LBS-P: A LBS PLATFORM SUPPORTING ONLINE MAP SERVICES

Yingwei Luo, Xiaolin Wang, Xiao Pang and Haibo Wang

Dept. of Computer Science and Technology, Peking University, Beijing, China, 100871
E-mail: lyw@pku.edu.cn

1. INTRODUCTION

With the development of 3G and LBS (Location Based Service), it tends to provide online map services and other GIS services, so as to allow users access them on demand.

This paper presents LBS-p, a LBS supporting platform, which provides online map service with Byte-Map. Byte-Map is a lightweight binary vector mobile map format using two-byte coordinates. LBS-p consists of LBS-p Mobile and LBS-p Server. LBS-p Mobile is a Java ME application running on the mobile terminal, which dedicates to the request, management and display of mobile map data. LBS-p Server consists of Byte-Map data preprocessing mechanism, Byte-Map data providing module and LBS-oriented GIS service module. Byte-Map data preprocessing mechanism processes the original map data (i.e. GML data) and produces Byte-Map data for LBS-p. Byte-Map data providing module provides Byte-Map data to LBS-p Mobile. And LBS-oriented GIS service module focuses on provision of additional GIS services needed by LBS. Performance evaluations and a LBS application example shows that LBS-p is effective.

2. LBS SUPPORTING PLATFORM: LBS-P

LBS-p is a LBS supporting platform. The "p" here means both "Peking University" and "platform". LBS-p adopts C/S architecture, and is illustrated as Figure 1. LBS-p consists of LBS-p Mobile and LBS-p Server, and the online map service between LBS-p Server and LBS-p Mobile is provided by utilizing a lightweight binary vector map format Byte-Map.

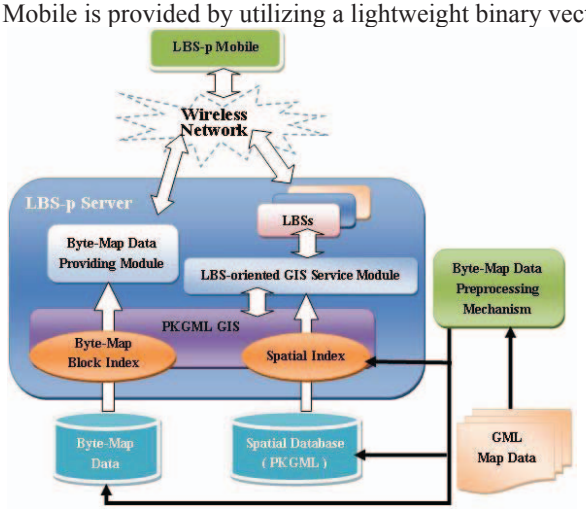

Figure 1. The Architecture of LBS-p

Presently the architecture of LBS supporting platform is correspondingly mature. But it is still a critical issue to provide online map service to users, to satisfy their "anytime anywhere" requirements. This paper dedicates to implementing a satisfactory online map service in LBS-p. Although Mobile SVG is recommended by W3C and hence adopted in most online map services today, we argue that Mobile SVG takes too much data amount because it is based on XML. Even if it is compressed before transfer on wireless network, the data amount is still unsatisfactory, without mention the additional uncompressing expense of time, memory and power on the mobile client side. Hence we utilize a novel lightweight binary vector map format, Byte-Map, in the implementation of online map service in LBS-p. Comparing to Mobile SVG, Byte-Map has advantages in both data volume and processing expense on mobile side. We design and implement Byte-Map Data Pre-processing Mechanism in LBS-p Server to prepare Byte-Map data for LBS-p; and implement Byte-Map Data Providing

Module in LBS-p Server to provide online map service. Also LBS-oriented GIS Service Module is implemented based on PKGML(a light weight GIS tool developed by ourselves) to provide additional GIS services needed by LBS in LBS-p Server.

LBS-p Mobile dedicates to the request, management and display of mobile map data, along with initiating LBS request and showing LBS results. LBS-p Mobile consists of map engine and GPS module, whose architecture is shown in Figure 2.

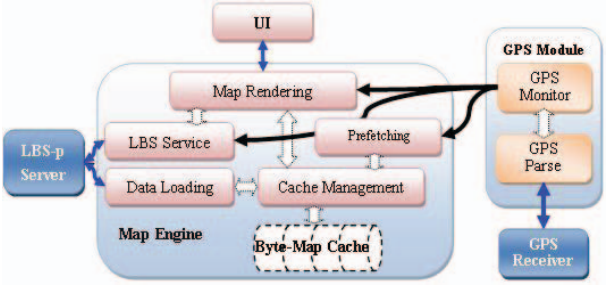

Figure 2. The Architecture of LBS-p Mobile

Also, we discuss the timing and content of Byte-Map request in LBS-p Mobile, request and response protocols between LBS-p Mobile and LBS-p Server, online provision of Byte-Map data in LBS-p Server.

3. EXPERIMENTS AND APPLICATION EXAMPLE

In this section, experiments on online map service in LBS-p are taken, which includes the data volume to be transferred, the handling complexity in LBS-p Mobile and the concurrent response time in LBS-p Server.

Figure 3 illustrated one of our experiments - the response time of Byte-Map Data Providing Module for concurrent requests. Here, Microsoft Web Application Stress Tool is hired to simulate concurrent users, and data requests are generated randomly with different levels, different range and different blocks.

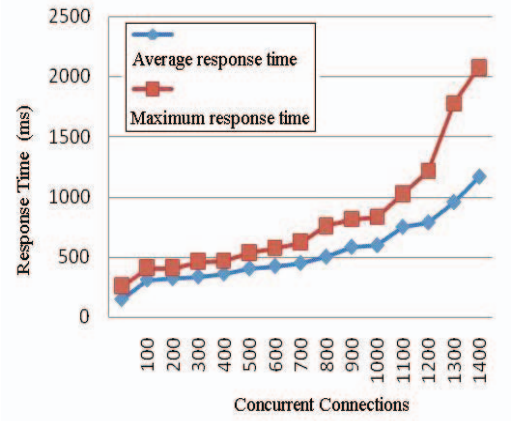

Figure 3. Response Time of Byte-Map Data Providing Module for Concurrent Requests

Also, we implement a navigation LBS service by using online map service provided by LBS-p. In this use case, the user needs to find out the shortest path from current location to a destination. After he/she gets the path by querying the navigation LBS service, he/she will move by this path, and the map on the way will be loaded and displayed dynamically on his/her demand.

4. CONCLUSION

In order to provide online map service and other GIS services, to allow users access map data on demand, this paper takes use of Byte-Map, a lightweight binary vector map format, establishes the data mechanism of requesting and replying based on Byte-Map, designs and realizes the online map service as well as implements a LBS supporting platform LBS-p. Performance evaluations and a LBS application example show that LBS-p is effective.

5. REFERENCES

[omitted here]