

The Design and Implementation of Logistics Information System based of Multitier Architecture

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Abstract. This article systematically analyzes the current situation of logistics and logistics information system, and finally puts forward a design scheme of logistics information system. In the design of logistics information system, the hierarchical 3-tier architecture is used to build the system; then, the system is designed using C# platform and SQL database. According to the system operation situation, the system basically achieves the desired function, and has good stability and adaptability to reduce the labor intensity of the workers and provide favorable convenience for users, at the same time, through the integration of transportation, it improves the vehicle carrying rate, reduces logistics costs, reduce the cost of main frame factory and suppliers production; supply and demand to reduce inventory, reduce market risk, and improve the management efficiency and economic benefit.

1. Preface

With the globalization of economy day by day and the development of high and new technology, the market competition has been strengthened. In order to improve their competitiveness, each enterprise is using various high-tech to improve their competitive ability, in order to strive for a place in society. Various restrictions led to the high cost of logistics, so the bearing capacity of enterprises increased,, especially medium and small-sized enterprises, the transmission of information is not smooth, the low efficiency of distribution, resource integration ability, distribution line is not excellent, this is mainly reflected in the following aspects:

- Low level of logistics management

Logistics is not so simple in each link to realize automation, intelligence, but in the whole business process, should use scientific and reasonable management method. At present, China's medium and small-sized enterprises lack professionalism.

- The application of logistics information is not extensive

Now, medium and small-sized enterprises logistics enterprises which use advanced information technology carry out less economic activities, and the application level is relatively backward. Even if there are logistics information systems, their system functions and business processes are also lacking, such as the logistics service subsystem is not integrated into.

- The confusion of logistics information management

In the stage of logistics informatization construction, the main task is to integrate logistics information system resources. However, each enterprise is fragmented, and the standard of information is inconsistent, which leads to the lack of resources unimpeded, and affects the strategic planning of logistics informatization.

For the logistics information system in China, many enterprises are using the free system. because



of the need to develop a system of funds is relatively large, and the enterprise itself has not paid much attention, so the results can not be good integration between the logistics technology and advanced management ideas with the actual situation of enterprises. Many enterprises logistics information system operating efficiency is not high, or simply idle there.

2. System requirement and design

2.1. User analysis

Logistics information system is a management information system based on the development and logistics system information resources management coordination system, which is based on the management of logistics operations This system use a variety of data through different ways to select, collect, input and statistic data, and then, the purpose of transaction for a variety of computer in simple terms, is in accordance with the requirements of the management, the use of special computer technology, the original data were calculated and output information the system has significance for the management work.

Fundamentally, the logistics information system is a path to link a variety of logistics activities and a process through the integration of various information technology. Each link in the logistics information system is interconnected through information exchange. Its basic resource scheduling is also achieved through information sharing, so the basis of logistics information system is logistics information.

Therefore, in order to develop a real and useful logistics information system, we should consider it from the perspective of logistics information. We divide users into two categories: internal users and external users.

The logistics information system internal users have product management department, warehouse management department, logistics department and sales department. At the same time, the logistics information system, logistics information can provide decision-making for the management of the company, it is the management of knowledge, from this point of view, the internal users include the company's senior management personnel, at the same time, also taking into account the company's future overall integration of all IT resources the needs of enterprises, companies are now using some of the information system, such as the OA system is the system user.

The external information of logistics information is from the outside, and at the same time it needs the external environment to provide support. Therefore, there is an external user using the system to facilitate the provision of external information of logistics information systems. For example: the company's production orders require retailers or wholesalers according to their own needs to integrate the information of the company and a company of logistics information system, according to its own sales of direct orders. Therefore, the logistics information system of external Cooperators or their collaborators in the supply chain is also an external user.

Through the above analysis, the numbers of logistics system users are large and crossing departments are also. users access to the logistics information system through the use of hardware and software is not the same. In order to make all kinds of users access to the system normally, it is very important to build a logistics information system with good portability, stable performance, good concurrency, and even unrelated to any platform.

2.2. Business process analysis

2.2.1. Overview of all business processes

In the business process, first by the main frame factory is sent to the supplier purchase orders, sales by the main frame factory feedback from main frame factory plans to develop vehicle demand plan, and give feedback to the vehicle dispatching center, vehicle dispatching center vehicle by GPS, the information feedback to suppliers and carriers at the same time, the vehicle feedback to the sales office, according to the different transportation delivery information, such as regional transportation or

transport route, to the end, no matter what kind of transportation will be the first to the distribution center, the distribution center unified distribution of transport to the main frame factory production line.

2.2.2. Receiving purchase order, making logistics schedule

The main frame factory according to the shipping instructions issued by the business needs of production, then NO.4 transport instructions will be downloaded and import into the procurement system, the supplier according to the purchase order, availability of information transfer system to upload stocking, at the same time, the system compares the main frame factory and supplier delivery transportation indication plan for the main frame factory transport plan the supplier has no stock information, it will display abnormal and details. If there is no abnormal system according to the supplier quantity, line information generation vehicle demand plan and related logistics plan and vehicle scheduling and stowage plan according to the transportation resources, vehicle demand planning information. The vehicle dispatching department to examine, pick up the plan and arrange the vehicle activities through the system, but also can according to the logistics execution plan collection plan and vehicle scheduling results, and the arrangement of parts in transit vehicles position flexibly.

2.2.3. Empty container management

In the cargo collection center, the empty container is recovered and the empty container is put into operation. According to the identification of the empty container, the empty container recycling information is input into the system, and the information is stored in the empty container management database. According to the relevant staff, suppliers, the number of empty container lines make empty container logistics execution plan, including: collecting centre library planning, warehouse planning, warehouse far away from the plan, supplier delivery plan, according to the system of vehicle scheduling and loading instructions to generate empty containers from the empty container storage: scanning the empty container delivery instructions, loading instructions to complete the empty container pick-up operation, and reduce the empty container inventory.

The carrier or driver downloads the empty container transport task list through the empty container management database, and then carries out the unified distribution of the loading.

Get away the warehouse, empty container storage according to the instructions of the empty container storage operations: empty container storage warehouse scanning distance instruction, the implementation of warehousing operation of empty containers, check number, empty container type, and update the empty container inventory after storage.

Remote warehouse loading empty containers in the warehouse system according to the instructions, arrive at the supplier location, the supplier of empty containers acceptance confirmation: check the empty container number, and returns the empty container results input system.

2.2.4. vehicle scheduling

The vehicle scheduling center according to the vehicle scheduling plan in the system, existing idle vehicles, or the GPS display vehicle location and other information in transit vehicles available resources, or according to the route information, parts code number, central pressure light principle of vehicle scheduling results and the corresponding loading instructions. At the same time, the stowage instructions and empty container return instructions are reflected on the branch / trunk transportation task list of the logistics company. Particular attention should be paid to the correspondence between the stowage instructions and the transport tasks.

2.3. system function analysis

According to the whole requirements for the informatization, We analyzes the status of the logistics business subsidiary of various departments and the requirements for future development, and integration of advanced logistics information technology, to the various departments of the company's

logistics business and management procedures, the scientific and reasonable integration and reconstruction, in order to make the analysis of tracking management sharing and the service level of information resources, improve inventory and delivery time is shortened and the rapid market response, logistics monitoring visualization, product flow, and decision support. Finally, it provides a comprehensive and efficient logistics information management platform for the company, subsidiaries and customer groups.

Logistics information management system is a platform which is based on a unified management platform to configure and maintain the existing one of the basic data required for the system as well as the basic code which focuses on the development of core business logistics management functions, these functions mainly include two parts: logistics and transportation management, implementation of procurement logistics information management. As shown in table 1:

Table 1 Tune up the logistics system

	Subsystem	Submodule	Functional requirements
Procurement logistics management system	Customer service subsystem	Plan management	Working out branch line, trunk line and straight line operation plan Requirements: to achieve automatic stowage of products, line optimization, document bar code management
		Exception management	All kinds of abnormal information immediate feedback Requirements: to achieve the classification of abnormal information and real-time feedback, and to record the processing results
		Supplier management	Supplier information processing Requirements: the supplier can send instructions to the database through the web page, and can feedback the vehicle arrangement information through the web page and meet the customer real-time query requirements
		Bill management	Print all kinds of documents and documents status tracking Requirements: the realization of the invoice bar code, through the transportation management system and collection center subsystem to document the whole process tracking
	Subsystem of centralized distribution center	Warehousing management	Enter the supply hub after picking up Requirements: to achieve the scanning task single storage
		Outbound management	Product assembly and distribution center Requirements: to achieve the scanning task, a single library
		In library management	Inventory in Library Requirements: record the inventory information
		Distribution management	Terminal assembly center brings products into mainframe factory Requirements: implementation of delivery scheduling
		Delivery order management	Information processing of backcross goods list from supplier Requirement: manually input the delivery order information

		Empty container management	Empty container system management Requirements: management of empty containers in accordance with the empty container process
	Vehicle subsystem	Vehicle information management	Vehicle files, operation status and location information
		Vehicle demand management	Forecasting vehicle demand and shunting on demand Requirements: able to generate the vehicle demand plan according to the volume plan, and schedule the vehicle according to the plan
		GPS	Docking with GPS information system
		Transport system interface	Transfer system and transportation system interface
	Statistical cost management	Stowage rate statistics	The vehicle stowage rate for statistical analysis, whether to set load rate of routes and transport companies, the license plate number
		Job volume statistics	Various operations Statistics (warehousing, outbound, outgoing preparation)
		Cost statistics	Statistics of large operating expenses
		Loss and damage statistics	Loss and damage statistics

Based on the vehicle procurement management subsystem, it can extend the function to realize transportation information management. The positioning of transportation management system is to manage the whole process of operation from customer consignment, and to provide the necessary business operation information to other systems; at the same time, It can connect the GPS system to realize the automation of enterprise transportation management. As shown in table 2:

Table 2 Transportation Management System

	Subsystem	Submodule	function
Transportation management system	Resource subsystem	Affiliated vehicle management	Information recording and processing of affiliated vehicle
		Social vehicle management	Social vehicle information recording and processing
		Own vehicle management	Private car information recording and processing
		Outbound management by entrustment	Information record and processing of entrusted Sinotrans company
		Forklift and tractor management	Information recording and processing of forklift and tractor
	Vehicle operation subsystem	Task sheet management	Task document printing, sorting
		Vehicle demand management	Information processing of vehicle demand in each business department
		Vehicle scheduling management	Vehicle scheduling
		Vehicle operation management	Vehicle operation condition monitoring
		GPS	GPS information processing
		Oil card management	Record of oil card usage
	Vehicle maintenance subsystem	Parts management	Maintenance spare parts management
		Vehicle maintenance record management	Vehicle maintenance record
		Oil management	Utilization of oil

	Statistical cost management	Tariff management	Vehicle freight
		cost control	Various expense statistics
		Vehicle volume statistics	Statistical analysis of vehicle operation
		Statistics of fines for violation of regulations	Statistical analysis of fines for violation of regulations

3. system implementation

3.1. The deployment of multitier architecture of the system

In order to make the system run normally, in addition to the scientific and rational design of the software system, reasonable deployment is also a key step to ensure the normal operation of the system.

The advantages of the system, the system interface layer, business layer, application server, database server is deployed in different places, the three layer of this system is the true meaning of the realization of the stratification, namely web service middle layer physical layer, separation of deployment, and ordinary three layer is the logic and non physical layer.

3.2. Implementation of GPS stored procedure

The operation of data is complicated in logistics information system, it is impossible to write all the operation process by C# language. Therefore, the storage process of structured query language SQL provides convenience for us to deal with complex processing in the operation of logistics information system.

The storage process includes 19 parts: meeting with the car meeting, deleting the meeting with the car meeting, canceling the meeting with the car meeting, confirming the operation of the vehicle demand week, and sharing the query of the vehicle demand week plan.

Here's how the stored procedure is implemented through code, taking the stored procedure of the GPS interface as an example. The stored procedures are as follows:

```
sp_addlinkedserver [ @server= ] 'server' [ , [ @srvproduct= ]
'product_name' ]
[ , [ @provider= ] 'provider_name' ]
[ , [ @datasrc= ] 'data_source' ]
[ , [ @location= ] 'location' ]
[ , [ @provstr= ] 'provider_string' ]
[ , [ @catalog= ] 'catalog' ]
```

Which involves the name of the server to link, product name, the name of the data source, the location of the database, as well as the connection to the required directory and other related fields. Finally, by returning the code value to determine whether the storage process is successful, the general "0" as a representative of success, "1" as a representative of failure.

3.3. Implementation of Web service security

Logistics information is the core of the whole logistics information system, so it is necessary to ensure the safety of logistics information in real time. As the core of the system, Web Service undertakes the responsibility of ensuring access security, where Soap Header authentication is adopted mainly to realize this responsibility. Its implementation steps are as follows:

1. Introducing namespaces


```

using System;
using System.Collections;
using System.ComponentModel;
using System.Data;
using System.Diagnostics;
using System.Web;
using System.Web.Services;
using System.Web.Services.Protocols;

2. client call
// Establish my Service object
Study Soap Head.my Service service=new Study Soap Head.my Service();
// Establish soap Header object
Study Soap Head.My Header header=new Study Soap Head.My Header();
// Establish Soap Head variable
Header.Pass Word="admin";
Header.User Id="admin";
Service.my Header=header;
// Call Web Method
Console.WriteLine(service.FS());
Console.WriteLine(service.FS("Valid request!"));
Console.Read();

```

4. conclusion

In this paper, through the design of multi-layer architecture, a good balance of load, after testing and trial, that the system has been able to greatly improve the effect. Among them, the achievements of the work are summarized as follows:

1. Using the combination of .Net technology and SQL database to develop logistics information system, and at the same time tested, the effect is good, which also proves that the combination is better. At the same time, this combination is easier for maintenance.
2. Using B/S model of logistics information system, this model is easy for maintenance and upgrade, only to upgrade the server, users do not need to install other additional upgrade procedures, greatly reducing the amount of maintenance and reduce maintenance costs.

Because of the limited space, there are a lot of local description is not detailed and complete, at the same time, for some functions of the system or process need to continue to study and improve. At the same time, because of the mastery of technology is not very skilled, so some advanced technology can not be very good application, such as the use of grid systems, the use of cloud computing systems and the use of the Internet of things.

Among them, for example, the compatibility of the system, the optimization of database query and the optimization of some functional algorithms need further study.

With the development of network expansion, the development of network technology, logistics information system according to the actual needs, make corresponding adjustment, to improve the defect, which makes the system more secure high-speed service for enterprises.

Remarks

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