

Cell Broadcast Simulation in Android

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Abstract - *In text-based cell broadcast [5] a message is sent to a large number of recipients. The Cell Broadcast Simulation App on Android platform [1] is an attempt to make cell broadcast possible. The app simulates important concepts of broadcasting using text messages or Short Message Service [8]. The user of the app is not required to maintain or select contacts. The app maintains and updates the contacts automatically. The user just installs the app and sends a message and whoever has already installed the app will receive the message. There is a radius feature. This feature gives complete control over the broadcast range. The app has a message filtering and saving system. A user can set his/her keywords to filter the incoming messages. Incoming messages with a filter keyword will be saved under that keyword and the user can access those messages at a later time.*

Keywords: Cell Broadcast, One-to-many, SMS, Android, Java

1 Introduction

Cell phones use radio frequencies to communicate. Two different radio frequencies create a channel to make communication possible between cell phones. In general, this type of communication is a point-to-point connection and each connection uses a single channel to make a call or send a text message. Point-to-point has many limitations. Only two users can use it to communicate. So, if many users want to communicate with each other through text messages at the same time, then point-to-point communication is not very efficient. For a large group, many point-to-point connections have to be established for proper communication. There is a more efficient solution to this problem: Broadcasting. Only a single channel is required to broadcast data or messages among the cell phones (Mobile Phones). In broadcasting, many cell phones can listen to a particular channel provided by the Service Provider. Broadcasting is a simple way to reach many users (one-to-many) by using only a single channel with less traffic and overhead. Since cell phones have become a common utility and most people are using smart phone nowadays, it is easier to reach an individual using cell phone. In the time of emergency, when it is required to reach a large number of people, cell broadcasting is the most effective way. Social communication at the local level with less traffic is another important application of cell broadcasting and there are many other uses.

Since no promising application of Broadcasting exists, service providers do not provide broadcast channels in the US

[5]. A prototype can be very helpful to investigate the applications of broadcasting, and Cell Broadcast Simulation app will serve this purpose. It simulates all the capabilities of SMS broadcasting. Using this app a large number of users can be easily reached. GPS feature and message filtering gives an indication of the many features that can be integrated with this promising smart phone application. Cell Broadcast Simulation has these basic features of the broadcasting along with other features. This app will act as a proof of concept that there are lots of practical uses of cell broadcast and upon availability of the broadcast channels this app will become the standard with which one can perform many real life activities all with little overload or traffic. The app is simple yet has many integrated features. The main focus of this app is to make cell broadcasting possible by giving the user a positive experience and expose them to its many potential uses.

For example, one can use this app to solicit the advice of his/her neighbors on a good local handyman. She will simply set the radius to one mile and sends a broadcast message such as “does anyone know a good handyman?” Those who have already installed the app will receive the message and if they are inclined they will respond with the phone number of a handyman that they had a good experience with. The sender of the message could wait for the responses by monitoring his/her phone, or set a new filter “handyman” to save away any message containing the word handyman and view them at a later time. As another example, one could solicit the traffic status from other drivers to find out the source of the traffic jam up the road and approximately how long it would take for the traffic to open up. All this happens anonymously without the parties involved knowing each other.

Using regular point-to-point channel to reach many people via text messages involves heavy traffic. But using a broadcast channel, it can be very easily done. All cell phones will listen to a particular radio frequency or broadcast channel. When a text message is sent on this channel, all those listening will receive the message at the cost of sending one message. Different level of broadcasting is possible. It can be limited to a particular radius. It can be limited to a cell area. It can be limited to a particular purpose. For example, it is very easy to discard unrelated messages, so that unauthorized users will not be able to see a message. In that way, the broadcasting can be used in a secure way. Social communication is another important application of text message broadcasting. Emergency broadcast is another important application.

Cell Broadcast Simulation app is implemented in a way so that the user can experience the cell broadcasting. When a

broadcasting channel is available, only the channel has to be integrated and nothing else needs to be changed in the app. Then the simulation app will be a fully functional broadcast app. Until then, this simulation app performs its functionality through the SMS system. Therefore, currently the broadcast is simulated using send and receive through SMS. It is important to note that users do not know how the broadcast is performed. The app will maintain the contact, so that only by installing the app, users can communicate with each other. The app has a radius feature which is the broadcasting area. With filtering and message-saving feature, users have total control over how they want to see their message. This app exposes the users to the functionality of the cell broadcasting and illustrates how promising the application would be. This app will be distributed to different service providers so that they can see the real application of the cell broadcasting and may agree to use their broadcast channel so that cell broadcasting can be implemented.

2 System Environment

Using this app on an Android cell phone, a user will be able to send an SMS to all the users who have also installed the app. She can also select a radius. When she sends an SMS, her current GPS position and her selected radius are added to the message. The receiver app will receive the message and calculates the distance with the sender's GPS location and receiver's GPS location. If the distance falls within both the sender's and the receiver's radius, then the message will be displayed on the receiver app. As shown in Figure 1, only user 4 receives the message because both users cover each other's radius. If the message has any word that matches the receiver's filter keyword, the message will be also saved and the receiver will be able to recall and see it later.

The process of adding a new user is shown in Figure 2. There will be a root user for this app. Root's mobile phone number will be used to introduce a new user to others. When a new user installs this app, the new user's phone will automatically send a message to the root to add her in the contact list. After receiving the add request message from the new user, the root updates its contact with the new user's mobile number and sends an add request to all other existing users. After receiving the add request from the root, existing user apps will automatically include the new user in their contact and send an add request with their own mobile number to the new user. The new user will receive those add requests and adds all of them to its contact list. All these processes happen in the background automatically without user involvement.

The root user can delete a user from the contact. The deletion process is shown in Figure 3. To delete a user, the root's app will notify all other users about the deletion. Upon receiving the delete request from the root, all the other users will delete that particular user from their contact. The deletion process is also automatic without user involvement.

3 Implementation

The app is implemented on Android platform using Java, XML, SQLite, Eclipse IDE with Android Emulator [2, 3, 4, 6]. Any smart phone with Android 2.1 software platform or above can install the app. There should be GPS and SMS system available for the proper functioning of the app. The following four tables are used in the Database:

Contact:

Id	Contact
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Message:

Id	Message	Phone	Time	Filter_Status
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Distance	Latitude	Longitude
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Filter:

Id	Filter
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Filtered_Messages:

Id	Message	Phone	Filter_Key
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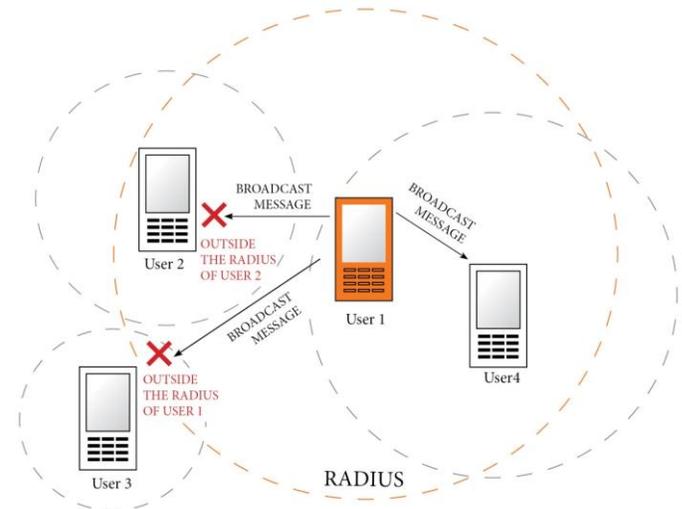


Figure 1. System Environment

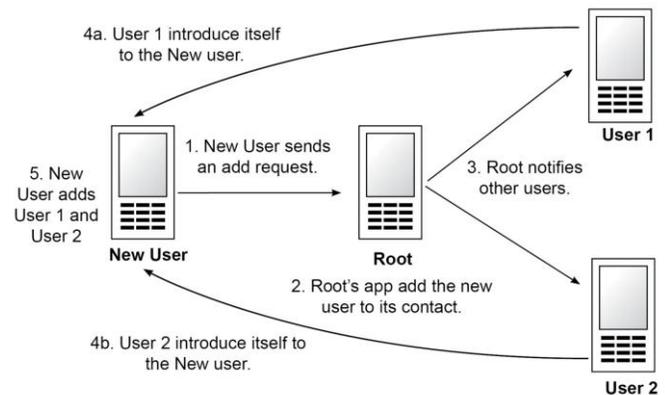


Figure 2. Adding a New User

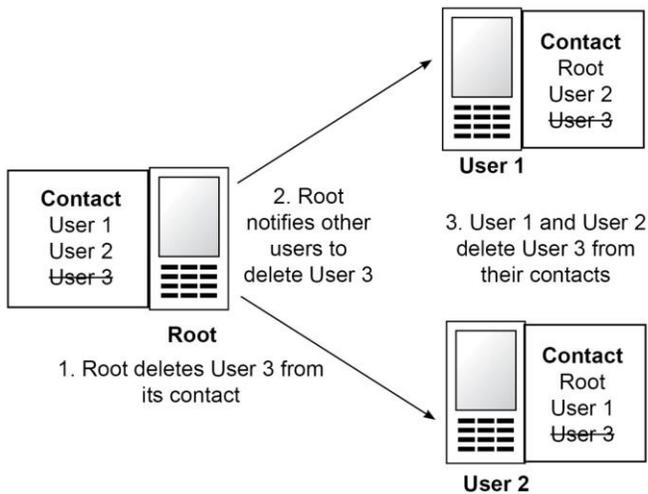


Figure 3. Deleting a User

There are several different screens with option menu and dialogs created with XML files. Icons are custom made. Navigation between different screens is very intuitive, and users can easily learn how to use the app.

There are many screens. The main focus is to keep the operation simple and similar to give the user a seamless experience. We will discuss four screens here. As soon as the app opens, the main screen appears, Figure 4. This screen is designed to display all the necessary information that is required to operate the app properly. There is a place to input the message and a button to send the message. The main screen also displays radius in terms of mile and the current location in terms of latitude and longitude [7]. It will also display a few filtered keywords that the user has already entered.

After installing the app, the user has to set the radius from the dialog shown in Figure 5. By clicking the menu button of the Android device, the user can get the option menu shown in Figure 6. The menu has six options to select. The “GPS Radius” option is for setting the GPS radius. The “Other Users” option opens up a new screen and displays the other users list. “Filter” option is for setting filter keyword and also for accessing saved filtered messages. “Delete All” option deletes all the messages in the main screen. “Exit” option shutdowns the app and the app will no longer use any resource of the device such as GPS service. When a message arrives, the app will notify the user through the notification service. It will make a sound and display the message in the notification bar. This feature can be turned off through the Notification ON/OFF option. If the notification service of the app is on, this option turns off the notification; otherwise, notification is on.

Figure 7 displays the “Filter” screen. When the user presses the “Filter” option from the option menu, this screen is displayed. One can put the filter keyword in the input field and press the add button to add the filter keyword. Messages with specified keywords will be saved under that keyword. One can see those messages by clicking on the displayed



Figure 4. Main Screen



Figure 5. Radius Dialog

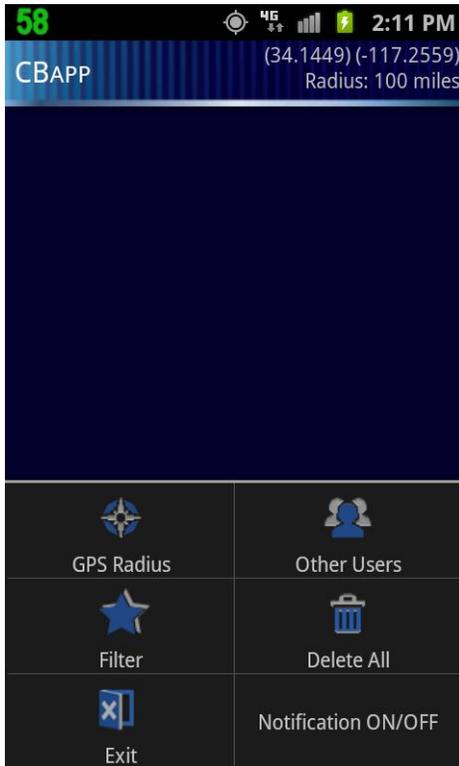


Figure 6. Option Menu

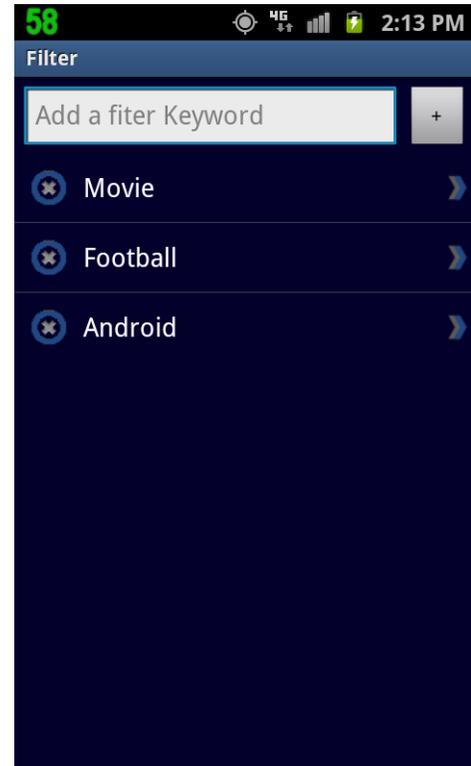


Figure 7. Filter Screen

keywords. One can also delete any keyword from this screen by pressing the delete button at the left of the keyword. All the messages saved under the deleted keyword will be also deleted.

The app has a root user, who receives the add and delete requests and notifies other users to add or delete users. The root has the authority to delete any user. Without root the app will not operate. Root should not be disconnected, and must be up at all times.

4 Conclusions

The app is developed to give the user the best experience to understand the usefulness of the text broadcast. Although a broadcast channel doesn't exist, the user would not be able to notice a difference. This app serves as a prototype of a real broadcast app.

Future work includes integrating a broadcast channel. The app is designed to easily replace the use of the current SMS system with the broadcast channel. This will reduce traffic for the carrier and cost for the user. It would also be beneficial to develop the same app for iPhone. This will give the app a wider audience and exposure.

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