

Research on Database Storage Technology based on Consensus Mechanism

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Abstract. With the continuous expanding amount of data and network information, the databases not only require to store the large-scale amount of data, but also demands for protecting the users' privacy information and promise to effectively verify the precise correctness content of the stored data. However, existing databases only guarantee the security of the privacy information and data-sets and have developed numerous encryption techniques to achieve privacy data preserving. There still leaks the verification mechanism for storage technology or the process will cost unacceptable system costs. Therefore, we utilize consensus mechanism to develop a novel database storage technology in the verification procedure in this work. Additionally, the utilization of consensus mechanism can greatly reduce the consensus procedure costs in the databases through our simulation and comparisons with existing storage algorithms. From our extensive experimental results, we can conclude that our model can effectively realize the database storage procedures with reasonable system costs.

Keywords: Databases Storage Technology, Consensus Mechanism, Data Verification, System Costs.

1 Introduction

Database is the main technology for the development and application of today's data storage methods, and the application of database mainly plays the role of data storage and protection^[1]. When the amount of information and data increases dramatically, data plays a key and decisive role in economic development and machine learning models. The improvement and development of database storage technology also shows a trend of complexity and refinement with the change of data storage requirements, especially on the basic concept of the implementation of big data theory and cloud computing technology, database storage technology has become more extensive and downstream applications^[2].

Database storage technology is a type of technology that is used to store and manage data in a structured format. It is used to store and manage large amounts of data in an organized and efficient manner^[3]. Database storage technology is used in a variety of applications, including web applications, enterprise applications, and mobile applications. It is also used to store and manage data for analysis and reporting. Database storage technology is used to store and manage data in a secure and reliable manner, and it is also used to ensure data integrity and accu-

racy. Database storage technology is an essential part of any organization information technology infrastructure, and it is important to ensure that the technology is up-to-date and secure [4].

Subsequently, relational database, as the main application of current database storage technology, can better protect and store data. At the same time, the demand for large number of data storage and security brought about by the theory and practical application of big data is increasing and the emergence of distributed database technology also puts forward new requirements for the development of database storage technology [5]. For distributed relational database systems, the consistency test of relational databases is an important part, and the consistency of database synchronization should be taken into consideration while effectively protecting data security.

Consensus mechanisms are algorithms used to reach agreement among distributed systems. They are used to ensure that all participants in a distributed system agree on the same set of data [6]. Consensus mechanisms are used in distributed systems such as block-chain networks, distributed databases, and distributed ledgers. They are used to ensure that all participants in the system have the same view of the data and that the data is consistent across all participants.

Consensus mechanisms are designed to be secure, reliable, and efficient, and they are used to ensure that all participants in the system agree on the same set of data. Consensus mechanisms are an essential part of distributed systems, and they are used to ensure that the data is secure and reliable [7].

The remainder of this paper will be arranged as an introduction of background knowledge and related contributions about databases storage technology shows in Section 2. Subsequently, Section 3 will introduce the procedures and framework of proposed model and Section 4 includes the experimental results and comparisons analysis for the proposed mechanism. Finally, the model conclusion and future improvement methods are illustrated in Section 5.

2 Related Works

Initially, researcher Cui proposed a relational database synchronization method based on SQL data-level trigger-ability considering the nature of data forwarding in the application scenario of gateway deployment [8].

With the continuous contribution on consensus mechanism, researcher Zhang proposed embedding effective distributed control into distributed controllers in area of electronic allocation tasks. By automatically and appropriately distributing power between connected buses, the incremental cost consensus algorithm can dispose the traditional centralized scheduling problem in a distributed manner by selecting the incremental cost of each generating unit as the consensus variable [9].

3 Model Framework

Initially, demonstrate the proposed model in Figure 1. Initially, we establish a consensus mechanism to ensure that all nodes in the database storage network are in an agreement on the data stored. Developing a distributed ledger system to store the data in a secure and immutable manner.

Through utilizing a consensus algorithm to ensure that all nodes in the network agree on the data stored in the distributed ledger. The model implements a system of penalties to discourage malicious actors from attempting to manipulate the data stored in distributed ledger.

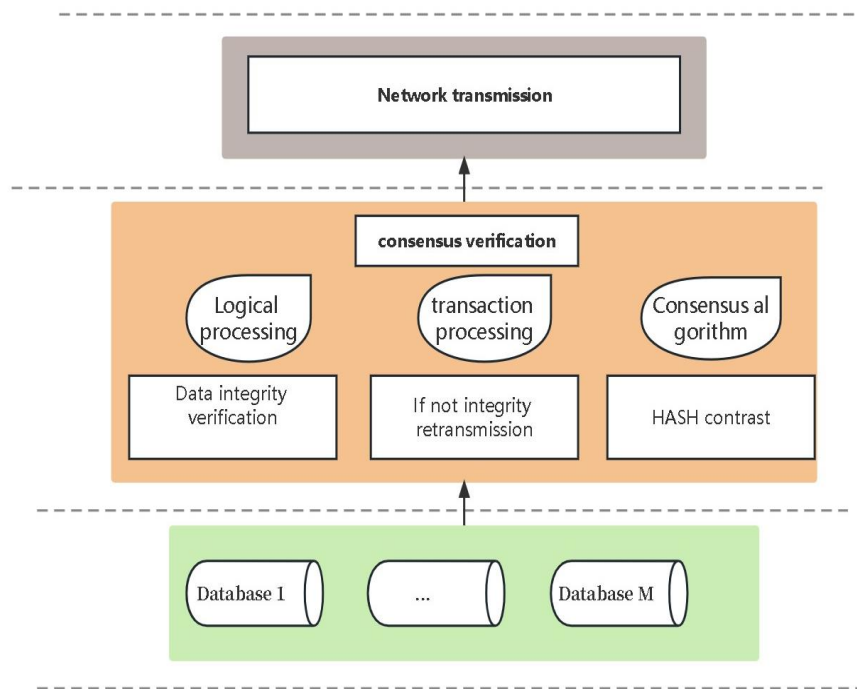


Fig. 1. Model framework.

After acquiring the basic structures of storage mechanism, we demonstrate the specific procedures of proposed model as following items.

- Establish the network: The database system should be set up as a distributed network with multiple nodes or servers. Each node should be connected to the network and have access to the same database.
- Define the database schema: The database schema should be defined, including the tables, columns, and relationships between them. This will ensure that all nodes in the network have a consistent view of the database structure.

- Implement the consensus mechanism: The chosen consensus mechanism should be implemented in the database system. This will involve defining the rules for validating transactions and reaching consensus on the state of the database.
- Validate transactions: When a transaction is submitted to the database system, it should be validated by the nodes in the network. The validation process will depend on the chosen consensus mechanism, but it will typically involve checking the transaction for correctness and ensuring that it meets certain criteria.
- Reach consensus: Once a transaction has been validated, the nodes in the network should work together to reach a consensus on the state of the database. This will involve comparing the transaction with the current state of the database and agreeing on the new state.
- Update the database: Once consensus has been reached, the database should be updated to reflect the new state. This will involve updating the relevant tables and columns to reflect the changes made by the transaction.
- Maintain the network: The network should be maintained to ensure that it remains secure and reliable. This will involve monitoring the nodes in the network, updating the software as necessary, and implementing security measures to prevent attacks.

4 Experimental Simulations and Results Analysis

In this section, we simulate the proposed model with existing heap storage (HS), sequential storage (SS) and multi-table aggregate storage (MAS) methods and demonstrate the storage cost comparison results in Figure 2.

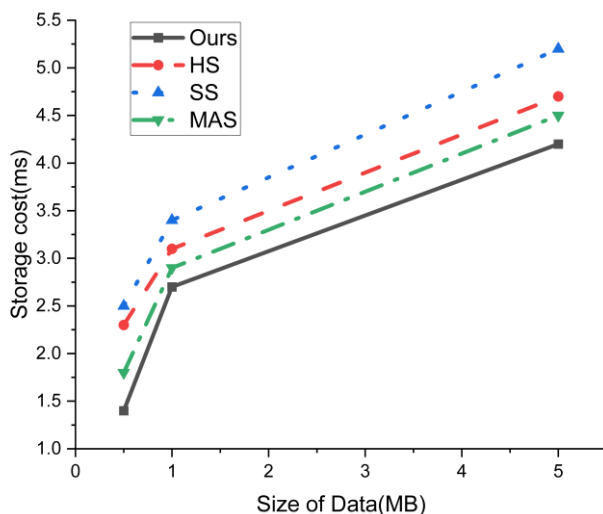


Fig. 2. Storage computation costs comparison results.

Additionally, the storage accuracy is another essential metric to measure the performance of proposed storage method and following Figure 3 shows the storage accuracy comparison results.

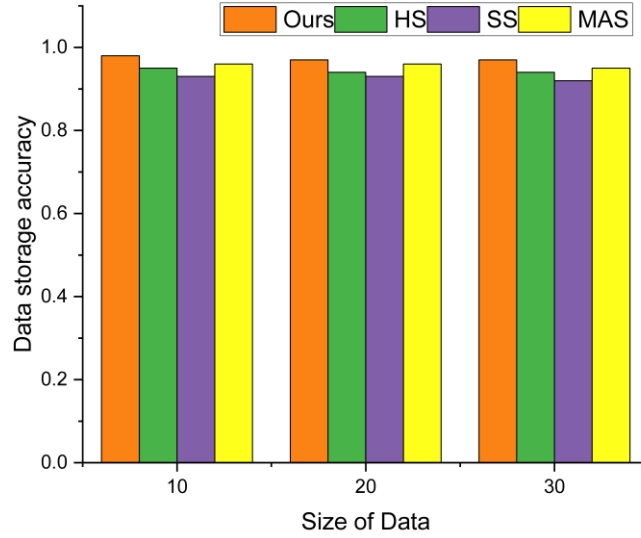


Fig. 3. Storage accuracy comparison results.

Furthermore, the computation costs affects the disposing effectiveness of storage methods and we compare our model average 1MB computation costs with existing methods by storing the certain size 100MB data. Following Table 1 shows the comparison results of simulation results.

Table 1. Average computation costs comparison results.

Models	Computation Cost(second)
Ours	1.4
HS	1.7
SS	1.1
MAS	1.5

The experimental analysis of database storage technology based on consensus mechanism has shown that it is a secure and reliable way to store data. Additionally, data replication and encryption have been shown to be effective in ensuring that the data stored in the distributed ledger is available to all nodes in the network and is kept secure and private. Overall, the experimental analysis of database storage technology based on consensus mechanism has shown that it is a secure and reliable way to store data.

5 Conclusion

In conclusion, database storage technology based on consensus mechanism is a secure and reliable way to store data. By utilizing a distributed ledger system, cryptographic algorithms, consensus algorithms, and a system of incentives, rewards, and penalties, the data stored in the distributed ledger can be kept secure, immutable, and up-to-date. Additionally, data replication and encryption can be used to ensure that the data stored in the distributed ledger is available to all nodes in the network and is kept secure and private. With these measures in place, database storage technology based on consensus mechanism can provide a secure and reliable way to store data.

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