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Live Communication Networking service developed exploiting GPS technology paradigms and Remote Location Update deployment over Cloud Network

Authors

[1]Kuldeep Mukherjee, [2]Sankar Dasiga

[1] M.Tech student,DCN,Nitte Meenakshi Institute Of Technology Bangalore,Karnataka,India

[2] Professor,Department of ECE, Nitte Meenakshi Institute Of Technology Bangalore,Karnataka,India

Email:[1]*kuldeepmukherjee1@gmail.com*.[2]*dasiga@hotmail.com*

Abstract

This paper describes about development of a new Live Communication Service provided over a network to the end user.This paper aims towards describing the GPS technology usage for the service.The service described here comes under Location Based Networking.The user interface developed for Android based mobile phone provides access to the developed service whereas the server side coding composed in core Java and J2EE is made to run on a Cloud platform.This paper also explains a new Algorithm known as RLCI or Remote Location Check In algorithm used in this developed service. The main aim of this paper is to explain the Networking involved in this service.The test performed over varied type of network with different GPS technology is utilized to make a comparative study of the parameters involved in networking.Location Based Networking described in this paper is motivated from resources and the services granted by Android operating System to provide location update using GPS.This paper is a work in a direction to make public safety forward by one step. This paper is dedicated to the people of India and is an attempt to make our country a safer place by using Live Network Communication service as a free tool to update location to combat emergency

.

Key Words: *Live Network,Communication Networking, GPS,GLONASS, Location Based Service, Java,Android GPS,Cloud Networks, and Emergency Services*

1. Introduction

When networking is considered, mobile forms a major field.The most important parameter to look after in Mobile Networking is its mobility of location and connectivity to the network service provider. The role of *location* ,in digital life is changing as growing numbers of internet users are adding a new layer of location information to their posts, and a majority of smartphone owners use their phones' location-based services

An earlier [2]Pew Internet survey of teens ages 12-17 found that 16% of teen social media users have their accounts set up to automatically include their location in posts.The IETF has developed protocols related to location servers. *HTTP-enabled location delivery – or HELD* – is waiting to be assigned a number at IETF.HELD means people don't have to change out lots of infrastructure to enable LBS services because HELD runs at the IP layer and works really well, he says, adding that the next major release of Firefox will include a HELD client. The attempt in this paper is made to discuss the location based networking developed.

1.1 Live Location based Communication Networking

A location-based communication network is a software application for a IP-capable mobile

device that requires knowledge about where the mobile device is located.

An LBS requires five basic components: *the service provider's software application, a mobile network to transmit data and requests for service, a content provider to supply the end user with geo-specific information, a positioning component and the end user's mobile device.*

By law, location-based networking must be permission-based. That means that the end user must opt-in to the service in order to use it. In most cases, this means installing the LBS application and accepting a request to allow the service to know the device's location.The approach in this paper is taken towards finding a person accessing the similar service within a particular range. This is reffered to as CHECK-IN[1] by the person in the specified range.CHECK-IN is another major aspect based on location based network services .The approach taken in this paper is to provide EMERGENCY CALLING and MESSAGING service to the available clients in a network with updated location information precisely tracked by GPS and latest GLONASS technology.

2. Detail study of GPS-The Backbone of the service

The Global Positioning System (GPS) is a satellite-based system that can be used to locate positions anywhere on the earth. Operated by *the U.S. Department of Defense (DoD), NAVSTAR (NAVigation Satellite Timing and Ranging)* GPS provides continuous (24 hours/day), real-time, 3-dimensional positioning, navigation and timing worldwide. Any person with a GPS receiver can access the system, and it can be used for any application that requires location coordinates.

2.1 Satellite Signals

GPS satellites continuously broadcast satellite position and timing data via radio signals on two frequencies (L1 and L2). The radio signals travel at the speed of light (186,000 miles per second) and take approximately 6/100ths of a second to reach the earth.

2.2 GLONASS

The Russian government has developed a system, similar to GPS, called GLONASS. The first GLONASS satellite launch was in October 1982. The full constellation consists of 24 satellites in 3 orbit planes, which have a 64.8 degree inclination to the earth's equator. The GLONASS system now consists of 12 healthy satellites. GLONASS signals. This increases the availability of satellites and the integrity of combined system.

2.3 GALILEO

Galileo is Europe's contribution to the next generation Global Navigation Satellite System (GNSS). Unlike GPS, which is funded by the public sector and operated by the U.S. Air Force, Galileo will be a civil-controlled system that draws on both public and private sectors for funding.

3. Live Location Networking using GPS

A GPS receiver calculates its position by a technique called SATELLITE RANGING, which involves measuring the distance between the GPS receiver and the GPS satellites it is tracking. The range (the range a receiver calculates is actually a pseudorange, or an estimate of range rather than a true range) or distance, is measured as elapsed transit time.

3.1 Available approaches to calculate location

[3]Haversine formula:

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1)\cdot\cos(\varphi_2)\cdot\sin^2(\Delta\lambda/2)$$
$$c = 2\cdot\operatorname{atan2}(\sqrt{a}, \sqrt{(1-a)})$$
$$d = R\cdot c$$

where *φ is latitude, λ is longitude, R is earth's radius (mean radius = 6,371km);*
note that angles need to be in radians to pass to trig functions!

4. Received location information processing[7]

The location information received from GPS is multiplied with a factor of 10^6 to convert into two digit integer followed by fractional part.The location is then stored in the database of the server residing in cloud.

For example latitude updated as .00001312847 is converted to 13.12847 an longitude .000077587801 to 77.587801 for NMIT ,BANGALORE location.[7]

As the server database is in cloud it is updated 24/7 and live network status is maintained.

The database reffered in this paper is designed to hold three tables

1. **cloudgps**-the table containing updated live location user information
2. **friends**- previously stored friendsinformation in the cloud
3. **user without GPS**-the user information who do not posses GPS service but updated their location manually[7]

5. Networking involved for the services

One of the major objective of this paper is to present and explain the updation of location in the mentioned services ,as to form a networking scenario.The approach taken in this direction aims at explaining the networking parameters and resources used to provide the service .An algorithm mentioned as Remote Location Check In (RLCI) has also been described in steps.
The major networking parameters involved in this attempted services are listed below.

5.1 Developed Algorithms in use

The proposed algorithm in this paper is named as Remote Location Check In (RLCI) algoritm .This algorithm is dedicated to discover all the devices accessing the service and to show their present location .This algorithm also provides the path to search user from database present in the cloud network.
The parameters defined to describe the algorithm are Userid/mobile number(UID), password(PWD),search range (SR),services – CALL or MESSAGING

The steps defined in the algorithm are

1. LOGIN to the user interface using your UID AND PWD
2. CONTINUE STEP 3 UNTIL SUCCESSFULL
3. Request for the location based network service ,it should be noted that the request goes via mobile network data service,so make sure Mobile data service is activated.
4. IF GPS is ENABLED let the device update your location,Provide access permission to GPS.ELSE GOTO STEP 9
5.Update device location UNTIL EXIT.CONTINUE STEP 6 UNTIL STEP 7
6. Specify your fiends number TO STORE IN DATABASE
7. Specify sr and search your known FRIEND in SR OR ALL USER in SR
8. Select from available USER and send MESSSAGE or make a CALL RETURN TO STEP 4
9. Select user from cloud database AND GO TO STEP 8
10. EXIT.

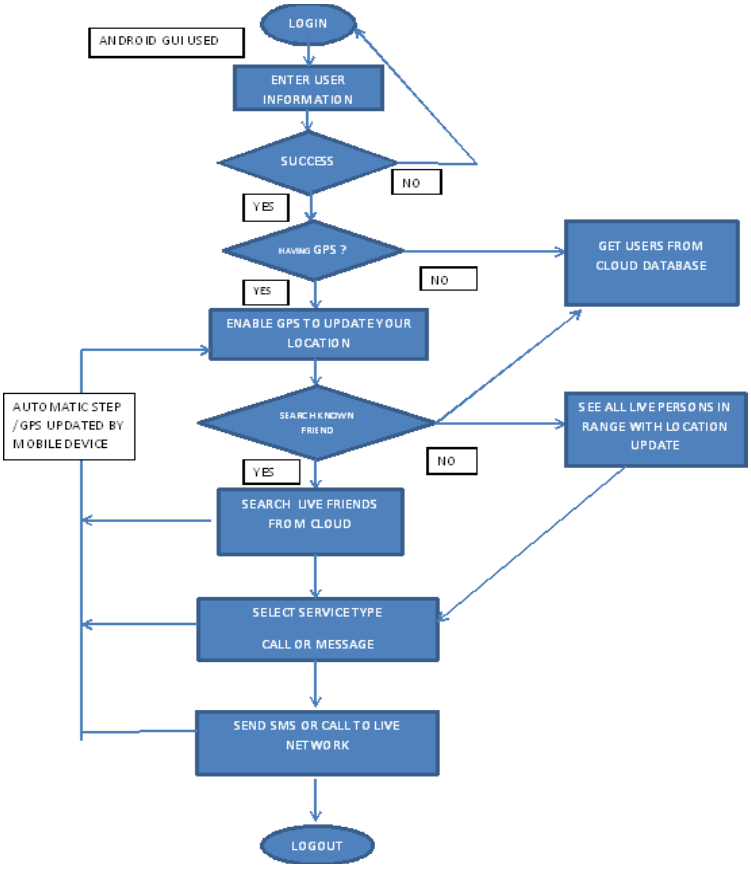


Figure -1*FLOWCHART for* ***RLCI***

6. Developing the GUI for Android[5]

The platform chosen to develop the GUI in this paper is Android OS.
As of 2011, Android has the largest installed base of any mobile OS and as of 2013, its devices also sell more than Windows, iOS and Mac OS devices combined.

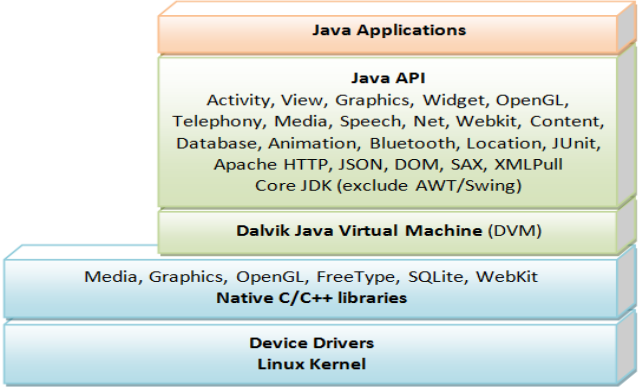


Figure 2-*Android stack description hierarchy*

7. Encryption [6]

7.1 Description of the cipher

AES is based on a design principle known as a substitution-permutation network, and is fast in both software and hardware.Unlike its predecessor DES, AES does not use a Feistel network. AES is a variant of Rijndael which has a fixed block size of 128 bits, and a key size of 128, 192, or 256 bits. By contrast, the Rijndael specification *per se* is specified with block and key sizes that may be any multiple of 32 bits, both with a minimum of 128 and a maximum of 256 bits.

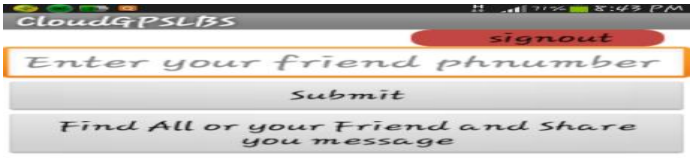
AES operates on a 4×4 column-major order matrix of bytes, termed the *state*, although some versions of Rijndael have a larger block size and have additional columns in the state. Most AES calculations are done in a special finite field.

The key size used for an AES cipher[6] specifies the number of repetitions of transformation rounds that convert the input, called the plaintext, into the final output, called the ciphertext. The number of cycles of repetition are as follows:

10 cycles of repetition for 128-bit keys.
12 cycles of repetition for 192-bit keys.
14 cycles of repetition for 256-bit keys.

Once the information is entered it is directly interfaced with the server code running on the cloud network thus enabling LIVE UPDATE and tracking.

Actual screenshots of client side service window[5]



8. Introducing Cloud Computing[7]

The server-side development discussed in this paper solely resides on a Cloud.**Cloud computing** involves computing over a network, where a program or application may run on many connected computers at the same time. It specifically refers to a computing hardware machine or group of computing hardware machines commonly referred as a serverconnected through a communication network such as the Internet, an intranet, a local area network (LAN) or wide area network (WAN).
In common usage the term "THE CLOUD" is essentially a metaphor for the Internet.[1]The cloud hosting suggested in this paper is primarily ***JELASTIC CLOUD***.Jelastic is a Platform-as-Infrastructure provider of Java and PHP hosting.It has international hosting partners and data centers.

8.1. How Cloud service is exploited in the project

[12]The server side code written basically in Java.The Jelastic service is choosen with servint .net service provider.once the access to cloud is granted The server Enviorment is created and the necessary software like apache tomcat compatible with jdk 1.7 and the My Sql 5.5 is installed .This service is cooperatively denotes the IaaS and PaaS services provide by the Jelastic cloud.

8.2 .Resources usage and specifications.[7]

The server code deployed in the jelastic cloud shows a statistical usage of 1 MHZ cpu MEM of 265 mb HDD of 205 MB.
Usage of 3 out of 4 default allocated cloudlets are up all the time.

9. Test results and comparisons for various platforms.

All the modules were found to be errorless and strictly according to the specifications. Functionality Testing of the deployed location based service is carried out accessing the variation of inbuilt GPS technology used.The functionality testing was carried out in NITTE MEENAKSHI INSTITUTE OF TECHNOLOGY ,Bangalore college campus.

Screenshots of database running in Jelastic cloud server

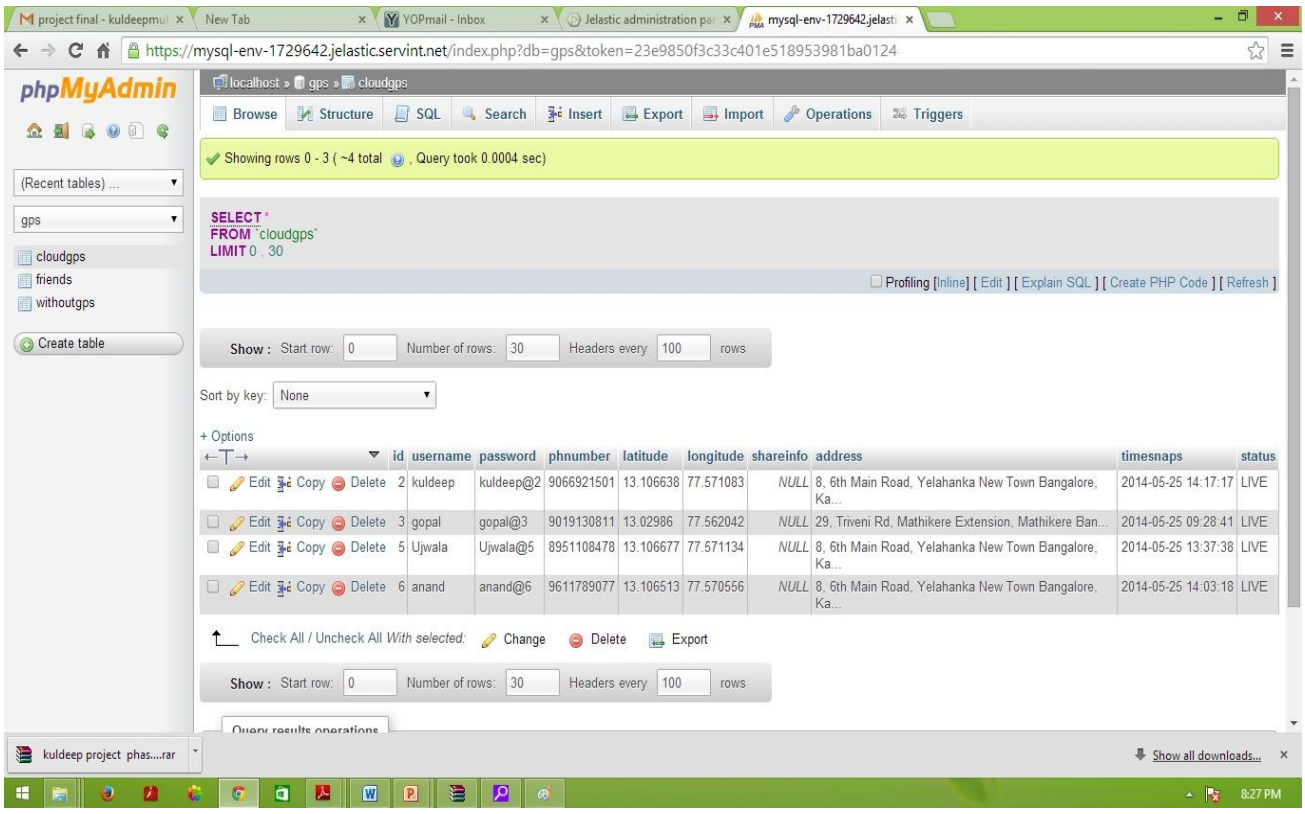


Table 1-USER DEVICE SPECIFICATION

USER	2G NETWORK	3G NETWORK	PROCESSOR	GPS TYPE
USER 1	GSM 850 / 900 / 1800 / 1900 - SM-T211, SM-T215	HSDPA 850 / 900 / 1900 / 2100 - SM-T211, SM-T215	1.2GHz dual core	AGPS support and GLON-ASS
USER 2	GSM 900 / 1800 - SIM 1 & SIM 2	HSDPA 2100	1.3 GHz dual-core MediaTek MT6572 processor	with AGP support
USER 3	GSM 850 / 900 / 1800 / 1900	HSDPA 850 / 900 / 1900 / 2100 HSDPA 850 / 1700 / 1900 / 2100 - for T-Mobile, AT&T	Quad-core 1.2 GHz Cortex-A7	AGPS support with GLO-NASS

TABLE 2–USER TEST LOCATION

USER	Device type	Manufacturer	Test location	Range
USER 1	GALAXY TAB 3	SAMSUNG	M.TECH DCN LAB	100 MTS
USER 2	A 74	MICROMAX	M.TECH DCN Library 200 mts from DCN lab	100- 200
USER 3	MOTO G	MOTOROLA	NMIT CANTEEN 300 mts fromM.TECH DCN lab 150 METRES FROM DCN LIBRARY.	200 -300 MTS

following are the results obtained upon analysis of location based networking access from the above mentioned devices when the designed service is attempt to run on the devices for four test cases.

TABLE 3- Analysis of Updation time

USER	TIME TAKEN TO APPEAR LIVE (SECONDS)	TIME TAKEN TO UPDATE LOCATION (SECONDS)	SYSTEM FAILURE out of 4 times	CLOUD SYNCH RONIZAT TION
USER 1	14.32	4.12	0	100%
USER 2	26.54	4.12	1	75%
USER 3	17.62	4.12	1	75%

9. Conclusion and future works.

The conclusion drawn from the test results shows that the GPS device available with the user device is responsible to provide LIVE NETWORK COMMUNICATION.The quality of technology integrated with GPS in individual device decides the minimum time to appear live for the first time.Thus GPS GLONASS gives a better performance.The processor speed does not influence any module of the developed service as quad core is found to provide only 75% synchronization with cloud whereas 1.2 GHZ dual core is providing 100% cloud synchronization.Cloud synchronization is decided by the number of times the live network service successfully updates the user location and stores in cloud.

Thus the overall conclusion arrived from this paper is that LIVE NETWORK COMMUNICATION is possible updating user location using GPS and running the server on Cloud. Future of this service depends on the number and type of services provided.More work has to be done to provide user with more usefull services such as chat window etc.Automatic login using existing google or facebook account can also be provided.The removal of login concept will make this an OPEN EMERGENCY LIVE LOCATION SERVICE ..

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BIOGRAPHIES

KULDEEP MUKHERJEE

M.Tech ,Digital Comunication and Networking.NMIT, Bangalore.

B.Tech ,Computer Science and Engineering,Aryabhatta Institute of Engineering and Management Durgapur .West Bengal

Areas of work-
Networking,Java,Android ,Cloud

Email
kuldeepmukherjee1@gmail.com

Prof SANKAR DASIGA

Professor,Department.of ECE.NMIT,BANGALORE.

Experience-Program Manager
NXP Semiconductors India Pvt Ltd.
Manager -Software Development
Cisco Systems India Pvt Ltd
Technical Manager
Wipro Infotech Ltd
Project Leader
Philips Software Centre
Manager / Consultant
Siemens Information Systems Ltd
Email-dasiga@hotmail.com