

Mobile Client Webservice Architecture for Personal Navigation Service

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Abstract: The development of an open LBS platform makes it easy to use of the location information between telecommunication companies which have different platforms and to develop various LBS solutions using position information. This paper proposes a mobile webservice solution providing public transportation services to the mobile subscribers.

Keywords: LBS, OpenLS webservice, KLP, WIPI.

1. Introduction

LBSs(Location Based Services) are emerging killer applications in the mobile communication networks. There have been already a lot of LBS applications in the market. But, due to the variable techniques and different platform systems, new issues are raised in the application development, such as scalability, heterogeneity and adaptability. To overcome such problems, Open LBS platform projects and studies have been started[1]. Here we introduce a mobile solution system which is based on the open platform. This paper proposes a solution architecture to support the open LBS platform and its webservice components and we make a prototype system for PNS(Personal Navigation Service) using public transportation database. Fig. 1 shows public transportation webservice solution working together open platform. The solution system is composed of solution server and client. The solution server based on J2EE platform provides PNS making use of the location information and OpenLS webservices from the open platform. The client is based on a mobile standard platform, WIPI(Wireless Internet Platform for Interoperability).

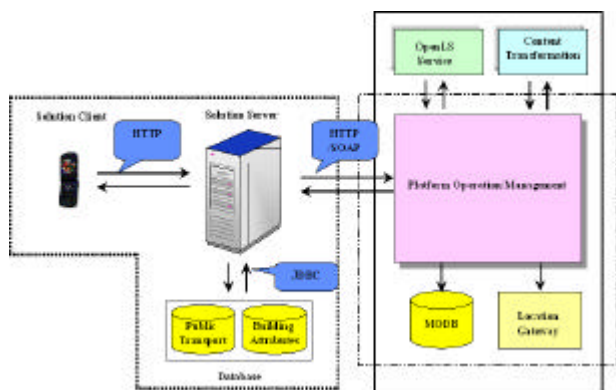


Fig. 1. PNS webservice solution and open platform

The outline of the paper is as follows: The section 2 describes the solution server architecture, MLP and

OpenLS webservice. Then, in section 3, we describe the client program architecture and the last section we present our future research direction for improving the system performance.

2. Solution Server Architecture

The function of a solution server is providing PNSs requested by a client using LBS platform and public transportation database. The structure is like Fig. 2.

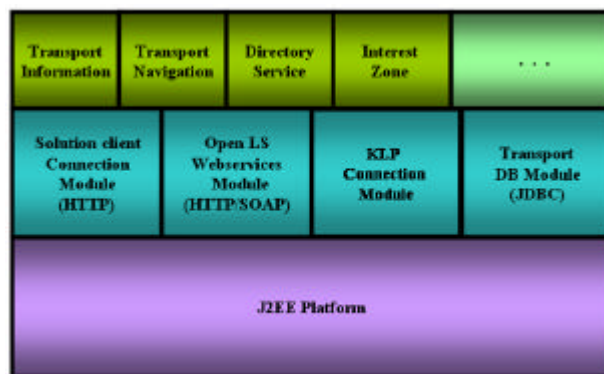


Fig. 2. Structure of solution server

The solution server, based on J2EE(Java Enterprise Edition) platform, have several sub modules such as solution client connection module, OpenLS webservices module, KLP connection module and public transportation DB module. The solution connection module is a HTTP communication module between server and client. The function of KLP connection module is getting a location of mobile phone as standard protocol. OpenLS Webservices module communicates with platform over the HTTP/SOAP and gets the Open LS services from the platform. At last, public transportation DB is accessed via the transport DB module. Using above modules, PNSs with public transportation are created for the client

1) KLP Connection Module

The KLP connection module gets the location of mobile phone from the LBS platform by KLP(Korea Location Protocol), XML based location request and response protocol, standardized by KLSF(Korea LBS Standardization Forum). KLP provides five services like LIF(Location Interoperability Forum) MLP(Mobile

Location Protocol)[2]. Table 1 is the description of each service. Fig. 3 and 4 are example XML codes for a location request and response with KLP.

Table 1. KLP Services

| Service | Description |
|------------------------------|---|
| Standard Location Immediate | A service used when a location response is required immediately or the request may be served by several asynchronous location responses |
| Emergency Location Immediate | A service used especially for querying of the location of mobile subscriber that has initiated an emergency call |
| Standard Location Reporting | A service used when a mobile subscriber wants an LCS Client to receive the MS location |
| Emergency Location Reporting | A service used when the wireless network automatically initiates the positioning at an emergency call |
| Triggered Location Reporting | A service used when the mobile subscriber's location should be reported at a specific time or event. |

```
<?xml version="1.0" encoding="UTF-8"?>
<slir ver="1.0.0" res_type="SYNC">
  <msids>
    <msid type="IPV4">93.10.0.250</msid>
    <msid_range>
      <start_msid><msid>461018765710</msid></start_msid>
      <stop_msid><msid>461018765712</msid></stop_msid>
    </msid_range>
  </msids>
  <eqop>
    <resp_req type="LOW_DELAY" />
    <hor_acc>1000</hor_acc>
  </eqop>
  <geo_info>
    <CoordinateReferenceSystem>
      <Identifier>
        <code>4004</code>
        <codeSpace>EPSG</codeSpace>
        <edition>6.1</edition>
      </Identifier>
    </CoordinateReferenceSystem>
  </geo_info>
  <loc_type type="CURRENT_OR_LAST" />
  <prio type="HIGH" />
</slir>
```

Fig. 3. Example of KLP request

```
<?xml version="1.0" encoding="UTF-8"?>
<slia ver="1.0.0">
  <pos>
    <msid>461018765710</msid>
    <pd>
      <time utc_off="+0200">20020623134453</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4004">
          <coord>
            <X>301628.312</X><Y>451533.431</Y>
          </coord>
          <radius>240</radius>
        </CircularArea>
      </shape>
    </pd>
  </pos>
  <pos>
    <msid>461018765711</msid>
    <pd>
      <time utc_off="+0300">20020623134454</time>
      <shape>
        <CircularArea srsName="www.epsg.org#4004">
          <coord>
            <X>301228.302</X><Y>865633.863</Y>
          </coord>
          <radius>570</radius>
        </CircularArea>
      </shape>
    </pd>
  </pos>
  <pos>
    <msid>461018765712</msid>
    <poserr>
      <result resid="10">QOP NOT ATTAINABLE</result>
      <time>20020623134454</time>
    </poserr>
  </pos>
</slia>
```

Fig. 4. Example of KLP response

2) Open LS Webservices Module

OGC(Open GIS Consortium) standardizes OpenLS services and the LBS platform support them as webservices. The OpenLS services are described in Table 2[3][4][5]. The solution server requests directory, route determination and presentation serve to platform and gets the service results. Fig. 5 and 6 are sample codes for the presentation service request and response.

```
<?xml version="1.0" encoding="UTF-8"?>
<PortrayMapRequest>
  <Output width="640" height="480" format="image/png">
    <BBoxContext>
      <UpperCorner>
        <Coord cs=" " -114.342 50.234 </Coord>
      </UpperCorner>
      <LowerCorner>
        <Coord cs=" " -114.123 50.031 </Coord>
      </LowerCorner>
    </BBoxContext>
  </Output>
  <Basemap filter="Exclude" />
  <Overlay> <Position></Position></Overlay>
</PortrayMapRequest>
```

Fig. 5. OpenLS Presentation Service Request

```
<?xml version="1.0" encoding="UTF-8"?>
<PortrayMapResponse>
  <Map>
    <Content width="640" height="480" format="image/png">
      <URL>http://www.mapseter.com/maps/hgt46.png</URL>
    </Content>
    <BBoxContext>
      <UpperCorner>
        <Coord cs=" " -114.342 50.234 </Coord>
      </UpperCorner>
      <LowerCorner>
        <Coord cs=" " -114.123 50.031 </Coord>
      </LowerCorner>
    </BBoxContext>
  </Map>
</PortrayMapResponse>
```

Fig. 6. OpenLS Presentation Service Response

Table 2. Open LS Services

| Service | Description |
|-----------------------------|--|
| Directory Service | A service that searches the location of a specific place(yellow and white page) |
| Route Determination Service | A service that determines routes between two locations (shortest, fastest route, etc.) |
| Presentation Service | A service that portrays a map |

3) Solution Client Connection Module

The solution services are public transportation information service, public transportation navigation service, directory service and interest zone service. Each service is transmitted to the solution client over the HTTP and the service description is like below.

Table 3. Solution Service

| Service | Description |
|------------------------------|--|
| Public Transport Information | -Bus, subway timetable Info. -Bus stop, subway station Info. |
| Public Transport Navigation | -Route determination using public transport -Alerting the destination |
| Directory Service | -White page -Yellow page -Proximity search |
| Interest Zone | -Registering the interesting places |

3. Solution Client Architecture

Fig. 7 shows the structure of the solution client that displays public transportation contents as explained in Table 3, to the service subscribers.

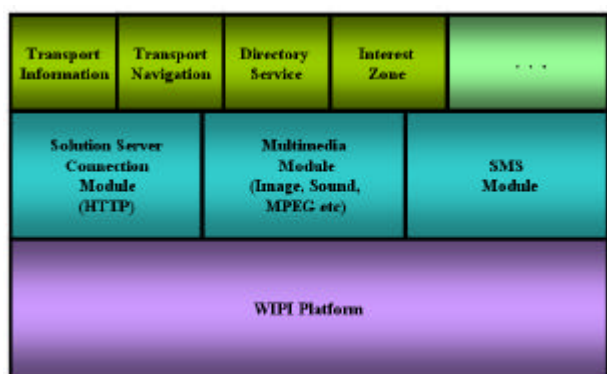


Fig. 7. Structure of solution client

The solution client, based on WIPI platform, consists of solution server connection module for communicating with solution server over HTTP, multimedia module for multimedia data processing and SMS module.

WIPI is a standard mobile platform standardized by

the KWISF(Korea Wireless Internet Standardization Forum) received requirements of Korea mobile telecommunication companies and it is embedded into mobile phone to execute mobile application programs. The solution client selects the WIPI platform and programs with *Jlet* to be compatible with various telecommunication companies and provides public transportation contents to the service subscribers.

4. Conclusions

In this paper, we developed a mobile webservice solution working together open LBS platform to provide PNSs using the public transportation contents. The solution consists of solution server and client. It uses webservice technology between solution server and LBS platform. By using open platform, webservice technology and WIPI platform, we improved the scalability, heterogeneity and adaptability. Currently, there are no mobile webservice libraries for J2ME(Java2 Micro Edition) platform such as *J2ME Web Services 1.0* and *ksoap*, however, there is no standard libraries for WIPI platform[6][7]. The development of standard WIPI webservice library is going to improve the performance of solution.

References

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