

Research of ERP Platform based on Cloud Computing

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Abstract. Manufacturing is the foundation of a nation, the apparatus of a national rejuvenation, and the cornerstone of making a country powerful. ERP (Enterprise Resource Planning) is one of the key factors which make "Made in China" to "Intelligent Manufacturing in China". Due to the cost of ERP systems, they are not widely used in small and medium-sized enterprises. A cloud-based ERP platform is proposed to meet the low-cost needs for these enterprises. This platform uses SOA (service-oriented architecture) to send message between different modules. It takes advantage of elasticity, high reliability, and high scalability of cloud compute technology. This platform is implemented by spring, Spring MVC and Hibernate. It takes advantage of faster development and the ability to provide multiple views by MVC (Model View Controller) model.

1. Introduction

While Chinese government intensify efforts to implement the Made in China 2025 initiative, a new round of scientific and technological revolutions makes a history intersection with industrial upgrading and transformation [1]. Intelligent manufacturing is identified as a key of raising the country's manufacturing power. Intelligent manufacturing is to apply new information technology and intelligent technology in all aspects of industrial production such as design, manufacturing, management, and service. By sensing, analysis, reasoning, judgment, it can increase manufacturing efficiency, improve product quality, and reduce product cost and resource consumption [2-3]. As the mainstream information product of intelligent manufacturing, ERP (Enterprise Resource Planning) has become the essential core information software in the manufacturing industry after several stages of development [4]. Although ERP is very useful for manufacturing, it is very expensive for small and medium-sized enterprises. A cloud-based ERP platform is proposed to meet the low-cost needs for these enterprises.

In this paper, the cloud-based ERP platform is presented. It is constructed an opened, extended and oriented service platform. It is developed by SOA (Service Oriented Architecture) and MVC (Model View Controller) model. By SOA, this platform empowers collaborative cloud-based resource management. The development of this platform integrates spring, Spring MVC and Hibernate all together as a MVC framework. By this way, it not only improved the development efficiency, and also reduces maintain cost. To improving the reliability, augment ability in runtime, this platform is deployed on AliCloud.



2. Analysis and Design

2.1. Requirement analysis

This ERP platform is a suite of integrated applications by which an enterprise can collect, store, manage and interpret data from many business activities. This platform includes the following modules, AIS (Accounting Information System), SCM (Supply Chain Management), CRM (Customer Relationship Management), MRP II (Manufacturing Resources Planning), and HRM (Human Resource Management).

AIS collects stores and processes financial and accounting data. It is designed to support all accounting functions and activities including auditing, financial accounting, managerial and tax [5]. SCM is designed to plan, dispatch, allocate, control and use materials, funds, information and other resources in each step of the supply chain [6]. MRP II is designed to be an intelligent production management tool by adopting production activity analyzing tools [7]. CRM enables enterprises to collect, store and analyze customer data to provide a comprehensive view of their customers [8]. HRM manages almost all the information related to human resources by a centralized method [9].

2.2. Functional Design

This ERP platform is based on cloud computing platform, and the architecture is shown in Fig.1.

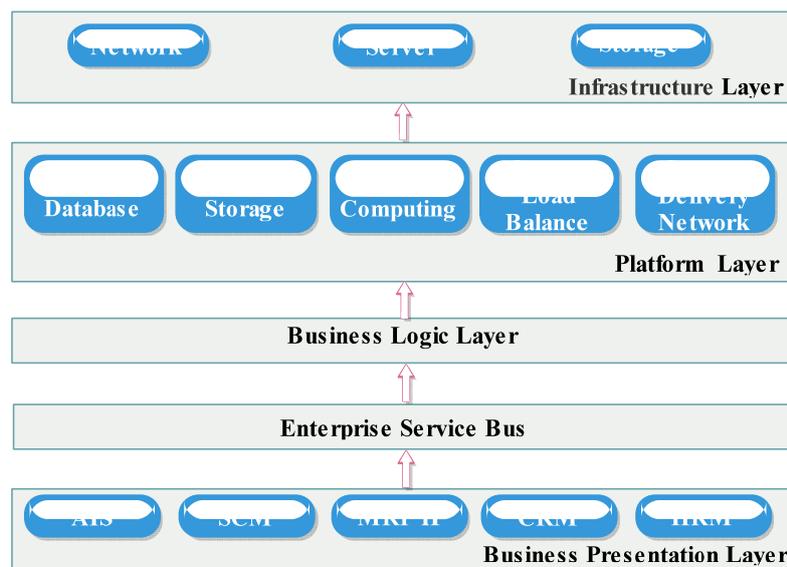


Figure 1. Architecture of ERP.

All resources are integrated into the form of virtual resources by IaaS (Infrastructure as a service). IaaS refers to online services that provide high-level APIs used to dereference various low-level infrastructures like virtual machines, location, scaling etc. A hypervisor runs the virtual machines as guests. Pools of hypervisors within the cloud can support large numbers of virtual machines which can provide computing and storage services.

PaaS offers a runtime environment for this ERP platform and it provides operating system, database, web server, object storage, server load balance and content delivery network. In this model, this platform is developed and launched without the complexity of building and maintaining the infrastructure typically associated. MySQL is a relational database and used for storing structured data. Object storage service is used for storing unstructured data such as video, image, and document. Elastic computing provides flexible computing power. Server load balance improves the distribution of workloads across multiple elastic computing resources. The content delivery network is to distribute web service spatially relative to end-users to provide high availability and high performance.

Functional modules of this ERP platform are encapsulated as services. In the SaaS model, small and medium-sized enterprises gain access to this ERP platform. ESB (Enterprise Service Bus) is a communication system between business presentation layer and business logic layer in a service-oriented architecture [10].

This ERP platform includes five modules, AIS, SCM, CRM, MRP II and HRM. The module structure of this platform is shown in Fig. 2. The AIS module manages internal financial revenue and expenditure information of enterprise production, sales, procurement, daily expenditure and employee wages. The SCM module manages and controls a flow, from acquiring raw materials to production. The MRP II module manages manufacturing process as the product moves through the production line. The CRM module manages customer information, and is used to have better, longer and more profitable relationship with customer. The HRM module executes necessary HR functions, such as storing employee data, managing payrolls, recruitment processes, benefits administration and keeping track of attendance records.

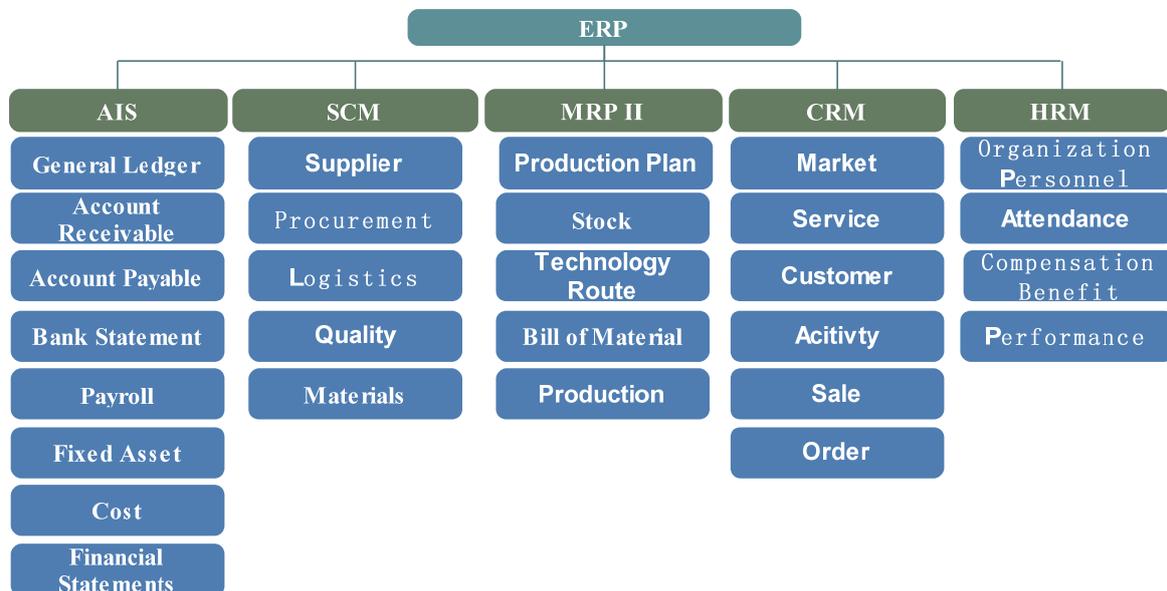


Figure 2. Functional diagram.

3. Implementation

3.1. Application of SOA

As the service requestors, ERP systems send requests to ESB by web services. Web Service is a lightweight, independent communication technology which can receive requests from other systems [11]. To avoid requests of a point to the other point, ESB is a service transfer station. All web services requests pass through ESB. The service registry center provides a DNS-like reference for SOA runtime infrastructure to dynamically discover and bind to deployed services and end points. Five functional modules are as service providers, and they execute business logic processing. This SOA of ERP platform is shown in Fig. 3.

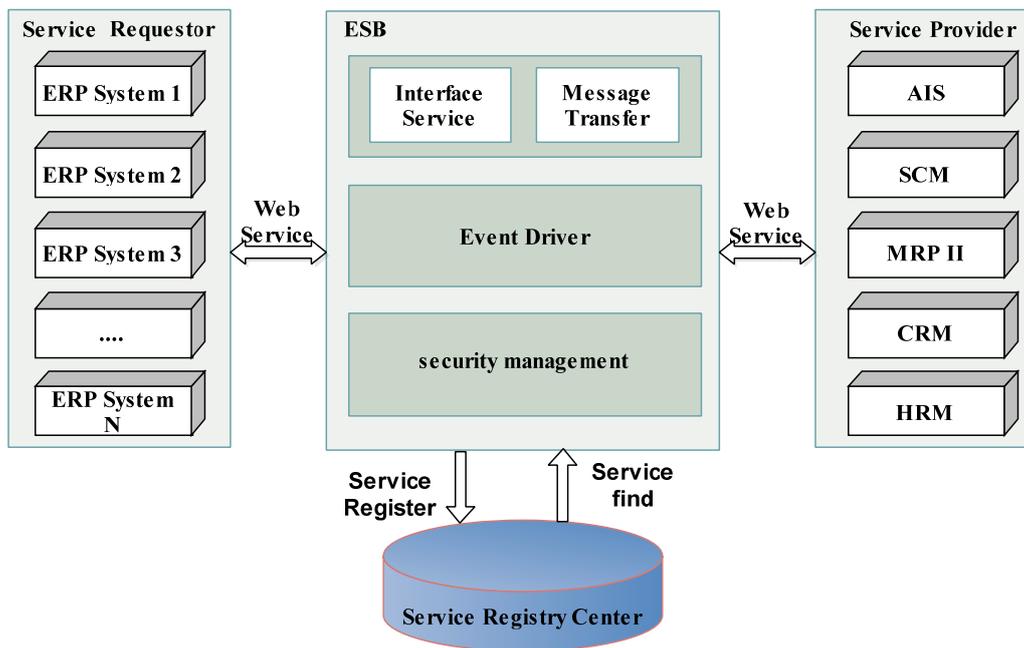


Figure 3.SOA diagram.

3.2. Application of MVC Model

This ERP platform is implemented by the MVC model. SSH (spring, Spring MVC, Hibernate) is a lightweight framework to achieve MVC model. The program flow of this platform is shown in Fig. 4.

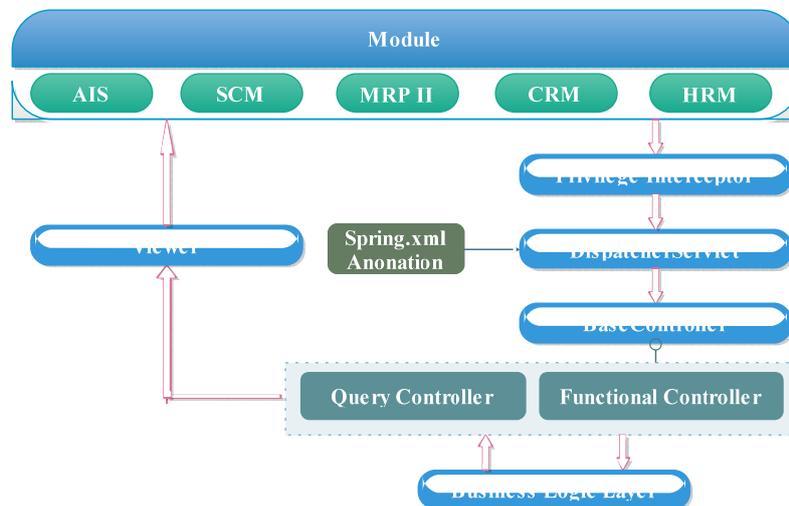


Figure 4. Program flow diagram.

No matter what operation users do, a request firstly arrives to the privilege interceptor. The interceptor checks whether or not the user logs in this platform. If not, it returns to the login page. If the user does not have enough privilege to operate a module, a tip of no authorization is shown. If the user has the privilege, the flow jumps to the DispatcherServlet. DispatcherServlet is the core of Spring MVC framework, and is a centralized access point for client access [12]. According to the configuration of Spring.xml and annotation, DispatcherServlet calls a controller to deal with the user request. All controllers are inherited from BaseController which provides general properties and

methods. Controllers are mainly divided into functional controllers and query controllers. These controller classes can be fused seamlessly with the Spring IoC (Inversion of Control) container.

Business logic layer mainly implements business logic and business verification. The layer calls the platform layer, and returns the corresponding view according to the operation results.

After the request is processed by the controller and the business logic layer, the name of the view is returned. According to the name of the view, Spring MVC jumps to the specified page to show the result to the user.

4. Conclusion

This ERP platform has been tested in many aspects, such as function, reliability, security, compatibility and performance in the cloud computing environment. The test results show that the platform achieves the desired effect. This platform adopts SOA and MVC model. Due to low cost and flexible, it is very suitable for small and medium-sized enterprises.

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