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Research on the Construction of Financial Information Service Platform Based on Cloud Computing

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Abstract: To address the limitations of traditional centralized architectures in financial informatization—such as low resource utilization, high expansion costs, and insufficient elasticity—and to meet the agile service and compliance demands of the digital finance era, this paper investigates the design of a financial informatization service platform based on cloud computing. The study begins by summarizing key cloud computing characteristics, including resource pooling and elastic scalability, and examines the evolution of financial informatization alongside the synergistic relationship between technological and business drivers. A five-tier architecture is proposed, comprising the infrastructure, platform service, application service, user interface, and service integration and collaboration layers, with the functional role of each tier clearly defined. For instance, the infrastructure layer ensures resource redundancy and security isolation, while the platform service layer offers middleware and development tools. The implementation pathways and application logic of core technologies—such as virtualization, distributed storage, big data processing, and cloud computing management—are further elaborated. Experimental analysis based on a large commercial bank demonstrates that the platform improves loan approval efficiency by 91.67%, doubles the acceptance rate of customer service recommendations, and achieves 95% accuracy in credit risk early warning, significantly outperforming traditional systems. The findings verify that the platform enables intensive financial resource management, facilitates business automation, personalized services, and intelligent risk control, thereby offering technical support and practical insights for the digital transformation of the financial industry.

1. Introduction

With the rapid development of the digital economy and the deep penetration of financial technology, financial informatization has become the core engine driving the transformation of financial institutions such as banking, securities, and insurance. Its service efficiency, data processing capabilities, and risk control level are directly related to the competitiveness and stability of the financial industry[1]. However, the traditional financial informatization model often adopts a centralized architecture with localized deployment. Faced with the explosive growth of massive transaction data, the upgrading of cross regional business collaboration demands, and the pressure of personalized financial service innovation, it gradually exposes prominent bottlenecks such as low resource utilization, high expansion costs, insufficient system resilience, and high operational complexity[2]. It is difficult to adapt to the strict requirements of agile services, real-time response, and security compliance in the digital finance era. Cloud computing, as a new computing paradigm that integrates distributed computing, network storage, virtualization, and other technologies, provides a revolutionary solution to solve the traditional financial informationization dilemma with its on-demand resource allocation elasticity, low-cost scale deployment, highly reliable redundant architecture, and efficient collaborative computing capabilities[3]. By deeply integrating cloud computing technology with financial informatization, an integrated and intelligent financial informatization service platform can be built. This not only enables intensive management and efficient scheduling of financial resources, but also provides technical support for new financial services such as intelligent risk control, precision marketing, and inclusive finance[4]. Therefore, conducting research on the construction of a cloud based financial information service platform, exploring key issues such as architecture design, technology selection, security protection, and business adaptation, has important theoretical value and practical significance for promoting the digital transformation of the financial industry, improving the quality and efficiency of financial services, and enhancing the resilience of the financial system.

2. Overview of Cloud Computing and Financial Informatization

2.1 Definition and Characteristics of Cloud Computing

After the proposal of cloud computing, there was no unified standard definition for a period of time[5]. However, its main characteristics have not changed, that is, the computing capability based on virtualization technology, grid computing and the Internet to provide elastic scaling and rapid deployment. The National Institute of Standards and Technology (NIST) in the United States first provided a standard definition in 2011; China began to develop standards in 2015 and officially implemented the standard definition for cloud computing in January 2017. The comparison of the two definitions is shown in the table.

It can be seen that both the standards in the United States and China define cloud computing as a current service model. The main features of this mode are as follows: firstly, extensive network access; Measurable services; Multi tenancy; On-demand self-service; Fast resilience and scalability: resource pooling; This includes deployment models such as public cloud, private cloud, community cloud, and hybrid cloud. The service models such as IAAS (Infrastructure as a Service), PAAS (Platform as a Service), and SAAS (Software as a Service) have been proposed. Based on this characteristic, the academic community has extended the concept of services, thus proposing concepts such as "Security as a Service" and "Testing as a Service".

2.2 Development history of information technology in the financial industry

Since the reform and opening up, China's financial industry has experienced rapid development. At present, the financial industry mainly includes specific industries such as banking, insurance, funds, wealth management companies, securities, etc[6]. According to the government information disclosure data of the former China Banking Regulatory Commission, there were a total of 4588 banking and financial institutions in China by the end of 2018. The informatization process of the financial industry has also been updated with the development of technology. The first stage is the era of computer processing, which mainly focuses on the electronicization of data information; The second stage is the networking processing period, during which data is mainly processed uniformly through internal networks; The third stage is the Internet era, mainly through mobile banking, online banking product presentation. With the development of Internet finance, the large and unified centralized processing mode is far from meeting the market demand. Therefore, cloud platforms based on distributed computing meet the current business needs and are widely promoted and applied in the financial industry.

2.3 The relationship between cloud computing and the financial industry

The application origin of cloud computing in the financial industry is generally divided into two factions. One is the theory of technology promotion, that is, technology is constantly updated, from stand-alone processing to online processing to Internet processing, from centralized processing to distributed processing[7]. The foundation of cloud computing is generally considered to be virtualization technology. So, the application of cloud computing in the financial industry is the result of technological advancement.

The second argument is the business driven theory. The financial industry, especially the banking industry, under the impact of Internet finance, seeking breakthrough and innovation points, must have a rapid response and deployment capability to the market. The current steady deployment and application mode is difficult to meet the demand for elastic expansion, so the business has promoted the transformation of technology.

The above two viewpoints are quite popular in the academic community. This article believes that technology and business should mutually promote and grow. In the early stage of information technology construction, technology is purely processed electronically based on the business process mode. In the process of informatization, technology has also optimized and improved business processes; Similarly, with the rapid development of cloud computing today, the financial industry is also adapting to the process of global integration, requiring efficient processing of big data, continuous improvement of computing power, and further assurance of security; The birth of cloud computing also provides a new service model, where computing and storage capabilities can be used on demand like electricity, making it convenient and fast. In summary, technology and business are interdependent, constantly driving the development of digitalization in the financial industry.

3. Construction of a financial information service platform based on cloud computing

3.1 Platform Architecture Design

3.1.1 Infrastructure Layer (Iaas Layer)

The Infrastructure as a Service (IaaS) layer is an important supporting part of the platform architecture. Its prominent feature is the integration and management of key physical resources such as servers, storage devices, and network facilities. In the system design phase, the high availability attribute of this layer should be specially improved to ensure the continuous and stable operation of core business through redundant deployment. In addition, a mechanism for dynamic resource expansion should be formed to cope with the problems caused by transient load changes. Security protection should also be strengthened, and physical isolation, data encryption and other technical means should be used to improve the security and reliability of the underlying environment.

3.1.2 Platform Service Layer (PaaS Layer)

The Platform Service Layer (PaaS) is an important supporting architecture for financial informatization, with its core responsibility being to build a technology ecosystem that covers the entire lifecycle. Service middleware plays a key role, integrating important elements such as message queues, cache storage, and database management, greatly improving the development and deployment speed of financial applications. With a large number of development tools (SDK, API interfaces), it significantly improves the design quality and online speed of applications. A complete operation and maintenance management system can dynamically supervise resources and implement intelligent scheduling, ensuring that the platform is always in a normal operating state, and providing strong support for the efficient development of financial business.

3.1.3 Application Service Layer (SaaS Layer)

The application service layer (SaaS layer) is a financial business platform aimed at end users, which includes various financial service functions. By improving business processes and utilizing cloud computing technology to enhance operational efficiency, it relies on big data analysis to achieve personalized service customization. It also ensures that the system operates in compliance with regulatory requirements, thereby guaranteeing data security and business compliance.

3.1.4 User Interface Layer

The user interface layer is a key node for the interaction between the system and end users. Its main function is to build a unified access platform. In the design phase, it is necessary to comprehensively integrate the functional modules of various channels, including web, mobile applications, social media platforms, WeChat, etc., and focus on improving the user experience. Responsive layout technology should be adopted to enhance the convenience and smoothness of interface operations, and a complete security protection system should be formed to implement identity verification and permission control policies, ensure the security of data transmission, protect the privacy rights of users, and create a stable and reliable interaction atmosphere.

3.1.5 Service Integration and Collaboration Layer

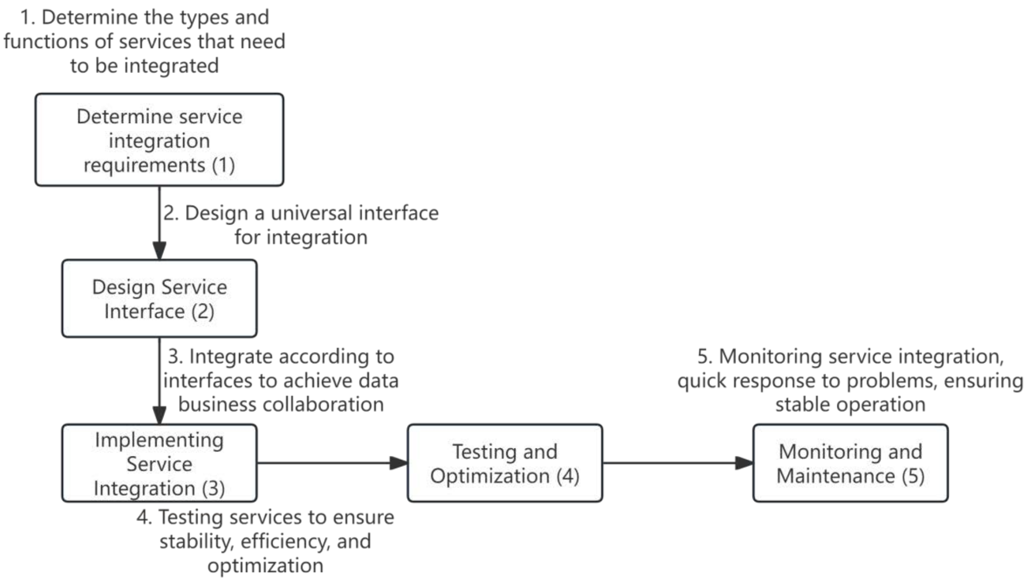

Figure 1 Platform Architecture Design Flow Chart

The service integration and collaboration layer is the main part of the financial service platform. Its main functions include service integration, collaborative linkage, process control, etc. This layer promotes the integration of infrastructure, platform services, and application services, enabling various service units to effectively connect and create a complete collaborative operation mechanism. It promotes in-depth interaction between financial applications and services, greatly improves business processing efficiency, formulates unified business process management guidelines, and ensures that each service module operates according to established steps to ensure the smooth development of the entire business process. The detailed operation steps are shown in Figure 1.

3.2 Key Technology Implementation

3.2.1 Virtualization Technology

By relying on virtualization technology, platforms can transform physical resources into virtual form and achieve centralized management of computing, storage, and network resources. This approach significantly improves resource utilization efficiency, reduces hardware investment costs, and enhances the flexibility and scalability of system architecture. By using a certain algorithm model, it aims to achieve optimal resource utilization efficiency:

$$\eta=\frac{V_{\mathrm{used}}}{V_{\mathrm{total}}}$$

Where η is the resource utilization rate; V_{used} indicates the resources used; V_{total} stands for total virtual resources.

3.2.2 Distributed Storage Technology

To ensure high availability and secure reliability of data, this system adopts a cutting-edge distributed storage framework, which follows the principle of multi node replication to enhance the trustworthiness and access speed of data, ensuring normal operation and efficient completion of backup tasks in complex network situations. After implementing the data redundancy backup plan and regular data backup strategy, the disaster recovery capability and data integrity protection have been improved. The specific technical solutions include:

$$Availability=1-(1-A_1)\times(1-A_2)\times\cdots\times(1-A_n)$$

Which, $A_1,A_2,\cdots,A_n$ respectively represent the availability of each storage node.

This technical solution relies on a distributed architecture design to achieve multiple redundant storage mechanisms for data. In the event of a local node failure, it can ensure the integrity of the data is maintained, thereby maintaining the continuous operation and stable performance of the service.

3.2.3 Big Data Processing Technology

The data generated by the financial industry has the characteristics of large quantity and complex types. Big data technology endows platforms with efficient processing and analysis methods. Core algorithms such as data mining, machine learning, and streaming computing can help financial institutions identify key elements from a large amount of information, thereby providing support for business decisions and strengthening risk control levels. The data processing process based on MapReduce architecture generally includes the following important steps:

$$Map(k,v)\rightarrow list(k',v')$$

$$Reduce(k',list(v'))\rightarrow list(v')$$

Among them, Map and Reduce represent mapping and reduction operations, respectively.

3.2.4 Cloud Computing Management Technology

Cloud computing management technology is an important support for the efficient operation of platforms. Its key elements include resource scheduling, service quality assurance, security monitoring, automated operation and maintenance, and many other aspects. These technical means can coordinate and dynamically allocate internal resources of the platform, thereby improving service reliability and overall operational efficiency. By using a certain algorithm model, the optimal allocation of resources can be achieved:

$$\min \sum_{i=1}^{n} C_i \ X_i$$

$$s.t. \sum_{i=1}^{n} R_i \ X_i \geq R_{total}$$

$$X_i \in [0,1]$$

Where C_i is the unit cost of the ith resource; R_i is the unit performance of the ith resource; X_i represents the resource allocation decision variable, and represents the allocation proportion of the ith resource (value range 0 to 1); R_{total} represents the total resource demand. This formula represents minimizing resource costs while meeting the total resource demand.

4. Experimental analysis

Taking a large commercial bank as an example, the analysis shows that after implementing cloud computing platforms, the automation of banking business processing, personalized customer service, and intelligent risk management have significantly improved the quality and level of financial services.

4.1 Business Processing Automation

The bank has utilized cloud computing platforms to automate loan approval, account management, and other business processes, significantly improving business processing efficiency and reducing time by approximately 91.67%, significantly enhancing operational efficiency. As shown in Table 1

Table 1 Comparison of Business Processing Efficiency

Business Type	Traditional processing time (hours)	Cloud computing processing time (hours)	Efficiency improvement (%)
Loan approval	48	4	91.67
Account opening	24	2	91.67
payment settlement	12	1	91.67

4.2 Personalized Customer Service

The financial institution has built a data collection and analysis platform using cloud computing technology to provide customized services to different types of user groups. Referring to the situation shown in Figure 2, this system uses analysis of customer transaction behavior data to generate personalized recommendation content, thereby significantly improving user experience and enhancing brand loyalty. From the statistical data, it can be seen that the recommendation response rate reached 30% from the beginning of the project, and after six months of operation, it gradually increased to 60%, showing a continuous upward trend.

4.3 Intelligent Risk Management

This commercial bank has utilized cloud computing technology platforms and integrated advanced data analysis tools and machine learning algorithms to achieve intelligent updates in risk management processes. In terms of credit risk management, the accuracy of its intelligent warning system has increased by 35.71 percentage points compared to traditional methods, reaching 95%. The accuracy of its operational risk monitoring system has also increased by 38.46 percentage points, reaching 90%. The credibility of market risk evaluation has increased by 41.67 percentage points, reaching 85%. This technological innovation has shown significant advantages in various risk prevention situations and has a wide range of promotion and use value.

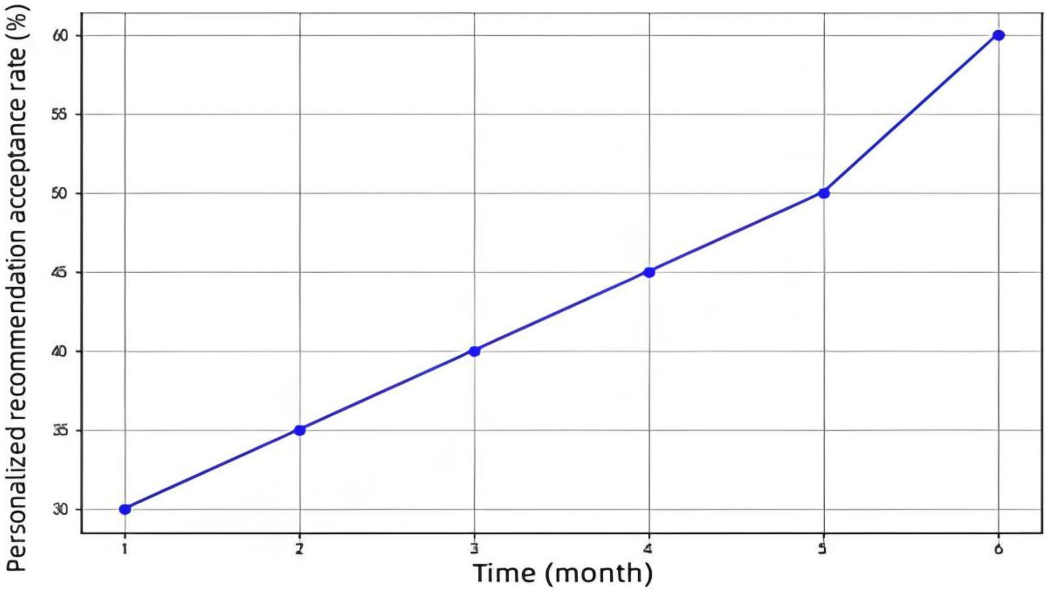

Figure 2 Schematic diagram of personalized service recommendation effect

5. Conclusion

This article focuses on the deep integration of cloud computing and financial informatization, and specifically addresses the inherent bottlenecks of traditional centralized architectures. The study first clarifies the core characteristics of cloud computing, such as resource pooling and on-demand services, clarifies the three-stage development of financial informatization, proposes the core viewpoint of technology and business synergy driven, and lays a theoretical foundation for platform construction; Furthermore, a five tiered architecture is designed to achieve full chain technology implementation through resource redundancy in the infrastructure layer, middleware support in the platform service layer, and business adaptation in the application service layer, supplemented by key technologies such as virtualization and distributed storage to ensure platform performance. The practical verification of a large commercial bank shows that the platform has achieved significant results in three dimensions: business efficiency, customer service, and risk control. The business processing time has been shortened by 91.67%, the acceptance rate of personalized recommendations has doubled, and the accuracy of credit risk warning has reached 95%. This fully proves the rationality of the architecture design and technology selection. Although the research has provided a feasible technical solution for financial digital transformation, there is still room for deepening in the security compliance details of cross agency data collaboration, resource scheduling optimization under extreme peak values, etc. In the future, the platform's resilience and intelligence level can be further enhanced by combining blockchain, edge computing and other technologies to better adapt to the high-quality development needs of the financial industry.

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