

Research on Architecture of Logistics Public Information Platform

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ABSTRACT

On the basis of the discussion on main functions of logistics public information platform, and the summary of general functions of some typical cases at home and abroad, such as China electronic port and TradeLink, the logistics public information platform architecture is introduced from a technical point of view. It contains multiple levels, such as cloud computing platform and data storage layer, and discusses some new technologies available. Finally, the important trend of the logistics public information platform development is discussed.

Keywords: Logistics Public Information Platform; Architecture; Cloud Computing

1. Introduction

Modern logistics in China has metamorphosed culture introduction in 1980s to pilot program of logistic and distribution centre built-up in early 1990s and evolved into full-fledged industry by the end of 1990s. China's logistic industry has been experiencing fast growth driven by sustainable national economic expansion. Delivery, processing and packaging has been on the high plateau with fast growth. In 2009, the State Council published the "restructuring and revitalization plan for logistics industry", promoting the rapid development of logistic information technology. In the report, a major task is to raise the level of logistics information, and to promote the logistics management information actively and to extensive use of information technology, such as accelerating the construction in industry logistics public information platform and promoting the construction in regional logistics information platform [1]. Thus, with the rapid development of information technology, building a logistic information platform has been would be a key point, which can support and integration logistics activities and improve operational efficiency, so as to increase economic efficiency.

To Logistics public information platform provides information connections between enterprises and government departments [2]. Currently, there is no authoritative definition on the logistics public information platform, and it is generally considered as the application form between inter-organizational logistics operation and its aim is to support the public requirement between organi-

zations in the logistic industry value chain [3]. The platform is a complex information system and involves multi-stakeholders, such as multi-industry administration section, logistics park, logistics enterprise, etc. [4].

This paper analyzes basic functions logistics public information platform, and describes some typical cases at home and abroad, and then introduce the logistics public information platform architecture combining with modern information technology, the functional description of each level in the architecture is also discussed, and the important trend of the logistics public information platform development is discussed in the last.

2. Functionality of Logistics Information Platform

The most important functionality of logistics information platform is integrating various information resources to complete the data exchange, implement the data sharing and the information transformation. Each information system send public data to the platform following specific rules, and the platform deal with those data and store them, then provide services using those data [2]. Logistics Information Platform can be described from different aspects, for example, 3C model was applied in paper [3], which describes 3 functionalities which contains content, connectivity and business, content refers to the release of logistics information and construction of logistics knowledge; connectivity mainly refers to the exchange of logistics data, focusing on data transmission; the core of business aspects is of online trading, logistics tracking and query. In addition, paper [4] summed up the

logistics public information platform of the five functions. From these papers, we can conclude that the main body of Logistics Public Information Platform mainly include as follow: Data exchange functionality which is the platform's core functions; logistics business data query functions; logistics information publishing; online trading service management functions; other value-added services; user management functions. In addition, in paper [2], it said that the platform includes not only the construction of information systems, but also should provide advanced management methods like smart distribution and cargo tracking.

3. Typical Cases of Logistics Information Platform

There have been some researches on logistics information platform at China and abroad, and some platform has been realized. Below are some examples from which we can understand the functionality of the logistics information platform better.

3.1. China Electronic Port [5,6]

China E-Port is a public data center and data exchange platform, based on the national public telecommunication network. It realized the networking between taxation, business, customs house, foreign exchange, and other management department, and stored import and export management flow information, cash flow, and goods flow information in a centralized database. It provides below functionality:

Data exchange and sharing between government departments and inter-enterprise; real-time online transaction processing (Verification Sheet approval, processing trade contract approval, customs declaration request, etc.); authentication of government departments, various corporate and individual user; legal attest and probation; standards conversion for exchanged data; services for data query and statistics collection; online payment; network isolation.

3.2. Shanghai Easipass [7,8]

Shanghai E & P International is a state-owned enterprises based logistics information service provider. It is mainly worked on the platform which united logistics information and e-commerce and is logistics information technology pioneer and leader in the field. Its business focus on five aspects such as international economic and trade e-business (B2B), international foreign trade and product development and systems integration for logistics specialized software, Web-based technology, ERP, CRM software and services, international shipping technology consulting, training and so on [2].

3.3. Australia Tradegate [9,10]

Tradegate is Australia's specialist international trade and transport e-commerce provider. They have built Smarttrade, the operational platform for our products and services, to be as open as possible. It "talks" to virtually any payment, messaging and authorization system. Making it easy and cost-effective for players large and small to leverage our nationwide network from anywhere across Australia. Tradegate has developed a market leading suite of value added services targeted at the service providers to the international trade and transport industry. Tradegate's EDI service supports secure messaging to Australian Customs as well as commercial EDI messaging between shipping lines, freight forwarders, customs brokers, and container terminal operator's messaging gateways. It mainly provides services like Message Direct, MessageXchange and PKI Hosted Certificates. Tradegate supplies a range of Internet access products to its members. These services range from standard Internet grade ADSL to business grade SHDSL connections. Commonly it provides below service: Payment, ExportNet, Smartimports, ImportNet CMR. Payment service can make secure online payments to shipping companies, freight forwarders and other releasing parties. ExportNet service requests Export Declaration Numbers (EDNs) and sends Pre-Receipt Advices (PRAs) to container terminals. Smart imports request and receive electronic delivery orders. ImportNet CMR can Lodge Import Manifests and request underbond movements.

3.4. Hong Kong TradeLink [11]

TradeLink is to use the network to connect to local manufacturers and the HKSAR Government to promote export licensing declarations and export documents electronically, which is jointly funded by the private sector and the authorities in January 1997 to establish. With strong government support, now 100% of the customs declaration formalities for electronic has been realized [2]. The number of enterprise users increase rapidly, and the average daily one-stop electronic services number also extended to the maximum of 51,200. Enterprise users only need to register so as to use the system providing services. TradeLink now provides the main online services as below: Customs declaration services; trade report submitting services; the packing list submitted to the US Customs Service; trade facilitation status inquiring; TradeLink royalty checking; tariff information inquiring. TradeLink also turns their attention to tens of thousands of small and medium enterprises account for more than 90% of exporters, and provides customized services

4. The Architecture and New Technology Prospect

Some research discussed the architecture for logistics

information platforms from business level are discussed. In paper [4], it was mentioned that this architecture can be described from the vertical and horizontal angles. In the vertical, there are four levels of information platforms, namely: National logistics information platform, provincial-level logistics information platform, city-level logistics information platform and the park enterprise logistics information platform, information platform on various aspects works for the various government departments such as Development and Reform Commission, customs, taxation, ports, business processes can be interactively made between similar government functional departments. In the horizontal, the platform architecture is focused on the business systems management and collaboration between same level government departments. Logistics information platform system servers for four kinds of objects: The government public service provider side, including customs, industry and commerce, foreign trade, ports, SAFE, etc; business services provider, including banking, insurance, specialized transportation, third party logistics, customs lines, etc; upstream suppliers, including foreign and domestic suppliers; downstream purchasers, including manufacturing, processing enterprises, distribution enterprises [2].

This paper focuses on discussing the architecture of platform from a technical perspective. Considering development trend of new information technologies, the paper discussed technology needed to build logistics platform following below layers showed in **Figure 1**.

In **Figure 1**, the underlying network infrastructure and communications equipment constitute the basis of logistics information system, providing support for data storage, information sharing, and application service. It covers a wide range of equipments and technologies, including hardware platforms, software platforms, communication facilities and logistics standardization system and so on. They are usually built by government due to huge infrastructure investment. Considering large amount of data in public information platform, the more and more incoming number of concurrent user connections and requirement on quick timely response, powerful storage devices is needed here; this usually refers to the mainstream server. Now there is another choice—we can use an emerging information technology cloud computing platforms to implement, cloud computing platform can not only store public information platform but also can provide storage service for SMEs. Internationally, the technical extent of logistics information reflects the development level of logistics industry, while China's logistics information is still lagging behind, due to high cost of establishing information platform, many of logistics enterprises, especially small and medium sized logistics companies are not able to build their own logistics system and meet business need. The use of cloud com-

puting model can helps a lot on dealing with such problem and should be considered during building logistics Information Platform.

Above the network infrastructure layer is the data storage layer, which stores various data used for querying, policy information or private data belonging to small and medium enterprises. At present, there are many kinds of manual data collection technology in the logistics industry like bar code technology, magnetic, radio frequency identification technology (RFID), EPC system (Electronic Product Code), etc. As there is no common standard for all enterprises to follow, the encoding code and data format for the same object maybe different between logistics information systems, due to the backward of logistics information collection. The data storage layer needs to have strong data format compatibility, and support not only common data format such as text file format, database format, xml formats, but also extended data format. Since the data sources on public information platform is very complex and often be required to interact with each other to get necessary information, how to extract information from different data sources and ensure the data consistency and accuracy becomes an urgent problem. To solve this problem, current data integration software is being used to ensure the relevance of heterogeneous data sources, and ETL tools (data stage, quality stage etc.) is used to do necessary data extraction and cleansing. In short, this level's implementation

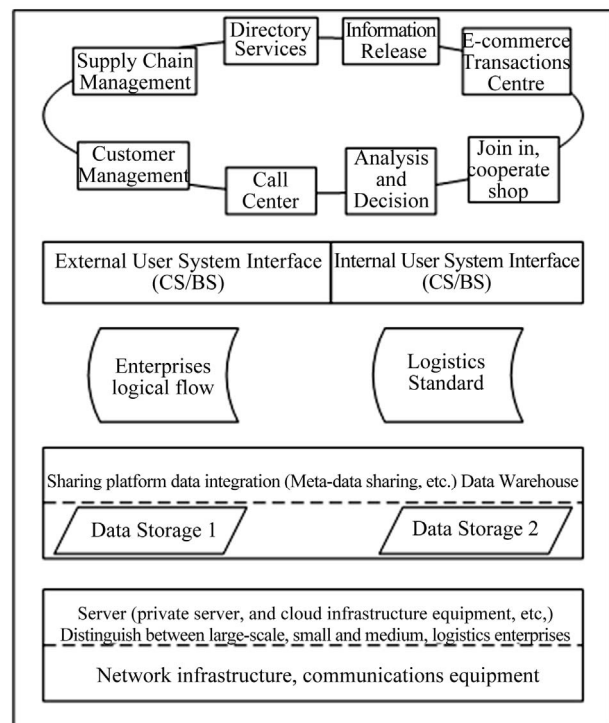


Figure 1. Architecture of logistics public information platform.

should be able to achieve the following objectives: 1) It can easily query the information logistics infrastructure, including the regional logistics market information, infrastructure information, transportation route information, distribution centers and route information etc; 2) It can be able to provide logistics management, including storehouse management, transportation management, distribution management, customer relationship management, supplier management and other related management work; 3) It can be able to get supply and demand information, including commodity supply and demand information, trading exchange information, vehicle supply and demand information, information on demand for raw materials, storage demand information, supply information and other logistics needs information; 4) It can provide necessary logistics decision-making information, including logistics planning information, transportation and distribution decision-making information, strategic decision-making information, supplier selection decision-making information and related logistics decision-making information. With vigorous development of the logistics industry and gradual increase of information dependences in China, it would become more and more important on solving these problems [12].

During construction of Logistics Information Platform at application layer, different industries and different functional departments need to deal with data according to specific needs. Usually, it needs to be implemented by combining logistics standards and workflow logic. Currently there are some products which can provide such functionality like BPM systems.

The aim of public information platform determines the diversity of its open interfaces. They need to provide different information for different users such as business users and individual users; also they need to deal with that information depending on the internal workflow. Currently SOA frameworks is popularly used for this aim, service requester is often request messages and response by messaging calls rather than using API and file format, which has loosely-coupled advantages. Concurrently some manufacturers have proposed the concept of a large logistics which means having all API interface opened to make the logistics service providers, the seller, vendor company and e-commerce sites be able to collect and deal with order information, logistics information, ERP system data together. In addition, the security authentication issue needs to be considered carefully on this layer, which promises that everybody can only access and deal with data he has privilege. The common method is authorization mechanism, but considering the security problem during information transition, the digital signature and third-party assurance can be used to get private data encrypted.

The top level in logistics information platform is the

application layer which provides logistics service for end user. What should be concerned here is that these applications have a lot of differences and can't be replicated, and the underlying layer relationship should be cover into consideration during design. For example, port logistics information platform is consisted of four cross-cutting related application areas: Supply chain management (SCM), transport equipment and cargo tracking positioning system (GPS & GIS), application hosting (ASP), and public operations opening [9]. The design should take underlying logic of these processes and data storage into account and enterprise needs to design personalized logistics application on application layer, such as third-party distribution logistics, port logistics services. Similar applications include the implementation of customer relationship management (CRM) system and distributor system.

5. Prospects: International Logistics Public Information Platform

An important trend of the logistics public information platform development is International logistics public information platform. With the increasing cooperation in international logistics, governments, research institutions and logistics business need timely access to foreign-related logistics information to understand the logistics dynamical domestic and international, and conduct cross-border logistics business interaction. Therefore, constructing a cross-regional international logistics public information platform is very necessary, which is an important trend of the development of the logistics public information platform. The cross-regional international logistics public information platform builds a unified platform for network data processing and business systems connecting domestic and foreign platforms, thus making the domestic logistics companies joint track with foreign logistics platforms; realizing data exchange; providing accurate, rapid and comprehensive domestic and international logistics information and other related value-added business services; developing inter-regional cooperation of logistics, which will be play a significant role in promoting multi-faceted, multi-level and wide-ranging cooperation and exchanges on domestic logistics enterprises and foreign enterprises.

6. Conclusions

This paper studies current logistics public information platform, and describes the technology architecture of the logistics system for some current key issues (heterogeneous data source integration, data exchange and workflow logic guarantees implementation), applying current advanced technologies (SOA, cloud computing) to improve scalability, reduce costs and make services such as

the standardization and information sharing for large, middle small enterprises and public people possible.

Future research will focus on the implementation investigation of specific technology in the platform, such as specific heterogeneous data integration technology (Oracle gateway, DB2 II, the private data exchange platform, etc.), cloud computing applications for different cloud model (SaaS, PaaS, IaaS), logistics application integration.

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