

Design of Ground Pressure Safety Monitoring System Based on SaaS

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ABSTRACT: Sudden ground pressure disasters caused by deep mining such as rock burst and cave-in are major hidden dangers affecting safety production underground mine. The safe and stable operation of ground pressure safety monitoring platform is of great significance for mine safety production. However, many small and medium-sized mining enterprises make slow progress in the construction of the online monitoring platform for ground pressure safety due to the limitations of enterprise scale, capital capacity and other factors. With the development of The Times, SaaS model (software as a service model) develops rapidly with the advantages of Internet, multiple leasing, service and scalability. Through SaaS model, it effectively solves the problem of building a low-cost and high-reliability online ground pressure monitoring platform for Chinese small and medium-sized mining enterprises.

1 INTRODUCTION

Deep mining is inevitable for the development of mining industry. The stress of deep raw rock increases, the strength of ore rock decreases, the rheological properties and mining disturbance increase, which aggravate the hidden danger of sudden ground pressure disasters and major safety accidents such as rock burst and collapse. Ground pressure monitoring technology is an important means of mine ground pressure risk assessment and disaster warning at present [6-7][9-10]. The safe and stable operation of ground pressure safety monitoring platform is of great significance for mine safety production. At present, there are many small and medium-sized mine enterprises, and the scale is small. The mine enterprises mainly adopt traditional software development mode, and the cost of client operation and maintenance is high. At the same time, mining enterprises lack professional IT technical team, which makes many small and medium-sized mining enterprises in the development of ground pressure safety online monitoring system difficult. On the other hand, software suppliers repeatedly develop similar systems for various mining enterprises, and most of them do repetitive work, which is difficult to effectively reduce development costs and improve software innovation, and the traditional software promotion mode is not conducive to the promotion of software suppliers. Aiming at the problem that the traditional software development mode is not conducive to the sustainable development of enterprise users and software suppliers, SaaS mode (software as a service) emerges at the historic moment, it can solve the above problems well under the existing software and hardware conditions. The design of ground pressure safety monitoring system based on SaaS can effectively solve the

problem that mining enterprises cannot build an online ground pressure safety monitoring platform due to small scale and lack of funds, which is of great significance for safety underground mine.

2 METHOD

SaaS, the full name of Software as a Service, is an innovative application mode of application software under the new Internet model [1-2]. Software suppliers deploy application software on their servers in a unified manner. Software users can order application software services from software suppliers through the Internet according to actual work requirements, and pay fees to software suppliers according to the number and duration of the ordered services. Software suppliers provide customized services for software requirements based on SaaS mode. Software operation, data maintenance and management are provided by software suppliers, and mining enterprises do not need to invest in the deployment and maintenance of application software. In the SaaS mode, software can provide offline operation, convenient software configuration and deployment, and further improve the efficiency of users in mining enterprises [3-5]. Software vendors design databases so that all user data is stored in the same set of tables in the same database, adding a user ID flag field to the table to indicate which customer the record belongs to. Therefore, software demanders no longer need to purchase and run application software servers, saving the cost of software installation, software maintenance and data archiving. Data is stored in the servers provided by software suppliers [8]. Traditional projects typically implement a specific system for a specific customer and deploy it within the corresponding enterprise. Different enterprises or organizations deploy

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their own software systems. The SaaS model is to deploy a set of software to a cloud server to provide the same service for different enterprises or organizations. When an enterprise or organization needs to use a service, the software provider establishes an account and assigns an

ID to the enterprise or organization. When the enterprise or organization uses the software, the ID is used to verify and use the software service on demand. The traditional software model versus the SaaS model is shown in Figure 1.

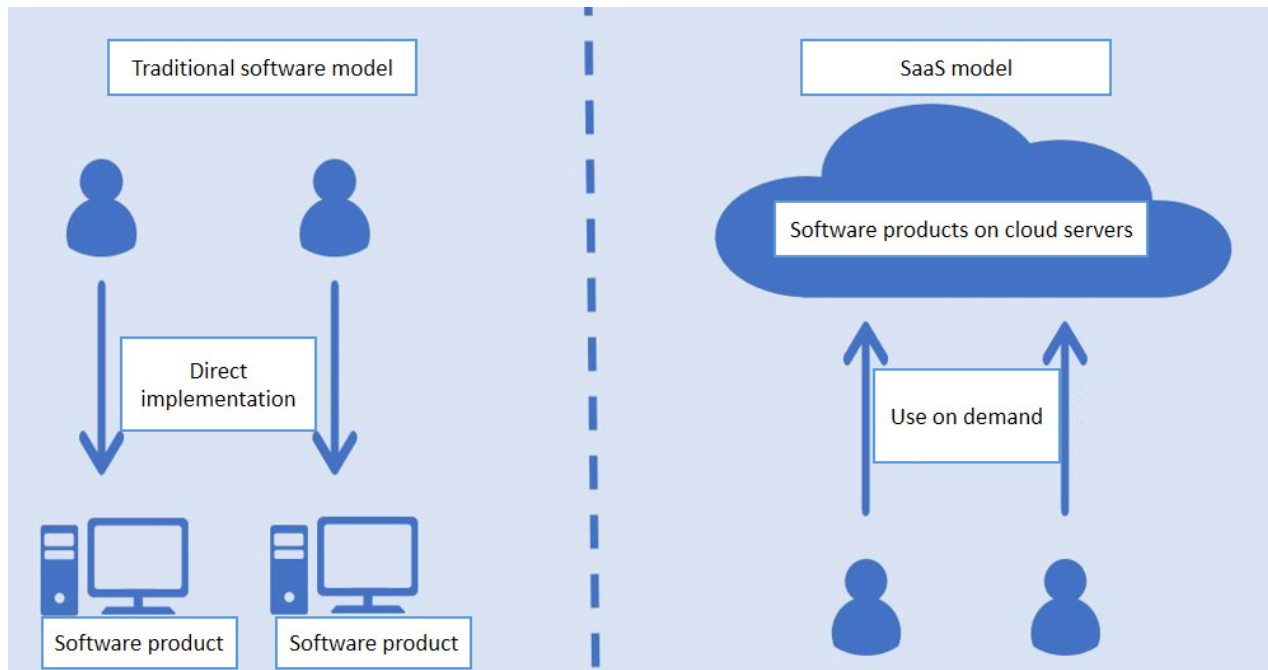


Figure 1. Comparison between Client model and SaaS Client model

3 EXAMPLES

This system is based on B/S architecture and adopts the system architecture of public cloud + private cloud. As shown in Figure 2, it develops WEB access software

service software through Java and manages it uniformly through database. The "large-screen view" is used to display the main information of the mine, including state, statistics, process curve, warning, fault, three-dimensional model, etc. The display content of "large-screen view" can be configured, as shown in Figure 3. The enterprise login interface is shown in Figure 4.

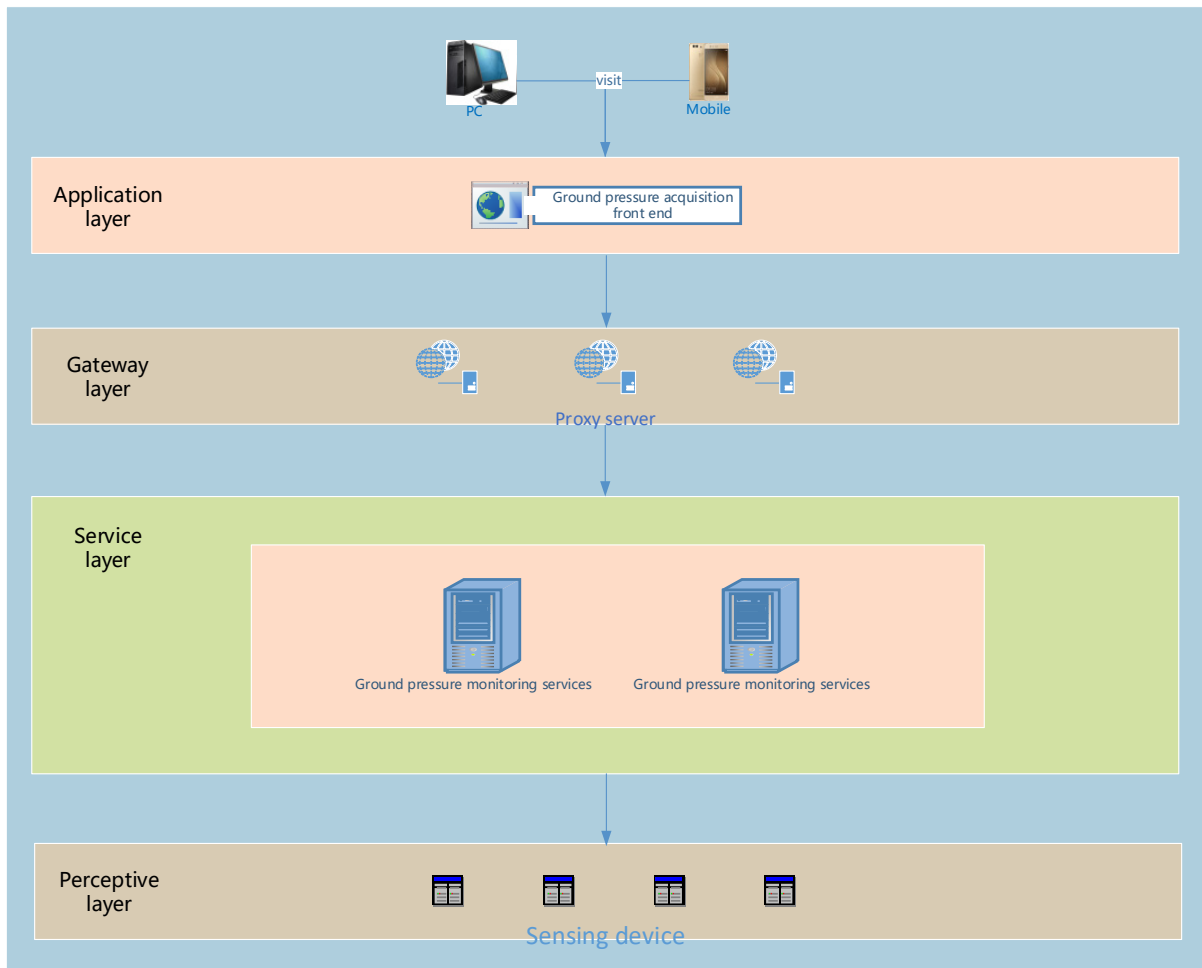


Figure 2. System architecture diagram

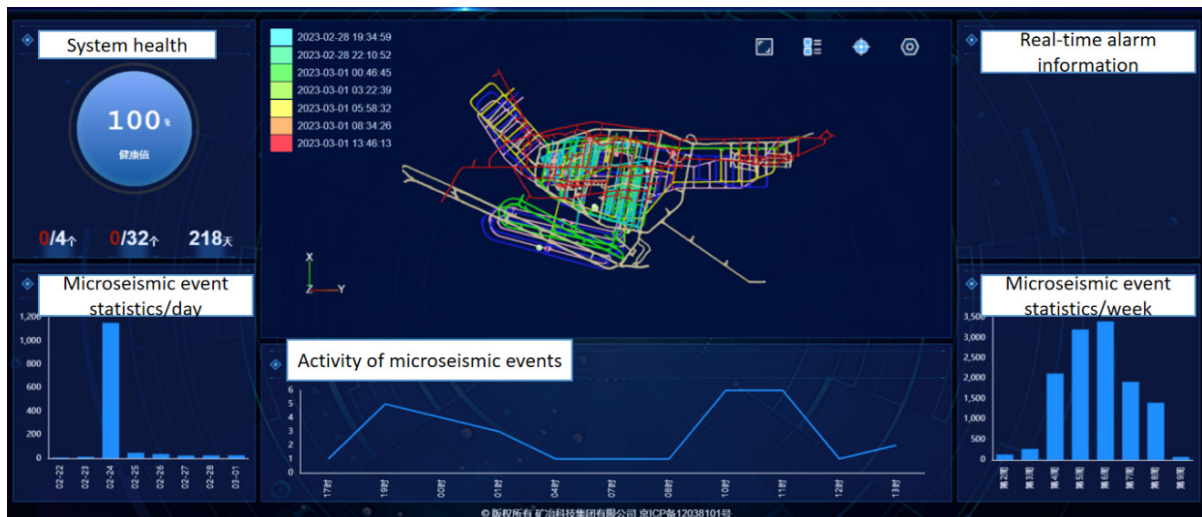


Figure 3: Front page of cloud service platform for ground pressure safety monitoring

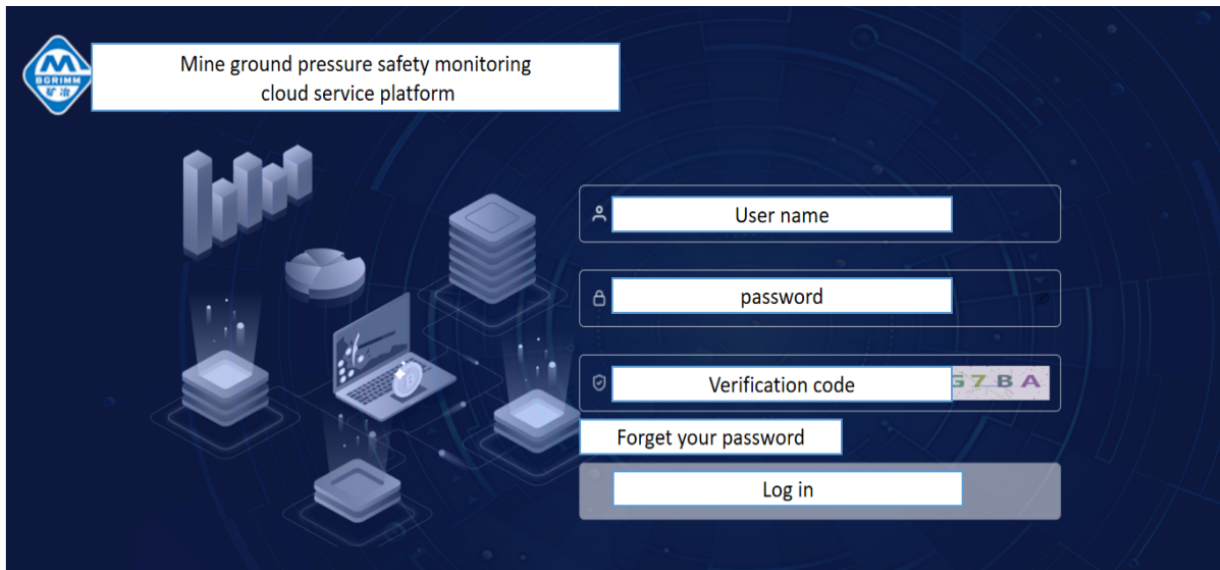


Figure 4:Enterprise user login page

4 CONCLUSION

In this paper, the design of ground pressure safety monitoring system based on SaaS has been completed. Mining enterprises do not need to purchase hardware and software, and they do not need to equip IT practitioners. They only need to purchase required services from software suppliers, which greatly reduces the cost of enterprises. At the same time, the SaaS model supports multi-tenants, and one set of applications can serve the construction of multiple mine ground pressure monitoring platforms, which effectively solves the problem that Chinese small and medium-sized mining enterprises cannot build an online ground pressure monitoring system due to their small scale and lack of funds.

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REFERENCES

1. Yang Ruirun. Research on College Student Examination System Based on SaaS Model [J]. Journal of Lanzhou University of Education,2017,33(1):101-103.
2. Fan Wenbing, WU Yuhao. Design of Express delivery business System based on SaaS Model [J]. Computer Applications,2017,37(S1):312-316.
3. Yin Weifeng.SaaS Multi-tenant data management and implementation Strategy [J]. Software Engineering,2016,19(1):44-47.
4. Pan Hua, Sun Linfu. Research on Adaptive Evolution Technology of SaaS Platform based on Complex Adaptation Theory [J]. Application Research of Computers,2016,33(6):1752-1757.
5. DONG Yan, JING Ruilin, WEI Quanli, et al. Research and Construction of Enterprise Software Application Resource Center [J]. Electronic Technology and Software Engineering,2017(7):67-69.
6. Dai R, Wang Y, Zhang D, et al. A study on microseismic location of velocity partition based on the 3D stations underground mine[C]//International Conference on Advanced Sensing and Smart Manufacturing (ASSM 2022). SPIE, 2022, 12351: 244-248.
7. Feng Xiating. Mechanism, Early Warning and Dynamic Control of Rockburst Incubation Process [M]. Science Press, 2013.
8. LIU Yingjie, Wang Lunyan, HU Fangyuan, et al. Security Access Control in SaaS Model Based on Improved RBAC Model [J]. Modern Computer,2017(15):81-84.
9. Wu S, Wang Y, Zheng Y, et al. Microseismic source locations with deconvolution migration[J]. Geophysical Journal International, 2018, 212(3): 2088-2115.
10. Zhang Da, Dai Rui, Zeng Zhiyi, et al. Microseismic monitoring technology and its application in BSN mine [J]. Earthquake Research in China, 2021, 37(2): 332-348.