ISSN:0975-9646

Analyzing a Mobile Framework for Location Based Tracking

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Abstract-**The number of mobile operator implementing the capability to locate mobile phone in wireless network is increasing day by day. Mobile Network operators and Application developers can use the framework to implement Standard Location immediate Service, Emergency Location immediate Service, Standard Location reporting services and Emergency Location reporting service and Triggered Location reporting Services. An existing framework based on Secure User Plane Platform, Assisted Global positioning system with the interface provided by Mobile Location protocol and User Location protocol was analyzed and studied. The problems were identified for providing better solutions. The results of the studied framework with precise Location Coordinates of Targeted Mobile Station are presented in this paper.**

Keywords- **GPRS, MLP, SUPL, WWRN, ULP, Assisted GPS.**

I.INTRODUCTION

Mobile Location Service uses the Location of Mobile subscriber to enable the Subscriber experience within an application. The number of mobile operators implementing the capability to locate mobile phone in the wireless network is increasing day by day. Location based Services is defined as "Information services accessible with mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device" [3]. Open Geospatial Consortium defined LBS service "A wireless-IP service that uses geographic information to serve a mobile user, any application service that exploits the position of mobile Terminal [17].The present work gives a framework of Location based services using Assisted Global positioning system, Secure user plane Location platform, GMLC Middleware platform with the help of Mobile location protocol, user location platform and Transmission control protocol with IP technology. The Most common positioning Methods for Location based Services are GPS and AGPS.The GPS is not successful in Location based Application as it needs extra handset for satellite signaling and also it does not work indoor. Assisted-GPS does not need extra handset, also works indoor. Assisted GPS is defined as a positioning system which uses the same satellites as GPS, but besides that, it also uses a reference network that tracks receiver and satellites and also makes some heavy calculations on handset [5]. The Mobile Location Protocol (MLP) is defined as an application-level protocol for getting the position of mobile stations independent of underlying network technology [6][7]. Basically, the protocol is used for querying the position of target mobile station between Client and Location Server. The User Location Protocol (ULP) was developed by the OMA. The TCP/IP ULP is defined as a protocol used to exchange of location data between a Location Server and a Target MS [8]. In a system, it also helps to determine which positioning system a mobile station supports. The Secure User plane Location Platform woks on IP Technology. It is defined as a most general and versatile solution for service discovery on TCP/IP networks [10]. The Gateway Mobile Location Centre (GMLC) helps to provide initial position of Mobile station. The GMLC is the first node an external LCS client accesses in a GSM or UMTS network [12]. Universal Mobile Telecommunications System (UMTS) is a third generation mobile cellular technology for networks based on the GSM standard [18]. A General Model of Location based Services in shown in Figure 1. Location Services (LCS) are network capabilities which enable the deployment of Location based applications [1].LCS Client is a software and/or hardware entity that makes request to LCS Server for the purpose of obtaining location information for one or more Target Mobile Stations[5]. LCS Server is a software and/or hardware entity offering LCS capabilities.

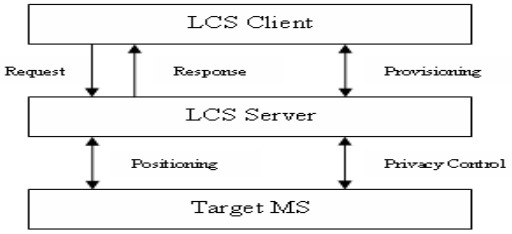

Fig.1. Model of Location based Services

The Location Server takes requests from the client, works on the requests and sends the responses to the client. Target MS is a Mobile Station whose Location Information is requested by other Mobile Station through its Client.

Working- A User queries for a Location of another mobile through its Location Client. The Client gives request to Location Server .with the following architecture and procedure described in section III and IV Location server gives the positioning of Targeted Mobile station to the Client.

II.RELATED STUDIES

Many researchers have already work on framework of location based Services. Dragon Stojanovic et al proposed a Global information system application framework for design and development of location based Services[13].in this framework with the integration of GIS and internet application, a prototype is developed for yellow pages for city Nis.This system had a limitation of unavailability of mobile positioning services and more based on internet access. Maya Haridasan et al design and implement a framework for enabling Track based applications [14].The Framework uses GPS as a positioning system with WIFI therefore it has a limitation of indoor.Sushil jajodia et al proposed a formal framework to model the problem of garmenting anonymity when requiring Location based services [15].This work identifies the privacy preservation techniques an algorithm is developed to make a check on attacker who tries to access the techniques. Axel kupper et al proposed a Device Centric Middleware framework for location based services,Trax which particularly focuses on position management, advanced functions of interrelating the position data of several targets and privacy protection[16].This system integrates the outdoor and indoor positioning methods and also provides means of dynamically change of position of Mobile user. Amit kushwaha et al proposed a middleware platform for Location based services using android operating system [4].The system helps the user to search any place of its own interest like school, restaurant etc.The Architecture presented in a paper is described in section III.

III.ARCHITECTURE OF LOCATION BASED SERVICES

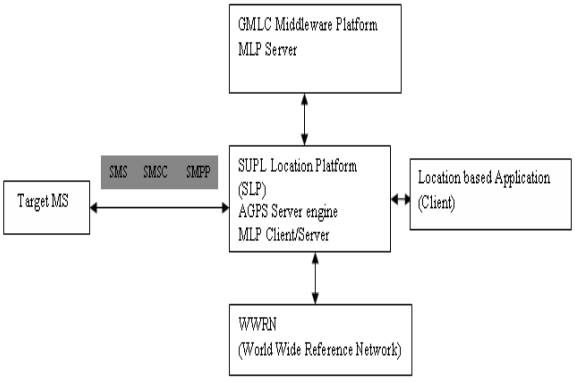

Fig.2. Architecture of Location based Services

The Architecture works on SUPL Location Platform[2] where SUPL (Secure User plane Location) is an IP Technology that was developed to support Location based services for wireless communication.SUPL was developed by Open Mobile Alliance (OMA), a Mobile communication Industry Forum that was created to bring open standards, platform Independence, and Global Interoperability to the LBS Market [2].It is a Server that handles the task associated with User authentication, User requests, Location based application download, also charging and roaming [2]. WWRN provides GPS assistance data i.e. Satellite ephemeris to AGPS Server engine in SLP. Broadcom Worldwide Reference Network collects and distributes data for all GPS satellites on a continuous basis [11].Client is an application that request and uses the Location Information of Targeted Mobile station for some purpose .A GMLC is a platform which is already installed in the client mobile based on the tower used by the requested client. A Protocol for Mobile Location [19] is used to set an interface between a Server and Client.ULP [2] is used to set an interface between Server and Target Mobile Station. In this architecture, there is a communication between GPRS and Server. GPRS is a data service whose common use is providing access to the Internet in GSM networks [9]. A subscribed User can access a service only in its home network therefore SLP is used with GPRS for roaming and accessibility in foreign network. The process of Notification that takes place between Server and Target Mobile station is given below.

A.How Notification Takes place between Server and Target MS:

The interaction between Target Mobile Station and Server is done with the help of two protocols which are ULP and TCP/IP where ULP is used to Initiate the Session, helps in proper positioning and responsible for end of session. The Server takes Notification of Targeted Mobile Station and also maintains an IP connection with the Mobile station. Notification process is performed through SMS (Short message service) from Server through SMSC (Short message service Center) using SMPP (Short message peer to peer protocol) [20]. How the communication takes place between client, GMLC, Server and Target MS is shown in figure 3.

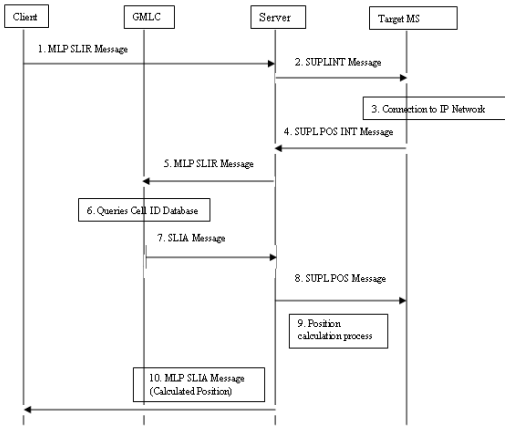

Fig.3. Communication between Client, GMLC, Server and Target MS

B. How Communication takes place between Client, GMLC, Server and Target Mobile Station.

The process is described in steps as follows-

1. The Mobile Client asked for the location of the targeted Mobile Station by sending a request to a Server. The request contains the identification of the targeted Mobile station with the routing information and a transaction code. The Server authenticates the client's request and then determines whether the transaction is based on GPS or AGPS or any another positioning device.

2. The Server sends an initiation message to the Mobile station. This message contains an access code, address of server, parameters for positioning method being used and a unique identification generated by server to the Targeted Mobile Station.

3. Now the Mobile Station authenticates the access code send by the Server and connects to an IP network through GPRS.

4. The Server gets an identification of tower used through which Mobile Station is accessible. It sends through the Mobile station only.

5. The Server sends a request message to the GMLC for getting the position of the Targeted mobile station. This message contains the Identification and access code for the Targeted MS, and also the Identification of the Cell tower being used by the Target MS.

6. Now GMLC authenticates the Sender request, and through its database, it calculates the latitude and longitude of the Cell ID referenced in the Server request message. This result act as initial position for the position calculation.

7. Now GMLC will send the acknowledgement message to the Server containing the result generated in point 6.

8. The SLP authenticates the ID number and sends a position of service message to the Targeted MS.

9. Now, the position calculation process will take place.

10. At Last a Server sends the calculated position to client through acknowledgement.

IV.IMPLEMENTATION

A.The Client Requested for getting the position of MS 9910198607-

```
<slir ver="3.0.0 ">
<client>
<Id>test></id><pwd>password</pwd>
</client>
<msid type="MSISDN">
<msid>9910198607</msid>
<loc_type="current"/>
<prio_type="high"/>
</slir>
```

Result with Successful Position of above MS.

```
<slia ver="3.0.0">
<Pos>
<msid type="MSISDN">9910198607</msid>
<Pd>
<Time>20050505065051</Time>
<Shape>
<Circular area>
<coord>
<x>155 08 34.223N</x>
<y>105 08 32.220E</y>
</coord>
<Radius>1500</Radius>
</circular area>
</shape>
</Pd>
</pos>
</slia>
```

B.The Client Requested for getting the position of MS 8800198607-

```
<slir ver="3.0.0 ">
<Client>
<Id>test1></Id><pwd>password1</pwd>
</client>
<msid type="MSISDN">
<Msid>9910197655</Msid>
<loc_type="current"/>
<prio_type="high"/>
</slir>
```

Result when Client is not authorized:

```
<slia Ver="3.0.0">
<result resid="3"> Unauthorized Application</result>
</slia>
```

C. The Client Requested for getting the position of MS 7482999999-

```
<slir ver="3.0.0 ">
<Client>
<Id>test2></Id><pwd>password2</pwd>
</Client>
<msid type="MSISDN">
<msid>7482999999</msid>
<loc_type="current/Last">
</slir>
```

Result when No Such Subscriber exists

```
<slia Ver="3.0.0">
<result resid="4"> Unknown Subscriber</result>
</slia>
```

V.RESULTS

A. A sample from Results-

Table I. Successful positioning of Mobile Station

MSID	RES ID	Location Coordinates	
		X	Y
99101 98607	0	155 08 34.223N	105 08 32.220E

Table II. Successful positioning of Mobile Station

MSID	RES ID	Radius	Time	Result
991019 8607	0	1500	20050505 065051	Successful Positioning

B. Problems Identified-

Table III. Unsuccessful positioning of Mobile Stations

MSID	RESID	Location Coordinates		Radius	Time	Result
		X	Y			
9910197655	3	-	-	-	-	Unauthorized Client
7482999999	4	-	-	-	-	Unknown Subscriber

C. Suggested Solution-

In case of Critical applications, the framework should provide the user ways to overcome the problems such as means of getting legal authorization easily through an integrated framework and better description of unknown subscriber.

VI.CONCLUSION

The existing Framework that can be used for both Push and Pull Location based Services was studied. A client can find the accurate position of Mobile user for various applications such as friend finder, searching of a child. The existing framework can be more successful for indoor and outdoor applications, if enhanced. This Framework uses secure user plane platform which enhances the performance and also limits the bandwidth consumption. World wide reference networks and assisted Global positioning systems offers mobile users' economical, high-performance and high-reliability Location based Services**.** Our aim in the present study is to extend these previously known results.

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