Design and Implementation of MQSPT Protocol for Establishing Financial Next-Generation Project PUSH Architecture

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Abstract. PUSH communications technology, which is used to transmit rapidly changing market price information in the financial market, has a significant and immediate influence on profits. Although the PUSH communications technology is introduced to convey critical information, some market price information is omitted because there is a lack of data transmission reliability. This problem leads to omissions of the information on transaction judgment of auto trading system and of inter-user transaction notification, greatly affecting trading profits. Therefore, this thesis proposes a plan to establish and design a PUSH communications system based on Safe Proper Time (SPT) to ensure that market price information is conveyed reliably.

Keywords: SPT, MQSPT, LOW-Latency, PUSH, MQTT Architecture

1   Introduction

The financial system architecture consists of an account system and an information system. In the architecture, the main information of the account system and information system is sent and received via the PUSH system. However, the existing system lacks architectural flexibility and reliability, which means that it fails to flexibly respond to changes in the architecture. As a result, with the passage of time, the system architecture experiences a side effect between systems, and thus has poor functional flexibility and ends up reducing recovery of reliability for performance assurance. Such a problem greatly reduces the usability of the overall architecture, resulting in the need for a massive investment in system reestablishment, which leads into the performance of a Next Generation Project. The next-generation system architecture should be assessed in terms of quality characteristics. To satisfy quality characteristics, it is necessary to design an architecture that meets the needs in terms of functionality, reliability, usability, efficiency, maintainability, and portability. This study attempts to analyze the existing architecture, design MQSPT (Message Queue Safe Proper Time) based on Safe Proper Time (SPT)[1] to guarantee data transmission reliability and low-latency, and establish the target architecture.

2   Related Works

The background to this thesis is the fact that PUSH system has mainly been used as a communications technology to convey main information from financial systems. The stock system architecture as a study subject is designed as shown in Fig. 1. The PUSH system that plays a critical role in transmitting information has the typical function of sending the market price and trading information received from a stock exchange to Home Trading System (HTS) devices and user devices. Such information is very important to users. Another role of the PUSH system is to send messages generated by various issues that occur in trading.
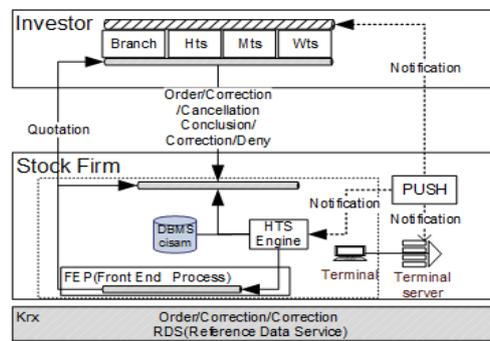

Fig. 1.   PUSH Architecture and Stock System overview

Based on the problems of the above stock system and referring to the ISO9126 quality characteristics standard, the main characteristics in terms of external quality and the sub characteristics of internal quality were defined. Then, the problems of the current system were analyzed.

Table 1.   ISO9126 Quality Characteristics

Main characteristics	Sub characteristics
Functionality	Interoperability, Flexibility
Reliability	Error Tolerance, Recovery
Usability	Understandability, Operability
Efficiency	Performance efficiency, Resource efficiency
Maintainability	Analyticity, Changeability, Stability, Testability
Portability	Environmental adaptability, Portable workability, Consistency

First, according to the analysis of the current stock system from the perspective of functionality, the system was able to transmit information between different systems, thus guaranteeing interoperability. However, since the system had difficulty in changing and designing architecture freely, it is judged that it had poor flexibility. Secondly, from the perspective of reliability, it was found the current system had low data reliability in terms of error tolerance and recovery. It is judged that it didn't guarantee error tolerance to overcome the obstacles of communications lines. Thirdly,

from the perspective of usability, it is judged that understandability and operability, which are related to data application, didn't greatly influence the quality characteristics of the PUSH system. Fourthly, from the perspective of efficiency, it is judged that performance efficiency and resource efficiency didn't greatly affect the current system. Fifthly, from the perspective of maintainability, changeability, safety and testability are most effective. The current system had difficulty with flexible management of the changes in PUSH reception points, and thus it is judged that changeability, safety and testability were weak. Sixthly, from the perspective of portability, portable workability, among its sub characteristics, is the most influencing factor. It is judged that the current system had difficulty in flexibly responding to system architecture change and structural change.

3   Architecture Proposal and SPT Mechanism

The architecture of the stock system that satisfies quality characteristics is presented in Fig. 2.
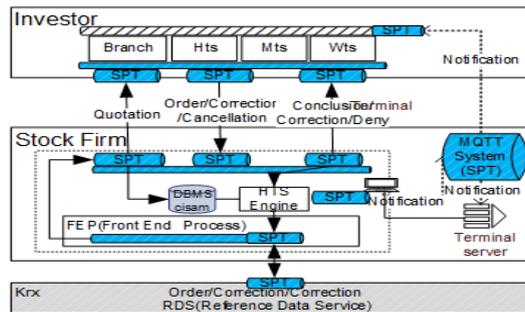

Fig. 2.   The Proposed MQSPT PUSH Architecture

4   Architecture Assessment and Comparison Analysis

Since data are transmitted on the basis of the SPT, it is possible to check the state of communications line for data transmission. When an obstacle occurs in the line, data are put in a queue and processed. Therefore, the reliability of data transmission was guaranteed. The test of data transmission was performed 100,000 times. According to the test, the existing method showed 99.97% success rate, whereas the MQSPT(Message Queue Safe Proper Time) method guaranteed 100% data transmission.

5   Conclusion

This thesis proposed a plan to establish and design a PUSH communications system architecture based on Safe Proper Time (SPT) to ensure that price information is reliably conveyed. The proposed architecture makes it possible to transmit information between different systems and accomplishes a flexible design. According to a test, the SPT ensured reliability. Therefore, error tolerance to overcome the obstacles of communications lines was guaranteed, and system reliability was improved. In addition, it was assessed that it was possible to achieve flexible management and responses to changes of PUSH reception points.

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