Journal of the Korean Society of Marine Engineering, Vol.31, No.3, pp.301~309, 2007(ISSN 1226-9549)

ebXML Collabration Model of Single Window for Marine Transport

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(Manuscript : Received AVG 29, 2006 ; Revised MAR 12, 2007)

Abstract : Netherlands had suggested a uniform system to standardize and simplify EDI systems relating to the Arrival/Departure, stay, and clearance of ships, persons, and cargoes for the Facilitation of International Maritime Transport to the International Maritime Organization(IMO). Republic of Korea proposed the Framework of XML-based Single Window System for the simplified clearance of ships to the 32nd session of Facilitation Committee of the IMO. Accordingly, the authors studied that the XML Infrastructure for Single Window efficiently supports the Single Window service and the business collaboration between business entities of logistics. The proposed XML Infrastructure designs to support the various document format translation and to easily manage. Therefore, business entity using the proposed system has the effect of downing the resource and costs on using Single Window.

Key words : XML;Infrastructure;Logistics;Entity;Single Window

1. Introduction

For the Facilitation of International Maritime Transport, in the FAL 27/5, Netherlands suggested a uniform system to standardize and simplify EDI systems relating to the Arrival/Departure, stay, and clearance of ships, persons, and cargoes[1]. In the FAL 30th Convention, Netherlands proposed the concept of Single Window System in order to enhance the efficiency of the report procedures for Arrival/Departure of ship[1]. In the FAL 32nd Committee, ROK proposed the Framework of XML-based Single Window System for the simplified clearance of ships. In this connection, the system suggested in this paper was based on ebXML (electronic business XML) proposed by UN/CEFACT in the FAL 32/5/3[1],[2]. This system includes the concept of Single Window, which is expanding the existing port information system confined to the national boundary to the global one. So, it is expected that the system suggested in the paper will lead to the global Arrival/Departure Clearance System for the international logistics. Hereby, ROK proposes the detailed and technical item for business

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collaboration between business entities of logistics area(Marine, Air and Rail, etc.). Following precedence requirement must be satisfied before Single Window service starts.

.1 Simplification and Unification of electronic document form
.2 Work flow simplification

Also, following advantages by applying Single Window for marine transport area can be achieved.

.1 Minimization of Legacy system modification
.2 Maximization of Resource reusability
.3 Build-up of National Competitive Power (Maximizing of economical effect)
.4 Interoperability Increment between countries

2. XML Infrastructure System for Single Window

The Single Window service has been commenced from 2004, Korea Standards Organization revised the following documents to be suitable for each government organization according to UN/CEFACT Standards vessel arrival/departure(DEOVAD: Declaration of ocean-going vessels' arrival and departure), passenger/crew list(PAXLST: Passenger list message), cargo(manifest) (CUSREP: Customs conveyance report message, CUSMAN: Customs response message, MACAGO: Export/Import cargo report)[2],[3]. The version of documents is D97A. Korea designed the XML infrastructure system to support Single Window concept and IMO FAL documents. Up to now, most of users have used EDI to declare the clearance of Vessel and Cargo, etc[3]-[7].

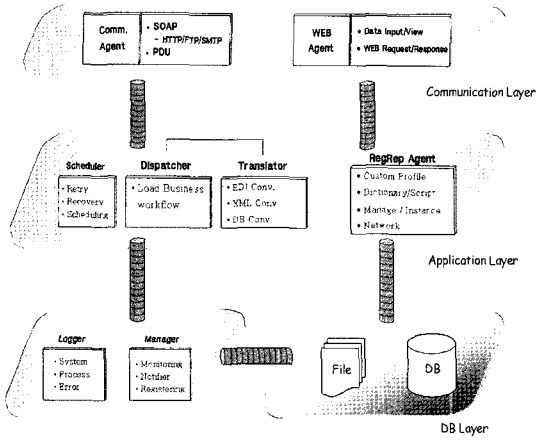

Fig. 1 Configuration of the proposed XML infrastructure

The proposed system in this paper could be easily migrated to user legacy system with minimum modification because it supports EDI, XML and Database all together. The proposed system by Korea was designed on the concept of ebXML technology and implemented with open framework, Java. Because this system was developed in component-based method, it is possible to compound the various configurations according to the system environment. Also, it is available to install the proposed system to any platform with JVM(Java Virtual Machine). The proposed system supports the following functionalities, such as translation, database interface, security and so on. Fig. 1 shows the configuration of the proposed system. Because the translation module leads to improvement of service by reducing the resource usage and processing time, it plays an important role in the proposed system.

The translation module is constructed as Fig. 2 and designed on the basis of open framework[8],[9].

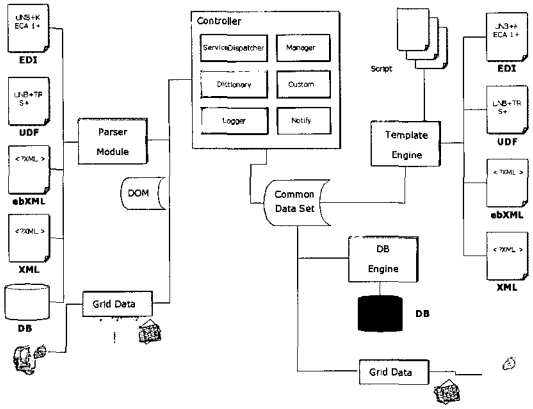

Fig. 2 Translation module

3. Application of Single Window Service

The User generates an EDI message using legacy system and sends the message to XML Hub system. The XML Hub system translates the received EDI message into designated message in conformity with the recipient type. Then, the XML Hub system delivers the results to multi-recipients. Figure 3 shows a flow of transmitting the message between logic entities of business. If a shipper sends a EDI document(DEOVAD which is similar to CUSREP) for vessel arrival/departure to the XML Hub system, the XML Hub system transfers this EDI document to three destinations such as Ministry of Maritime Affairs and Fisheries(MOMAF), Customs Service and Korea Maritime Dangerous Goods Inspection Center (KOMDIC)[3]. In this case, three different formats was applied; EDI for MOMAF, XML for Customs Service and a private format for KOMDIC[10]. The XML Hub system converts the received EDI document into three different document formats EDI, XML and private formats. And, it transfers the converted documents to each official authority. A user can easily make Arrival/Departure declaration of vessel to each official authority with only a single document sent(one input).

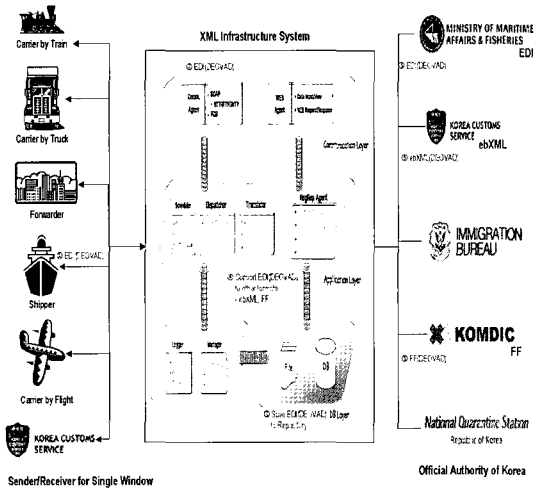

Fig. 3 Single Window work Flow

4. Trend of Standardization

Complimentary explanations of the body of the proposed paper are provided in the Annex for easy understanding. The Annex is composed of the trend of standardization, the characteristics and components of XML Infrastructure for Single Window followed by examples applied in Korea.

4.1 International Single Window Service

A "Single Window" is a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements

(UN/CEFACT Recommendation and Guidelines on Establishing a Single Window, ECE/TRADE/352, September 2004)[2]. Some countries, such as ROK, USA, Singapore and Australia, have already been started or prepared the Single Window Service. Most of participants think Single Window System is successful within domestic area. Therefore, they should consider interoperability between Single Windows and standardization of exchanged documents. At May 2006, UN/CEFACT will hold Symposium on Standards and Interoperability related to Single Window System at Geneva[2],[11],[12].

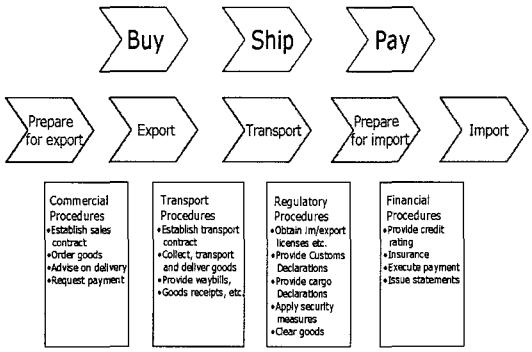

Fig. 4 International Trade Reference Model of UNeDocs

4.2 UNeDocs

The United Nations electronic Trade Documents(UNeDocs) Project is to facilitate international trade and electronics transfer of data for cross border trade by developing, publishing and maintaining a coordinated set of international standards including in UN/CEFACT Trade Reference Model, a comprehensive cross-domain data model, UN/EDIFACT and XML document structures, document presentation methodologies and box completion guidelines[2],[11]. And it is to enable the development of simple low-cost solutions to support the generation and exchange of standardized paper and/or electronic international trade document by implementing existing standards and recommendations. Fig. 4 shows the international Trade Reference Model. In response to the UN Millennium Declaration and the demands of both Governments and trade for increased use of information and communication technologies, UNECE in 2000 set up the United Nations electronic Trade Documents(UNeDocs) project to analyze the documentary issues of the supply chain and to develop solutions. Supported by governments, industry associations and research institutes, the project team developed an integrated concept for the global trade documentation system.

5. XML Infrastructure for Single Window

5.1 Characteristics

The proposed system is designed and implemented with Java, so it is platform-independent[8],[9]. It is developed with component-based structure, so it is available to compound for system environment. It would be constructed to extract user wanted functionality. Currently, there are various electronic document formats such as, EDI(Electronic Data Interchange), FF(Flat File), ebXML and, etc. in electronic business environment. The translation module of

proposed system supports the converting functionality between heterogeneous document formats. and operates in way of scripts. If new format is added or existed format is modified, it is easy to add or modify the corresponding script without modifying the translation module itself. As the translation module supports the database interface, the proposed system is able to convert between database and text file as well as between text files. The proposed system also provides the various Database adaptor, such as oracle, DB2, Informix, SQLql-Server, OODB(Object Oriented Database) and, etc..

5.2 Components

5.2.1 Parser

Parser Module is defined by input electronic document. Parser module parses data per syntax structure and converts into node tree, common data set. Then, parser verifies the document syntax whether input electronic document structure is correct as standards or not. For examples, EDI is suitable to MIG(Message Implement Guide) or XML is suitable to XML schema structure. We shall process only correct document through verification. This module is able to process and to extract data from database as well as text file. The proposed system will be easily able to extend if user was only develop corresponding parser module and migrate the legacy system whenever new document is added.

5.2.2 Data Modeler

Data Modeler converts the generated result data by parser module into common data set. Data Modeler is not necessary if it needs only one-to-one mapping. However, as business transaction has been activated, business logic needs translating. Business logic is needed to makes new data on the basis of input data. Common data set used in this paper is based on node tree. XSL(XML Stylesheet Language), object-oriented scripts language, is used when new result data applying business logic to input data are made.

5.2.3 Generator

Generator module is divided into text file generator and database generator. Text File generator is making into text-based result file, such as EDI, private format message and , ebXML Database generator is saving the result data into result database. Text file generator is designed on the basis of templates-engine. Basically, Database generator interfaces with DB basically using JDBC(Java Database Connectivity) driver.

5.2.4 NotifyServer

NotifyServer manages corresponding status for generated events when it is operated within each module of XML infrastructure and informs that status to user or manager. It is possible to predefine the notify level and to inform the result to registered user according to the notify level. Also, it is possible to inform to user through various communication methods such as SMS, E-Mail, etc. Currently, we notify status using by SMS(MSN Messenger) in ROK.

With this, user will be able to manage and monitor sites installed XML infrastructure system. Also, user is easily able to monitor current processing status and immediately to cope with an error.

5.3 Examples applied in Korea

We explain how to convert between heterogeneous types of documents using the proposed XML infrastructure. Below EDI, XML and DB have been currently used in ROK single window service. Firstly, user sends EDI document to XML hub system. The XML hub system converts the received EDI message into XML or database system[4]-[7].

```
kldb1:/home/users/kledi/krahn>more 20060320*
UNB+KECA:1+KLTEST01:KL+KMPAE030:KL+20060320:0937+P1060320093746'UNH+1+DEOVAD:D:9
7A:KE'BGM+6S2::KE:GENERAL DECLAR OF OCEANGOING VESSEL+06DRPTD1517+6'DTM+186:2006
03192030:203'DTM+150:20060319:102'LOC+22+016:113:KCS+46:5AB:KCS'LOC+153+031:139:
6AA'LOC+6Y6+PT'NAD+CA+ZZ-7-9999:172:6AA+TEST Company:680-1 KUNWOO B/D 8F YEOKSAM
-DONG, SEOUL'TDT+20+++:53++++HO2905:::FRONTIER MEBIUS:PA'DTM+247:2006:602'QTY+6A
1:2'UNS+S'LOC+135+KRPTK:140:6AA+1'DTM+6AA+200603192030:203'UNT+15+1'UNZ+1+P1060
```

Fig. 5 EDI Message

5.3.1 EDI converts to database, vice versa

Parser module is parsing EDI document and separates into meaningful values. And it generates the meaningful values to common data set.

Common data set is constructing with node tree, DOM(Document Of Management) tree. DOM is based on object-oriented, so it easily combines with the proposed system. Fig.5 shows the EDI message and Fig. 6 shows how to map between EDI message and field of database.

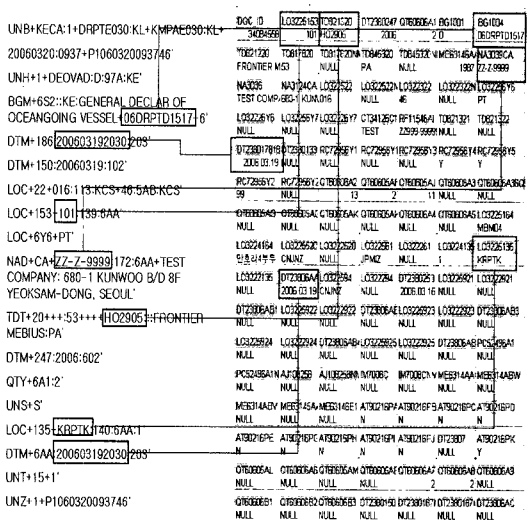

Fig. 6 Mapping between EDI and Database

Fig. 7 Converting Flow between EDI and Database

Fig. 7 shows the converting flow when parser module is activating and Data Modeler generates the common data set and Database generator saves into database.

Fig. 8 shows how to map between EDI message and WEB system.

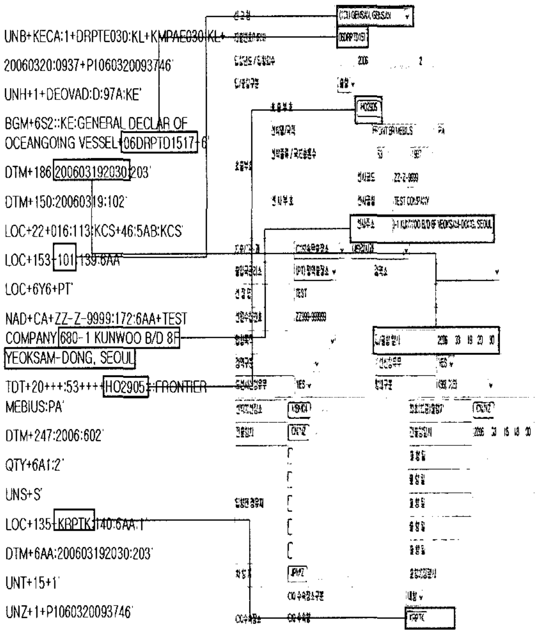

Fig. 8 Mapping between EDI and WEB


```
<?xml version="1.0" encoding="euc-kr" ?>
- <message msg_id="20060320093350110100001" msg_size="0Byte">
    <header>
      <msg_type>EDI</msg_type>
      <sender>KLDRPTE030</sender>
    - <receiver>
      - <receiver_to type="single">
          <receiver_id>KLKMPAE030</receiver_id>
        </receiver_to>
      </receiver>
      <icn>P1060320093746</icn>
      <encoding>UNICODE</encoding>
      <user_snd_time>20060320093350</user_snd_time>
      <digital_signature />
      <extensions />
    </header>
  - <body>
    - <documents total_count="1">
      - <document standard="KECA1" agency="KE" ver="D97A" name="DEOVAD"
        - &lt;segment name="UNH" group="GROUP0">
          - <single>
              <element>1</element>
            </single>
          - <composite>
              <element>DEOVAD</element>
              <element>D</element>
              <element>97A</element>
              <element>KE</element>
            </composite>
          &lt;/segment&gt;
        - &lt;segment name="BGM" group="GROUP0">
          - <composite>
              <element>682</element>
              <element />
              <element>KE</element>
              <element>GENERAL DECLAR OF OCEANGOING VESSEL</element>
            </composite>
          - <composite>
              <element>06DRPTD1517</element>
            </composite>
          - <single>
              <element>6</element>
            </single>
          &lt;/segment&gt;
        - &lt;segment name="DTM" group="GROUP0">
          - <composite>
              <element>186</element>
              <element>200603192030</element>
              <element>203</element>
            </composite>
          &lt;/segment&gt;
```


Fig. 9 XML File

5.3.2 EDI converts to XML, vice versa

It is similar to EDI⟨-⟩DB operation. Firstly, parser module is parsing EDI message. And Data Modeler generates the common data set adding business logic. Then, text file generator makes the result

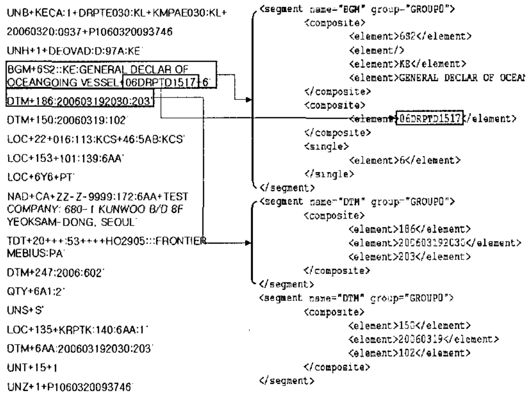

Fig. 10 Item mapping between EDI and XML(1)

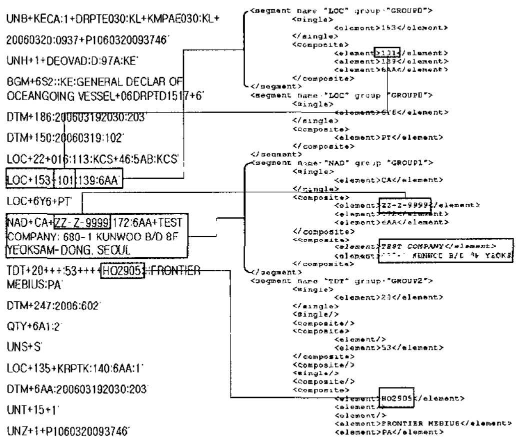

Fig. 11 Item mapping between EDI and XML(2)

Item	Specification
H/W	- Any machine that is installed JVM - HP, SUN, AIX, Win, NT, LINUX, ETC.
Database	- RDBMS: Oracle, Iformix, DB2, SQL-Server, etc - OODB: SONIC XIS
Communication	- Supproting Protocol: TCP/IP (HTTP) - Programing Language: JAVA
Application	- Supporting Data Format: EDI, XML, DB, FF, etc. - Technology: Java, XPath, Jython, DOM, SAX - Well-Formed XML & Valid XML - Syntax & Semantic Check

file(XML) using template engine. Following XML document is based on XML DTD. It is easily making the other text file because the common data set is DOM tree. Fig. 6 shows XML File.

Fig.10 and Fig.11 shows how to map between EDI and XML

The specification of the proposed system is as follows

6. Conclusion

Single Window can eliminate the user's duplicated input and maximize the data reusability. Also, the administrative authority can promote simplification and unification of government documents. Therefore, work procedure of government would be improved and business collaboration with other organization could be achieved. As the proposed system in this paper can be applied to Single Window, interoperability between countries can be increased. It could have an effect on national or international economical advantages. In case of Korea, re-definition of government document was completed in 2004 in accordance with the international standard for Single Window System.[4]

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