Research on Key Technologies of Collaborative Logistics Information Integration Platform System Based on OGSA - DAI

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Abstract. Based on OGSA-DAI (Open Grid Services Architecture- Data Access and Integration), aiming at the existing problems that the logistics collaborative distribution platform's low level of information integration, the dynamic grid nodes' large fluctuations and the system data' high heterogeneity, a five-layer collaborative logistics information integration platform system(CLITPS) is designed and the key technologies in five layers of grid structure are described in detail. Emphasized in core service layer to discuss the five service contents of the platform. Taking the collaborative delivery order processing as an instance, this article creates the customer activity intelligent search engine(CATSE), clarifies the user information search process and analyzes the implementation of the distribution order processing, which confirms the feasibility of the collaborative logistics information platform system.

1. Introduction

The collaborative logistics information integration platform (CLITPS)has the cost advantage of network economy. It optimizes the resource allocation while integrating the information data, which help to reduce the distribution operation cost, improve the region logistics distribution efficiency and finally realize win-win economic benefits in the integrated supply chain. Nowadays, in terms of the development of logistics collaborative distribution system in our country, the whole integration level of logistics information along with social resource is still inferior, the dynamic grid nodes' fluctuation is fast and the regional distribution issue is extremely critical. Associated users among collaborative logistics platform are unable to form an effective information integration communication system.

2. Grid technology based on OGSA-DAI

Open Grid Services Architecture - Data Access and Integration (OGSA-DAI) integrates existing data resources into a grid environment, with the primary goal of accessing and integrating data in a grid environment in a general means[1][3]. OGSA-DAI supports numerous popular database management systems, My SQL, Microsoft SQL, Server, Oracle, XML, etc. Via OGSA-DAI, it provides an expansion interface, unifies multiple heterogeneous databases and access and control systems through one single data source. OGSA-DAI realizes the basic data fusion and distributed query on the virtual distribution chain, shields the communication protocol running mechanism between different database drivers and data formats. Use the distributed processing technology to enhance the information integration speeds. OGSA-DAI provides the upper user Layer more stable data with superior scalability.

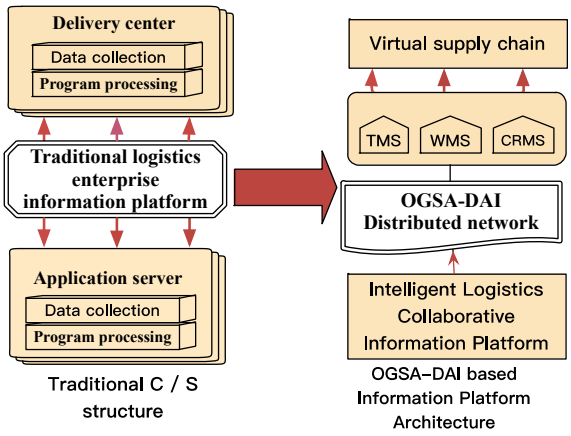

Figure 1. Grid technology based on OGSA-DAI

3. Collaborative logistics information integration platform system and key technologies based on OGSA-DAI

Based on the OGSA-DAI data specification, the collaborative logistics information platform is constructed by from bottom-to-Top(FBTT) modeling method. As shown in Figure 2, the whole collaborative logistics information platform grid is divided into infrastructure layer, integrated resource layer, application structure layer, core service layer and user interface layer. Focus on implement integration of collaborative logistics information through the core service layer. The grid structure and key technologies are described as follows:

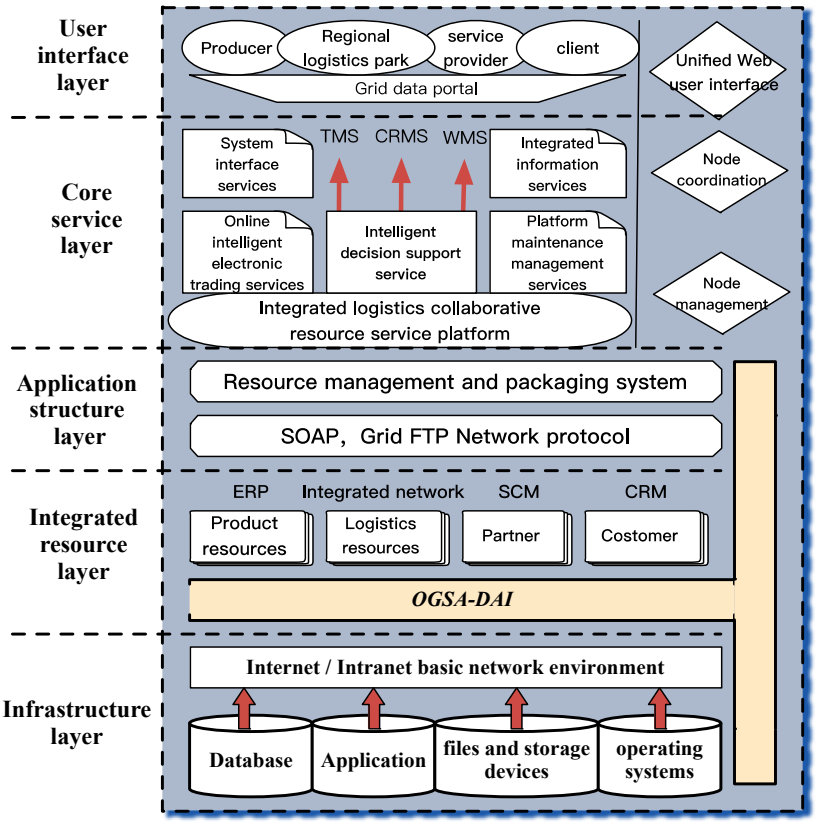

Figure 2. Collaborative logistics information platform based on OGSA-DAI

3.1 Infrastructure layer

This layer is the operational platform of the logistics resource grid, provides the Internet/Intranet basic network environment required for the overall framework. includes various network communication devices and physical connections. It's based on the underlying distributed databases, heterogeneous applications, files and storage devices, operating systems and other grid resources to facilitate upper layers in construction of distributed resource integration.

3.2 Integrated resource layer

The core of this layer is GT and GT-based OGSA-DAI. It abstracts the underlying information infrastructures into a unified logical entity，shields the divergence between heterogeneous system and host environments. OGSA -DAI encapsulates the data which related to the intelligent logistics distribution as Grid Services. Then it connects access with upper layers. The integrated resource layer also distributes resources across the enterprise, such as ERP-based product resources, ship/container management-based logistics resources, CRM-based customer resources, etc.

3.3 Application structure layer

This layer encapsulates the Grid Data Transfer Protocol (Grid-DTP) to guarantee the collaborative data is efficiently and securely transmitted in the grid. [2]Grid-FTP dynamically adjusts the execution cost according to the grid loading situations, makes reasonable data transmission plan, accelerate transmission speed of massive data compared with traditional file transfer protocol (FTP). Simple Object Access Protocol (SOAP) has the independent characteristics of the distributed computing platform, shield differences between various types of data format in the bottom access process.[2]

3.4 Core service layer

This layer is the core layer of the whole collaborative logistics information platform system. Fig. 3 is the integrated logistics collaborative resource service platform. The integration of information is mainly through the five service contents of the platform.

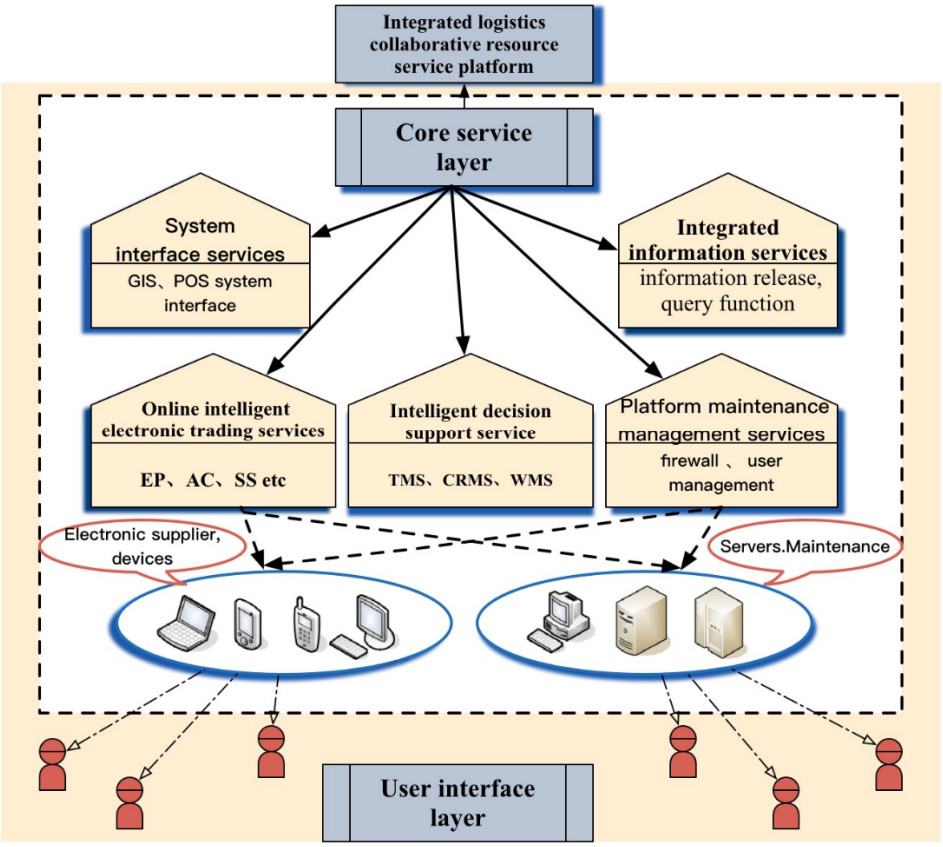

Figure 3. Integrated logistics collaborative resource service platform

3.4.1 System interface services

System interface service is the basic content of building regional collaborative logistics platform. Through the data exchange standard provisions, solving the intermediate system and format data sharing problems between the newly-built information platform and the original ones. Achieving interactive sharing and effective use transfers between GIS, POS and other systems.[4]

3.4.2 Integrated information services

Intelligent logistics coordination system not only comprises the regional logistics park, logistics service supplier enterprises, but also related logistics facilities, government departments, the relevant functional departments of the information system requirements. Usually it integrates information dissemination, query and other information services: regional policies and regulations, logistics needs and supply and so on.

3.4.3 Online intelligent electronic trading services

The service generally includes electronic payment and accounts settlement. Information security issues need to be paid special attention, which must be an important area of logistics in further future development.

3.4.4 Platform maintenance management services

Including the daily management and maintenance of network security, software system, hardware systems, security firewall inspection, and user platform management.

3.4.5 Intelligent decision support service

Intelligent decision service provides logistics enterprise decision-making services, thereby enhancing the scientific decision-making efficiency. The commercialization software which support the logistics enterprise alliance and the third party logistics can meet the growing need for business logistics data analysis and statistics, logistics trends and forecasting, logistics cost control and management, logistics quality analysis and other value-added services. Embodied in the establishment of transportation management support(TMS), customer relationship management support(CRMS), warehousing management support(WMS) and so on.

3.5 User interface layer

This layer provides a unified Web portal and access interface for end users (including producers, regional logistics parks, service providers, customers, partners, etc.), providing a good interface view. It acts as a user agent program, provides node entry management service for data application, calls the lower layer grid service according to the user instruction, realizes the automatic management of logistics business.

4. Application instance based on OGSA-DAI information platform system: Delivery order processing

In the above information platform hierarchy, the primary core is the user interface layer information exchange issues' architecture. The design of logistics service intelligent search engine is a key problem[5]. Taking the urban intelligent collaborative distribution order processing process as an example, we further build an OGSA-DAI-based customer activity intelligent search engine(CATSE).

The core of the OGSA-DAI-based customer activity intelligent search engine (CATSE) is to determine the appropriate transport distributors orders. The traditional Web service needs to select the transport carrier by directly browsing the classification model in the directory service. In the operation of the customer activity intelligent search engine, the service request is sorted according to the degree of similarity of the constraint, then reused with the current service request, which makes the logistics information service more efficient and convenient to realize the call. Still，take Collaborative Logistics delivery order processing process as an example, which is shown in Figure 4.

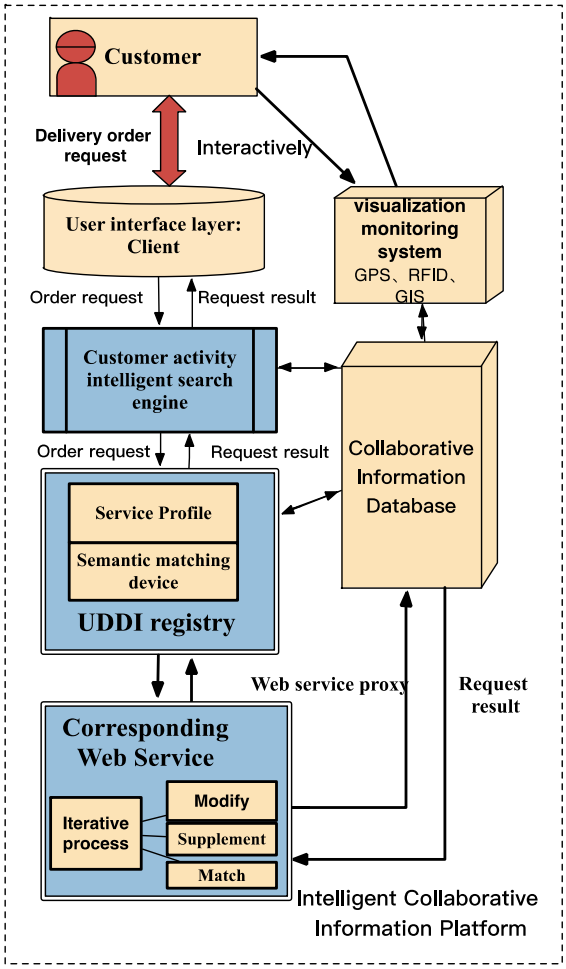

Figure 4. Client activity Smart search engine operation

Step 1: The customers interactively accesses the user interface layer，enters the delivery order request into the client.

Step 2: The client sends the order request to the customer activity intelligent search engine(CATSE).

Step 3: The customer activity intelligent search engine gives delivery order request to the UDDI registry.

Step 4: UDDI registry accepts order requests through semantic matching device, refer to the definition of the Service Profile, request information such as the type of goods, quantity of the demand, the mode of transportation will be compared. Then the service request will be put forward to the semantic matching device through the service interface which defined the constraints.

Step 5: The semantic matching of the UDDI registry accepts the service requests from the customers, classifies them according to the parameters (the preconditions and type constraints involved in the service request) and translates them into pre-defined terms for the database.[6]

Step 6: The semantic matcher compares the similarity between service request description and the pre-defined data body. They will be sorted by the system according to the degree of semantic compliance. To continue the iterative process of constantly modifying and supplement the request to match the results until the corresponding Web services be found out.

Step 7: UDDI registry's directory service center of the registration center returns the binding information of the Web service to the service layer. The service layer generates the Web service proxy according to the obtained binding message and binds it to the corresponding Web service.

Step 8: The order request matches the result by the client and returns to the customers. Customers get the results of service requests and then can call the logistics information services, direct access to the service package business logic method.

Step 9: The return results determined by the order matching will be passed to the visualization monitoring system in the virtual system. The use of intelligent logistics GPS, RFID, GIS and other information technology monitor the real-time vehicle traffic distribution conditions, which means the customer can monitor the order fulfillment on the map.

Step 10: With the intelligent logistics handheld terminal in the receipt site, order fulfillment will receipt way back to the information platform through the GPRS, finally confirm the actual number and time for distribution orders. For instance, with the popularity of smart courier delivery box, order collection process can be automatically returned to the user by the system and directly return the receipt of data to the information platform.

5. Conclusion

The service-oriented architecture is an effective way to realize the information integration in the collaborative distribution logistics system. Based on the OGSA-DAI technology, the logistics intelligent collaborative information integration platform provides the integrated service for the urban distribution integrated service through the concrete application of the core service layer. In addition, the current emerging cloud computing technology and grid computing are more able to adapt to the future demand for intelligent logistics data needs, is the future research's direction.

References

[1] Wei Zhenlin, Sun Jianqing, the face of small and medium-sized electric business enterprises in urban common distribution model, Beijing Jiaotong University[J], 2015-01-20

[2] Wang Lei, Chen Qing, Li Tianyou, Grid Dispute Dispute Architecture Based on Network Platform, Power System Automation[J], 2012-11-19

[3] Huang Chao, Huang Biqing, Li Chunping, Research on Resource Integration Framework in Logistics Resource Grid Environment, Computer Integrated Manufacturing Technology[J], 2005-05

[4] Song Tingxin, Huang Biqing, Wei Chunmei, collaborative logistics and integration technology based on semantic Web service, computer integrated manufacturing technology[J], 2008-03,588-594

[5] Research on OGSA-DAI Key Technology and Its Application in Database Grid, Information System, 2007-04

[6] Hu Chunming, Huai Jinpeng, Sun Hailong, Grid Architecture Based on Web Services and Its Supporting Environment Research, Software Journal[J], 2004-07, 1064-1074