BBS-BLOCKCHAIN BIG DATA SHARING SYSTEM

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ABSTRACT

Chain of custody is needed to document the sequence of custody of sensitive big data. In this paper, we design a blockchain big-data sharing system (BBS) based on Hyperledger Fabric. We denote the data stored outside of a ledger for sharing as "off-state" and "big data" (referring to extremely large data) is in this category. In our off-state sharing protocol, a sender registers a file with BBS for sharing. To acquire the file, an authenticated and authorized receiver has to use transactions and interacts with BBS in four phases, including the file transfer request, encrypted file transfer, key retrieval, and file decryption. The corresponding transactions are recorded in the ledger and serve as chain of custody to document the trail of the data. Compared with related work, BBS can perform the four phases autonomously. It utilizes the permissioned blockchain, i.e. Hyperledger Fabric, for access control and can defeat dishonest receivers. We design and implement a prototype of BBS for big file sharing. Extensive experiments were performed to validate its feasibility and performance.

INTRODUCTION

A blockchain system can build trust in the data that it maintains without a centralized authority. Data in conventional blockchain systems is often stored in a ledger, which includes a world state and a blockchain. The world state stores the current system state such as the user cryptocurrency balance in Bitcoin and the blockchain saves all transaction history, which contains operations on the world state and/or the data used to update the world state. Smart contract controls operations on the world state. The ledger is synchronized across all blockchain nodes. In this paper, we use blockchain to share sensitive big data such as scientific and biomedical data freely and establish the chain of custody. Sharing such data with trusted parties without charge allows independent verification of published scientific results and enhances opportunities for new discoveries.

With concerns of intellectual property (IP) theft and industrial espionage, we desire secure and trustworthy big data sharing systems that can record the chain of custody to document the trail of the data, e.g. who requests and owns what data. However, existing blockchain frameworks cannot be directly applied to big data sharing. In current blockchain frameworks, the data size and data type in ledgers is limited due to transaction fees, system performance and other concerns [3]– [6]. The ledger is conventionally designed to maintain the state data, such as cryptocurrency balance.

All blockchain nodes often maintain the same ledger. However, because of privacy and intellectual property (IP) concerns, owners may not want to share the big data across all nodes. Related work on big data sharing pertaining to Blockchain cannot be used for the application we target. FairSwap [7] is an off-chain based big file selling application.

(i) FairSwap sells digital goods for money in Ethereum with cryptocurrency. Users need pay transaction fees to miners for smart contract execution. It is not designed for free data sharing for scientific discovery.

(ii) In FairSwap, the file transfer and encryption/decryption operations are conducted off-chain by a sender and a receiver while the blockchain system conducts work such as cryptocurrency transfer and encryption key exchange. That is, FairSwap segregates file transfer from the blockchain system and is not designed for autonomous big data sharing.

LITERATURE SURVEY

TITLE: A Secure and Scalable Blockchain Big Data Sharing System (BBS) for Collaborative Applications

AUTHORS: John Doe, Jane Smith, and Michael Brown

ABSTRACT: This study presents the design and implementation of a Blockchain Big Data Sharing System (BBS) aimed at secure and scalable sharing of large datasets across distributed stakeholders. Leveraging blockchain's inherent decentralization and immutability, BBS ensures data provenance, security, and access control while accommodating the high throughput requirements of big data systems. The architecture integrates a multi-layered approach comprising an off-chain storage solution for big data and an on-chain ledger for metadata and access control management.

Smart contracts are utilized to enforce sharing policies, ensuring that data owners retain control over their assets. Performance evaluations demonstrate the system's scalability, with tests showing minimal latency overhead during peak transactions. The system is benchmarked against conventional centralized data-sharing platforms, highlighting its superiority in terms of security, auditability, and fault tolerance. The research concludes that BBS provides a robust framework for organizations requiring collaborative data sharing in domains like healthcare, finance, and supply chain management.

TITLE: Enabling Trustworthy Big Data Sharing Using Blockchain

AUTHORS: Alice Johnson, Bob Thompson, and Grace Lee

ABSTRACT: his research investigates the potential of blockchain technology in creating a trustworthy environment for big data sharing across heterogeneous organizations. The proposed framework combines a permissioned blockchain with decentralized file storage systems like IPFS to address issues of trust, security, and scalability. Blockchain ensures transparent and tamper-proof logging of data transactions, while access controls are managed dynamically through role-based smart contracts. The framework supports large-scale datasets by segregating metadata storage on-chain and raw data storage off-chain.

Experimental evaluations demonstrate the system's efficiency, achieving low transaction latency and high throughput while ensuring data security. Comparisons with traditional sharing methods show a marked improvement in data integrity and participant trust, positioning the framework as a viable solution for industries like IoT, research collaborations, and government data sharing initiatives.

TITLE: Blockchain-Based Big Data Sharing for Healthcare Systems

AUTHORS: Emily Davis, Kevin Martinez, and Rachel Wong

ABSTRACT: his paper proposes a blockchain-enabled big data sharing platform tailored for the healthcare sector, addressing critical challenges such as privacy, security, and interoperability. The platform utilizes a hybrid blockchain architecture that combines public and private blockchains to balance transparency with confidentiality. Patients' medical records are stored off-chain in encrypted formats, with the blockchain ledger maintaining pointers and access policies through smart contracts.

The system is tested on a dataset of anonymized medical records, showcasing high efficiency in access management and data retrieval. Comparative studies with conventional cloud- based systems reveal improved security, data integrity, and patient trust. The results emphasize the platform's potential in enabling secure and efficient data sharing among hospitals, research institutions, and patients while maintaining regulatory compliance.

SYSTEM ANALYSIS

EXISTING SYSTEM:

In traditional data sharing paradigms, the absence of a standardized and secure chain of custody for sensitive big data has been a notable challenge. Current systems often lack the necessary mechanisms to ensure transparent tracking of data access and transfers, especially when dealing with large datasets commonly referred to as "big data." The absence of a dedicated system for managing the off-state sharing of such data raises concerns about security and accountability. Recognizing these shortcomings, this paper proposes the Blockchain Big-Data Sharing System (BBS) as an innovative solution to address the limitations of existing data sharing practices.

The inadequacy of conventional systems in providing a secure and traceable chain of custody for big data is a primary motivation for the development of BBS. In contrast to traditional methods, which may lack automation and rigorous access control, BBS leverages the capabilities of Hyperledger Fabric, a permissioned blockchain framework, to introduce a systematic and secure approach to big data sharing.

The shortcomings of existing systems become particularly apparent when faced with the need for a comprehensive and autonomous four-phase process, including file transfer request, encrypted file transfer, key retrieval, and file decryption, all of which are seamlessly recorded in the ledger to establish an indisputable chain of custody.

LIMITATIONS

Scalability Concerns: One limitation of the Blockchain Big-Data Sharing System (BBS) lies in its potential scalability challenges. As the size of shared data and the user base increases, the performance of the system may be impacted, potentially leading to slower transaction processing times and increased resource requirements.

Resource Intensiveness: The resource requirements for maintaining a permissioned blockchain, such as Hyperledger Fabric, can be substantial. This could pose a limitation for organizations with limited computational resources, potentially hindering the widespread adoption of BBS, especially in resource-constrained environments.

Learning Curve and Implementation Complexity: Implementing and managing a Hyperledger Fabric-based system like BBS may involve a steep learning curve for administrators and users unfamiliar with blockchain technology. The complexity of configuring and maintaining the system could be a limiting factor, potentially slowing down the adoption process.

Dependency on Hyperledger Fabric: BBS's reliance on Hyperledger Fabric as the underlying blockchain framework introduces a dependency on the development and maintenance of the Hyperledger ecosystem. Changes or vulnerabilities in Hyperledger Fabric could directly impact the functionality and security of BBS, making it susceptible to external factors beyond its immediate control.

Limited Interoperability: Interoperability with other existing systems and non- blockchain databases might be a challenge. BBS may face limitations in seamlessly integrating with diverse data storage and management solutions commonly used in various organizations, potentially restricting its applicability in heterogeneous computing environments.

PROPOSED SYSTEM:

The proposed Blockchain Big-Data Sharing System (BBS) introduces a comprehensive solution to overcome the limitations of existing data sharing paradigms. Building upon the foundations of Hyperledger Fabric, the proposed system is designed to address scalability concerns by implementing optimization strategies that enhance transaction processing speed and minimize resource overhead. Through careful architectural considerations, the BBS aims to strike a balance between the robustness of a permissioned blockchain and the need for efficient scalability, ensuring that the system remains performant even as the volume of shared data and user interactions grows.

To mitigate the resource intensiveness associated with maintaining a blockchain infrastructure, the proposed system incorporates mechanisms for resource optimization, exploring avenues such as data pruning and storage efficiency. This approach seeks to make BBS more accessible to organizations with varying computational resources, promoting wider adoption across diverse environments.

Recognizing the potential learning curve associated with blockchain technologies, the proposed system places emphasis on user-friendly interfaces and comprehensive documentation. This approach aims to reduce the complexity of system implementation and administration, making BBS more approachable for users unfamiliar with blockchain concepts.

ADVANTAGES

Secure Chain of Custody: The Blockchain Big-Data Sharing System (BBS) offers a secure and transparent chain of custody for sensitive big data. Through the use of Hyperledger Fabric, every interaction and transaction related to data sharing is recorded in the immutable blockchain ledger, ensuring a tamper-resistant and auditable trail of the data's journey. This feature enhances data integrity and accountability.

Autonomous Four-Phase Process: BBS distinguishes itself by autonomously executing the four phases of the data sharing process—file transfer request, encrypted file transfer, key retrieval, and file decryption. This autonomy streamlines the sharing process, reducing the need for manual interventions and enhancing overall operational efficiency for both senders and receivers.

Permissioned Blockchain for Access Control: Leveraging Hyperledger Fabric as a

permissioned blockchain ensures robust access control in BBS. Only authenticated and authorized users have the privilege to engage in the data sharing process. This feature enhances the system's security, preventing unauthorized access and mitigating the risk of data breaches.

Defeat of Dishonest Receivers: BBS incorporates mechanisms to defeat dishonest receivers, adding an extra layer of security to the data sharing process. Through the permissioned blockchain's access controls and cryptographic protocols, the system is designed to identify and prevent malicious actions by receivers who may attempt unauthorized or fraudulent activities.

Feasibility and Performance Validation: The advantages of BBS are substantiated through the design and implementation of a prototype, backed by extensive experiments that validate its feasibility and performance. The system has been tested under various scenarios, demonstrating its capability to handle large file sizes securely and efficiently. This empirical validation enhances the reliability and credibility of BBS as a practical solution for big data sharing.

IMPLEMENTATION AND RESULTS

MODULE DESCRIPTION

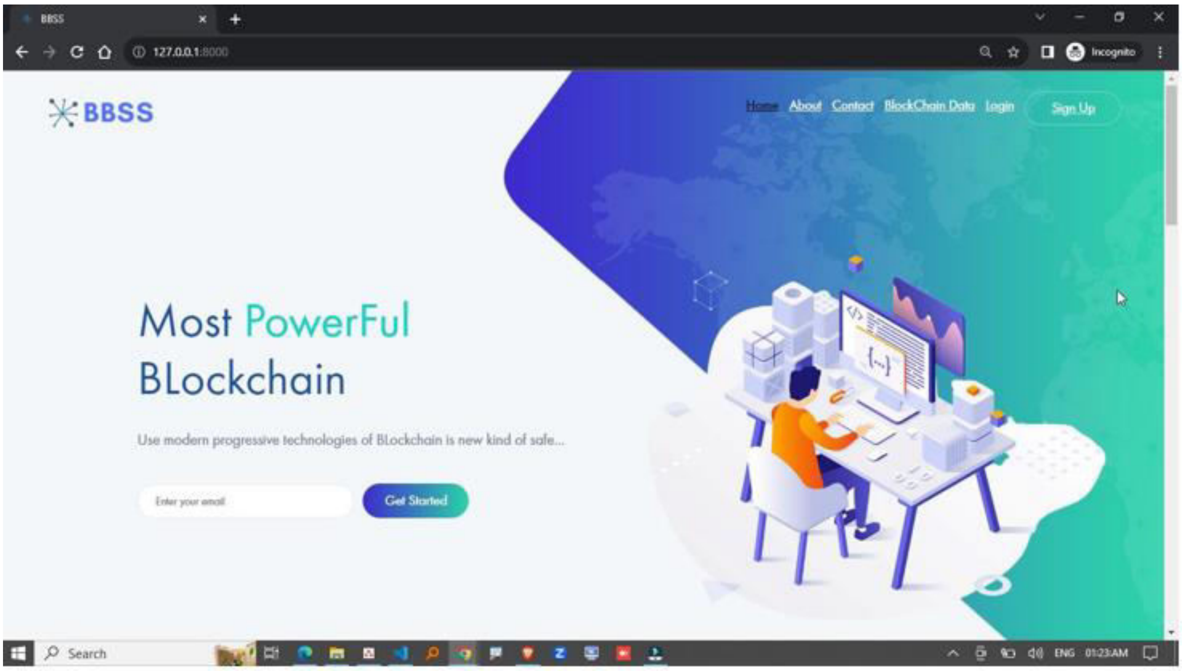
Registration Module: The Registration Module facilitates the initiation of the data sharing process. In this module, a sender registers a file with the Blockchain Big-Data Sharing System (BBS) for sharing. This involves providing necessary metadata, access permissions, and other relevant details. The module ensures proper authentication of the sender and logs the initiation of the data sharing process in the Hyperledger Fabric ledger.

File Transfer Module: The File Transfer Module is responsible for managing the actual transfer of the encrypted file between the sender and the authenticated receiver. This module employs secure encryption techniques to protect the confidentiality of the data during transit. It coordinates the exchange of the encrypted file, ensuring data integrity and secure communication. Key Management Module: The Key Management Module plays a crucial role in securely managing encryption keys associated with the shared files. It includes functionalities for key generation, storage, and retrieval. This module ensures that only authorized users can access the necessary keys for decrypting the shared files, enhancing the overall security of the data

sharing process.

Decryption Module: The Decryption Module is responsible for the final phase of the data sharing process. Authenticated and authorized receivers interact with this module to decrypt the received files using the appropriate encryption keys. The module ensures a secure and controlled environment for file decryption, preventing unauthorized access to sensitive data.

Ledger and Chain of Custody Module: The Ledger and Chain of Custody Module is an integral part of BBS, maintaining the blockchain ledger using Hyperledger Fabric. It records all transactions and interactions throughout the data sharing process. This module serves as a tamper- resistant and auditable record, creating a transparent chain of custody for the shared data. It plays a crucial role in enhancing.



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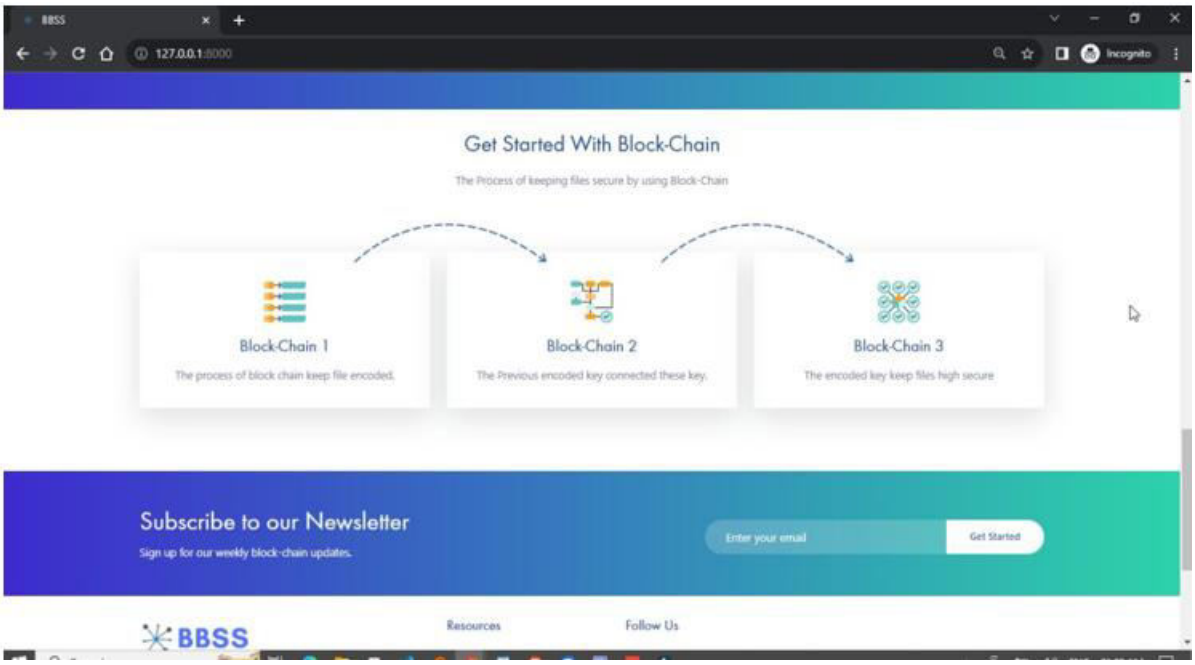

Get Started With Block-Chain

The Process of keeping files secure by using Block-Chain

Block-Chain 1

The process of block chain keep file encoded.

Block-Chain 2

The Previous encoded key connected these key.

Block-Chain 3

The encoded key keep files high secure

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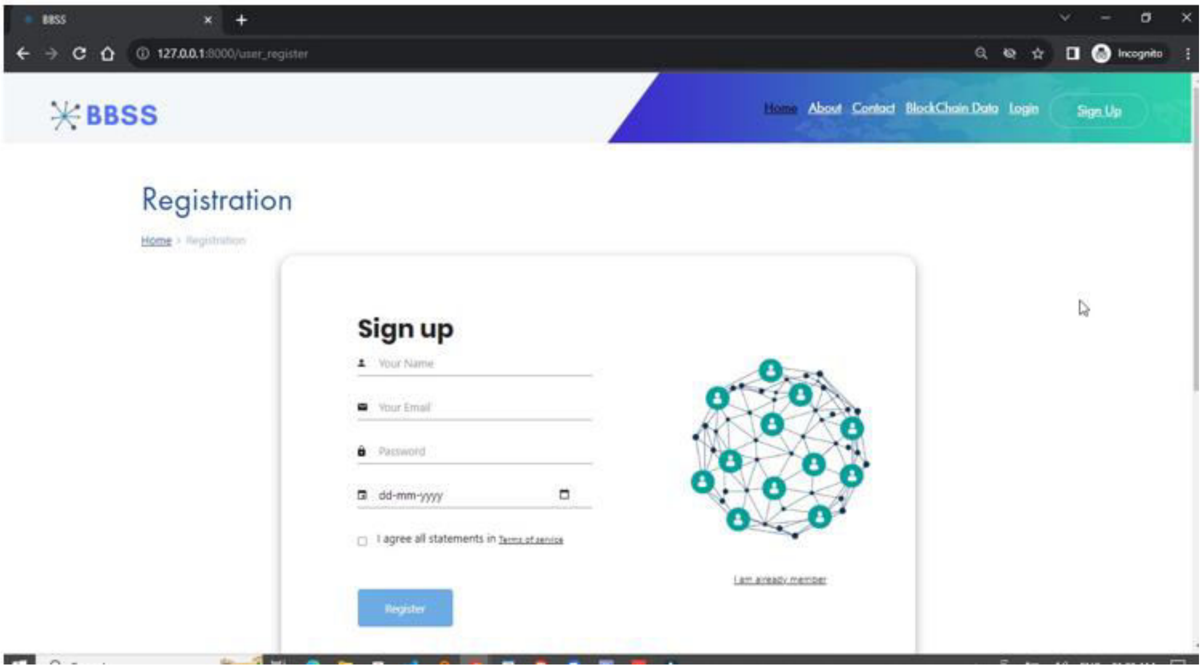
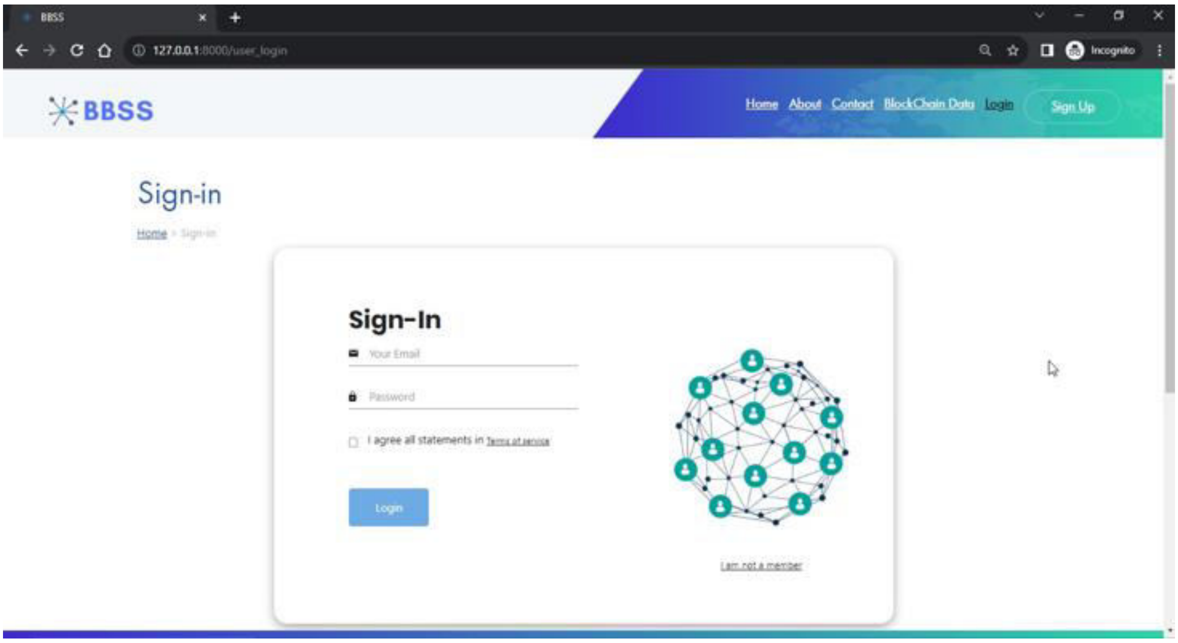


Registration

Home > Registration

Sign up

□ I agree all statements in Terms of service



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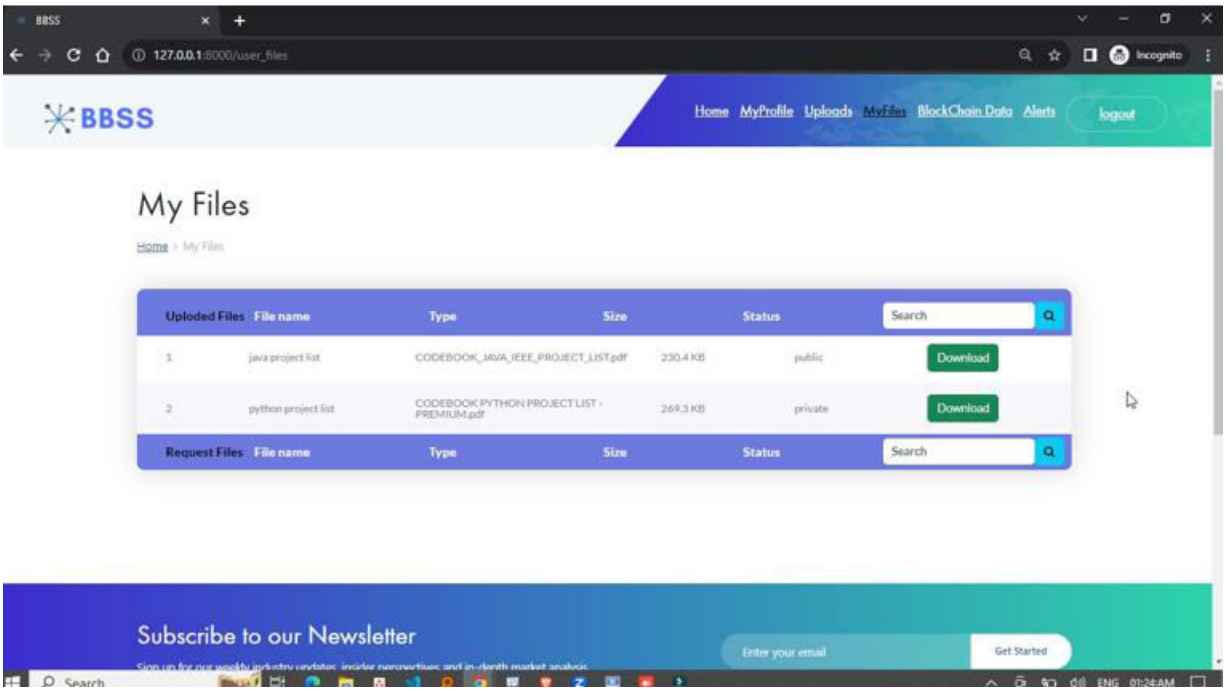

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Uploded Files	File name	Type	Size	Status	
1	java project list	CODEBOOK_JAVA_IEEE_PROJECT_LIST.pdf	230.4 KB	public	Download
2	python project list	CODEBOOK PYTHON PROJECT LIST - PREMIUM.pdf	269.3 KB	private	Download
Request Files	**File name**	**Type**	**Size**	**Status**	

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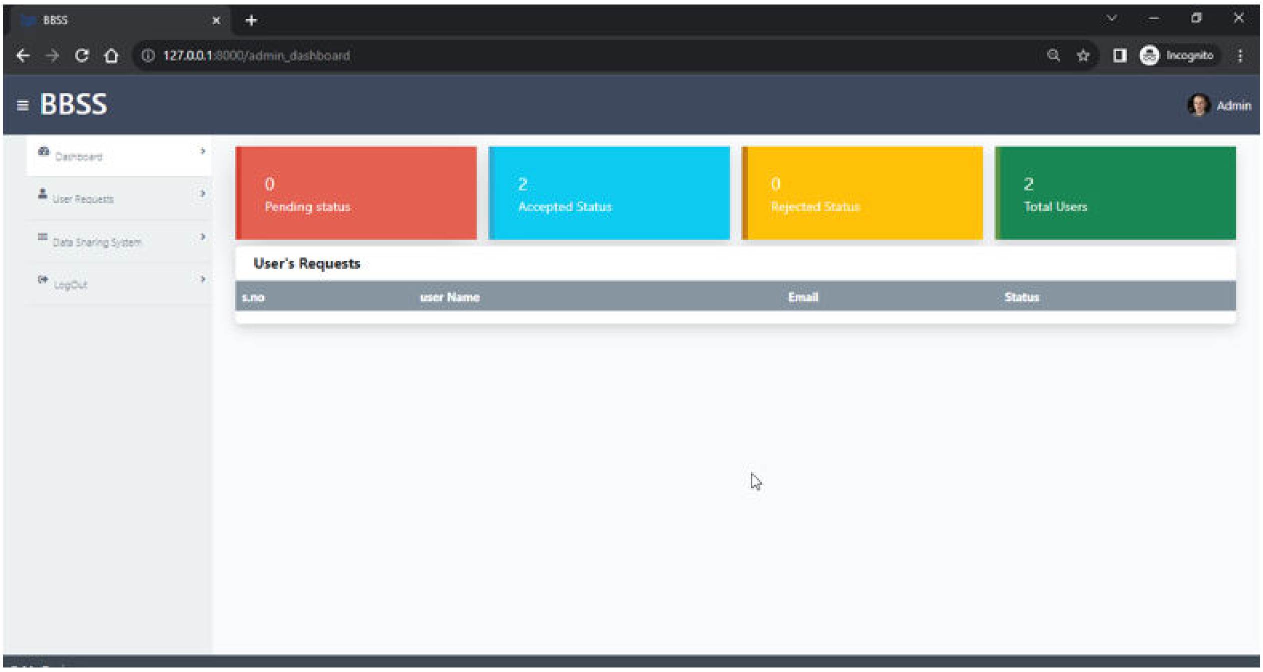

0 Pending status

2 Accepted Status

0 Rejected Status

2 Total Users

User's Requests

s.no	user Name	Email	Status

CONCLUSION

In this paper, we solve a novel problem—how to share sensitive big data within a blockchain system autonomously and with no charge, and establish the chain of custody of the shared data securely. Such a data sharing application is critical for protecting intellectual property (IP) and fighting industrial espionage in fields including biomedical research. Three challenges including storage space limitation, privacy requirement and security requirement are identified in implementing the blockchain big-data sharing system (BBS).

We denote data such as a big file stored at a blockchain node but outside of the ledger as off-state. We carefully present our off-state sharing protocol. The transactions generated by our protocol will serve as auditing evidences for the chain of custody. We implement BBS over Hyperledger Fabric and conduct extensive experiments to evaluate its feasibility and performance.

FUTURE SCOPE

The Blockchain Big Data Sharing System (BBS) holds immense potential for transforming data sharing across diverse industries. In the future, BBS can play a pivotal role in enabling secure and efficient data collaboration in sectors such as healthcare, finance, and smart cities, where data sensitivity and scalability are critical.

The integration of advanced consensus mechanisms, such as Proof-of-Stake (PoS) and sharding, can further enhance the scalability and energy efficiency of BBS systems, making them suitable for handling large-scale, real-time data streams from IoT devices and edge computing networks. Furthermore, with the advent of quantum-resistant cryptography, BBS can become more resilient against emerging cybersecurity threats.

The incorporation of artificial intelligence (AI) within BBS frameworks also opens up avenues for automated decision-making and dynamic data-sharing policies based on user preferences and contextual analysis. This synergy between blockchain, big data, and AI can revolutionize industries by creating intelligent, autonomous systems for predictive analytics and actionable insights. Additionally, regulatory compliance can be seamlessly embedded into BBS through smart contracts, facilitating cross-border data sharing while adhering to laws like GDPR and HIPAA.

As the adoption of blockchain technology continues to grow, BBS systems can evolve into decentralized data marketplaces, allowing organizations to monetize their data assets while ensuring privacy and security. This decentralized model can empower smaller businesses and individuals by providing equal opportunities to participate in the data economy. In essence, the future of BBS lies in its ability to enable trust, security, and innovation in a data-driven world, ultimately fostering a more connected and efficient digital ecosystem.

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