Design and Analysis of Intelligent Small-Micro Enterprise Cloud Service Model

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Abstract. The development of a new generation of information technology and the construction of information infrastructure have not only led to a rapid increase in enterprise productivity, but also become a revolutionary driving force for the transformation of enterprises to smart enterprises. The cloud service platform for smart small-micro enterprises researched and designed in this paper solves the troubles of traditional manual recording, heavy and inconvenient information aggregation. It is a kind of small-micro enterprise with multi-organization, multi-tenant, heterogeneous. The intelligent cloud service platform with features such as foreign land can promote more small-micro enterprises to join the ranks of informatization.

Keywords: cloud computing, microservices, multi-tenant

1. Introduction

The development of information technology has promoted the development of enterprise productivity. It must rely on Internet technology and information technology to improve production management efficiency, further development and growth. It is a general trend to improve the traditional management of daily business activities of enterprises into a digital cloud service management model [1].

Judging from the current status quo, most of the informatization constructions are medium and large enterprises, and the corresponding application software maintenance costs are high, and specialized technical personnel are required for maintenance. However, due to factors such as small scale, lack of funds, incomplete talent allocation, and the relatively simple management business process of small-micro enterprises, it is not cost-effective to use such application software. The use of cloud computing technology can better solve the problem of insufficient information management capabilities for small-micro enterprises. In this model, tenants can rent services according to their own needs and pay for resources on demand, without worrying about server deployment. Cloud computing includes three service models: infrastructure as a service, platform as a service, and software as a service [2]. For small-micro enterprises, choosing a SaaS-based service platform to achieve informatization is a better way. Based on the analysis of the status quo of small-micro enterprises informatization, this paper proposes a cloud service model suitable for most small-micro enterprises and studies a service-oriented core business management architecture based on small-micro enterprises.
2. Relevant concepts

2.1. Cloud computing
There are at least two main lines of cloud computing. One is cloud. In the current Internet era, it should focus on interconnection or enterprise data centers and storage; the other is computing, which is the core function of computers. The initial cloud computing refers to simple distributed computing, which decomposes tasks for calculation, and finally merges the calculation results to complete tens of thousands of data processing tasks that would otherwise take several hours in a few seconds. Of course, with the development, cloud computing has been given a brand-new concept [3]. In the process of enterprise informatization, as the market expands and the number of users increases sharply, a single server cannot meet the needs and it is necessary to configure server clusters, but buying hardware equipment is not cost-effective, and cloud computing services emerge as a new service that can solve the current dilemma.

At present, the most accepted cloud computing can be defined in this way. Cloud computing is a service model in which users order and pay on demand. Cloud computing service providers provide flexible and scalable service resources, including host-type servers or virtual machines, etc. Cloud database or cloud storage and other storage, distributed computing or load balancing and other computing [4].

2.2. Microservice architecture
Generally speaking, microservices are small and autonomous services that work together. Microservices usually have the following characteristics: small granularity and focus on one thing; running in a separate process; lightweight communication mechanism; loosely coupled and independently deployable [5]. The microservice architecture advocates dividing a single application into a set of small services, and the services coordinate with each other to provide value to users. Each service runs in an independent process, and a lightweight communication mechanism is used to communicate between services. Each service can be independently deployed in the production environment.

It should be noted that microservices are not equal to components and are also different from traditional monolithic applications. The latter modules, components or dynamic libraries are integrated and run in a large process. Microservices are also different from the traditional SOA architecture. SOA is based on a heavy-duty bus ESB, centralized management and control architecture. Each microservice can be independently compiled, deployed, and run independently.

When there are too many microservices, there will be inconvenient management defects. Service registration and discovery are one of the aspects to solve this problem. The so-called service discovery is to find the correct target service address among many microservices. The so-called service registration means that the service provider reports its address to the service registry when it starts, and the service caller can dynamically receive the service address list pushed by the service registry by subscribing to the service change notification. See below:

![Figure 1. Service registration and discovery.](image_url)
3. SCBMA

This paper proposes a service-oriented core business management architecture (SCBMA), which applies SOA ideas to the core business management of small-micro enterprises and splits them into independently deployable modules according to the core business of small-micro enterprises. Each module as a unit and provided to users as a service. Each core business can be used as a separate system to provide services to the outside world, or it can communicate with other core businesses through agreed interfaces and contracts to form a new business module to provide services to the outside world, and the businesses are mutually reused. As shown below:

![Figure 2. a service-oriented core business management architecture.](image)

SOA is a coarse-grained service structure that encapsulates different functional units into services, and then combines these services into business processes according to standard interfaces to meet specific business needs. The SCBMA proposed here is centered on core business services and the division boundary between different core businesses is clearly defined. It is a more fine-grained structure. The change of one service will not affect other services, which can make the software service system more elastic, flexible, loosely coupled, and scalable. It is also more suitable for the software service system for the core business management of small-micro enterprises.

4. Multi-tenant model based on enterprise cloud platform

Multi-tenancy simply means that a single instance can serve multiple organizations. Multi-tenant technology is how to provide the same or even customizable services for most clients with a single system architecture and service in a shared data center, and still guarantee customer data isolation [6]. A system that supports multi-tenant technology needs to be designed for virtual partitioning of its data and configuration, so that each tenant or organization of the system can use a separate system instance, and each tenant can use its own needs. The leased system instance is configured for personalization.

As shown in the figure below, there are three forms of multi-tenant isolation: In the first type, each tenant has a separate application instance and database, so they actually form a physical isolation with independent physical space. This isolation method is it is very convenient for individual tenants to carry out personalized customization services. But there are also drawbacks. For developers, later maintenance costs are higher. In the second type, each tenant shares an application instance, but each tenant has a separate database. This shared application instance actually applies virtualization technology, and each tenant performs personalized customization on its own virtual host. Waiting for the operation of the service, this is a logical isolation. The isolation in this way has obviously decreased. The third type is to share in-app instances among tenants and share databases. In order to achieve personalized customized services, this method of isolation needs to be implemented at the application level. As the database is shared, data sharing between tenants is relatively convenient, but the isolation strength is not high, suitable for small and medium enterprises [7, 8].
The cloud service model designed in this paper for small-micro enterprises adopts the third method, that is, sharing application instances and databases between multi-tenants for logical isolation, and providing personalized customized services for each tenant at the application level. By using a new generation of information technology to provide a cloud platform, no infrastructure purchase configuration is required, and by accessing the portal, you can log in to the service platform of your own company. The model of the service mode is shown in the figure below:

![Multi-tenant model based on enterprise cloud platform.](image)

5. Conclusions
To sum up, in the current rapid development of cloud computing technology, combining it with the core business management architecture based on microservices to create a cloud service model can promote the transformation of small-micro enterprise entities to digital organizations and promote enterprises in the process of production and operation, the transformation of offline business processes to digital business processes, and the innovation of service models can realize the transformation of many small-micro enterprises from labour-intensive industries to technology-intensive industries.

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