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Fault Tolerant Service Composition Model Design of Intelligent Logistics System Based on Internet of Things Technology

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Abstract: *The rise of Internet technology makes the intelligent logistics system develop further. Relying on advanced technology, intelligent logistics system can grasp the order trend in real time, scientifically allocate the system capacity, improve the supervision of distribution personnel, effectively improve the management level, logistics efficiency and customer satisfaction. The intelligent logistics system of Internet of things can effectively improve the efficiency of logistics, but in the case of unstable environment, there may be a series of service problems in the service end. It is necessary to study the logistics service combination of the system service end to avoid the internal management confusion or customer complaints caused by the problems. This paper discusses the design of fault tolerant service combination model of intelligent logistics system based on Internet of things technology.*

Keywords: *Internet of Things, Intelligent Logistics, Fault Tolerance, Model Design*

1. Introduction

Logistics business has also been developed rapidly in the period of rapid development of e-commerce. It relies on the rapid development of modern information technology. Intelligent logistics emerges as the times require, which can well complete the order, warehouse management, sorting, allocation, distribution and other business transactions which flow between the major operation centers, and comprehensively track logistics information to provide intelligent services. The rise of Internet of things technology makes the intelligent logistics system further develop[1]. Relying on advanced technology, intelligent logistics system can grasp the order trend in real time, scientifically allocate the system capacity, improve the supervision of distribution personnel, effectively improve the management level, logistics efficiency and customer satisfaction. The intelligent logistics system of Internet of things can effectively improve the efficiency of logistics, but in the case of unstable environment, there may be a series of service problems in the service end. It is necessary to study the logistics service combination of the system service end to avoid the internal management confusion or customer complaints caused by the problems. This paper discusses the design of fault tolerant service combination model of intelligent logistics system based on Internet of things technology[2].

2. The concept of Internet of things

The concept of Internet of things was born in 1999 as the connection of all items with the Internet through information sensing equipment such as RFID, and realizing intelligent identification and management, that is, the technology is the connection between various sensors and the Internet. Nowadays, the era of Internet of things communication has come[3]. The Internet of things is applied to all fields of the world. The goods can be exchanged actively through the network. In August, 2009, China put forward the strategy of "perceiving China", established China's sensing information center, and the Internet of things was written into the government work report, and officially became one of the five emerging strategic industries of the country. The Internet of things changed from an external concept to a concept of "made in China", and was labeled "Chinese style".

Internet of things is considered as the third revolution of information technology industry. Based on the network standard communication protocol, information exchange and communication are carried out through information communication media, which realizes intelligent identification, positioning, tracking, supervision, etc., which makes the communication and sharing between goods and articles,

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between things and people more efficient and convenient. Compared with the Internet, the main information exchange objects of Internet of things are changed from human to objects, and the information between objects is collected for exchange, and a network system with "things" as the main body of information exchange is constructed. The Internet of things technology is developing towards integration[4]. Through the application of various technologies, more object information management is realized, including collection, storage, transmission and monitoring.

3. The concept of intelligent logistics

Under the background of the rapid development of information technology, there are emerging technologies of big data and cloud computing. Based on the Internet of things, combined with the application of mobile Internet, the logistics links are closely combined through the combination of Internet and sensor network. At present, intelligent logistics is the product of the rapid development of information. The emergence of intelligent logistics promotes the progress of the whole logistics industry. Intelligent logistics technology uses integrated intelligence, which enables logistics system to imitate human intelligence and has the ability to solve some problems in logistics transportation[5]. Intelligent logistics can take logistics management as the core to realize the integration of all links in the logistics process. The whole intelligent logistics system presents a clear hierarchy, highlighting the service concept of "customer centered". The intelligence of intelligent logistics system is embodied in the intelligence of acquisition technology, transmission technology, processing technology and application technology. The application of intelligent logistics system greatly improves the efficiency of express service industry. It can realize the stable operation of the whole system and improve the transportation efficiency under the condition of less manpower[6]. Figure 1 shows the express workshop which runs stably under the intelligent logistics system.

Figure. 1 The express workshop which runs stably under the intelligent logistics system

The main advantages of intelligent logistics system include the following:

(1) Intellectualization

Intellectualization is the inevitable trend of the development of logistics industry, and it is also a typical feature of intelligent logistics, which runs through the whole process of logistics activities. Intelligent development has solved a series of problems, such as the determination of inventory level, the selection of transportation road, the control of automatic tracking, the operation of automatic sorting, the management of logistics distribution center, and so on. With the development of science and technology, it has been given new content.

(2) Soft softening

Softening is to flexibly adjust the production process according to the changes of the actual needs of consumers. Logistics must provide highly reliable, special and additional services according to the actual needs of customers, truly "customer-centered", constantly increase the content of services and enhance the importance of services, which also puts forward high requirements for intelligent logistics system.

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(3) Integration

Intelligent logistics activities include all the logistics activities within enterprises, between enterprises and between enterprises and individuals. With intelligent logistics management as the core, the system integrates transportation, storage, packaging, loading and unloading into an integrated system to provide customers with the most satisfactory logistics service at the lowest cost.

(4) Socialization

With the popularization of globalization in various fields, logistics activities are also going to the world. Logistics activities are no longer only for an enterprise, a region or a country, but go abroad and play an important role in international exchanges. In order to realize the international flow and exchange of goods, promote the development of regional economy and optimize the allocation of world resources, intelligent logistics system tends to be socialized.

4. Fault tolerant service composition model of intelligent logistics system based on Internet of things technology

4.1 Platform construction of intelligent logistics system

Applying the Internet of things to the logistics industry and building a platform combining traditional logistics and intelligent system management can better realize the intellectualization, informatization, systematization, automation and transparency of the intelligent logistics system. In the implementation process, the system emphasizes the intellectualization of logistics process data, network collaboration and intelligent decision-making, and should realize six "correct" functions Including the correctness of goods, quantity, place, quality, time and price. Using automatic identification technology, data mining technology, artificial intelligence technology and GIS technology, it can realize the object identification, location tracking, object traceability, object monitoring and real-time response[7].

Internet of things intelligent logistics system greatly improves the level of information technology and automation of the logistics industry. Starting from the goods entering the logistics enterprise, the intelligent perception terminal will receive the goods information, transmit it and store it in the data service center. The data processing center will intelligently allocate the goods according to the destination information. The warehouse will generate the delivery information and store it in the data service center, and dispatch the freight vehicles for intelligent transfer[8]. After the goods arrive at the destination, check whether the read goods information is consistent with the information stored in the data service center. If it is consistent, it will be transferred to the corresponding partition of the destination warehouse, and then the local express company will select the delivery personnel to deliver the express to the user. The whole process can be tracked and queried in real time on the integrated information service platform in Figure 2.

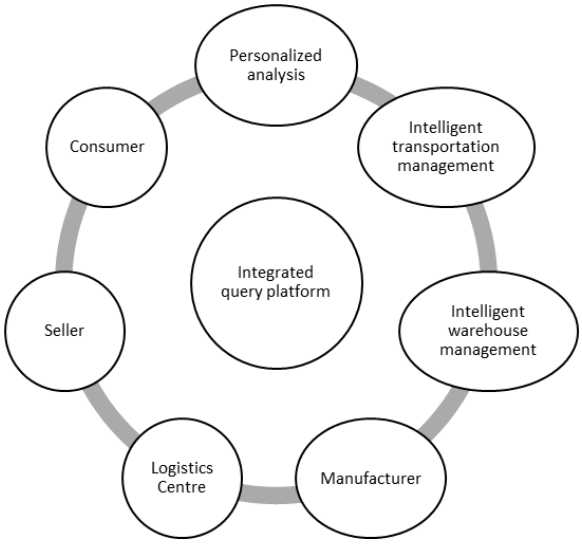

Figure. 2 Integrated query platform of intelligent logistics system

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4.2 Design of system reliability and Fault Tolerant Service Composition Model

High efficiency is required. The ability of information collection and processing of Internet of things nodes is very limited. In the process of work, all kinds of unexpected errors are easy to occur, which affects the reliability of the system. In order to solve this problem, many scholars have carried out a series of research, but the reliability research of the Internet of things in other fields is difficult to be applied to the intelligent logistics system with many nodes, and there are still some problems such as data error and data redundancy. The intelligent logistics system based on the Internet of things has its own information processing characteristics and processes, and its reliability design must run through all links, only with the design of the system Only a highly reliable logistics information collection, processing and management system of the Internet of things can really solve the application requirements of information management in the logistics system of the Internet of things[9].

According to the composition structure and working mechanism, the reliability design model in this study divides the logistics information system into three levels: equipment operation reliability, application environment reliability and operator application reliability. The first layer of equipment operation reliability is further divided into five parts: control computer reliability, storage server reliability, computing server reliability, network communication equipment reliability and IOT node reliability; the second layer of application environment reliability is further divided into three parts: wireless signal transmission reliability, temperature and humidity adaptability and networking distance reliability; and the top layer of application environment reliability is further divided into three parts The reliability of operator application is further divided into operation mode reliability, software design process reliability and application mode reliability.

The design of reliability mainly includes three aspects: fault-tolerant correction algorithm, data fusion technology and redundant storage of database. Redundant deployment strategy is adopted to deploy a large number of IOT sensing nodes to collect all kinds of information and data. One or a group of data is sampled by multiple IOT sensing nodes to improve the reliability of data sampling. Then the collected data is filtered and a data error correction code is added after the original data. The data of a basic data unit in the Internet of things information system includes the combination of data part and error correction code. After the basic data unit is formed, it uses multi-path transmission strategy to transmit to the target node along multiple paths. In the process of transmission, various phenomena such as loss and error may occur, which leads to the inconsistency between the data and the initial transmission state. At this time, the data voting algorithm is designed to select the correct transmission data according to a certain strategy, so as to improve the reliability of the data in the transmission process. Finally, the logic and rationality of the obtained data are predicted. According to the relationship between the data and the correlation characteristics between the data, it is predicted that the current received data should be in a normal logical range, which is in line with various logical constraints. This can ensure that all the data processed in the operation of the logistics information system based on the Internet of things are true, reliable and effective.

5. Conclusion

The intelligent logistics system based on Internet of things technology greatly facilitates people's daily life, expands the scope of information collection and control, and further improves the service quality of logistics system. At present, the high-speed intelligent logistics system puts forward higher requirements for the reliability of information management. The possible problems need to be avoided through the design of fault-tolerant service composition model. Continuously improving the accuracy of information collection and transmission is the pursuit of scientific research workers.

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