

# Research on Network Architecture of the E-commerce Platform and Optimization of the System Performance

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**Abstract:** With the rapid development of computer technology, especially the rapid development of network technology and the acceleration of global economic integration, electronic commerce has been used more and more widely. This also puts forward a new standard for the enterprise application computer to business activities. On one hand, we should take into account the advanced nature of the electronic commerce platform, on the other hand, we should make the existing business system of the enterprise more smoothly into the new business platform. Aiming at the problem of resource bottleneck in current e-commerce system, the application model of grid based electronic commerce system is put forward to be based on the application background of grid technology. How to make full use of the existing software and hardware resources, to obtain the largest data processing capacity has become an important part of the electronic commerce platform application system.

**Keywords:** Electronic commerce, framework, grid, system optimization.

## 1. INTRODUCTION

With the rapid development of economic globalization and the rapid development of Internet technology, e-commerce which is a new business model has been the world's attention and recognition. It has become the only way for the development of enterprises, which is gradually changing the business model around the world and triggering a far-reaching economic revolution. With the continuous expansion of electronic commerce, traffic system is more and more big, size of the system database is also increasing, and the property problem of the database is getting more and more prominent. Therefore, the optimization is very important to electronic commerce system database. The basic principle of system performance optimization is: access to the required data through the least possible disk access. To evaluate the database performance, in the database before and after the adjustment of the evaluation indexes should be compared, including the trade-off between response time and throughput, the availability of a database, the hit rate of the database, and the use efficiency of memory. It can measure the effect of adjustment measures to guide the direction of adjustment. How to use limited computer system resources for more users? How to guarantee the user's response speed and service quality? These problems can improve the service quality of the electronic commerce platform.

## 2. ELECTRONIC COMMERCE, ELECTRONIC COMMERCE PLATFORM AND ITS CAUSES

### 2.1. E-commerce

E-commerce [1] usually refers to a new business model which can realize the consumer's on-line shopping, merchant

network transactions and online electronic payment and a variety of business activities, trading activities, financial activities and comprehensive service activities without the meeting between the buyers and sellers, in a wide range of commercial and trading activities around the world, in the Internet and open network environment. From the present situation, the electronic commerce according to the subject and object of the transaction to classify, can be divided into the following several basic models: B2B (Business-to-Business) model, the subject and object of the transaction are enterprises; B2C (Business-to-Consumer) model, the subject of the transaction is the enterprise, the object is the consumer; C2G (Consumer-to-Government) model, the subject of the transaction is the consumer, and the object is the government; C2C (Consumer-to-Consumer) model, the subject and object of the transaction are the consumers.

### 2.2. E-commerce Platform

Electronic commerce platform is a platform that can provide online trading opportunities or trading opportunities to enterprises or individuals, use the Internet technology in virtual network space to create a possible guarantee business for the smooth operation of the environmental management, integrate the information flow, capital flow and commodity flow of network transaction, promote enterprises and businesses to make full use of its network infrastructure, payment platform, security management and other resources, carry out efficient and low into the local e-commerce activities [2]. E-commerce platform is the inevitable development of e-commerce to a certain extent. The ultimate goal of electronic commerce is to facilitate business development. However, the electronic commerce is carried out in the virtual network space. Although it has great convenience and high efficiency, but at the same time electronic commerce also exists the lack of security, imperfect payment means and

**Table 1. Five layer structure's structure and function.**

Structure	Function
Application layer	Provide tools and applications for specific virtual organization
Convergence layer	Directory services, resource services, resource detection, diagnosis, load control, schedule
Resource layer	The security access of resource and service
Connectivity layer	
Fabric layer	Various kinds of sharing resources, physical entities and logical entities, such as computer, storage media, etc

management mechanism, some good and some bad merchant, and a large number of online business and online business, which makes the development of electronic commerce difficult. In this case, the electronic commerce platform appears. Through the frame system of e-commerce platform, people can effectively regulate online business, provide perfect network resources, security, payment and management services, which really realize the network's resource sharing ability and convenience, and promote the rapid development of electronic commerce.

**2.3. The Reason of the Electronic Commerce Based on the Grid**

Electronic commerce is the main strategy and procedure to realize the new century development in the new century. Developing e-commerce is an important part of the national information construction and potential growth point of economic development. Internet itself has the characteristics of open, global, low cost and high efficiency, which makes the electronic commerce greatly exceed the value as a new form of trade [3]. It will not only change the production, operation and management of the enterprise itself, but also affect the economic operation and structure of the whole society. But with the continuous development of e-commerce, enterprises in the application of electronic commerce in the process have a lot of problems. Enterprises in the market space is gradually expanding and the process of business development, and the enterprises clearly fell that the flow of information is not smooth. Although the enterprises in the construction of information had a lot, but did not form a unified platform. The data can not be shared between departments, and a lot of repeat inputs, information system, the existence of redundant construction, which is not conducive to the further development of enterprises. All kinds of social organizations of computing resources, storage resources, communication resources, software resources, information resources, knowledge resources are not mutually communicated, are respective independence and form "information isolated island" and "resource island" [4]. In order to solve the above problems, we can share the resources through the method, and the key to resource sharing is the grid technology. Grid technology is accompanied by the rapid development of Internet technology and developed rapidly. This technique uses the Internet to organize a computer organization that is scattered in different geographical locations into a "virtual supercomputer". Each of the computers involving in computing is a "node", while in the whole calculation, thousands of nodes made up a grid. The biggest advantage of grid service

is the interconnection of the program and resource in the area network environment [5]. Its characteristics can well solve the problem of data resource autonomy and distribution, and solve the problem of heterogeneous and interface. Electronic commerce which is based on grid service allows suppliers, buyers, customers, partners and employees, managers and decision makers to be able to take a variety of ways, achieve high-speed interconnection, coordinate the overall development of enterprises' operations and management, realize the business process reengineering of the enterprise management. The enterprises can be provided an efficient decision-making, management, marketing, covering production, technology, finance, human, inventory, sales, customer, service, etc. Using grid technology can maximize the integration of resources and services and eliminate information island.

**3. THE CONSTRUCTION OF THE E-COMMERCE PLATFORM AND THE STRUCTURE OF THE GRID SYSTEM**

Grid architecture is the concept framework of grid technology [6]. There are two important grid architectures: one is five layer structure; the other is the open grid service architecture (OGSA).

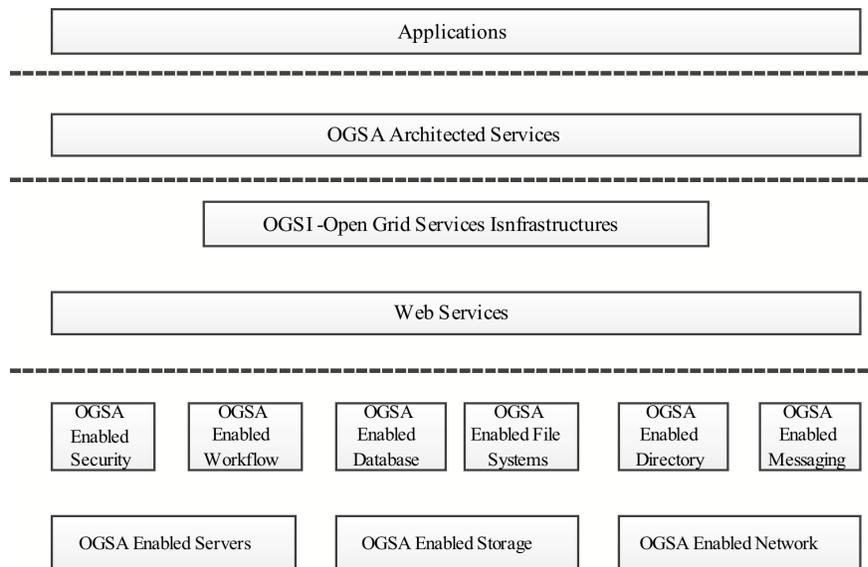
**3.1. Five Layer Structure**

The five layer structure is a kind of structure which has a wide influence. Its core idea is at the center of the "agreement", to emphasis on service and interface [7]. Each layer has its own services, application programming interface, and the development of software toolkit. The upper protocol calls the lower layer protocol services. Its structure and function are shown in Table 1.

Application layer is the application of the specific users on the grid, which is oriented to the virtual organization, and solves the problem of different virtual organization.

Convergence layer is a collection of controlled resources which are submitted by the resource layer and shared by the application of the virtual organization [8]. In order to manage and control the sharing of application layer, the convergence layer provides the functions of directory service, resource allocation, resource proxy, load control and so on.

Resource layer is the implementation of a single resource control [9]. With the available resources to shake hands, it can shake hands with the available resources, make the resources to initialize, detect the running status of resources, and use the data of the statistics and pay related resources.



**Fig. (1).** The structure of OGSA.

Connectivity layer is the core protocol layer of the network transaction processing and authorization control. The data exchange of resource is realized through the transmission, routing and name resolution.

Fabric layer's function is to provide the resources that can be shared in the grid, such as processing power [10], storage system, directory, distributed file system, distributed computer pool, *etc.*

In the five layer structure, the protocol of each layer is different. The resource layer and the connecting layer constitute the bottleneck of this core, which makes the five layer structure become the hourglass shape. The advantage of the five layer is that the core of the structure is small, and it can be easily realized.

### 3.2. OGSa

As shown in Fig. (1), the OGSA architecture is composed of four main layers. From bottom to top:

- (1). Resources layer - physical resources and logical resources.
- (2). Web service layer - web service, and OGSI extension for defining grid services.
- (3). Service layer - based on OGSA architecture.
- (4). Grid application layer.

OGSA is a service-oriented architecture, which is more perfect than web service [11]. It has dynamic characteristics and can be dynamically created and deleted. OGSA platform can better exist at variety of technology, make full use of the existing technology and software and hardware resources, better achieve the idea of grid.

## 4. THE FEATURES OF E-COMMERCE APPLICATION PLATFORM

### 4.1. Transparency

The structure and working principle of the platform are transparent to the user. As long as people use the grid

browser to access to a grid server, and they can complete the required work through the interface provided by the platform.

### 4.2. Functional Completeness

The platform should provide information exchange, fund payment and other commonly used functions.

### 4.3. Security

All kinds of electronic business activities which are carried out in this platform must be safe, including information security, electronic payment security, *etc.*

### 4.4. Adaptability

The platform should be able to dynamically monitor the running situation and allocate resources reasonably.

## 5. NETWORK ARCHITECTURE OF THE E-COMMERCE PLATFORM

According to the five layer service structure of grid system, the concept structure of electronic commerce hierarchy based on Globus grid system is shown in Fig. (2).

The electronic commerce platform on the grid is made up five parts.

### 5.1. Data Grid and Computing Grid

The basic unit of data grid sharing is data. Data management is a separate module, and provide users with transparent access, storage, management data interface [12]. Users can easily achieve data sharing in the grid. In the grid of electronic commerce system, the available storage space is unlimited. Computing grid dynamically uses the powerful computing resources of the entire grid to provide users with a good interface and services to share resources.

### 5.2. Information Exchange Grid

On the one hand, the grid is transmitted and processed from the user's information. On the other hand, the informa-

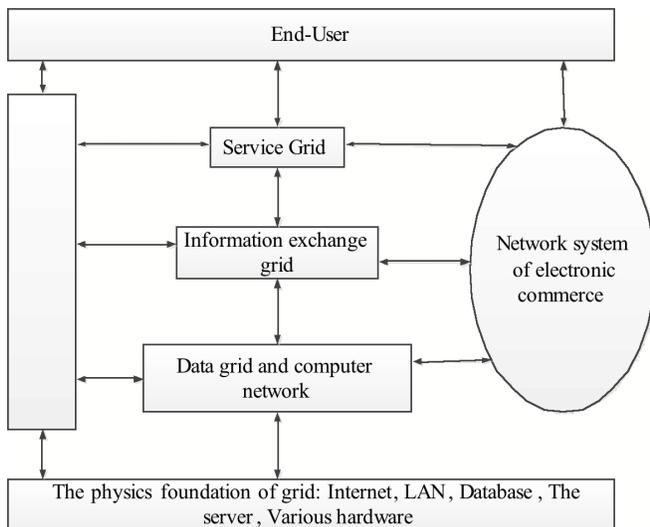


Fig. (2). E-commerce platform framework based on grid.

tion from the data processing grid is processed, which can meet the requirements of the electronic commerce information exchange. The information flow in the electronic commerce is the main and the mass. For example, the exchange of information in the B2B business includes inquiry, quotation, preliminary order, reply, last orders, shipping instructions, notice of shipment, receipt notice, remittance, collection report and other electronic invoices. Massive information exchange needs the sharing of resources, which is not caused by the local area of the communication bottleneck.

5.3. Service Grid

It is the core component and the main functional unit of the grid based on electronic commerce platform. Service grid provides a variety of services to support e-commerce systems, while providing support for the application of e-commerce applications in various enterprises.

5.4. Grid System of E-commerce

SOAP [13] messages sent from the service grid provide different computing and resource services. Demand for application system of electronic commerce can be gotten the required service through the system to realize the interaction with the grid platform.

5.5. The Control Platform of Grid Management

It is based on the grid of the electronic commerce system set control management unit. Through the unified control of the system, the new e-commerce grid system and service grid, information grid resource, data grid and computing network subsystems through the unified standard realizes the interoperability, interconnection and mutual operation of the subsystems. Under the unified and coordinated control of the grid management platform, the maximum function of the grid system is played.

6. SYSTEM PERFORMANCE OPTIMIZATION OF E-COMMERCE

Database application system performance tuning and optimization is a process, from the development of the system

and testing the process of continuous optimization. It mainly includes the adjustment and optimization of hardware configuration, application, Web server, database management system, operating system and network resources, etc. [14]. Through the adjustment and optimization, it can improve the performance of the whole database application system, so that the whole system achieves the desired results, thereby reduce the cost of system development. The performance tuning and optimization of the system is a dynamic process. Before the operation of the system, the performance of the system can be tested by the performance test, which can make the system achieve the maximum throughput in the existing software and hardware environment. With the continuous operation of the system, the system performance is likely to continue to decline. At this point, we must use a variety of diagnostic tools to identify the system bottlenecks, and use a variety of optimization strategies to optimize the system, and the system has always maintained normal operation.

7. THE PURPOSE OF SYSTEM PERFORMANCE OPTIMIZATION

7.1. Eliminating System Bottlenecks

System bottleneck is an important factor to limit the performance of the system, which can be software or hardware. In the system without proper configuration and optimization, the bottleneck will seriously affect the performance of the system. Through performance tuning and optimization, it can eliminate bottlenecks, so as to better play the performance of the whole system.

7.2. Improving the Throughput and Response Time of the Whole System

Response time is the time to complete a single task. Throughput refers to the amount of work done in a fixed period of time. Through optimizing the application, database management system, web server, operating system and network configuration and reducing the running time of the program, reducing time of operational data, reducing the network traffic, improving the speed of the network, and ultimately reduce the response time of the system, it can improve the throughput of the whole system.

8. SPECIFIC CONTENT OF SYSTEM PERFORMANCE OPTIMIZATION

Database application system's performance tuning and optimization include the wide range of contents. For each system, the uses of the software and hardware resources are different, and the adjustment and optimization of the specific methods are also different, but the basic content is the same, mainly including the following aspects.

8.1. Hardware Configuration

Hardware configuration mainly refers to the selection of hardware, according to the needs of the system to choose cost-effective configuration.

8.2. Optimization of Memory

The objects in the database access must be in whole or in part into memory and process in memory, because the mem-

ory of the operating efficiency is much greater than the disk. Therefore, the expansion of physical memory is the most direct method to improve the performance, but it is more important to utilize memory resources reasonably and efficiently under the limited memory resources [15]. In fact, the optimization of memory mainly refers to the adjustment of the system global area (SGA) of the oracle database. SGA is mainly composed of a shared pool, data cache, redo log buffer, large pool, Java pool. The components of its components are shown in Fig. (3).

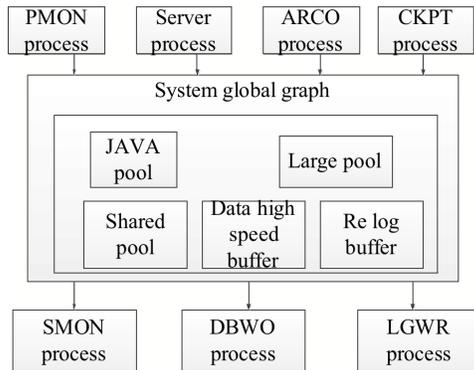


Fig. (3). Component of SGA.

### 8.3. DBMS (Relational Database Management System) Optimization

According to different DBMS, there is different optimization strategies, the electronic commerce platform DBMS, and the optimization work is very important. Especially when the amount of data in the system is getting larger and larger, the DBMS is likely to have some bottlenecks. Therefore, we must be familiar with the various diagnostic tools and optimization strategy of DBMS, at any time to adjust and optimize the DBMS, so that the whole DBMS maintains good performance.

### 8.4. Optimization of Application

The optimization of the application system is based on the use of the development language to optimize the program code, improving the operating efficiency of the program. At the same time, the SQL [16] statements in the program can be adjusted according to the selected DBMS. Efficient SOL statements have a great effect on improving the performance of DBMS.

### 8.5. Optimization of Server

The optimization of the server includes the reasonable choice of the Web server and the parameter configuration of the server. It is very important to select the appropriate Web server according to the system requirement, and the reasonable configuration of the system is very important to improve the overall performance of the system.

### 8.6. Optimization of Operating System

Optimization of operating system mainly refers to the system requirements, selecting the operating system for the system and its reasonable configuration.

### 8.7. Optimization of Network Environment

Network optimization is mainly related to the hardware and software. The reasonable configuration of the hardware and software will greatly improve the performance of the system, which is very important for Web application system.

## CONCLUSION

With the continuous development of network technology, the electronic commerce platform has also been improved. It's important to understand the e-commerce platform, integrate network technology which is applied in the application of electronic commerce, the technology, knowledge, management and human resources in one. Making the production elements closely integrated, fully playing the advantages of various information resources is also important, so that it is in short product cycle to ensure product quality, reduce costs and improve the competitiveness of enterprises. According to the performance of the whole structure process step by step optimization of e-commerce system, it can improve the electronic commerce system, customer service quality, and user experience, so that the entire business processes from the implementation to experience can be simple, convenient and fast. The development and expansion of e-commerce industry is important.

## CONFLICT OF INTEREST

The author confirms that this article content has no conflict of interest.

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## REFERENCES

- [1] E. Nygren, R.K. Sitaraman, and J. Sun, "The akamai network: a platform for high-performance internet applications", *ACM SIGOPS Operating Systems Review*, vol. 44, no. 3, pp. 2-19, 2010.
- [2] C.C. Huang, W.Y. Liang, Y.H. Lai, and Y.-C. Lin, "The agent-based negotiation process for B2C e-commerce", *Expert Systems with Applications*, vol. 37, no. 1, pp. 348-359, 2010.
- [3] Y. Li, C. Shu, and L. Xiong, "Information services platform of international trade based on E-commerce", *Advances in Information Sciences and Service Sciences*, vol. 3, no. 1, p. 78, 2011.
- [4] C. Piao, X. Han, and H. Wu, "Research on e-commerce transaction networks using multi-agent modelling and open application programming interface", *Enterprise Information Systems*, vol. 4, no. 3, pp. 329-353, 2010.
- [5] K. Fan, "Comparative analysis on E-commerce application of agriculture in China", *Journal of Convergence Information Technology*, vol. 6, no. 7, pp. 210-218, 2011.
- [6] J. Li, H. Pan, and Y. He, "A study on the upgrading of the B2B e-commerce platform-virtual trade platform", *Journal of Zhejiang Gongshang University*, vol. 5, p. 004, 2010.
- [7] Y. Du, and Y. Tang, "Study on the development of O2O E-commerce platform of China from the perspective of offline service quality", *International Journal of Business and Social Science*, vol. 5, no. 4, pp. 308-312, 2014.
- [8] X. Yu, S. Guo, J. Guo, and X. Huang, "Rank B2C e-commerce websites in e-alliance based on AHP and fuzzy TOPSIS", *Expert Systems with Applications*, vol. 38, no. 4, pp. 3550-3557, 2011.
- [9] H.S. Alhorr, N. Singh, and S.H. Kim, "E-commerce on the global platform: Strategic insights on the localization-standardization perspective", *Journal of Electronic Commerce Research*, vol. 11, no. 1, pp. 6-13, 2010.

- [10] R. Ramanathan, "The moderating roles of risk and efficiency on the relationship between logistics performance and customer loyalty in e-commerce", *Transportation Research Part E: Logistics and Transportation Review*, vol. 46, no. 6, pp. 950-962, 2010.
- [11] S. Yin, H. Luo, and S.X. Ding, "Real-time implementation of fault-tolerant control systems with performance optimization", *IEEE Transactions on Industrial Electronics*, vol. 61, no. 5, pp. 2402-2411, 2014.
- [12] Z. Shengjun, W. Huaixin, and G. Tao, "Performance comparison and parametric optimization of subcritical Organic Rankine Cycle (ORC) and transcritical power cycle system for low-temperature geothermal power generation", *Applied Energy*, vol. 88, no. 8, pp. 2740-2754, 2011.
- [13] S.K. Firth, K.J. Lomas, and S.J. Rees, "A simple model of PV system performance and its use in fault detection", *Solar Energy*, vol. 84, no. 4, pp. 624-635, 2010.
- [14] J.C. Downs, C.F. Burgoyne, W.P. Seigfreid, J.F. Reynaud, N.G. Strouthidis and V. Sallee, "24-hour IOP telemetry in the nonhuman primate: implant system performance and initial characterization of IOP at multiple timescales", *Investigative Ophthalmology & Visual Science*, vol. 52, no. 10, pp. 7365, 2011.
- [15] J. Mittermayer, M. Younis, R. Metzsig, S. Wollstadt, J.M. Martinez, and A. Meta, "TerraSAR-X system performance characterization and verification", *IEEE Transactions on Geoscience and Remote Sensing*, vol. 48, no. 2, pp. 660-676, 2010.
- [16] D. Wang, "Influences of cloud computing on E-Commerce businesses and industry", *Journal of Software Engineering and Applications*, vol. 6, no. 6, pp. 313-318, 2013.

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