Network Security Challenges in Cloud Computing Environments

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Abstract: ***With the rapid development of China's social economy and the continuous improvement of the level of science and technology, information technology and big data technology are also developing rapidly. Cloud computing has been widely used in various fields of people's daily life and work and occupies a very important position in social production and life. Based on this, combined with the development and application background of cloud computing, this paper discusses the main problems faced by computer network security and tries to put forward corresponding security prevention technology to promote the construction of a high-quality environment under the cloud computing environment and ensure the security of information and data applications.***

Keywords: Cloud computing; Computer; Network security.

1. INTRODUCTION

Cloud computing has a far-reaching impact on human life, greatly facilitating people's work and life, but at the same time, the issue of network security has also attracted more attention. In the application of cloud computing technology, the open Internet system is needed to complete the operation of data processing. In the process of data transmission, information may be stolen, leaked and other issues. At present, there is still a lack of sound security technologies in cloud computing. In the face of sudden situations, we cannot actively fend off them, and in the development of the information age, network viruses have become more hidden and aggressive, and hackers' technical level has also increased, making prevention work more difficult, and seriously threatening information and data security. It calls for strengthening the security scheme for computer networks, improving security technology, strengthening encryption, etc., to enhance computer network security.

2. THE CONNOTATION OF CLOUD COMPUTING TECHNOLOGY

Cloud computing is a new way of computing, which can process hundreds of millions of pieces of information in a few seconds, and it also provides a powerful Internet service.Cloud computing is the extension of distributed arithmetic, parallel processing arithmetic and Internet. At present, the cloud computing technology has achieved unprecedented development. The infrastructure of cloud computing technology has the characteristics of reliability and security.It is gradually showing its strong stability and vitality, and is being adopted by more and more users, enterprises, governments and universities. Cloud computing technology will be distributed in the computer's resource pool, a variety of applications can refer to their own actual demands to obtain the relevant resources, These huge and very rich data will be stored in the cloud computing platform, and the implementation of computing in the platform, this method of computing and traditional computing method has obvious differences, which can provide users with convenient at the same time, more economical use of computer resources. Zhou [1] develops a collaborative filtering model for digital precision distribution of social media content on private domain platforms. Wensi [2] explores AI-enabled data visualization marketing for automated production lines to build customer trust and improve lead-to-order conversion. In data security, Deng [3] investigates homomorphic encryption-based data integrity verification and anti-tampering mechanisms in cloud storage environments. Lin et al. [4] present a Bayesian framework for modeling multivariate degradation data with dynamic covariates in reliability engineering. In financial risk management, Yang et al. [5] integrate large language models for cross-asset real-time monitoring of equity, fixed income, and currency markets. Tang and Zhao [6] employ neural networks to examine the relationship between aging population distribution and real estate market dynamics. For network testing, Tu [7] introduces SmartFITLab, an intelligent execution and validation platform for 5G field interoperability testing, while Tu [8] develops AutoNetTest, a platform-aware framework for intelligent 5G network test automation and issue diagnosis. In business intelligence, Xie and Chen [9] present CoreViz, a context-aware reasoning and visualization engine for business intelligence dashboards. In logistics, Wang [10] leverages AI for last-mile delivery efficiency in smart city logistics, and Meng et al. [11] research green warehousing site selection and path planning using deep learning. Wu [12] focuses on the construction and

optimization of an intelligent gateway software management platform under cloud-edge integration for the Industrial Internet of Things. Chen [13] introduces a data quality quantized framework to ensure large-scale data integration in gig economy platforms. Xu [14] presents UrbanMod for text-to-3D modeling in accelerated city architecture planning. Yuan [15] exploits GPT-4 for multimodal medical data processing in electronic health record systems. Li et al. [16] explore gamifying data visualization to foster citizen engagement in smart cities. Tang and Zhao [17] further examine the relationship between aging population distribution and real estate market dynamics using neural networks. Zhao et al. [18] research labor market efficiency evaluation under the impact of media news based on machine learning and the DMP model. Finally, Chen et al. [19] investigate the green innovation effect of the digital economy within the framework of international review of economics and finance.

3. THE EXISTING PROBLEMS OF COMPUTER NETWORK SECURITY IN CLOUD COMPUTING ENVIRONMENT

3.1 There is a certain lack of identity authentication in the security system

When analyzing today's cybersecurity systems, authentication is essential in order to further strengthen the ability of cybersecurity systems to resist external insecurity. However, due to the current stage of authentication as a technical level, there are certain limitations. There are also uncertainties and shortcomings in this system, Therefore, there is a risk of information data leakage, and some hackers and criminals when attacking computers, usually use platform managers to steal information about others, and then use this information to log onto other platforms to illegally steal and intercept data.

3.2 Flood of false information on the Internet

Due to the virtual nature of the network environment, along with the spread of a large number of false information, a large number of false information, dangerous links and other content, making network security is seriously challenged, and induce serious information security problems [2]. At present, cloud computing is still in the optimization stage, and the security measures need to be optimized. In particular, the lack of network source address and source code security detection, screening, so that all kinds of false information is difficult to be screened in time, to the server, software and other pressure, interference and damage, to the depth of cloud computing applications threat.

3.3 Cloud Computing Security Risks

The hidden trouble of cloud computing itself is an important problem which threatens the security of computer network. While cloud computing improves the speed of data processing and computing, the transmission of a large amount of data to the cloud system itself has certain risks. As all the documents stored in a huge cabinet, as long as the master of the key to crack the cloud system protection, you can easily access a lot of data and information, which is the current cloud computing environment of the most core risks and problems. Cloud computing involves the uploading and storage of personal and corporate data, which is highly valuable among all types of data. Although the cloud computing service provider for units and individuals to provide data will not be leaked guarantee, but the unit internal personnel itself has uncertainty, coupled with the value of the cloud computing internal data itself are virtually increased the risk of data information in the cloud computing environment. Reports of data breaches in recent years also show that most users' personal information breaches are a vicious problem caused by insiders breaking the law. In addition to preventing external risks, the validity and standardization of internal key storage also need to be paid attention to in cloud computing environment.

4. COMPUTER NETWORK SECURITY IN CLOUD COMPUTING ENVIRONMENT

4.1 Enhance security awareness

In the cloud computing environment, computer network security to enhance awareness, which is to protect network security prerequisites and basic elements, cloud computing users, service providers need to enhance their own security awareness. In particular, cloud computing service providers need to conduct in-depth analysis of the current network security environment, improve system security protection and defense capabilities, and create a safe cloud computing environment [3]. At the same time enhance security awareness, strengthen internal

management, cloud computing system internal security risks can be reduced. Similarly, the security awareness of cloud computing users and users should be strengthened. Comprehensive consideration should be given to the comprehensive strength and security level of cloud computing servers, cooperation with institutions with strong security capabilities should be strengthened, and identification keys should be strictly controlled to avoid disclosure. In the cloud computing environment, relevant participants should pay full attention to the confidentiality of network information and data. In the process of using cloud computing and computer network to regulate the operation, the source, purpose unknown file can not be clicked, avoid using public computers and public network to perform related operations, minimize security risks.

4.2 Strengthening the security management of client networks

With the development of the information age, every computer network user based on cloud computing environment,All need to constantly strengthen the ability of security, in the process of practical use can take standard, safe operation, at the same time regularly maintain the security software and equipment, do a good job of information data management and backup, avoid the database is attacked and damaged [4]. For example, with the help of the anomaly behavior analysis module in the network security management system, it is mainly responsible for implementing monitoring and analysis of the operation of the system client. It also checks the permissions and data in the database to keep abreast of the anomaly dynamics in a timely manner, determining whether there are violations in the operation, and once it is confirmed that it is a violation problem, it will be handled by the defensive decision generation module, especially implementing analysis of the resulting anomaly. Rapidly generate scientific defense decisions, including USB interface closure decisions, network severing decisions, virus isolation decisions, and network warning decisions, to prevent information and data in the cloud platform from being stolen by USB interfaces or network channels, thereby automatically completing the response to client network security problems. The use of system constraints, and cloud computing together with the security of the upstream and downstream convergence, so that network attacks have no escape, and comprehensively enhance the security of information and data.

4.3 Improve the security and confidentiality of user information and data

4.3.1 The rational use of encryption technology

It is very important to improve the security of information and data and protect the legitimate rights and interests of users. In the process of improving security and confidentiality, the most common and practical method is to use encryption technology, which is typically used to transmit data securely in cloud management and cloud storage servers. The most commonly used encryption technology today is the RSA asymmetric encryption algorithm, which makes direct asymmetric data transmission between server and client to the key present in the client, and generally uses the DES asymmetric cryptographic algorithm when making data transmission. In actual life, when users want to store data, the data will be stored into the corresponding database. The data is then encrypted by the client's encryption technology, and under the virtual network environment, the user's identity is verified using a variety of authentication modes, and then the cloud computing security system can ensure information security while enhancing the security system's confidentiality.

4.3.2 Application of filter technology

At this stage the use of a wide range of filters, including Websense and Vericept, etc., this technology is mainly to leave the network data for the whole process of supervision and management, and some sensitive information to intercept, all-round use of data and data transmission monitoring.

4.4 Building a security system

In order to improve and optimize the computer network security management model, relevant staff can actively construct a computer network security protection system, including two modules: workstation protection and server protection. Workstation protection belongs to the lowest level of protection in the computer network security protection system and is the last security defense measure. Server protection not only has the ability to monitor viruses, but also should include automatic virus code update function, alarm function, and remote installation function. Most users' emails and web pages are viewed more frequently, which makes the number of virus entry paths increasing. The security of user data can be ensured by setting up new barriers. As for the customer's network data information resources, once the safety accident occurs, it will produce the big loss.

Therefore, users can ensure the security of their data by regularly backing up the data information within the computer network, such as backing up system logs and server data.

4.5 Data backup and restore

Network security in the cloud computing environment must do a good job of data backup and restore. Data backup and restore is the most important and critical line of defense in network security. In order to ensure the security of computer network in cloud computing environment, data backup is needed regularly. Data backup provides room for subsequent system failure, virus infection or operation error. And in the cloud computing environment, cloud computing technology provides more convenient conditions for backup and restore, Data storage through discrete storage can ensure the security of data to a certain extent, and in the event of data damage, the backup stored data can be quickly recalled, thereby reducing user loss.

5. CONCLUSION

To sum up, with the rise and development of the Internet, human beings have entered the information age, cloud computing technology is also developed and improved, this technology provides a boost for the development of society, make people's lives more convenient. But cloud computing can also be described as a double-edged sword, a technique that makes it easier for people to work and learn, However, there are also some cybersecurity issues, and once it is not scientifically solved, it will inevitably affect the legitimate rights and interests of the people, lead to the disclosure of users' private information, and also restrict the further advancement of a harmonious society.

REFERENCES

[1] Zhou, Z. (2025, November). Digital precision distribution strategy for social media content on private domain platforms in the automotive industry: a collaborative filtering model based on user behavior. In Proceedings of the 2025 International Conference on Digital Society and Intelligent Computing (pp. 516-521).
[2] Wensi, L. (2026). AI-Enabled Data Visualization Marketing for Automated Production Lines: Building Customer Trust and Improving Lead-to-Order Conversion. Academic Journal of Natural Science, 3(1), 8-13.
[3] Deng, X. (2025). Homomorphic Encryption-Based Data Integrity Verification and Anti-Tampering Mechanism in Cloud Storage Environment.
[4] Lin, Z., Liu, X., Xiang, Y., & Hong, Y. (2025). AI End-to-End Autonomous Driving. ynamic covariates under a Bayesian framework. R
[5] Yang, J., Tang, Y., Li, Y., Zhang, L., & Zhang, H. (2025). Cross-Asset Risk Management: Integrating LLMs for Real-Time Monitoring of Equity, Fixed Income, and Currency Markets. arXiv preprint arXiv:2504.04292.
[6] Tang, Y., & Zhao, S. (2025). Research on Relationship Between Aging Population Distribution and Real Estate Market Dynamics based on Neural Networks.
[7] Tu, Tongwei. "SmartFITLab: Intelligent Execution and Validation Platform for 5G Field Interoperability Testing." (2025).
[8] Tu, Tongwei. "AutoNetTest: A Platform-Aware Framework for Intelligent 5G Network Test Automation and Issue Diagnosis." (2025).
[9] Xie, Minhui, and Shujian Chen. "CoreViz: Context-Aware Reasoning and Visualization Engine for Business Intelligence Dashboards." Authorea Preprints (2025).
[10] Wang, J. (2025). Smart City Logistics: Leveraging AI for Last-Mile Delivery Efficiency.
[11] Meng, Q., Wang, J., He, J., & Zhao, S. (2025). Research on Green Warehousing Logistics Site Selection Optimization and Path Planning based on Deep Learning.
[12] Wu, W. (2025). Construction and optimization of intelligent gateway software management platform based on jenkins cluster management under cloud edge integration architecture in industrial internet of things. Preprints, January.
[13] Chen, J. (2025). Data Quality Quantized Framework: Ensuring Large-Scale Data Integration in Gig Economy Platforms.
[14] Xu, Haoran. "UrbanMod: Text-to-3D Modeling for Accelerated City Architecture Planning." Authorea Preprints (2025).
[15] Yuan, J. (2024). Exploiting gpt-4 for multimodal medical data processing in electronic health record systems. Preprints, December.
[16] Li, X., Wang, J., & Zhang, L. (2025). Gamifying Data Visualization in Smart Cities: Fostering Citizen Engagement in Urban Monitoring. Authorea Preprints.

[17] Tang, Y., & Zhao, S. (2025). Research on Relationship Between Aging Population Distribution and Real Estate Market Dynamics based on Neural Networks.
[18] Zhao, S., Lu, Y., Gong, C., & Xu, Q. (2025). Research on Labour Market Efficiency Evaluation Under Impact of Media News Based on Machine Learning and DMP Model.
[19] Chen, K., Zhao, S., Jiang, G., He, Y., & Li, H. (2025). The Green Innovation Effect of the Digital Economy. International Review of Economics & Finance, 103970.