IV describes the detailed design of the system along with the technologies and concept being used whereas Section V explains the real world implementation of the solution in terms of a commercial product. A survey was conducted to identify the feasibility and applicability of the study and the results are documented in the Section

VI along with the potential further improvements on the solution. In the section VII a comparison against other work is explained highlighting the important findings of the survey conducted.

II. PROBLEM IN BRIEF

Sending e-mails have restrictions such as network issues and PC issues. Specially, when we are sending a message to a lot of people, the sender might have to encounter an unnecessary burden to share every person's responses within a group and to get an update of replies from each person to his/her message. This creates excess communication needs which consume time, money and resources. (Suman Srinivasan, IEEE ICC 2007) Further, in an organizational environment the administration might want to have a secured communication system which is capable of sending secured and encrypted messages among employees. Thus, a special application is needed to provide solutions for the following issues:

- Sharing responses of participants in a group.
- Sending secured messages within an organization.
- Getting a live update of responses.
- Prevent the unnecessary time and resources consumed in communication.

A. Limitations of existing mobile application and systems

There are similar approaches taken to address the above mentioned issues using vivid technologies and methodologies. Certain limitations and drawbacks are identified in those hence this solution tries overcome the existing problems in similar applications

The table 1 compares the basic available features in the prevailing communication systems.

Other Approaches		Feature			
		Distributed GCS	SMS GupShup Chat	ONEChat	GroupMe
1	Group messaging	√	√	√	√
2	Mobile application	√	√	√	√
3	Chat enabled	×	√	√	√
4	SMS service	√	√	×	√
5	Desktop Application	×	×	√	×

Table 1. Comparison between similar approaches

1) *SMSGupShup Chat*: This is a commercial group chat application based on SMS and managed by a central server. Users are able to create a group by sending a SMS message to the special phone number of the server. Also invitation messages containing up to four phone numbers are possible. Users can post a message to the group by sending

a simple SMS message to the special phone number. The message forwarding to all group members is done by the server. (SMSGupShup Chat ,Online, 2010)

However, the messages are not secured in this application and can only be used to send SMS messages.

2) *GroupMe*: GroupMe is a mobile application run on Android, iPhone and BlackBerry which enables group messaging. They create SMS-based groups hence people could communicate with and manage their social circles. GroupMe allows talking to multiple friends or contacts at once, share photos or conference call across a group of people. This application can be used to geo-locate yourself and share your location with friends. (GroupMe, Online, 2010)

Limitation that can be found is non-secured messaging.

3) *Distributed GCS: (Distributed Group Communication System for Mobile devices based on SMS)*: This was designed as a group communication system (GCS) providing both the primitives to manage a group of mobile phones as well as offering multicast to group members. This system is completely relying on a network carrier that supports SMS (the GSM Short Message Service) and a Java enabled phone.

In this application all information and data are shared via SMS messages and security is not considered.

4) *ONEChat*: This was implemented as an efficient group chat application for opportunistic networks called ONEChat (Opportunistic NEtwork Chat). ONEChat was built using the Java programming language. ONEChat does not need to be manually configured, nor is a fixed infrastructure required for it to work properly. This works even in the presence of transient nodes that enter and leave the network quickly. (ONEChat, Heming Cui et al Columbia University)

This does not support mobile phones hence SMS messages are not supported by the network.

III. OUR APPROACH

To solve the above-discussed problem we came up with the solution of a group message system where it integrates many features of communication.

Our system consists of two applications:

- Android Mobile Application
- Desktop Application

The choice of using Android operating system for development purpose was based on the rapidly growing market of Android. Considering the world smartphone market size the larger penetration is occupied by Android. Having 50% of the market share Android claims a larger proportion of the smart phone users. Figure 1 shows a

distribution of different mobile operating services in global market by 2012.

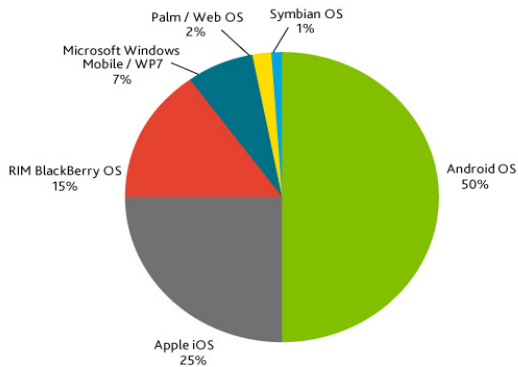


Fig 1. Global Android Market Penetration 2012 (Android Developers Blog, 2011)

The Desktop application is designed for Windows operating systems since it is mostly used in organizations for office usage.

Using these two applications this system has tried to provide high efficiency and integration. In an organization, employees are most likely to use a computer hence by logging to the desktop application they can receive the messages and notifications sent to their phone. Further having two applications will reduce the chance of missing an important message or invitation.

Following features are implemented in our system:

- Group messaging and sharing responses within a group via mobile and desktop applications.
- The user will have to follow a simple login process and from there he/she can connect to friends, colleagues via the application. The user can create groups and start sharing data and messages.
- Sending notifications through SMS for un-delivered messages.
- People who are not using the application or users who are offline will get a notification SMS when a person shares some data or message with the group.
- Encrypted and secured messaging among users.
- This feature is implemented to ensure the safety of the communication system. Data will be encrypted by the application in a way that it could be decrypted only by the application itself hence it prevents access from external parties along the channel of communication.
- Getting a dynamically updated summary of responses from multiple recipients.

Live response system could be used to get the attendance count for a function, meeting or an event. After the invitation is being sent the application will listen to

respondents recording their response. This continuous update will display a summary of the attendance of the event to the invitation sender.

Figure 2 illustrates the basic modules of the proposed solution.

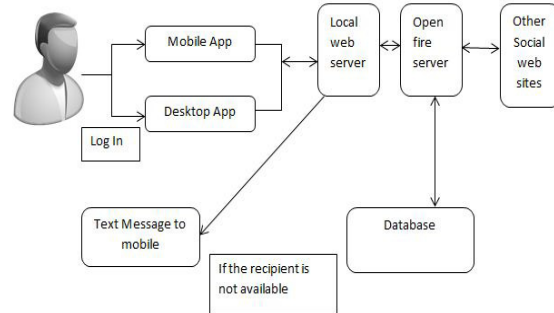


Fig 2. Top Level Architecture of the System

The user can log in via either mobile application or desktop application. A simple login process will save the data of each user. Both applications connect to a web server called Open Fire server.

Open fire is a server which enables instant messaging. New accounts are created and contacts are managed in the Open Fire server. Messages are directed to recipient through this server. Offline users will get a SMS to their phone notifying the message sent. This is implemented using the Kannel SMS Gateway.

The fundamental technologies used involve Java, Android, Web services, Open Fire server, Jabber/XMPP protocol and Jive software. (Ignite Realtime Smack API, 2007)

IV. DESIGN OF THE SYSTEM

The proposed system mainly consists of following components;

- A. Mobile Application
- B. Desktop Application
- C. Open Fire Server
- D. SMS Gateway

A. Mobile Application

Android OS was selected to implement this solution because of the high growth rate in Android market. (Android Developers Blog, 2011) This mobile application has functions of sending group messages, chat and getting live updates of a particular event. First user must sign up and create an account, after that he can sign in. Through internet it connects to the database and searches for related data and contacts.

B. Desktop Application

This functions in the same way as the mobile application and user logs in to the application and he will be connected to the internet. User can either log into mobile or desktop application. Plug-Ins could be added to this as well.

C. Open Fire Server

Open Fire is a powerful instant messaging (IM) and chat server that implements the XMPP protocol. This server was used as the main server to create accounts and contact groups as it provides facilities for those. And XMPP protocol for the connection between the servers for communication.

In Open Fire server an admin could be assigned to manage accounts, this is beneficial in corporate environment where a centralized management of account is needed. Accounts creating and deleting will be managed by the admin ensuring the permitted access. Following features are identified in this server that integrates with our system. (Ignite Realtime Smack API, 2007)

- Web-based administration panel
- Plug-in interface
- Customizable
- User-friendly web interface and guided installation
- Database connectivity (embedded Apache Derby or other DBMS with JDBC 3 driver) for storing messages and user details
- Platform independent, pure Java
- Full integration with Spark IM client

D. SMS Gateway

SMS messages are sent if the recipient is not logged in either of the applications.

Kannel SMS gateway is used for sending SMS in these applications. This is connected to the local web server and from there SMS are directed to the recipient.

V. IMPLEMENTATION

Implementation of the proposed solution according to each module varied according to different technologies used; however, the basic functional procedure of messaging follows the same configuration.

A. Mobile Application

Our application mainly focused on Android OS 2.3.3 (Gingerbread version) which is mostly available in Sri Lankan market. Also though there are new updates of Android Gingerbread has the highest market share. For this application JAVA and XML languages were used for development. Eclipse IDE (Integrated Development Environment) for the development and testing of the mobile application. The emulators are created in Eclipse to

test the procedure and coding of the mobile application. As this is a mobile device we are trying to use the minimum system resources for our application (Wallace, 2011)

B. Desktop Application

Developments are mainly done based on the Windows platform using NetBeans IDE. Also SMACK API was integrated to get the libraries for group communication and Jive software for implementation. Users can access to their prevailing accounts in other networks as well. Further, this solution has introduced an attendance calculation for messages. If the user integrates Attendance with his message finally with the replies the system calculate the percentage of attendance for the particular event. Figure 3 illustrates the basic procedure of messaging.

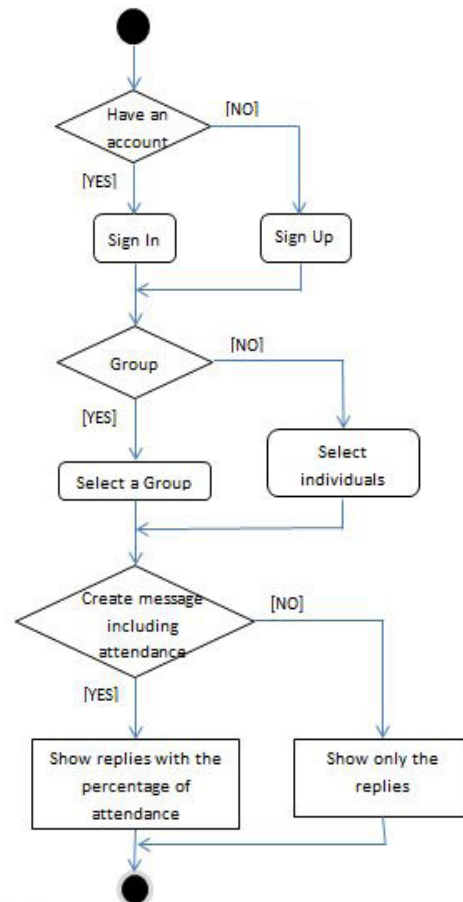


Fig 3. Flow Chart of messaging process

C. Open Fire Server

Open Fire server is used as the main server in this system as it is a specialized server for instant messaging. It consists of in-built Java libraries for our direct use. Using this server groups are created and contacts are manipulated. Smack Library is used for the development process in Eclipse. The connection to Open Fire server is established through the Jabber/XMPP protocol and a web service is used for connecting purposes. (Peter et al, XMPP, The Definitive Guide, 2009)

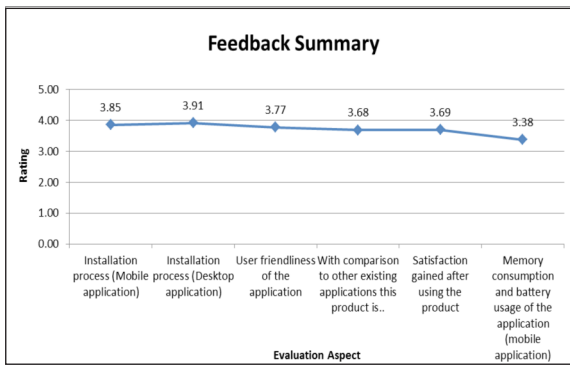


Fig 4. Feedback Summary

Contacts are mainly handled by a class in Open Fire called Roster. Roster is updated with each adding/removing of contacts. For group messaging Multi User Chat (MUC) feature is used. Separate methods and classes are created for detecting presence and handling requests.

Message encryption is too supported by this server. (OpenFire, Wikipedia 2012)

D. SMS Gateway

We have used "Kannel" SMS gateway to send notification SMS for users.

When sending a message to a group, it checks for the presence of the recipient, and if the recipient is not available a text message is sent to his phone notifying the message.

VI. EVALUATION

A survey was conducted to gather data from users of the application in order to evaluate the research work based on several aspects. The main evaluation aspects were,

- Installation process (Mobile application)
- Installation process (Desktop application)
- User friendliness of the application
- Comparison with similar applications
- Satisfaction gained after using the product
- Memory consumption and battery usage of the application (mobile application)

A beta version of the application was developed and was given for use in organizations. Data was collected from users in the corporate industry as well as from university undergraduates. The analysis of gathered data is as follows:

The average response rate of the survey was 3.72 and it was found out that the installation of mobile and desktop application recorded a higher response rate than the average. User friendliness recorded a rate of 3.77 and was above the average. With comparison to other

similar applications, users have responded averagely to this application with the result rate being 3.68. Also the satisfaction gained lies on the average as well.

Memory and battery consumption has recorded a response rate below the average with less 0.34 from the average.

The mobile application is developed only for the Android Operating system and the desktop for Windows. Other prevailing mobile operating systems will not be able to use this system. The memory and battery consumption in the mobile application needs further improvement hence the performance will be efficient.

VII. CONCLUSION

Modern world is in need of highly efficient and reliable communication in order to save resources, money and especially time.

This system has been able to provide a solution for secured group messaging with added features using mobile technologies. The usage of mobiles is growing day by day and we identified the potential of such demand for a mobile application.

This solution is implemented in order to be used for both personal and corporate use. Main objective is to develop a group message system which enables sharing messages in a group of people. We have successfully implemented the system with SMS notifications. Studying about other communication and network systems gave us the domain knowledge hence we were able to come up with the important functional and non-functional requirements needed in our system.

We identified using internet as a more economical way to conduct communication processes that telephonic services. Integration of both these has resulted in a more efficiently in our system. Also we were able to enhance our knowledge on Android application development, web services, database management and integrating software systems.

The following table shows a comparison between our approach and other approaches considering the similar features and distinct features of our proposed solution.

	Approach	Other approaches	Our Approach
	Approach		
	Feature		
1	Group Messaging	Yes	Yes
2	Mobile application	Yes	Yes
3	Chat Enabled	Yes/No	Yes
4	SMS service	Yes/No	Yes

5	Desktop application	Yes/No	Yes
6	Message encryption	No	Yes
7	Live update of the responses	No	Yes

Table 2. Comparison between Our Approach and Other Approaches

It can be highlighted from the above comparison that, among other approaches, our system has many distinct features such as live update, message encryption, SMS notifications in order to make an efficient communication system.

VIII. FUTURE WORK

In order to make this system more value added and user friendly we will upgrade and do needed modifications in future. We hope to develop the mobile application for other platforms like Blackberry, Windows mobile since it will enhance the usage of the application. Further modifications will be done to improve the personalization as well as user friendliness. Also in order to create awareness about the product a business plan will be designed for the product.

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