

The e-Logistics Integrated Platform for a Logistics Services Industry

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Abstract: The concept of e-Business has been around for more than two decades but it has not been used widely enough due to high installation and maintenance cost and complexity. In order to solve such problems, two standardization organizations UN/CEFACT and OASIS have developed an open e-Business standard called ebXML that can be easily adopted by industries. Based on the ebXML, we have developed an e-Logistics integrated platform for industries to do business electronically. The e-Logistics integrated platform was applied to B2B postal logistics industry and efficient interoperability between companies with different systems has been achieved.

Keywords: e-business, ebXML, UMM, logistics.

1. Introduction

The rapid development of information technology lead transformation of traditional business convention into new era of business act such as B2B, B2C. The trend of business these days shows active merger and acquisition activities and that arose the need of system integration. There are many requirements for different business systems to be integrated; interoperability of various data, application, and process. The current companies usually have different kinds of application and platform and they all use their own protocols so data sharing was meant only for application programs within a company. Costs and effort for integrating different systems between different companies are increasing.

In order to solve such problems, the international standardization organizations like UN/CEFACT and OASIS has joined together and developed a standard framework for e-Business, which is ebXML (electronic business XML). ebXML is a technology neutral specification that allows to perform e-Business between different parties with different systems. e-Logistics integrated platform incorporates ebXML specifications and extends current B2B framework idea so that we can achieve thorough integration between B2B environment. The e-Logistics integrated platform can be applied to any place

where B2B transactions are required. In this paper, we would like to introduce the structure of the e-Logistics integrated platform and show how it has been applied to a B2B postal logistics system to totally integrate the different systems within different companies.

2. The e-Logistics Integrated Platform

The e-Logistics integrated platform has been developed for the purpose of achieving easy integration between parties with different legacy systems. It helps parties with different systems to do business electronically without struggling to integrate the entire systems. This can be achieved by utilizing XML, which is becoming widely used for data description. The architecture of the system is shown in Figure 1.

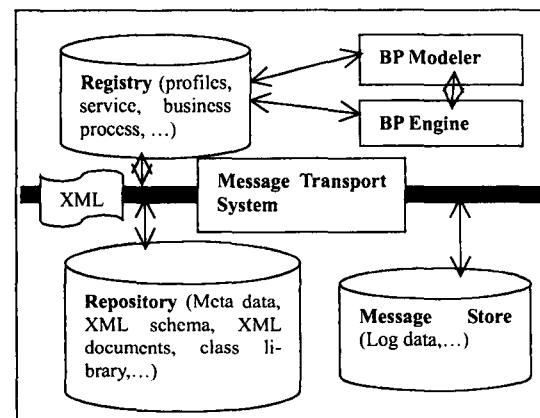


Figure 1. The e-Logistics Integrated Platform

The main components of the e-Logistics integrated platform are registry/repository, BP Modeler, BP Engine Message Transport System. Each of their roles is described below.

- BP modeler: Provide UML based GUI to model business process and automatically

generate BPSS instance XML document.

- BP Engine: Executes business process described in BPSS in sequence
- Message Transport System: Provide secure and reliable XML messaging channel
- Registry/Repository: Enables collaborative development, for example by providing a collaboration mechanism between trading partners via a common access mechanism to trading partner owned registries.

3. B2B Postal Logistics System

The e-Logistics integrated platform consists of components that support electronic B2B environment. In order to show the use of the platform in a real world application, furthermore to suggest a reference business model for the e-Logistics platform, it has been applied to a B2B postal logistics system. Even though the rapid development of technology is absorbed in everyday of our lives, there is no common system that can be used between different parties. Thus there were no efficient techniques that actually support e-Business without struggling to directly attach different systems by force. We start by showing the application of the e-Logistics integrated platform for a logistics industry.

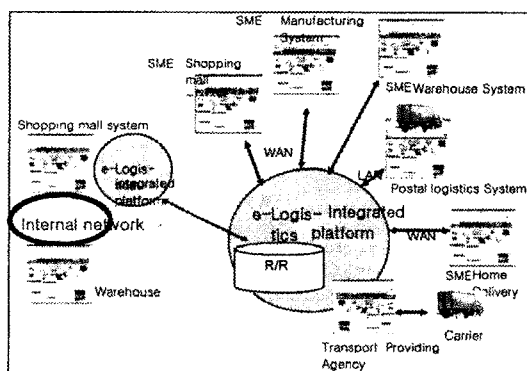


Figure 2. The e-Logistics Integrated Platform Service Model

Figure 2 shows an e-Logistics integrated platform service model. The e-Logistics integrated platforms in the figure act as the bridge between parties with different systems. As shown in section 2, the e-Logistics integrated platform includes registry/repository that stores information of companies for B2B transactions such as basic company information, what sort of services they provide, their business process, business documents being used, etc. Companies can search for the appropriate parties that can collaborate with via e-Logistics integrated platform's registry/repository and they can also store their own company information into the registry/repository. When companies find the appropriate customer, they can send/receive the appropriate business documents according to the business process defined.

The B2B postal logistics business model is shown in Figure 3. Within the business model, we have focused on the shaded area that includes parties of e-Marketplace,

warehouse, home delivery service provider, carrier for implementing our postal logistics system.

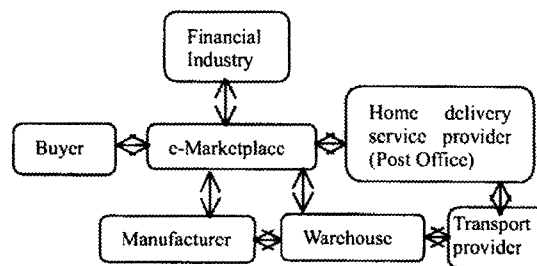


Figure 3. B2B postal logistics business model

1) The B2B Postal Logistics Business Model and UMM

Before we incorporate the e-Logistics integrated platform to the above business model, we should figure out what business practices actually are being performed in the real world. In order to model business processes, we have applied UN/CEFACT's Modeling Methodology (UMM) to the postal logistics business domain. UMM is a methodology for modeling B2B process that is recommended by ebXML. UMM is a technology neutral modeling methodology that allows business process knowledge to be directly implemented into an XML format.

There are four steps in UMM.

1. Business Modeling Workflow: The given business domain is being categorized into Business Area, Process Area, Business Process.
2. Requirements Workflow: By using the artifacts of Business Modeling Workflow, we understand and identify the requirements of the interested parties and specify business process use case scenario, constraints, collaboration protocols and their relationships.
3. Analysis Workflow: The requirements defined in the previous step are transformed into technical format.
4. Design Workflow: It describes business collaboration between network components, information model describing domain and business documents, and application of business service exchange pattern.

By incorporating the above steps to a business domain, we can gradually classify a big domain into smaller processes and identify collaboration between parties as well as the exchanged business documents' information in the form of XML that can be used directly in the systems. The more detailed information on UMM can be obtained from [1].

UMM has been applied to the B2B postal logistics business model. The B2B postal logistics business model includes three major parties, e-Marketplace, home delivery service provider, and transport provider. e-Marketplace requests a shipping order to home delivery service provider to accomplish purchase order of their customer. If the home delivery service provider is lack of appropriate vehicle for the shipping request, home deliv-

ery service provider requests vehicle to a transport provider. E-Marketplace's customer may request to return the product they bought. In this case, e-marketplace requests to ship the returning order from their customer. Home delivery service provider notifies interested parties about the delivery status, and after delivery is complete settlement of accounts follows. As a result of step 1 of the UMM, we obtain B2B postal logistics business model classification shown in table 1.

Table 1. Business Modeling Workflow of B2B postal logistics domain

Business Area	Process Area	Business Process
Shipping	Shipment Ordering	Obtain Shipping Quote and Availability
		Place Shipping Order
	Shipment Status	Notify of Registration Advice
		Notify of Delivery Status
		Notify of Delivery Completion
	Shipment Payment	Present Billing Statement (Shipment Order)
		Payment Confirmation (Shipment Order)
	Goods Returning Order	Cancel Shipping Order
		Return Product
		Notify of Shipment Receipt
Confirm Returning Product Content		
Vehicle Supply	Vehicle Ordering	Obtain Vehicle Quote and Availability
		Place Vehicle Order
	Vehicle Payment	Present Billing Statement (Vehicle Order)
		Payment Confirmation (Vehicle Order)

The next step of UMM, Requirements Workflow discovers the detailed user requirements for B2B collaboration by specifying use case scenarios, input and output triggers, constraints the collaborations. Here, we first figure out collaborations between trading partners and specify the details listed above using the UMM worksheets. Figure 4 shows the use case diagram of collaboration process discovered in the previous step.

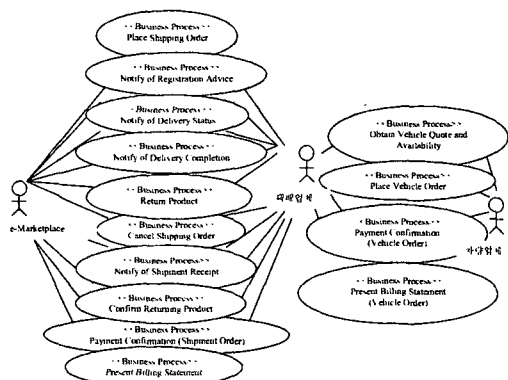


Figure 4. B2B postal logistics collaboration

We can obtain business scenarios by choreographing

business processes identified so far. There are five process scenarios obtained such as shipping process, returning process, shipping settlement process, vehicle ordering process, and vehicle order settlement process. We introduce one of the identified process scenario, shipping process as follows. Figure 5 shows shipping process scenario. We can see that the business processes identified in step 1 have turned into series of processes and this flow can be implemented as BPSS (Business Process Specification Schema) which is one of the specifications established from ebXML.

The Analysis Workflow, we define transaction patterns for business transactions and recognize the flow of documents for each transaction. There are six transaction patterns defined in UMM, and each transaction pattern has different parameter settings that directly represents



Figure 5. Shipping process activity diagram

the type of transaction technically. We can assign the transaction patterns to each transaction identified in the previous step. By assigning those patterns to the transactions, the physical business transaction turns into an electronic transaction that gives direct implication to ebXML compliant software. The transaction identified in the model assigned to the transaction patterns are shown in table 2. We have also identified business documents for each business transaction as well as its information entity but it has been omitted in this paper.

Table 2. Business Transactions with Transaction Patterns

Transaction Patterns	Business Transactions
Commercial Transaction	Place Shipping Order, Present Billing Statement, Cancel Shipping Order, Return Product, Place Vehicle order,
Query/Response	Request product catalogue -Query product information, etc
Request/Response	-Obtain Vehicle Quote and Availability

Request/Confirm	Query order status, Query shipment status, Query inventory level, Query stock information, etc.
Notification	Notify of Delivery Status, Notify of Registration Advice, Notify of Delivery Completion, Payment Confirmation, Notify of Shipment Receipt, etc.
Information Distribution	-Product offering, etc.

2) The B2B Postal Logistics System

The business model of B2B postal logistics has been developed by using UMM. This physical business model has been directly transformed into a machine-readable format for business to be performed electronically with use of the e-Logistics integrated platform. This implies the UMM model for B2B postal logistics has been transformed into BPSS which is in XML format. BPSS is constructed from a semantic subset of the UMM meta-model which acts as the bridge between e-business process modeling and specification of e-business software components. Using the BPSS, the business model developed by UMM has been transformed into the XML format of business process specification. This business process specification has been run under the BP Engine, and the BP Engine logic decides the flow of business process depending on the business process specification and sends business documents to right parties using the Message Transport System. This is the basic operation inside the e-Logistics integrated platform.

In order to show interoperability of the B2B Postal Logistics System, the following has been developed. A legacy shopping mall system and home delivery service provider's system under web environment has been developed and was interoperated with BP Engine in the e-Logistics integrated platform. This is shown in Figure 6.

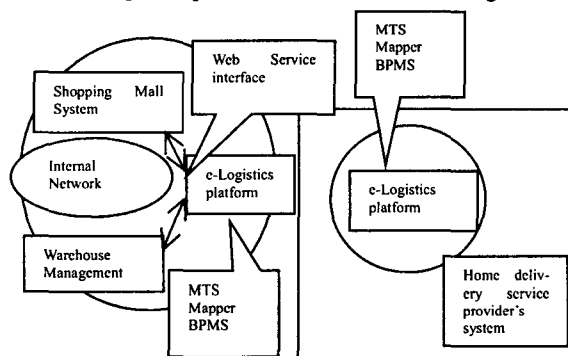


Figure 6. Legacy systems integrated with the e-Logistics Integrated Platform

The shopping mall system has functionalities such as product purchase, payment, processing delivery status inquiry, placing shipping order, returning order, sending return product warehousing notification, creating re-

quired XML documents, etc. The home delivery service provider's system has functionalities such as delivery scheduling, sending advanced shipping notification, return product content confirmation, creating required XML documents, etc. By using web services interface with the e-Logistics integrated platform, shopping mall system and warehouse management system could easily utilize the functionalities of the e-Logistics integrated platform and the easy interoperability between legacy systems and the e-Logistics platform has been achieved.

4. Conclusions

The concept of e-Business has been around for more than two decades and the pioneer, EDI (Electronic Data Interchange) has been dominated what it has been called e-Business. However, there were many disadvantages like high implementation cost, cryptic syntax that became major obstacles for it to be spread widely. There was no easy way to integrate entirely different systems where easy integration of differently systems is critical for e-Business to work well. Using the concept of ebXML standards, the e-Logistics integrated platform has been developed. This platform is based on XML messages that is compatible with most of computer systems, and with web services interface there are less hesitation for interoperability of different systems. We have applied this platform to a B2B postal logistics business model and it is shown that the e-Logistics integrated platform allows easy smooth interoperability between different systems.

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References

- [1] Technical Modeling Working Group, UN/CEFACT's Modeling Methodology, 2001