THE MCP-MAUS INTERFACE FOR UPDATING PARTIAL MAP

In-Sung Jang, Ju-Wan Kim

TELEMATICS·USN Research Division, ETRI,
138 Gajeong-dong, Yuseong-gu, Daejeon, 305-350 KOREA
{e4dol2,juwan}@etri.re.kr

ABSTRACT ... Telematics, one of the so-called New Growth Engine of IT839, is a leading IT service where wireless internet service represented by information and mobility is extended to the area of transportations to provide Telematics service. The killer-application of Telematics is navigation system.
Recently, due to the mass storage conversion, the performance of the terminal and mobile communications technology development, navigation system is also changed.
It more and more develops into 3D in a preexistence 2D map. In the future, it is expected to include the remote sensing map. There is also the characteristic of all the information expressed in frequently a change partially happening. That is, POI(Point Of Interest) which is freshly registered or is deleted is many.
In a preexistence, MCP(Map Contents Providers) offer the new version map by off-line monthly or quarterly. And a user wastes time and is inconvenient because of updating the total map by the off-line. Thus, in this paper, in order to resolve this, we describe MCP-MAUS(Maus Air Update Server) interface for updating only the partial map that was changed.

KEY WORDS: Telematics, Map, Update

1. INTRODUCTION

Telematics, one of the so-called New Growth Engine of IT839, is a leading IT service where wireless internet service represented by information and mobility is extended to the area of transportation.[1]

The telematics industry is a giant convergence-type industry, which links with not only automobiles and IT industries, but also almost all sectors, including wireless communication networks and system, terminals, contents, security, SI, insurance, financing, transportation, logistics and distribution. The killer-application of Telematics is navigation system, and now map for navigation has changed continuously. In this paper, we suggest interface to facilitate partial update for map information on telematics or LBS. In chapter 2, we review related work. Next we observe architecture, in chapter 3. And we study the interaction protocols between MCP and MAUS, in chapter 4. The experiments, results and analyses are presented in charpter5. Finally, we conclude this paper.

2. RELATED WORK

In this chapter, we review ISO/TC211, ISO/TC204, TTA/PG310 and ActMAP Project.

2.1 Standard

2.1.1 ISO/TC211

ISO/TC 211 Geographic information/Geomatics is responsible for the ISO geographic information series of standards. This work aims to establish a structured set of standards for information concerning objects or phenomena that are directly or indirectly associated with a location relative to the Earth. These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. The work shall link to appropriate standards for information technology and data where possible, and provide a framework for the development of sector- specific applications using geographic data."[2][isotc211,april2007]

Many bodies are actively engaged in the work of ISO/TC 211. These include national standardization bodies, the OpenGIS Consortium (OGC), international professional bodies (such as FIG and ICA), UN agencies, and sectoral bodies (such as DGIWG and ICAO) [2]

2.1.2 ISO/TC204

ISO/TC 204, a technical committee for standardization for ITS within ISO, was set up in 1992 and went into operation the following year. In ISO, subcommittees (SC) are usually founded under technical committees (TC) and working groups (WG) under subcommittees.[3]

Regarding TC 204, working groups are directly under its jurisdiction. Among working groups, some have been suspended or integrated for the ten years since its inception, and now a total of 12 working groups are carrying out its activities. They deal with Standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and

commercial services. Practically, in working group 3, they handle GDF, XGDF(eXtended Geographic Data File), PSF(Physical Storage Format) and Navigation API.

2.1.3 TTA/PG310

The scope of TTA's activities includes the fields of telecommunications, information technology. The purpose of TTA is to contribute to the advancement of technology and the promotion of information and telecommunications services.[4] TTA/PG310 is responsible for standard on telematics. Recently following two interfaces were proposed.

They are MCP-MAUS Service Protocols for Map Air Update [TTAS.KO-06.0129] and MAUS-Terminal Service Protocols for Map Air Update [TTAS.KO-06.0130][5,6]. This standard defines the interaction protocol between MCP, MAUS and Terminal. The standard specifies are to facilitate a partial update for map information on telematics or LBS.

2.2 ERTICO ActMap Project

ERTICO is Europe's intelligent transportation system organization that funds research and defines ITS industry standards. ERTICO had executed ActMap Project.[7]

The ActMAP project focuses on online standardised updating mechanisms to deliver and integrate actualised map data into in-vehicle map database from map makers and location based content providers for Navigation and ADAS applications.

The aim of the ActMAP project is to investigate and develop mechanisms for online incremental updates of digital map databases into the vehicle. Up-to-date map components containing dynamic or static location-based content should be integrated and/or attached to the in-vehicle digital map.

3. ARCHITECHTURE

The architecture of Map Air Update System consists of MCP, MAUS and Terminal like following Figure 1.

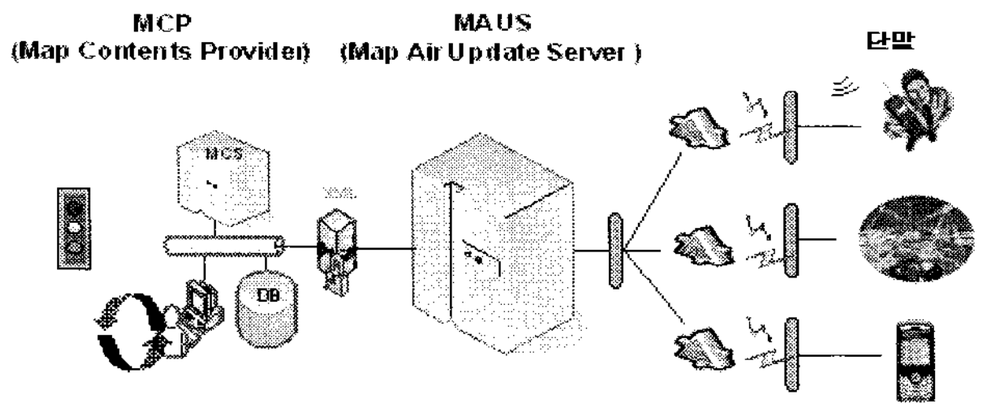


Figure 1. The architecture of Map Air Update System

3.1 Map Air Update Server

The roles MAUS are to parse interface, to check validation, to store difference map, to control version , to aggregation, to manage profile and to provide terminal with map changed,

3.2 Mobile Terminal

Mobile Terminal contains navigation application, updating module. It is request updating to MAUS and response xml with difference map from MAUS. And it applies mobile terminal.

3.3 Map Contents Provider

The main role of MCP is to extract difference map between old version map and new version map. And it encodes xml document based on the interaction protocol between mcp and maus. Lastly, mcp send xml document to MAUS.

4. INTERFACE OF BEWTEEN MCP AND MAUS

In TTAS.KO-06.0129[5], it defined interface of between mcp and maus based on XML referencing ActMap Project[7].

But that interface has several problems. That is, the size of xml document is very large to deal with the whole country map. So it frequently occurs to overflow heap, to take timeout for request, to require long processing time and to disconnect session. So solving problem, we suggest new interface with having reduced size and eliminated unnecessary element for light-weight interface.

Interface of MCP-MUAS has four elements which is updateSupplier, MetaData, MapData and Appdata, like Figure 2.

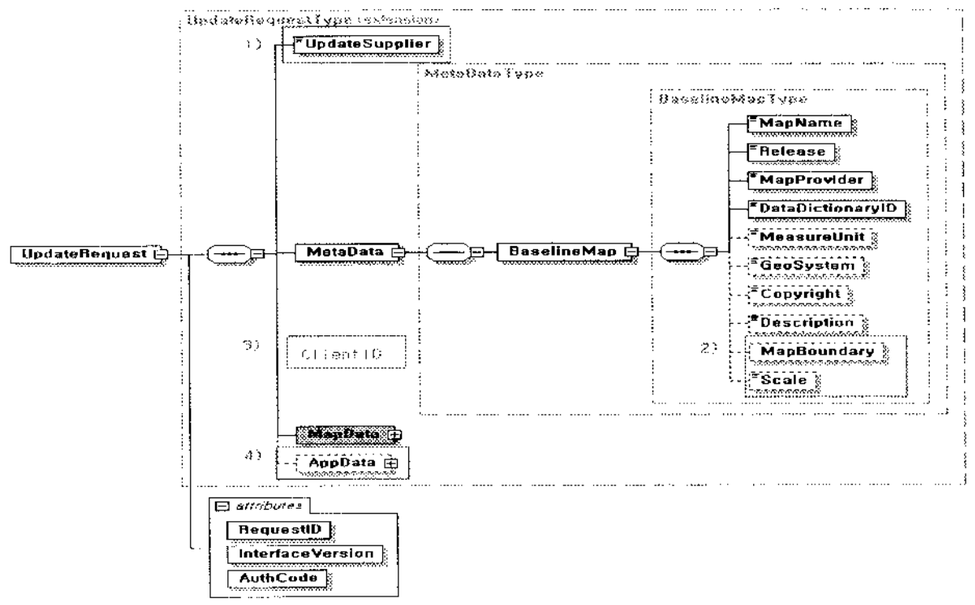
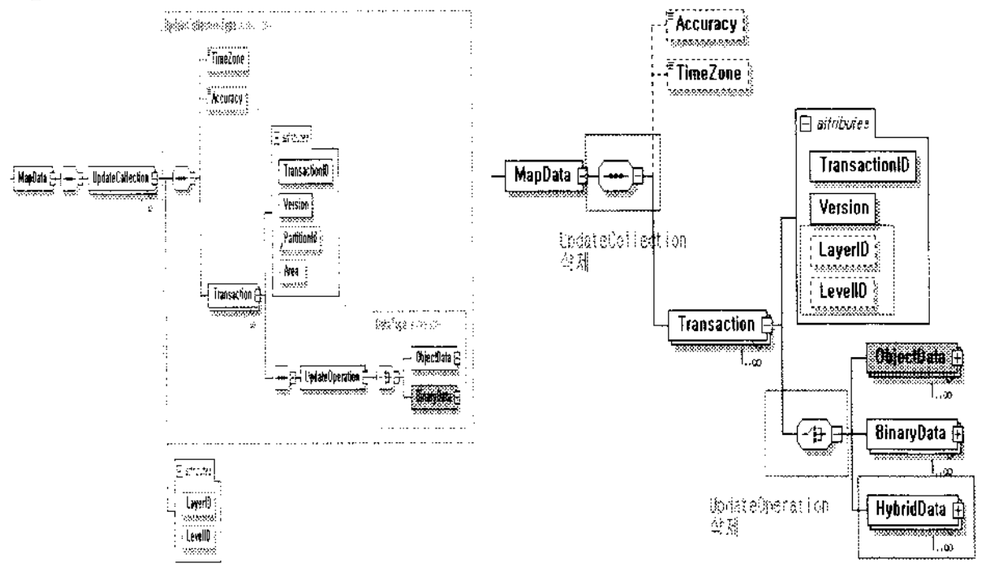


Figure 2. The schema of element on updateResquest

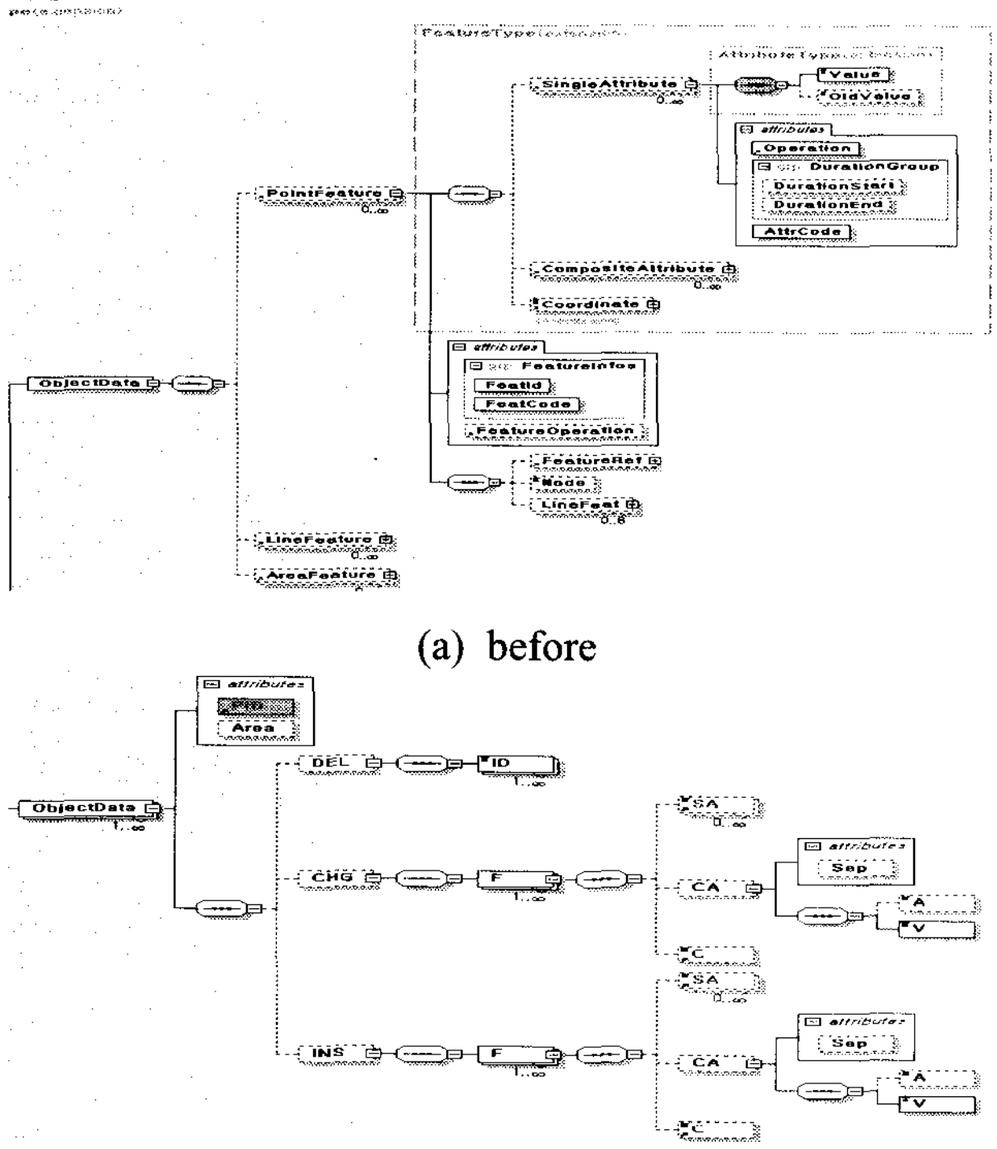
Like Figure 3. Elements on updatecollection and update operation are eliminated.



(a)before (b) after

Figure 3. The schema of element on map data

Like Figure 4. It exchange element name that frequently used to short element name. And with update operation, it groups child elements. Unnecessary element is removed..



(a) before

(b) after

Figure 4. The schema of element object data

Following example is presented in Figure 6. The size of xml is much decreased.

```
- <SingleAttribute AttrCode="104" Operation="NEW">
    <Value />
  </SingleAttribute>
- <SingleAttribute AttrCode="108" Operation="NEW">
    <Value>2</Value>
  </SingleAttribute>
- <SingleAttribute AttrCode="109" Operation="NEW">
    <Value>1</Value>
  </SingleAttribute>
- <SingleAttribute AttrCode="110" Operation="NEW">
    <Value>2</Value>
  </SingleAttribute>
- <SingleAttribute AttrCode="111" Operation="NEW">
    <Value>0</Value>
  </SingleAttribute>
- <SingleAttribute AttrCode="112" Operation="NEW">
    <Value>0</Value>
  </SingleAttribute>
- <SingleAttribute AttrCode="113" Operation="NEW">
    <Value>5</Value>
  </SingleAttribute>
```

Sample 1
<CA Sep=","> <A>104,108,109,110, 111,112,113 </A> <V>2,1,2,0,0,5 </V> </CA>
Sample 2
<CA> <V> 2,1,2,0,0,5 </V> </CA>

(a) before (b) after

Figure 6. Simply Example

Next, we suggest hybrid element. It is encoding map data with attribute data and coordinates. Encoded data is contained in data elements.

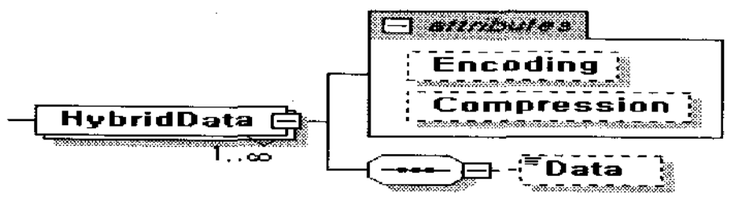


Figure 5. The schema of element on hybrid data

5. EXPERIMENT

In this chapter, we describe sample data for experiment and analysis results.

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5.1 Sample data

For experiment, we used two kind sample data. One is Road Network (node-link) data, the other is background data.

As sample data for Road Network(Node-link), we use the map of gyeonggi, jeju area. Figure 6 displays the map of gyeonggi area. Figure 7 displays the map of jeju area. In table 1, there is number of link, node. And following figure 8 display partial map of Seoul.

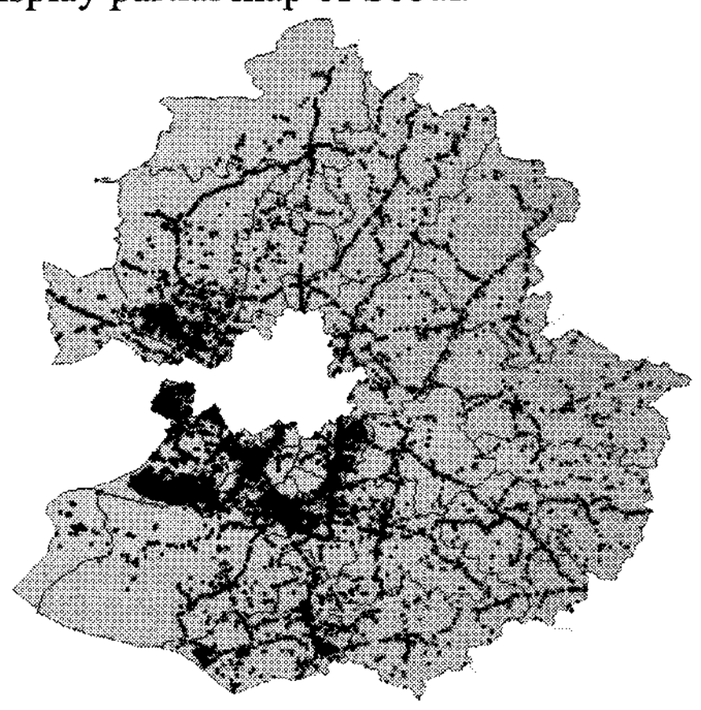


Figure 6. The Map of Gyeonggi (Node-Link)

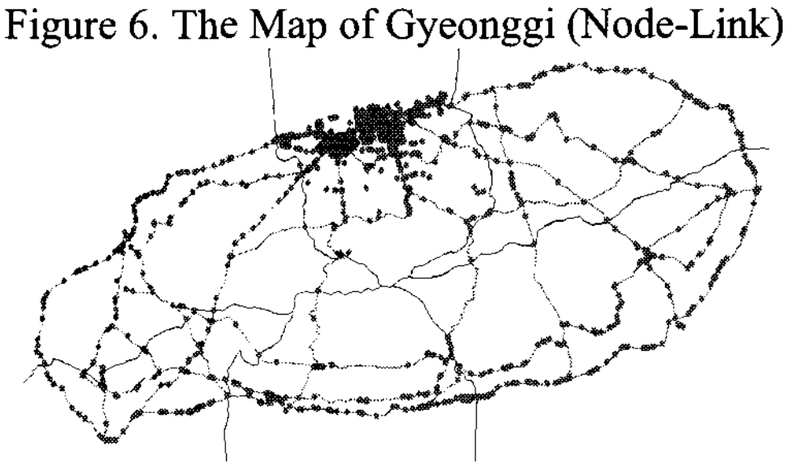


Figure 7. The Map of Jeju(Node-Link)

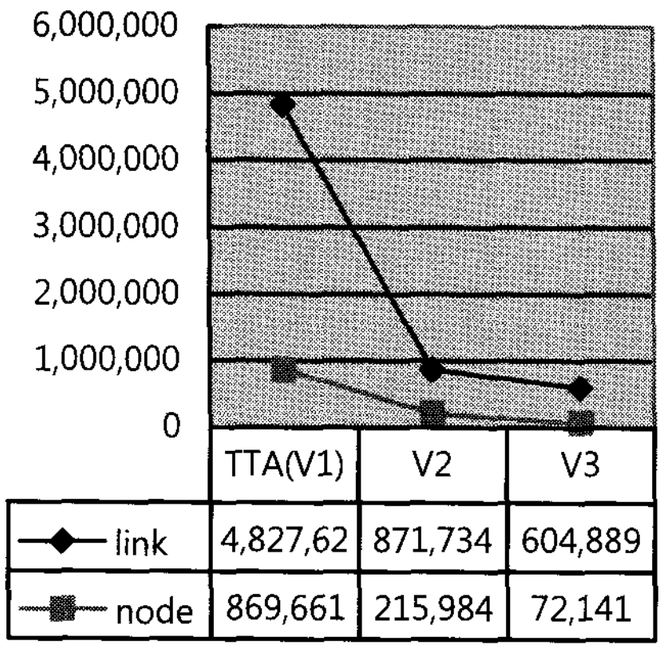
Figure 8. The Partial Map of Seoul (Backgound)

Table 1. The Number of Node-Link Object

Area	Link #	Node #
gyeonggi	10203	10217
jeju	1649	1337

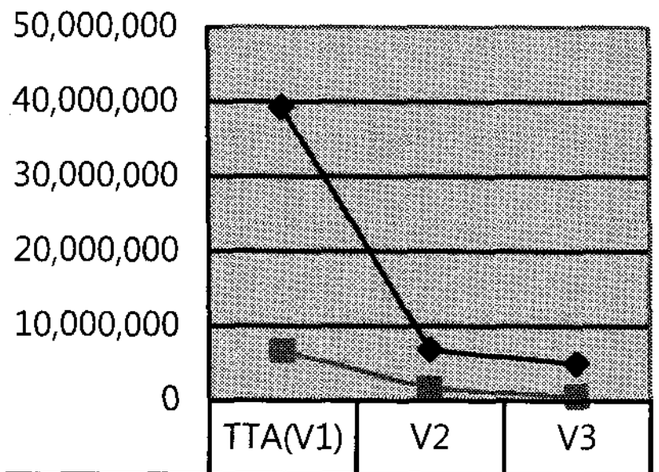
5.2 Analysis

With Sample maps introduced In 5.1, we compare the size xml document. TTA(V1) is applied [TTAS.KO-06.0129], each of V2,V3 is applied new interface and hybrid data element without compression.



	TTA(V1)	V2	V3
link	4,827,62	871,734	604,889
node	869,661	215,984	72,141

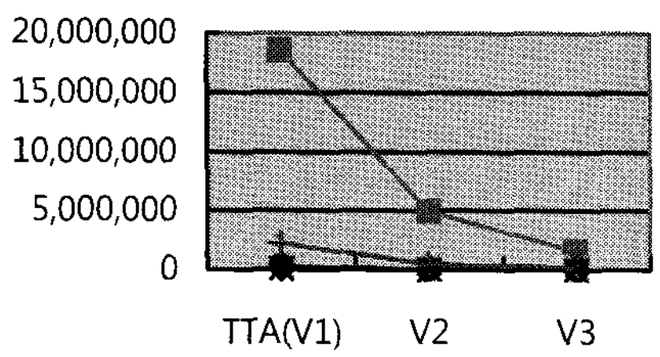
(a) Jeju



	TTA(V1)	V2	V3
link	39,317,4	6,832,87	5,027,11
node	6,652,29	1,646,72	545,745

(b) Gyeonngi

Figure 9. Xml Size of node-link data



	TTA(V1)	V2	V3
kn13	58,532	12,190	8,298
kn16	18,498,186	4,910,119	1,547,338
kn31	410,681	90,849	45,194
kn34	2,445,938	551,548	242,106
sc13	72,169	14,169	10,326
sc31	292,029	64,642	32,534

Figure 10. Xml Size of background data

Figure 9, 10 shows reduction of XML size. The improved interface reduces xml documents to average 22%. In addition, with applying Hybrid element, it reduces xml size to 11%.

6. CONCLUSION

This research is about delivering differential map data for partial updating. To facilitate a partial update for map information on telematics or LBS, there is standard specifies the interaction protocols between MCP and MAUS . that interface used XML for interoperability and openness. But that interface has drawback that the size of XML Document is very large to deal with the whole country map. So it occurs it frequently occurs to overflow heap and to disconnect session, etc. So solving problem, we suggest new interface with having reduced size and eliminated unnecessary element for light-weight interface. As shown chapter 5, new interface is an improvement over nearly 78%,89%.smaller than standard specifies of TTA .

.The interface suggested contributes to facilitate the increment map update service on Telematics/LBS and to revitalize the Telematics service/LBS market

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