DESIGN AND IMPLEMENTATION OF TELEMATICS SERVER TEST FRAMEWORK

Jun Wook Lee, Sang Gi Hong, Jong Hyun Park

Telematics Research Division, ETRI,
161 Gajeong-dong, Yuseong-gu, Daejeon, 305-350 KOREA
{junux,sghong,jhp}@etri.re.kr

ABSTRACT:
In order to provide the reliable service and contents to telematics service user, any service server must be tested and verified before launching its service in sufficient. In this paper, we proposed a test framework for telematics server. The proposed framework includes conformance test of server, interoperability test between telematics service server and telematics terminal. The framework proposed the concept and test model for two categories of testing.

KEY WORDS: Telematics, Server Test, Framework, Conformance Test, Interoperability Test

1. INTRODUCTION

Telematics is a convergence technology of computing, communication, contents, positioning and vehicle industry. Recently, as the increasing interests on telematics services in vehicle environment, many service technologies have been developed. For example, telematics terminal s/w platform technology, open telematics service application protocol technology, and service provider technology are now developing. Service provider technology includes LBS platform(Hong,2004), Geomobility server and ASP server. In order to provide the reliable service and contents to mobile user in vehicle, service server must be tested and verified before launching its service in sufficient.

In this paper, we proposed a test framework for telematics server. The proposed framework includes conformance test of server, interoperability test between telematics service server and telematics terminal. The framework proposed the concept and test model for two categories of testing also.

The outline of the paper is as follows. In section 2, telematics service model is introduced. The server test and test framework is defined in section 3 and section 4. In section 5, we present the implementation example of the framework. Finally, we discuss the result and further research.

2. TELEMATICS SERVICE MODEL

2.1 Telematics Service

Telematics, which is complex words of telecommunication and informatics, is a convergence service that integrates vehicle, wireless communication and information technology.

In vehicle environment, telematics service is to deliver much useful contents and functions to driver throughout the telematics terminal. To use these contents and function in vehicle, the terminal has to communicate with the telematics server or other vehicles which have a communication device via various communication networks.

2.2 Telematics service model

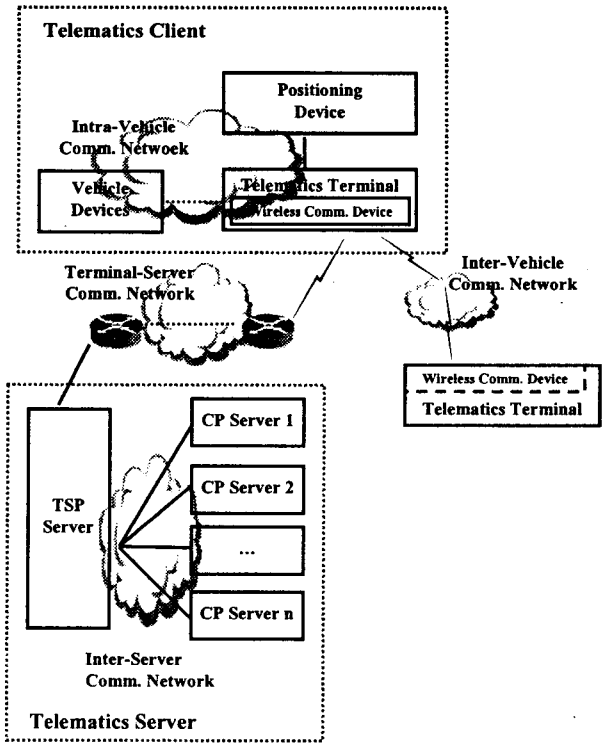


Figure 1. Telematics service model

In our model, telematics service is consisted of three essential parts. One is telematics server part, the other is telematics terminal part and the third is telematics communication part. In telematics client part, there are telematics terminal, positioning device and vehicle devices. This part represents and uses the information from the telematics server part using various HMI. The server part is consisted of not only the many contents servers which process the information but also the TSP server which support interconnection to the communication network. The former examples of server are LBS server, traffic information server, navigation server, ASP server, etcs. The latter are communication server, authentication and billing server, etc. Telematics communication networks are terminal-server communication part, intra-vehicle communication part and inter-vehicle communication part. Each part has external interface as well as internal interfaces.

3. SERVER TEST

In general, quality characteristics are defined in (ISO/IEC 9126, 2001). However, quality characteristic for telematics server is not defined yet. Concern with the functionality, reliability and interoperability, we are focusing both conformance test and interoperability test

3.1 Conformance and Conformance Test

The concept of conformance for telematics service means that each component of service conforms to any specification applied(ISO/IEC 9646, 1991). These component are located in telematics center or between the center and telematics terminal. Elements in telematics center are servers which provide some functionalities or contents, the component between service center and terminal is application protocol.

The objective of conformance test is to establish whether the target, which is called the Implementation Under Test(IUT), conforms to the relevant specification. The test to the telematics service is distinguished to two categories of testing. One is the testing of the implementations lying in the telematics center, the other is the testing of implementations lying in between center and terminal. The former is to check if the requirement of specification is correctly implemented and operated in the IUT as well as to check whether the IUT satisfies the required quality of performance. These IUTs can be the application servers and contents servers. The latter is to check whether two IUTs correctly process the syntax of any protocol specification, which is used for the information exchange between center and terminal. We assume that these teo IUTs are the protocol processors in center and terminal.

3.2 Interoperability and Interoperability Test

Interoperability in telematics service means the ability to work with each other by processing and interchange any information to use any specific service between components composing the service. This interoperability is very essential to assure the correct working of each components. Components are correlated with each other and cooperate together as expected.

In this paper, the interoperable components in telematics service, this is IUTs, are the server in telematics center and the telematics terminal.

The Interoperability testing in telematics service is done between two IUTs. Because the conformance testing is not suitable, this testing is very important.

Our interoperability testing is focus on the checking if the behaviour and exchange between two implementations of center and terminal are working correctly in accordance with the USE CASE of WTP(World Telematics Protocol), which is a kind of open application protocol. Two IUTs are the application programs in telematics center and terminal

4. SERVER TEST FRAMEWORK

In this section, based on telematics service architecture, we present a server test framework considering the conformance test and interoperability test.

4.1 Definition of Server Test Framework

Framework is defined to a service model, assumptions and test architectures that are utilized to test telematics service. Besides, test methodology is defined to a methodology and approach which to applicable to test the server based on any framework.

4.2 Telematics Service Architecture

In order to design a test framework for telematics service, we need to model the structure or architecture of telematics service in real environment. In real environment, one service component such as terminal or server may operate independently or interoperate with other service components. We assume that each service component provides interfaces more than one.

Normally, the types of service architecture are i) Client-Server architecture, ii) Peer-to-Peer architecture, iii) Master-Slave architecture. In this paper, we choose the client-server architecture as a telematics service architecture.

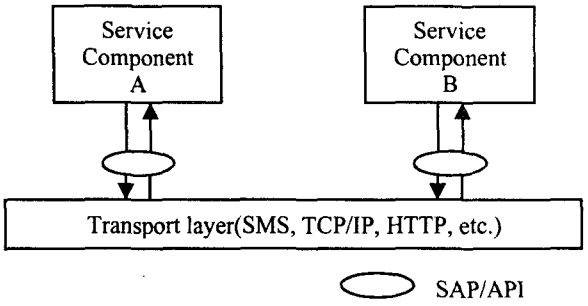


Figure 2. Client-Server Architecture(I) for Telematics Service

The structure in Figure 2 generalizes two types of services, which are service between server and server, service between server and terminal. Component A, which is a server, performs a service to provide the defined functions or information in specification. For example, CP(content provider) server or application server in telematics center. As a client, component B performs the service by taking the function or information from the component A. For example, other server in telematics center or telematics terminal are belonging to this element type.

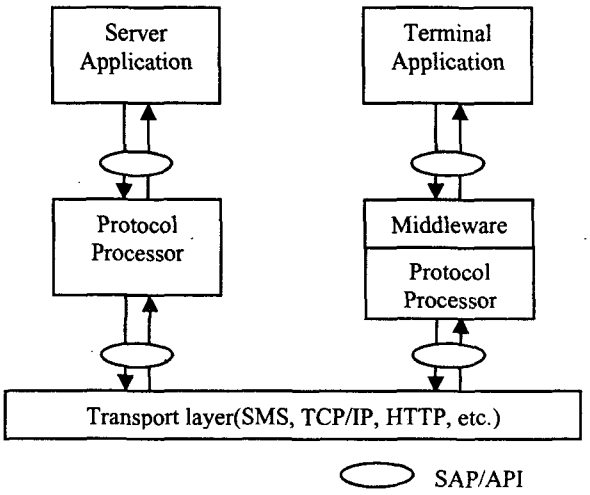


Figure 3. Client-Server Architecture(II) for Telematics Service

The structure in Figure 3 generalizes service between telematics center and terminal. The basic assumptions are as follows.

Assumption 1. The service is performed using application protocol between center and terminal.

Assumption 2. The terminal application run on the terminal s/w middleware and interoperates with server application using application protocol.

Assumption 3. The protocol process should provider interface such as SAP(Service Access Point) or API(Application Programming Interface) to the upper layer component.

4.3 Server Conformance Test Framework

Generally, conformance test architecture is distinguished to five categories considering the number of interfaces providing by testing target, the position of testing tools and the coordination model between testing tools. There are local, distributed, coordinated, remote and multiparty test methods.

First of all, in case that the IUT has only one external interface, the conformance testing architecture is as Figure 4 . This architecture use remote test method. This architecture is applicable to the component A of the client-server architecture of Figure 2.

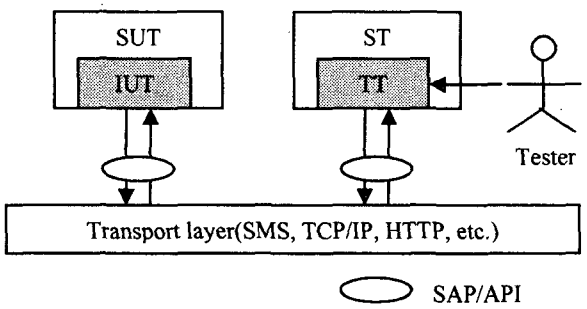


Figure 4. Conformance Testing Architecture(I)

In Figure 4, the IUT has an interface applying some specification and the conformance of IUT is verified using the request message and response message.

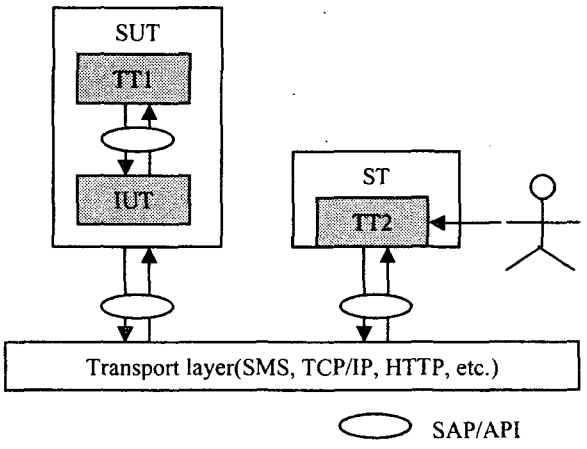
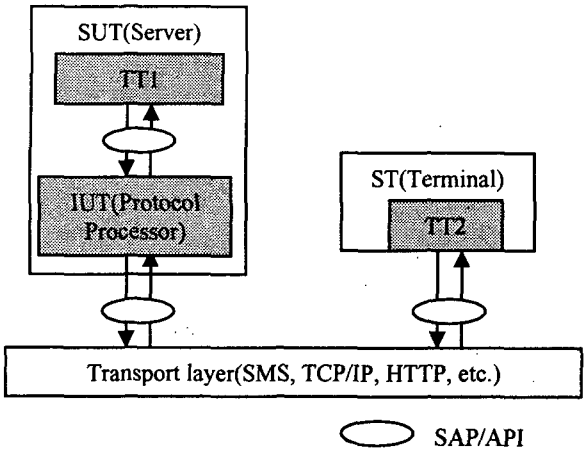


Figure 5. Conformance Testing Architecture(II)

If the IUT has two interface of upper and lower, the testing architecture in Figure 5 is applicable. This testing is conducted by the coordination of TT1 and TT2. This architecture is applicable to IUTs which work as the lower component of any system. The following two

figure show the example of applying to application protocol processor.



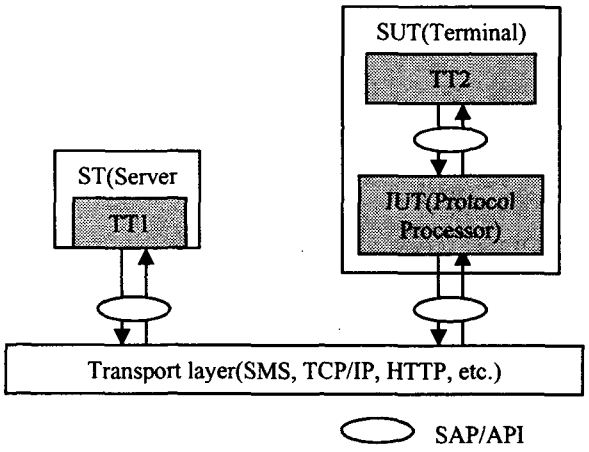


Figure 6. Protocol Conformance Testing Architecture

In figure 6, one is to test the conformance of the protocol processor of server side and the other is to test the conformance of the protocol processor of client side. On terminal side, the IUT works as a bundle of terminal middle platform based on OSGi.

5. IMPLEMENTATION OF SERVER TEST FRAMEWORK

Using the proposed server test framework, we implemented a conformance testing tool. The interoperability testing tool based on the framework is now developing. The IUT of this tool is the LBSP(LBS platform) server. LBSP is an kinf of open system for LBS client. This IUT is applied KLP(KLSF,2003) interface. In order to prove the openness and accuracy of working, conformance testing tools is needed. The LBSP is a kind of server using client-server architecture(1) in figure 2. Therefore, we implement the testing tool using the conformance testing architecture (I) shown in figure 4.

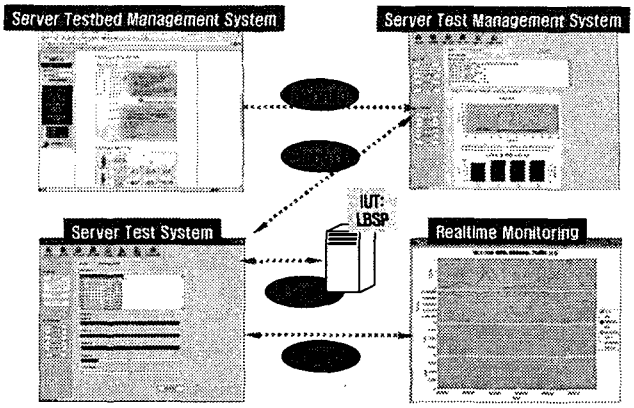


Figure 7. Conformance Testing System

6. CONCLUSION

In telematics service area, many service components should be integrated to make a service in flexible. Each component must be worked in showing expected result. Also, each component is interoperable to other component using some defined protocol. In developing testing tools having required features of telematics service, test framework is very essential part. Any test framework has to reveal of real service architecture. In this paper, we introduce service architecture of telematics and show some test architecture. Also, the conformance test tools which implemented base on the framework are presented. Currently, the conformance testing tool is extending in order to perform the conformance test of the geomobility server.

In the future, base on the framework, interoperability testing tools will be implemented.

REFERENCE

ISO, Information Processing System - OSI Conformance Testing Methodology and Framework, ISO/IEC 9646, 1991

ISO, Software engineering -- Product quality -- Part 1: Quality model, ISO/IEC 9126, 2001

Hong, S. K.., et. Al, 2004, "Open LBS Solution Architecture using Service Changing Webservices Technology", *In. Proc. Of the 12th Int. Conf. on Geoinformatics*, Sweden, pp. 134-138.

KLSF, 2003: *LBS Platform Stage2: KLP (Korea Location Protocol Version 1.0.0).*