# The Contents Server for Telematics Services

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**Abstract:** Today, the vehicle is used the mean of transportation as well as the mobile office with the third digital life space. So telematics is an emerging industry that has tremendous future potential.
It is necessary the essential contents for telematics services : navigation map for navigation, POI, real-time traffic information etc. In this paper, we proposed the telematics contents server to manage the telematics contents with efficient performance in distributed environment. The telematics contents server transforms and stores the essential contents and provide it to user through standard interface.
The telematics contents server is middleware to offer a rapid essential telematics contents management, client connectivity, and communications. It is useful for the telematics service provider to build telematics system under distributed environment.

**Keywords:** Telematics, GIS

## 1. Introduction

Recently, due to explosive increase of human's mobility and wide spread of the mobile industry based on wireless communication network and GPS technology so on, telematics is rapidly emerged. Telematics might indeed deliver an enticing variety of in-vehicle services[6].

The telematics services provider usually need to the various core technologies for telemtics services such as navigation map management, technologies related to traffic information, and telematics data service technologies. The telematics service provider means group and enterprise offering the telematics services. However they have to develop different service interface in various development environment for telematics contents providers and service users. So it would be the availability of a common platform for the delivery of more diverse telematics services to the vehicle through the wireless communication.

The telematics contents server should be able to efficiently provide various kinds of telematics information in standardized format to telematics service company or clients. It should be able to serve various kinds of telematics information such as GIS map data for navigation, POI(Point of Interests), and real-time traffic data using GDF(Geographic Data File), GML(Geographic Markup Language), XML, and image format. So it provides the interoperability, reusability, and extension. And telematics service provider can design and develop independently with telematics contents provider.

The following chapter shows you the overview of telematics, web services, GML developed by OGC, and GDF of ISO TC204. The third chapter shows you the details of the designed telematics contents server. And the last chapter discusses about future works.

## 2. Background

### *1) Telematics*

The vehicle is most representative transportation method. Recently there has been rising concerns to search the route and get a various information such as real-time traffic information, location information, entertainment service, and shopping in the vehicle.

Telematics is the combination of telecommunications and informatics, and provides navigation services, traffic information, location based services, entertainment services, shopping, internet and emergency and safety features such as remote diagnostics in vehicle in wire and wireless communication network[2]. The impact of telematics on drivers and passengers is even more dramatic. They'll have access to e-mail, the Internet and telephone services; e-commerce features such as shopping and banking; traffic and navigation information; a wealth of information services; and emergency and safety features such as remote diagnostics[8].

It define telematics as vehicle-dependent information, products, and services. By "vehicle-dependent" it mean products, services, and information that are physically dependent on the vehicle's architecture or location. Regardless, to enable telematics services, an in-vehicle wireless communications connection to an outside network is necessary[11].

Telematics services can be broadly classified into three categories:[11]

- Safety & Security Services: Remote Vehicle Diagnostics, Stolen Vehicle Tracking, Roadside Service Assistance, Automatic Collision notification, Automatic Accident Notification
- Information Services: Navigation, Traffic Information, Voicemail, Email, News, Weather, Stocks, Sports
- Entertainment Services: Music, Movies, Games, Browsing, eCommerce (or mCommerce)

### *2) Web Services*

Recently, the web services concept is rapidly rising as new solution to solve the integration problem among heterogeneous application systems as next generation solution. The web services concept is a kind of standard-

ized software technology that can integrate and share various computer programs.

The web services provide a set of protocols that allow applications to expose their functionality and data to other applications over the Internet. Also the web services provide a language and platform-independent syntax for exchanging complex data using messages. The internals of web services are implemented using XML to exchange data between clients and application servers over HTTP or sockets, making it easy for any platform to support this technology. So the web services has an advantage that can transparently access any web servers in any places, with any devices and at any time[10].

The web services concept is also adaptable in the field of application systems for telematics. It has some advantages of being flexibly and powerfully owing to adapting the web service standard specifications of W3C.

### *3) GML(Geography Markup Language)*

The GML is an XML based encoding standard for the modeling, transport and storage of geographic information developed by the OpenGIS Consortium (OGC). GML is a powerful new way to look at spatial information using XML encoding

Using GML, you can deliver geographic information as distinct features, and then control how they are displayed in a Web browser[4]. Just as XML is helping the Web to clearly separate contents from presentation, so GML needs the specific viewer in client, for example GML viewer, to display vector map. The GML approach is a great improvement over the historical reliance on simple GIF/JPG image maps for the following reasons: better quality maps, works on a browser, custom map styling, editable maps, more sophisticated linking capabilities, better query capability, control over content, service chaining, and so on. The version of the GML that we implemented is GML 3.0 released in 2003.

We adopted international standards for Geography Markup Language (GML) Specification implementation made by the OGC. If user requests the telematics services, contents server for telematics provides result of GML format. Fig. 1 shows examples of GML.

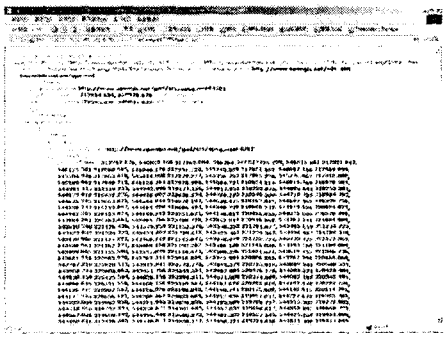

**Fig. 1. The example of GML.**

### *4) GDF(Geographic Data Files)*

The GDF is used to describe and transfer road networks and road related data. Its content describes roads and associated attributes. It is much more than a generic GIS standard, because GDF gives rules how to capture the data, how the features, attributes and relations have been defined[9]. It's a vector based and object oriented model of road networks and related data.

It's primary use will be for car navigation systems (Bosch , Philps, Volvo etc.), but it is very usable for many other transport and traffic applications like Fleet Management, Dispatch Management, Traffic Analysis, Traffic Management, Automatic Vehicle Locations etc.[2]

For effective utilization of digital maps, a presentation of geometry, attribute, and topological information is essential.

## 3. Architecture

The telematics contents server is middleware for efficient services of telematics information. It provides the mechanism to offer a rapid telematics information management, client connectivity, and communications, and support the international standards.

If user requests navigation map, POI, and real-time traffic information using web services interface, the contents server confirm user through authentication process. If authentication is completed, the contents server analyzes user request, and searches information from telematics contents provider. Then it provides data to user that it makes GML, XML documents or image.

It shows sequence diagram for request of navigation and traffic information in Fig. 2. and Fig. 3.

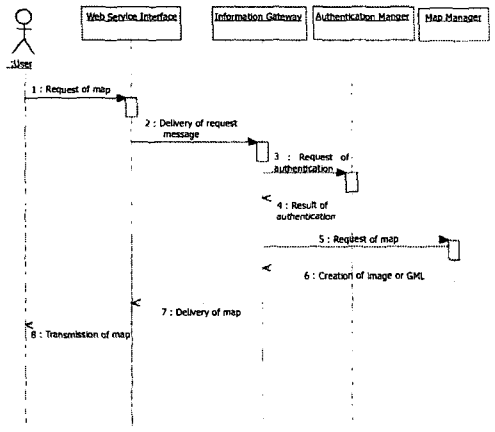


**Fig. 2. Sequence Diagram of request of Navigation Map.**

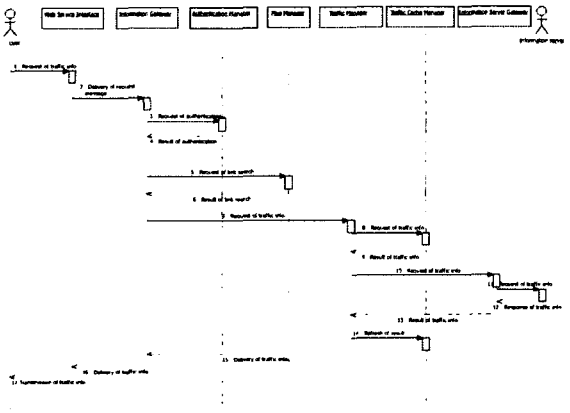

**Fig. 3. Sequence Diagram of request of Traffic Information**

This telematics contents server is mainly composed of information gateway, information manager, and operating manager as shown in Figure 4.

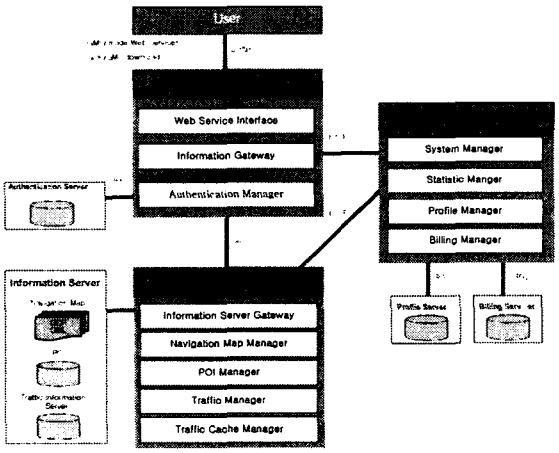


**Fig. 4. Overview of telematics contents server**

### *1) Information Gateway*

The Information Gateway receives the user request and provides the telematics related data when user requests the telematics information in distributed environment. It conforms to XML web services using SOAP and performs effective inquiry process about user's request .

The information gateway three essential roles: web service interface, information gateway, and authentication management. Fig.5 shows class diagram of Information Gateway.

### *2) Information Manager*

The telematics data of navigation map, POI, real-time traffic information are usually heavy and have their own formats. So integration or conversion of the data consumes a lot of cost and time. And it needs to special process technology because traffic information is collected real-time. So it is almost impossible to integrate and share the all kinds of telematics information and

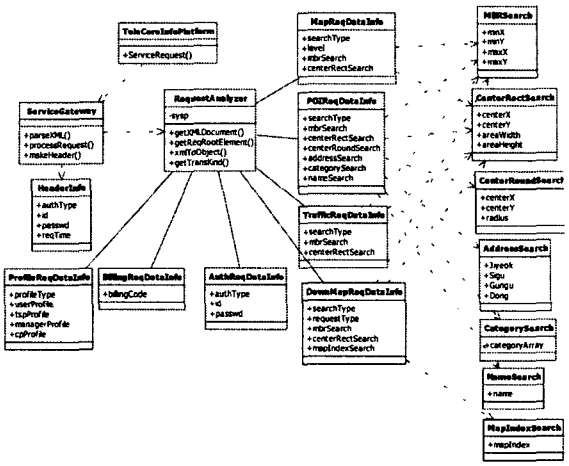

**Fig. 5. Class Diagram of Information Gateway**

services.

The Information Manager can analyze, process, and manage various kinds of the telematics related data such as navigation map, POI, real-time traffic information. It collects the data from information server and manages telematics contents. And It retrieves navigation map, POI, and real-time traffic information rapidly and create results.

The Information Manager is composed of information server gateway, navigation map manager, POI manager, traffic manager and traffic cache manager.

The navigation map manager stores the navigation map data in main memory and also plays a role of spatial engine. It provides navigation map data management such as spatial operation, and GML encoding. It performs efficient performance by reducing time to read data from disk for each request. It creates and manages spatial index structure while loading the navigation map. It supports efficient access for navigation map data using feature pointers. The index is used for rapid response time when user requests the navigation map operation such as boundary search etc. We will implement a R*-tree method The spatial indexes always reside in main-memory for performance.

The POI Manger manages POI. The POI is intended only to indicate a location of a target and its location-related information; various representations of information about the target, such as restaurant, bank, school, government office etc The traffic manager and traffic cache manager manages the real-time traffic information efficiently . The information server gateway provides the interface Information server.

### *3) Operating Manager*

The Operating Manager provides functions of user profiling, billing, system statistics, system monitoring, and system failure detection of the server so on. It consist of system manager, statistic manager, profile manager, and billing manager.

## 4. Feature works

We designed the telematics contents server that could serve various telematics related data. In order to provide interoperability and reusability for the telematics, we adopted standards of ISO TC 204 and W3C. So user can retrieve and manage a diverse telematics information in wireless environment.

We have a plan to implement prototype system for telematics contents server using Java. Also we will use Tomcat 5.0 for web application server, SOAP for user interface, and MySQL for data management.

This system prevents the duplication development of telematics services system. It will be used as a base server for new Telematics service provider in Korea.

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## References

[1] Electronics and Telecommunications Research Institute, 2001. Report for Telematics technology and market.

[2] Kapadia, V., V. Bai, and G. Parthasarathy, 2003. Telematics System Architecture, *Wipro Technologies.*

[3] Telematics Research Group, 2004. Concept & Production Telematics Asia 2004.

[4] OpenGIS Consortium Inc., 29-January 2003, OpenGIS Geography Markup Language (GML) Implementation Specification version 3.0.0.

[5] Kim, M.S., M.J. Kim, B.T. Jang, and I.H. Joo, 2004. Direction of Development of Telematics Server Technology, *Korea Information Processing Society.*

[6] Anhan Chatterjee, Hans-Werner kaas, T.V.Kumaresh, 2002. A road map for telematics, *Mckinsey & Company.*

[7] Egil Juliussen, Phil Magney, 2001. Telematics: Technologies, Trends and Markets, *Telematics Research Group.*

[8] Dick Kelsey, 2000. Telematics creating e-vehicle wonderland, *Newsbytes.*

[9] **URL :** ERTICO, GEOGRAPHIC DATA FILES (GDF). Available at: http://www.ertico.com/links/gdf/gdf.htm.

[10] **URL :** W3C Consortium, Web Services Architecture, 8-August 2003. Available at: www.w3c.org.

[11] **URL :** Lawrence J., A Look Ahead at Telematics In the Year 2013, Available at: http://www.telematicsupdate.com/.