

Original Research Article

Integration strategy and optimization of information technology systems based on cloud computing*Feiyan Jin , Yu Zhe**Zhejiang Communication Industry Service Co., Ltd. Hangzhou Branch, Hangzhou, Zhejiang, 310009, China*

Abstract: With the rapid development of information technology, cloud computing has gradually become an important means for enterprises to optimize information system integration. This article explores the integration strategy and optimization methods of information technology systems based on cloud computing. Through research, it is found that the reasonable use of cloud computing technology can significantly improve the flexibility, scalability, and security of the system. The aim is to provide valuable references for researchers and practitioners in related fields, and promote the efficient integration and optimization of information technology systems.

Keywords: Cloud computing; Information technology; System Integration Strategy

1. Introduction

In the context of global digital transformation, enterprises are facing unprecedented opportunities and challenges. In order to adapt to rapidly changing market demands, improve operational efficiency and competitiveness, more and more enterprises are adopting cloud computing technology for information system integration and optimization. Cloud computing provides new solutions for enterprises with its powerful computing power, flexible resource scheduling, and high cost-effectiveness. However, how to effectively integrate cloud computing into existing IT architectures and achieve optimal system integration remains an urgent problem to be solved. This article will delve into the integration strategy and optimization methods of information technology systems based on cloud computing, aiming to provide scientific and reasonable guidance for enterprises.

2. Overview of cloud computing and its advantages in system integration

2.1. Basic concepts of cloud computing

As a revolutionary computing model, cloud computing provides on-demand access to shared computing resource pools through the Internet. This model abstracts computing power, storage space, and network resources into services, allowing users to use them without needing to understand the underlying infrastructure details. Cloud services are typically divided into three modes: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), each providing different levels of service abstraction. Virtualization technology is the core support of cloud computing, which achieves logical isolation and dynamic allocation of resources by creating virtual machines or containers. Distributed architecture design enables cloud computing systems to have horizontal scalability, capable of handling massive amounts of data and concurrent requests. The elastic scalability feature allows resources to automatically adjust according to demand, meeting peak demand while avoiding resource waste. The deployment modes of cloud computing include public cloud, private cloud, and hybrid cloud, and different modes are suitable for the needs of various organizations. Public cloud provides cost-effective shared resources, private cloud meets specific security requirements, and hybrid cloud

combines the advantages of both. Service providers achieve efficient resource utilization through a multi tenant architecture, ensuring data isolation and security among users.

2.2. Advantages of cloud computing in system integration

Cloud computing brings significant advantages to system integration, and the resource pooling feature eliminates the islanding effect of traditional IT infrastructure. Through a unified cloud platform, different systems can achieve seamless connectivity and data sharing, reducing integration complexity. The API driven architecture design simplifies the interaction between systems, and standardized interface specifications improve the scalability and flexibility of integration. The on-demand allocation of resource supply mode makes system integration more cost-effective, as users only need to pay for the resources actually used. Automated deployment and management tools accelerate the integration process and reduce the risk of errors caused by manual intervention. The application of cloud native technology further improves integration efficiency, and microservice architecture and containerized deployment make system components easier to integrate. Data integration has been significantly improved in cloud computing environments, with centralized data storage and processing platforms eliminating data silos. The real-time data synchronization mechanism ensures data consistency between different systems and improves the timeliness of business decisions. The security integration solution simplifies cross system security management through unified identity authentication and access control.

3. Integration strategy of information technology systems based on cloud computing

3.1. System architecture design

The system architecture design of cloud computing needs to fully consider elasticity, scalability, and high availability. Microservice architecture is currently the mainstream cloud native design pattern, which achieves loose coupling and high cohesion by breaking down the system into multiple independent service units. Each microservice can be independently developed, deployed, and expanded, significantly enhancing the flexibility and maintainability of the system. The introduction of containerization technologies such as Docker and orchestration tool Kubernetes has further optimized the deployment and management efficiency of microservices. In architecture design, the combination of edge computing and cloud computing has become a trend. Edge computing sinks some computing tasks to edge nodes near the data source, reducing data transmission delay and improving real-time performance. This hybrid architecture is particularly suitable for Internet of Things and industrial Internet scenarios, and can effectively balance computing load and network bandwidth. Serverless architecture is also gradually gaining attention, as developers only need to focus on business logic without managing underlying infrastructure, further reducing operational complexity. The application of cloud native technology has brought new possibilities for system architecture design. Service mesh enhances the security and observability between microservices by providing a unified communication layer. Event Driven Architecture improves the system's response speed and fault tolerance through asynchronous message passing mechanisms. The combination of these technologies makes the system architecture more adaptable to dynamically changing business requirements.

3.2. Data management and integration

As a centralized storage solution, Data Lake can accommodate structured, semi-structured, and unstructured data, providing rich data sources for data analysis. The combination of data lakes and data warehouses forms the core of modern data architecture, supporting large-scale data storage and meeting high-performance query

requirements. The key to data integration lies in achieving standardization and consistency of data. ETL (Extract, Transform, Load) tools play an important role in traditional data integration, but in cloud computing environments, the ELT (Extract, Load, Transform) pattern is gradually becoming mainstream. ELT utilizes the powerful computing power of cloud platforms to directly load data into the target system and then convert it, improving the flexibility and efficiency of data processing. The application of real-time data stream processing technologies such as Apache Kafka and Apache Flink provides new solutions for data integration. These technologies can capture and process data streams in real-time, support complex event processing and real-time analysis, and meet the high real-time requirements of modern business. Data virtualization technology abstracts underlying data sources and provides a unified access interface, simplifying the integration process of multi-source data. Metadata management, data quality monitoring, and data lineage analysis constitute the core content of data governance. By establishing a comprehensive data governance framework, enterprises can ensure the accuracy, consistency, and traceability of data, providing reliable support for data-driven decision-making.

3.3. Safety and compliance

The security design in cloud computing environment needs to follow the ZeroTrust principle, which means that no user or device is trusted by default, and strict authentication and authorization are required to access resources. Multi factor authentication (MFA) and role-based access control (RBAC) are fundamental technologies for implementing zero trust architecture. The application of encryption technology runs through various stages of the data lifecycle, including data transmission, storage, and processing, ensuring the confidentiality and integrity of data. Network security is an important component of cloud computing security. Virtual Private Cloud (VPC) provides dedicated network space for cloud resources through logical isolation, and combines firewalls and intrusion detection systems (IDS) to build a multi-level network protection system. Cloud service providers typically provide advanced security services such as DDoS protection and Web Application Firewall (WAF), enhancing the system's ability to resist attacks. Compliance is another important consideration in cloud computing security design, as different industries and regions have specific compliance requirements for data storage and processing, such as GDPR, HIPAA, and PCIDSS. Cloud service providers typically demonstrate compliance with relevant standards through third-party audits and certifications. Enterprises need to choose cloud services that meet compliance requirements based on their own business characteristics and establish corresponding internal control mechanisms. A centralized log collection and analysis system can monitor system status in real-time, detect and respond to security incidents in a timely manner. The Security Information and Event Management (SIEM) system provides comprehensive security situational awareness by correlating and analyzing security logs from different sources. The application of automated response tools such as SOAR (Security Orchestra, Automation and Response) further enhances the efficiency of handling security incidents. In terms of data privacy protection, data anonymization and anonymization technologies are widely used. These technologies reduce the risk of sensitive information leakage without affecting data analysis. The issue of data sovereignty is also receiving increasing attention, and enterprises need to choose suitable data storage locations based on business needs to ensure compliance with local laws and regulations.

4. Optimization methods for information technology systems based on cloud computing

4.1. Performance optimization

The dynamic resource allocation mechanism can automatically adjust computing, storage, and network resources based on load changes, avoiding resource waste and performance bottlenecks. The application of

virtualization technology significantly improves hardware resource utilization, and through virtual machine migration and load balancing strategies, the system can flexibly schedule tasks between different physical nodes. The introduction of containerization technology further optimizes application deployment efficiency, reduces system overhead with lightweight container instances, and improves application startup speed and performance. The reasonable design of caching mechanism has a significant impact on system performance, and distributed caching architecture can effectively reduce database access pressure and improve data reading speed. Asynchronous processing mode is widely used in cloud computing environments. Through message queues and event driven architecture, the system can handle high concurrency requests and avoid performance degradation caused by synchronous blocking. Data compression and transmission optimization techniques reduce network bandwidth usage and improve data transmission efficiency. Performance monitoring and analysis tools play an important role in cloud computing platforms, collecting real-time system performance indicators and identifying performance bottlenecks. Intelligent prediction algorithms based on machine learning can detect potential performance issues in advance and achieve proactive optimization. The elastic scaling mechanism ensures that the system automatically expands resources during high loads and releases excess resources during low loads, maintaining stable performance.

4.2. Cost control

The pay as you go model is one of the core advantages of cloud computing, where users only need to pay for the resources they actually use, avoiding the fixed cost investment of traditional IT infrastructure. The precise measurement and monitoring of resource utilization is the foundation of cost control. Through detailed resource utilization reports, resource waste points can be identified and optimization measures can be taken. Automated resource scheduling strategies can dynamically adjust resource allocation according to business needs, reducing resource consumption while ensuring service quality. The reasonable combination of reserved instances and bidding instances can significantly reduce computational costs. By analyzing the characteristics of business load, the optimal instance combination scheme can be selected. Optimizing storage costs requires considering data access frequency and storage cycle, and adopting a layered storage architecture to store hot and cold data separately on storage media with different performance. Network transmission cost cannot be ignored in cloud computing environment. Content distribution network and edge computing technology can reduce data transmission distance and reduce network bandwidth consumption. The establishment of cost forecasting models helps to develop reasonable budget plans and predict future resource demands based on historical data and business development trends. The establishment of a cost sharing mechanism ensures the reasonable allocation of resource utilization costs among multiple departments or projects, and improves cost transparency.

4.3. Reliability and availability

The data redundancy mechanism ensures data security through multi replica storage and distributed architecture, ensuring data integrity even in the event of hardware failures. Fault tolerant design is fully reflected at the system architecture level, reducing the impact of single point failures through fault isolation and automatic recovery mechanisms. The development of Service Level Agreements (SLAs) specifies service availability indicators and provides quantitative standards for system reliability. A disaster recovery plan is a key measure to ensure business continuity, ensuring timely service recovery in the event of major failures through regular backups and rapid recovery mechanisms. The multi regional deployment strategy improves the geographic disaster recovery capability of the system, reducing the impact of regional failures through cross regional data synchronization and service redundancy. The automatic fault detection and repair system can monitor the system status in real time, detect and handle potential problems in a timely manner. Load balancing technology

not only improves system performance, but also enhances system reliability by dynamically allocating request pressure to avoid single node overload. The service downgrade mechanism can ensure the availability of core functions when the system pressure is too high, temporarily shutting down non critical services to maintain stable system operation. Reliability testing and stress testing are important means of verifying the robustness of a system, evaluating its fault tolerance by simulating various abnormal situations.

5. Conclusion

In summary, the integration and optimization of information technology systems in cloud computing are of great significance for improving the operational efficiency and competitiveness of enterprises. By designing a reasonable architecture, effective data management, and strict security measures, the advantages of cloud computing can be fully utilized to achieve efficient integration and optimization of the system. In the future, with the continuous emergence of new technologies, cloud computing will play an important role in more fields.

References

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