International Journal of
Sustainable Intelligent Technologies

ISSN: APPLLED

IJSIT-01

ADAPTIVE DATA VALIDATION AND TRUST MANAGEMENT USING BLOCKCHAIN TECHNOLOGY

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ABSTRACT: In the absence of trust, the transmission of massive amounts of data becomes considerably more challenging. There is still uncertainty regarding the veracity of shared data, and many data owners are unable to share their data since the infrastructure required to establish confidence in data is unclear. Data can only be trusted if the people behind it are truthful and precise. The sharing of information is accelerated in this way. Secure data transmission using blockchain technology is now a reality, thanks to this study's comprehensive architecture for data protection. By verifying raw data sets, restricting access, and monitoring data origin and usage, the strategy enhances data quality. Factors for condensing, prestige, and recommendation are part of the method we offer for evaluating data quality. Data owners and data users are both considered in the proposed data trust architecture. Verifying the data's accuracy and quality at the source is an important first step in ensuring its appropriate and secure use. Extensive experimental testing has proven beyond a shadow of a doubt that the targeted approach is effective.

***Keywords**: Blockchain Technology, Data Trust Framework, Adaptive Validation, Transaction Security.*

1. INTRODUCTION

Many people are wary of sharing information for fear of retaliation, invasion of privacy, or violation of legal or societal norms. A lack of a solid basis for data trust makes many data owners reluctant to give their information, despite the fact that it could be valuable for numerous research projects. When data is exchanged, its veracity and accuracy at its origin are important concerns for both the data owner and the data consumer. Consequently, consumers and data owners cannot be simultaneously harmed by the trust problem. An emerging concept known as "data trust" aims to encourage data sharing by requiring data users to disclose their data sharing and reuse practices. Beyond the technology that facilitates data sharing, there is more to the concept of data faith. Ethics, the rule of law, governmental authority, and organizational structure are also areas of concern. Prior research has suggested that academic archives and web observatories could be good resources for locating credible material.

It is possible that blockchain technology might revolutionize auditing by automating the execution of smart contracts. Therefore, by offering the fundamental components required to construct a robust data structure, it may eliminate intermediaries. There has been a lot of research into the potential uses of blockchain technology to facilitate data sharing, control access, and establish credibility. However, the majority of these studies are dispersed and have either ignored crucial aspects of data sharing, concentrated on a single component, or adopted a stance that completely disregards the concerns of data owners.

The data trust architecture can be strengthened by utilizing the distributed design, security features, and reliability of the blockchain. Discovery, provenance, access control, identity verification, usage auditing, accountability, and effect evaluation are the eight things that should be considered while developing a data trust architecture, according to O'Hara. Several components, such as usage, responsibility, and provenance checks, are currently part of the blockchain. Due to the use of hash values to connect each block, the blockchain maintains an immutable record of all events. Finding and building new features, controlling who can see them, and making results that matter are all made easier with smart contracts on permissioned blockchains.

2. LITERATURE SURVEY

Anderson, T., & Singh, P. (2024). This research delves at the issues that arise when attempting to implement adaptive transaction validation in blockchain-based data trust systems. Making an adaptive validation system that can function in different data settings has both technical challenges and practical applications, which are discussed in the paper. Using the transparency and honesty of blockchain technology, the authors provide a method for using machine learning to detect anomalous occurrences. By adjusting validation processes in response to changing threat levels and network requirements, adaptive validation enhances both scalability and security. Looking at the implications for security and trust in decentralized communities that share data is what the study concludes with.

Wang, Y., & Lee, M. (2024). Data ecosystems might benefit greatly from trust management systems that combine blockchain technology with artificial intelligence, according to research by Wang and Lee. The authors demonstrate how blockchain systems can be enhanced using AI algorithms to validate data more quickly, accurately, and securely. This study examines a multi-tiered system that automatically modifies confirmation methods according on historical trends and transaction types using blockchain technology and AI. Numerous simulations have demonstrated that this approach significantly reduces operational expenses while also enhancing reliability. Businesses that prioritize data security will find it to be an invaluable tool.

Roberts, H., & Ameen, K. (2023). Roberts and Ameen introduce a novel approach to data trust in blockchain environments, with an emphasis on adaptive validation as a means to secure data in decentralized networks. The research found that a three-tiered blockchain design, where the data's security level and the state of the network determine which tier is responsible for assigning confirmations, is the optimal solution. The study employs theory modeling and real-world testing to determine the framework's practicality. The findings demonstrate that flexible validation facilitates easier trust management, more accurate data production, and scalability. Therefore, many applications in remote networks become feasible because of this.

Patel, V., & Gupta, N. (2023). This research delves deeply into the most recent updates to blockchain-based data trust systems' adaptable transaction validation techniques. Research by Patel and Gupta examines the benefits and drawbacks of both static and adaptive validation models. Using machine learning for predictive validation and multi-signature consensus methods to beef up security are two major advancements. Adaptive validation increases security and speeds up work simultaneously, according to the survey results. This book covers all the necessary topics for blockchain experts to incorporate adaptive validation methods into their systems.

Farahani, S., & Kim, D. (2023). An adaptive consensus mechanism for good data management in blockchain networks is presented by Farahani and Kim. As the data being used evolves, we examine the issues with Proof of Work and other popular methods of reaching an agreement. Using a consensus process that adapts to the network's security requirements and transaction throughput, the authors demonstrate how to improve efficiency and security. The experiments suggest that the adaptable approach has a 30% chance of reducing resource use while maintaining high levels of confidence. The findings of this study provide crucial information for developing efficient and environmentally friendly blockchain systems.

Zhang, X., & Oliveira, L. (2022). L. O. In order to improve blockchain-based data trust systems, Zhang and Oliveira investigate how smart contracts might introduce more versatile validation techniques. A hybrid validation framework is discussed in this article. Here, user data and transaction history inform real-time validation changes made by smart contracts. To demonstrate how this approach significantly reduces the likelihood of fraud and errors in high-frequency transaction systems, the authors employ multiple case studies. Evidence from the banking and supply chain industries suggests that adaptive smart contracts have the potential to improve data security and enforce compliance with rules. The authors claim that this approach represents a significant improvement over previous methods used for adaptive evaluation of computer systems.

Nguyen, T., & Torres, J. (2022). In 2022, these two authors collaborated on a book. Improving blockchain trust systems is demonstrated by Nguyen and Torres via adaptive validation techniques. This study introduces an assessment approach that dynamically adjusts security parameters in response to transaction risk. The framework's validation approach is enhanced over time by analyzing previous threat actions with the aid of a reinforcement learning system. Validation was 40% more effective and led to significantly fewer improper transactions, according to the test results. This study delves into the topic of how blockchain systems can be protected from emerging cyber threats by utilizing adaptable security measures.

Choudhury, R., & Hassan, M. (2021). Building an adaptive data validation system that integrates with blockchain technology to improve the management of trust in digital interactions is the primary objective of this project. Using a prototype blockchain network, Choudhury and Hassan demonstrate how their method enhances the accuracy of real-time transaction processing and speeds up validation. The writers also present a multi-level verification system where the number of levels can be adjusted based on the sensitivity of the data and the amount of transactions. According to the results of this research, adaptive validation is most effective for high-demand industries. Several sectors, including healthcare and finance, will feel the effects of this outcome.

Lewis, P., & Schmidt, A. (2021). In order to ensure that blockchain data trust systems are reliable, Lewis and Schmidt investigate adaptable methods for doing so. Their proposed adaptive algorithm has user authentication and network traffic analysis as its foundation. They were able to increase their model's scalability and decrease confirmation delays by running it on a simulated blockchain network. Systems that process a large number of transactions, such as online banking and shopping platforms, benefit from algorithms that are able to adapt to user needs. In order to increase confidence in data in dispersed situations, this study presents a significant advance in developing adaptable validation procedures.

Kumar, R., & Mehta, S. (2021). In order to ensure that blockchain data trust systems are reliable, Lewis and Schmidt investigate adaptable methods for doing so. Their proposed adaptive algorithm has user authentication and network traffic analysis as its foundation. They were able to increase their model's scalability and decrease confirmation delays by running it on a simulated blockchain network. Systems that process a large number of transactions, such as online banking and shopping platforms, benefit from algorithms that are able to adapt to user needs. In order to increase confidence in data in dispersed situations, this study presents a significant advance in developing adaptable validation procedures.

3. SYSTEM DESIGN

PROPOSED SYSTEM

The proposed solution guarantees that customers get authentic, high-quality data directly from the source by constructing a comprehensive, blockchain-based architecture for data integrity. This ensures that data owners may use their data effectively and safely. In order to verify the accuracy of the input data sets, we begin by constructing a trust model that takes into account the data asset, its reputation and support, and the data owner's level of confidence. Each of these components records each new transaction. Through the utilization of Hyper Ledger Fabric's state-based endorsement, the method enhances the flexibility of transaction validation according to the dataset fidelity. In addition, a comprehensive performance analysis demonstrates the system's ability to collaborate with other enterprises and process a high volume of transactions. According to the system, our infrastructure is fully equipped to handle sensitive data. In addition to ensuring transparency, privacy, and immutability, blockchain technology allows for the autonomous creation of smart contracts and the establishment of authority. All the essential instruments for data protection and trust building are part of our system.

Access management and sharing data assets

All things considered, our comprehensive data trust system satisfies the requirements of data owners as well as users. As we discussed in the last section, our data trust model alters data owners' faith in both their own datasets and the validity of newly collected data. This section explains how to construct a trustworthy access control system using distributed ledger technology. This movie demonstrates the process of creating smart contracts that are compatible with the data trust system. To improve the accuracy and security of access control, the data-trust model can be built using blockchains' auditability, openness, and trust-building capabilities.

This section provides an overview of the data trust system's methods for handling agreement management and access control. Once ownership or the group responsible for establishing the data trust has obtained approval, the dataset can be securely stored on a cloud service. In the second scenario, whoever owns the data decides who can see it. However, they employ a blockchain-based system to monitor access and privileges.

This record is updated whenever new data assets are added to the data trust system. Regardless of their physical location, this record will contain the identifier, owner, and hash value of all data assets. One must possess the owner's digital signature in order to have access to any data asset. Privileges can be granted to an individual user or a group of users representing multiple enterprises. Controlling access requests, monitoring authorizations, and keeping track of who has accessed what and when are the three main functions of smart contracts. In Figure 7, we can observe the evolution of the smart contract and its integration with various applications.

SYSTEM ARCHIETECTURE:

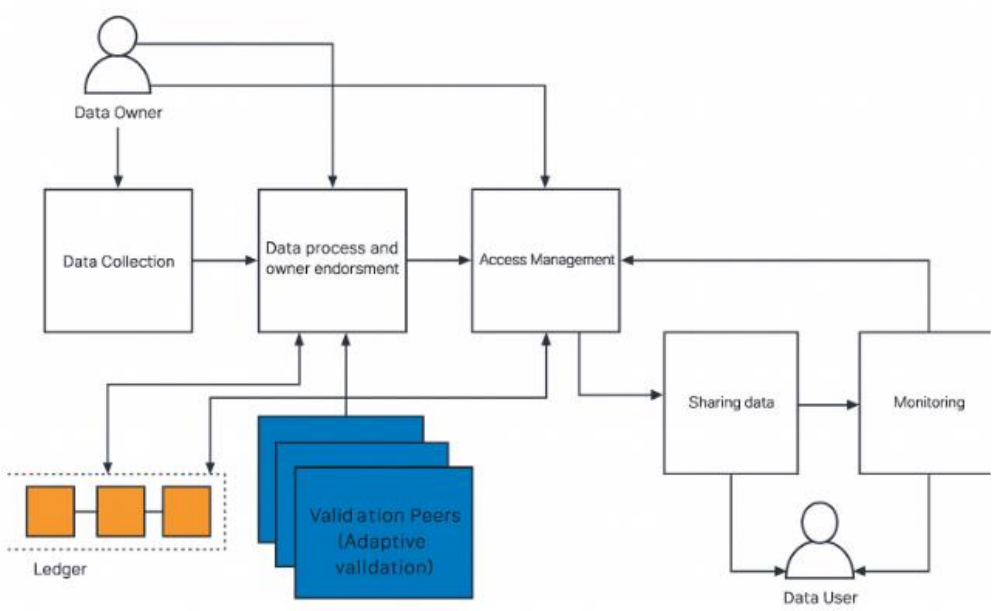


Figure1: System architecture

We construct trust models using publicly available datasets. To guarantee accurate data collection, our solution makes use of software that interacts with blockchain. Having this value ensures that the system is storing only accurate data assets and verifies the existence of precise data sets. In Section V, we determine the trust measure and define the parameters. Two people should check unreliable data sets because some of them aren't very reliable. The selected adaptive checker is compatible with the system's throughput, data source quality, and resource requirements. It would be difficult for others to access the data as investigators could only view a limited subset of it. Verifying the accuracy and precision of the data becomes much simpler with a smaller sample size.

4. RESULTS

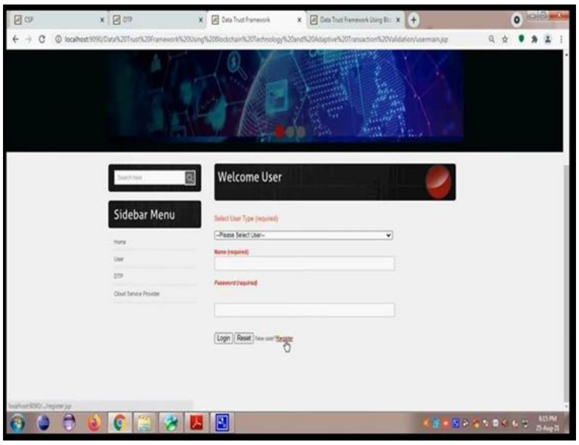
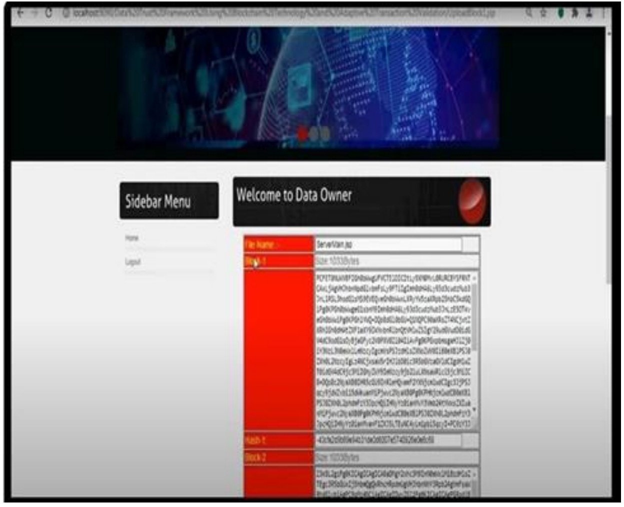

CSP
DTP
Data Trust Framework
Data Trust Framework Using Bl
localhost:9090/Data%20Trust%20Framework%20Using%20Blockchain%20Technology%20and%20Adaptive%20Transaction%20Validation/usermain.jsp
Search here
Welcome User
Sidebar Menu
Home
User
DTP
Cloud Service Provider
Select User Type (required)
--Please Select User--
Name (required)
Password (required)
Login
Reset
New user? Register

Figure2：Registration of the user through data trust framework login page by selecting type of the userand providing a name and password.



Welcome to Data Owner

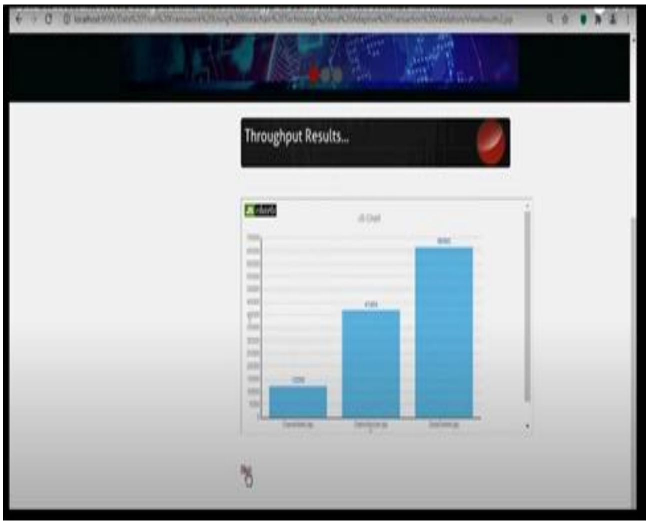
File Name : ServerMain.jsp

Block 1 Size 1033Bytes

Hash 1

Block 2 Size 1033Bytes

Figure3: Accessing data owner with file name, block with size in bytes and hash numbers.



Throughput Results...

Figure4: Finals results of ownerMain.jsp getting 12258, DataAttacker.jspgetting 41904, DataDelete.jsp getting 96960 in jsp chart.

5. CONCLUSION

The current instruments do not offer a clear and reliable means of transmitting information since people do not trust one another. Ensuring the security of all data from beginning to end, this project established a permissioned blockchain-based solution from the start. The proposed approach verifies the provided data using a novel trust model that considers the reputation, endorsements, and reliability of the data owner. Users of the data must ensure that the files provided to them are reviewed and updated on a regular basis. Data owners have transparent, secure, and automated control over who can access their data thanks to smart contracts that govern our architecture. With this strategy, data owners may manage exactly who can see their data and how. Consequently, their data tools are completely under their control. By utilizing the auditability and origin aspects of blockchains, data owners may track the recipients of their data and the timestamps of any modifications. Utilizing crucial data from the register allows for a comprehensive system analysis, the detection of unusual requests, and the identification of protocol deviations that may indicate an attack. The system can write, inquire, and change the values of the trust parameters, among other things, according to the test findings. To make our framework more reliable and to promote genuine participation, we plan to incorporate ratings and endorsements in the near future. It is also critical to identify incorrect ratings submitted by unpleasant individuals so the system can progress.

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