Goose: Social Network Services for Developing Regions and Rural Areas

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ABSTRACT

Many Social Network Services (SNSs) such as Facebook and MySpace rely on a web server that enables the communication between users. As a consequence, SNSs' users require Internet access to participate and interact with their contacts, a service that is not usually available in rural and developing areas.

In this paper we introduce Goose, a distributed SNS for developing regions which provides services including friend searching, resource sharing and information seeking. Goose utilises both the limited GSM coverage and Delay Tolerant Networking (DTN) technologies running on mobile phones to enable social information exchange between members of a community even when cellular data coverage is not available.

Categories and Subject Descriptors

C.2 [**Computer Systems Organization**]: Computer Communication Networks—*Network Architecture and Design*

General Terms

Design, Implementation, Experiment

Keywords

Social Network Service, Forwarding, Delay Tolerant Network

1. INTRODUCTION

According to the World Internet Statistics[1], 76.5% of the world's population do not have Internet access, mainly in developing regions and rural areas. As a consequence, despite being such a big percentage of the world population, we are not able to provide them any kind of SNS yet.

On the other hand, mobile technologies are rapidly spreading through out developing regions when compared to the Internet and fixed lines. For example, while in the USA the number of mobile and landline subscriptions per inhabitant are approximately 0.9 and 0.5 respectively, in developing countries such as South Africa are 0.86 and 0.09 [1]. Moreover, in central Asian countries such as Kazakhstan, people still rely on traditional social network mechanisms to gain information about local news or seeking for resources.

SMS is a killer application for mobile services all over the world that includes social features due to its ability to maintain communication groups and also interconnecting members of a community [3]. Nevertheless, due to SMS's monetary cost, some Instant Messaging applications over GPRS/3G such as MxIT have become popular in developing regions. Once again, those services are based on a centralised server and require Internet access.

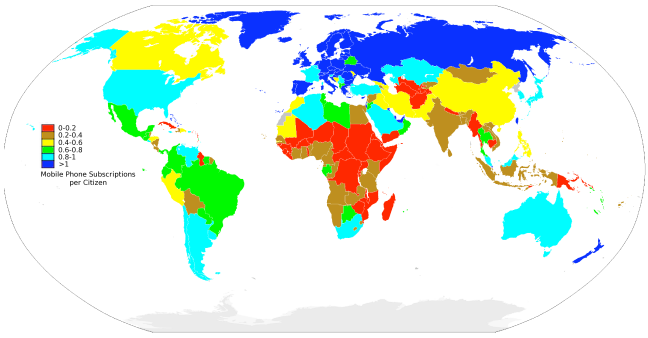

Figure 1: Mobile Penetration (number of active mobile phone numbers per citizen) in the world

All these facts point out that SNSs for developing regions and places with intermittent or limited connectivity must be clearly handset-oriented [6], being as easy to use as SMS. However, it is also necessary to take into account that the literacy rate in these regions is low[2], therefore many users may not be able to use text-based services. We need to design intuitive GUIs and find communication techniques such as voice messages to target that considerable population.

After thinking carefully about all these issues, we envisioned Goose, a distributed social network that does not necessarily require Internet connectivity nor a central node. Goose combines features from SNSs such as status, activity and resources availability report, alarms and microblogging with other SMS social features such as group coordination, leisure purposes and group messaging.

Goose utilises both GSM network and DTN technologies [4] supported by local area connectivities like Bluetooth. That new distributed SNS model takes advantage of the users' social interactions and their inherent mobility both to forward information and to provide a security scheme to identify trusted carriers around.

In addition, Goose architecture was conceived by taking into account the limited resources in mobile handsets. That is the reason why Goose has a light event-driven architecture. In fact, the system is constantly aware of the currently available resources (e.g. memory and battery) to decide whether or not perform any networking task.

In other words, Goose decides which connectivity is the most appropriate for each message by also taking into account the message metadata. For example, messages which are created in scenarios without network coverage are forwarded in a DTN store-and-

[1] `http://www.internetworldstats.com/stats.htm`

[2] Bangladesh has a literacy rate of 47% and a population density of 1045 inhabitants per km^2

forward fashion while SMS is used only for sending urgent unicast text messages because of its monetary cost.

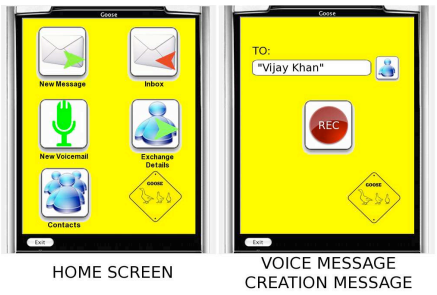

Figure 2: User Interface for J2ME MIDP 2.0 capable devices. It will support both keyboard-based and touch-screen mobile phones

2. GOOSE USE CASES

Goose combines features from SNS (such as status and activity reports, alarms, microblogging and resource-availability reports) with the social uses of SMS (such as group coordination [8], leisure purposes [9] and group messaging [2]). Moreover, Goose will extend GSM network coverage by providing connectivity in areas where the network service is limited or even non-existent.

The basic use cases are illustrated in Figure 3. In the unicast case, a user could use Goose to send a message to his wife about the location of their dog. The message can spread over both the GSM network and the social network taking advantage of social encounters and epidemic algorithms. Intermediate nodes buffer the message in persistent storage during connection outages, retransmitting it to other devices until it reaches the destination. In the broadcast example, Vijay sends a message to all the members of the community asking for help since he has lost his goose.

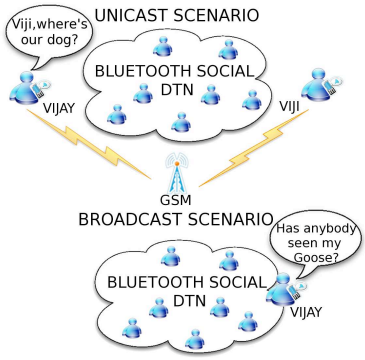

Figure 3: Goose Application Scenarios.

3. RELATED WORK

In recent years, many mobile SNSs use Bluetooth to discover nearby contacts. Some examples are Aka-Aki, BluetoothFlirt and Imity. However, those social networks cannot be extended to developing regions and isolated areas since the user to user connections are through a web service, requiring a 3G or GPRS connection.

Applications such as Nokia Sensor (a Bluetooth-based distributed SNS) enables interaction between nearby users. Nokia Sensor users can visit others' personal page (profile) and post messages on their guest-book. However, it does not support multihop communication and requires physical proximity between the users to enable the social interaction.

There are many projects such as OLPC that aim to provide technology and services for developing areas. Goose can easily run on top of these ad-hoc networks both over WiFi or Bluetooth. While there is not any work focused on providing social mobile networks in developing countries, there are several projects about providing services and connectivity in developing areas by using DTNs.

TIER Research group at the University of California Berkeley, are investigating the design and deployment of new technologies and services for emerging regions [7]. In addition to this, other services such as Kaash [10] gather rural health care data relying on physical device transport to overcome the lack of connectivity as DarkNet [5] does by copying data to a USB drive and physically carry the drive over vehicles.

4. CONCLUSION

Goose is a mobile phone-oriented distributed SNSs for developing areas. This new kind of SNS takes into account the strong mobile penetration in these regions and the users' inherent mobility to propagate data.

In the demo, we will introduce Goose's architecture and some of the technical challenges that it needs to face: User Interface design, networking, energy and storage among many others. At the same time, we are interested in testing the system on a real scenario by inviting the conference attendees to install and try the application on their mobile phones. From this experiment, we aim to obtain useful information about the system performance in challenging environments as the one that Sigcomm 2009 will provide.

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