Green University of Bangladesh

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A Survey on Thesis Papers

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1 IDMoB: IoT Data Marketplace on Blockchain

DOI: 10.1109/SST.2016.7765669

1.1 Introduction

This paper proposed a decentralized marketplace for trading IoT data using blockchain technology. According to them, current centralized data marketplaces suffer from issues such as lack of transparency, limited data access, and high transaction costs, which can be addressed by decentralization.

IDMoB (IoT Data Marketplace on Blockchain), is a peer-to-peer network that allows data providers to share their data with consumers directly, without intermediaries. The blockchain technology is used to provide a secure, transparent, and tamper-proof record of all transactions on the network. They proposed a smart contract-based incentive mechanism for data providers to ensure the quality of the data and encourage participation in the marketplace.

The authors implemented a prototype of the IDMoB system and conducted experiments to evaluate its performance. The results show that the proposed solution can provide a secure, transparent, and efficient marketplace for trading IoT data.

1.2 Problem Domains

The Problem domains are stated below :

1. Lack of transparency: Current centralized data marketplaces are often opaque, with limited information available to consumers about the data they are buying. By using blockchain technology, the authors ensure that all transactions on the network are transparent, secure, and tamper-proof.

2. Limited data access: In centralized data marketplaces, access to data is often limited to a few large data providers. The proposed decentralized solution allows data providers to share their data with consumers directly, without intermediaries, thus increasing data access.

3. High transaction costs: Centralized data marketplaces often have high transaction costs, as intermediaries charge fees for facilitating transactions. The proposed decentralized solution eliminates intermediaries, which reduces transaction costs and makes the marketplace more cost-effective.

1.3 Solutions

The authors proposed the following solutions :

1. Requirement analysis: The authors conducted a comprehensive requirement analysis of the existing centralized data marketplaces and identified their limitations. Based on the analysis, the authors proposed a decentralized marketplace for trading IoT data using blockchain technology.

2. System design: The authors designed the IDMoB system architecture, which consists of data providers, data consumers, and the blockchain network. The data providers are responsible for sharing their data with the consumers, and the blockchain network is used to provide a secure, transparent, and tamper-proof record of all transactions on the network.

3. Smart contract development: The authors developed a novel smart contract-based incentive mechanism for data providers. The incentive mechanism is designed to ensure the quality of the data and encourage participation in the marketplace.

1.4 Limitations

1. Scalability: The proposed IDMoB system is implemented using the Ethereum blockchain platform, which may not be scalable enough to handle large volumes of data and users. As the number of participants and data transactions increase, the system's performance may degrade, and this could limit its adoption in real-world applications.

2. Security: The authors focus on the security of the transactions on the blockchain network but do not explicitly address security issues that may arise from data breaches or cyber-attacks on the data providers' systems. As the system relies on data provided by multiple third-party sources, ensuring the security and integrity of the data can be a significant challenge.

How SDN can be an improvement in this case?
SDN integration: Software-defined networking (SDN) can potentially provide some benefits for the IDMoB system. SDN is a networking architecture that separates the control plane from the data plane in a network, enabling centralized management and control of network traffic.
In the context of the IDMoB system, SDN can potentially improve network performance and security by allowing for more efficient traffic routing and load balancing. By separating the control plane from the data plane, SDN can enable centralized management of network traffic, making it easier to optimize traffic flows and allocate network resources. This can help to reduce congestion and latency, improving the overall performance of the IDMoB system.
Additionally, SDN can potentially enhance security by enabling fine-grained control over network traffic. SDN controllers can use policies and rules to monitor and control traffic flows, providing an additional layer of security beyond traditional network security measures. This can help to mitigate attacks on the IDMoB system, such as DDoS attacks or attempts to compromise network security.

2 Data Marketplace for Internet of Things

DOI: 10.1109/SST.2016.7765669

2.1 Introduction

In this paper the authors proposed the concept of a data marketplace, which would allow different entities to buy and sell IoT-generated data in a secure and transparent manner. The paper discusses the key features of such a marketplace, including the use of blockchain technology to ensure data security and integrity, the role of smart contracts in automating transactions, and the need for a decentralized architecture to avoid the centralization of power and control. The authors also outline a potential business model for the data marketplace, which includes revenue sharing between data providers and platform operators. The paper concludes by highlighting the potential benefits of a data marketplace for IoT, including increased collaboration and innovation, improved data quality, and new revenue streams for data providers.

2.2 Problem Domains

The Problem domains are stated below :

1. Lack of standardization: The paper notes that the lack of standardized protocols and formats for IoT data makes it difficult for different entities to share and integrate data. The proposed data marketplace addresses this challenge by providing a common platform for data exchange, with standard APIs and data formats.

2. Data privacy and security: The paper recognizes that data privacy and security are major concerns in IoT data sharing, given the sensitive nature of the data involved. The proposed data marketplace uses blockchain technology to ensure data security and integrity, and smart contracts to automate data transactions in a secure and transparent manner.

3. Limited incentives for data sharing: The paper notes that there is currently a lack of incentives for IoT data sharing, with data providers often reluctant to share their data due to concerns around ownership and control. The proposed data marketplace offers a new revenue stream for data providers, by allowing them to monetize their data through the sale of data to interested parties.

2.3 Solutions

The authors proposed the following solutions :

1. Design: The authors proposed a design for the data marketplace, which includes the use of blockchain technology, smart contracts, and a decentralized architecture to facilitate secure and transparent data exchange.

2. Business model: The authors outlined a potential business model for the data marketplace, which includes revenue sharing between data providers and platform operators.

2.4 Limitations

1. Scalability: The proposed solution relies heavily on the use of blockchain technology, which may limit the scalability of the data marketplace and increase the complexity of its implementation.

2. No SDN: The proposed solution works on a traditional Iot network but without SDN. This is a limitation that should be resolved. How SDN can bring some improvements in this case?
   SDN integration: Traffic management: SDN can be used to manage the traffic of an IoT data marketplace, ensuring that data flows are efficiently routed to their intended destinations. This can improve the overall performance and reliability of the data marketplace, ensuring that data is delivered in a timely and accurate manner.

   Security: SDN can be used to implement security policies and protocols for the data traffic of an IoT data marketplace, ensuring that data is protected from unauthorized access and threats. This can help to address some of the limitations identified in the paper, such as the dependency on blockchain technology for security.

   Scalability: SDN can provide greater scalability and flexibility in managing the data traffic of an IoT data marketplace, allowing for more dynamic and adaptable network management. This can be useful in addressing the limited applicability of the proposed solution to different types of data and industries.

   Programmability: SDN provides a programmable view of the network, allowing for greater customization and automation of network management tasks. This can be useful in developing more comprehensive business models and revenue-sharing schemes for the data marketplace.

3 Towards a blockchain powered IoT data marketplace

DOI : https://doi.org/10.1109/COMSNETS51098.2021.9352865

3.1 Introduction

This research proposes a decentralized and secure system for managing and exchanging data generated by Internet of Things (IoT) devices. The paper discusses the challenges associated with the current centralized data exchange systems, which are often inefficient, expensive, and prone to data breaches. The proposed solution is a blockchain-based data marketplace that enables secure, transparent, and efficient data exchange without the need for intermediaries. The paper suggests that the use of blockchain technology can help to ensure data privacy, security, and immutability, and enable data owners to retain control over their data. The paper also discusses several facilitators for implementing a blockchain-powered IoT data marketplace, including decentralization, smart contracts, consensus mechanisms, tokenization, and interoperability. The proposed system has the potential to revolutionize the way in which IoT data is managed and exchanged, and the paper provides a valuable contribution to the ongoing research in this field.

3.2 Problem Domains

The Problem domains are stated below :

1. Centralized Data Exchange Systems: The paper discusses the limitations of current centralized data exchange systems, which are often inefficient, expensive, and prone to data breaches. The paper suggests that a decentralized blockchain-based data marketplace can provide a more secure, efficient, and transparent way to manage and exchange IoT data.

2. Data Privacy and Security: The paper addresses the issue of data privacy and security in the context of IoT data exchange. The paper suggests that the use of blockchain technology can help to ensure data privacy, security, and immutability, and enable data owners to retain control over their data.

3.3 Solutions

The authors proposed the following solutions :

1. To remove the centralized characteristic of the current marketplace, the authors introduced a 3 layer model in which the facillators will be connected in a blockchain. This will decentralize the whole marketplace.

2. The Blockchain technology will also provide security and prevent hackers.

3.4 Limitations

1. Using IOT devices in a centralized network and incorporating blockchain in it will result in less scalability.

2. Using Blockchain will bring its own security concerns.

4 A Decentralized IoT Data Marketplace

DOI : https://doi.org/10.48550/arXiv.1906.01799

4.1 Introduction

In this paper the authors propose a novel approach to managing the exchange of data in the Internet of Things (IoT) ecosystem. With the rise of IoT devices and sensors, there is an increasing need for a decentralized marketplace that enables the exchange of data in a secure, transparent, and efficient manner. The paper presents a decentralized IoT data marketplace architecture that uses blockchain technology to manage the exchange of data between different stakeholders. The proposed architecture is designed to address the limitations of current centralized data exchange systems, such as high costs, limited scalability, and security risks. The paper also discusses the potential benefits of a decentralized IoT data marketplace, including increased data privacy, reduced costs, and improved interoperability. Overall, the paper presents a compelling case for the use of blockchain technology in managing the exchange of data in the IoT ecosystem, and provides a roadmap for the development of a decentralized IoT data marketplace.

4.2 Problem Domains

The Problem domains are stated below :

1. Centralization of data exchange: Current data exchange systems are often centralized, which can lead to issues with data privacy, security, and vendor lock-in. A decentralized IoT data marketplace can address these issues by providing a secure and transparent platform for the exchange of data.

2. Trust issues: Data exchange systems often require a trusted intermediary to manage the exchange of data, which can lead to issues with trust and accountability. A decentralized data marketplace can address these issues by using blockchain technology to provide a transparent and immutable record of data transactions, enabling trust and accountability in the data exchange process.

4.3 Solutions

The authors proposed the following solutions :

1. Blockchain: A distributed ledger that provides a transparent and immutable record of data transactions on the data marketplace.

2. Smart contracts: Self-executing contracts that facilitate the exchange of data between different stakeholders on the data marketplace.

4.4 Limitations

1. Using IOT devices in a centralized network and incorporating blockchain in it will result in less scalability.

2. Using Blockchain will bring its own security concerns.