

# **Development of Real-time Tracking and Log Management Prototype System using FOSS4G**

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One of the recent developments in geospatial technologies is the ubiquity of location information. Especially, the emergence of GPS-enabled cell-phone and mobile devices has facilitated mass marketing of Location Based Services (LBS). For example, navigation service, geo-tagged contents, Volunteered Geographic Information and tracking of assets and personnel. Integration of GPS and GIS is also effective for fleet management, logistics, emergency medical services, rescue and relief. Access to such LBS requires the use of customized devices or service-supported cell-phones. Presently, it is difficult to develop or tailor LBS that could meet a wide variety of application scenarios and user needs. There is a need to implement a framework, wherein LBS and other Geospatial Services could interoperate more easily and effectively.

In order to address some of the above mentioned issues, a prototype system for real-time GPS tracking and log management was developed using FOSS4G tools. The workflow for prototype system can be demarcated into 3 components. First is the server component that provides data processing, archiving and geospatial services. Second is tracking component that includes GPS enabled target. Third is the client component for viewing GPS location and the track log.

The server component was implemented on Linux platform using Apache, PHP, Java, PostgreSQL and PostGIS in order to store GPS data from tracking component and display the current position of GPS target on the web map. Data from the tracking component in raw NMEA (National Marine Electronics Association) format are extracted to the information such as longitude and latitude, time, etc. and archived in PostgreSQL DBMS. Real-time track logs are converted to GeoRSS to be viewed in OpenLayers using auto-refresh functionality. 3D track logs in KML format are also generated at the server and can also be viewed in Google Earth. In the prototype system, Google Maps (vector and satellite maps) are used as background layer and a road network layer (Orkney 2008 Data Pack) can be overlaid through WMS connection. The client can also query and display the track log on-the-fly by date, time interval between, IP address of GPS user and PDOP (Position Dilution of Precision) on the web map and export as GPX, KML formats for further use on other GIS applications.

Tracking component uses PDA with a Java program which was developed for retrieving raw GPS data in NMEA format from GPS receiver and sending GPS data to

the server through cell-phone wireless network. Sending GPS data to the server, socket programming is implemented in the Java program. The Java program sends the data to the server at user demand time interval. In addition, PDA with a low cost GPS receiver and GlobalSat TR-102 Personal Tracker were used for the experiments in Japan (CDMA) and India (GSM).

Although the performance of low cost GPS receivers have greatly improved due to better GPS chips, enhanced receiver functionality and SBAS (Satellite Based Augmentation System). GPS signal are degraded in “urban canyons” and under forest canopy. In the prototype system, GPS signal errors are minimized using map matching functionality which is implemented using PostGIS and quality filtering for GPS signal using Dilution of Precision data available on the server. The prototype system provides better interoperability between LBS and geospatial applications by implementing workflow using Open Geospatial Standards.