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A Block-Chain for Supply Chain Solutions

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ABSTRACT

Blockchain is the upcoming technology in creating the Dapp for different types of use cases. The transactions in the block-chain technology are transparent to all the nodes in the decentralized network. Most of the applications were built and trying to implement it with the Hyperledger fabric platform in block-chain for the security purpose. The nodes in the distributed network shares all the data to the other nodes without any modification of their data in the blockchain technology. The transactions done by the nodes are trusted through the digital signatures. In this paper, we built a decentralized web application for e-commerce by using the blockchain Hyperledger fabric platform. Our application is deployed by using the smart contracts, which are written in the solidity language and the front-end and back-end process are explained. All these data about the e-commerce details are stored into the blocks in blockchain. The web application for online shopping will be secured and trust worthy for the nodes in the decentralized network. The other online shopping platforms like Amazon are trying to deploy the blockchain for security of data and user's convenient. The issues like storage, scalability and others can be considered for the future work.

Keywords: Blockchain · Hyperledger fabric · fabric-SDK · E-commerce · Smart Contracts

I. Introduction

The trade supply chain represents the required steps to complete the trading process, which eventually results in delivering the goods to the buyer. The process of trade involves a legal bind agreement between the trading parties (seller and buyer), which specifies the conditions that must be addressed by each party for the successful completion of the trade. For instance, these conditions could specify the acceptable transportation method for the goods. The trading process is typically monitored by a third-party that acts as a regulator for the trade. The complexity of the trading process increases significantly in the international trading scenario. International trade involves many parties, mainly including the trading community (importers and exporters), customs agency, shipping agent, port operators, freight forwarders, and customs brokers. The freight forwarders arrange shipments for customers. The shipping agents usually deal with the transportation of cargo.

Decentralized applications are applications that run by using the Blockchain Hyperledger fabric platform or in other words, the nodes in the peer-to-peer network or the nodes used to communicate with other nodes. The biggest thing is that the stored data are stored on a public ledger that records everything in a secure and transparent way and guarantees no one can manipulate it. The distributed database that stores all the records of the transactions among the nodes in the network are named as Blockchain [1]. Each and every transaction is verified by the majority of the nodes in the network. It is the backbone for the digital crypto currency

In the international trade supply chain, the employed information sharing mechanism is also a dominant factor in determining the overall efficiency of the supply chain. In this trading domain, several entities require access to the documents from the different participants in the supply chain in a timely manner. A key document's dependent entity in this supply chain is the customs authority, which plays an important regulatory role. Customs authority acts as the gate that protects society and the economy. The protection task is established by monitoring the flow of goods entering the country to detect counterfeit products and smuggling activities. To fulfil this task, customs authority relies on the information provided by several participants in the international trade supply chain. This information is used in the shipment clearance process to examine the shipment under consideration and to determine if a physical examination is required [1]. The issue of ensuring the integrity of the exchanged information can be addressed by providing a traceable secure

II. Related Work

In this paper, the author presents an application scenario to describe the entire process, where the author assumes that the traded food is harvested crop plants. All the required information about the environment where these plants grew (for instance, light, and temperature) is stored in the blockchain. Any participant in the food supply chain can access this information. In addition, through the use of the IoT infrastructure, we can monitor and store important information about the warehouse environment and distribution. Regarding the performance of the presented approach, the authors did not present any technical details, and therefore the performance of the presented approach needs to be validated. The problem of food safety has also been investigated

by Malik et al. [44]. To address this problem, the authors proposed permissioned consortium blockchain-based framework. By using the consortium mechanism, the authors aimed to increase the trust of the customers by avoiding having a single node with high authority. This framework deals with four types of members: (1) non-participating, (2) participating, (3) governance board, and (4) validators. Nonparticipating members (such as customers) can only query the blockchain. Participating members are the food supply chain entities, and they are the source of transactions. The governance board members consist of several government agencies, and they are responsible for determining the read and/or write access rules for the participating members.

To increase the scalability of the network, the author adopted the sharding mechanism, where the blockchain data is divided between several shards. Using this mechanism, the task of validating the transactions is performed by several nodes simultaneously. Additionally, the network is divided into geographical zones, where a validating node processes the transactions originated inside its zone. Once they are verified, the participating members' transactions are stored in their local ledgers. To improve the privacy of the data, a transaction is not shared with other participating members, and it is only submitted to the validator nodes. A valid transaction must contain a pre-determined set of fields and must satisfy the rules determined by the governance board. For each shard (local ledger), a set of predetermined validators are identified, where, in each validation round, one of these validators will be selected to process the current block under consideration. Local ledgers are duplicated and continuously submitted to the global validator to update the product ledger, which is accessible by customers using query manager.

III. Methodology

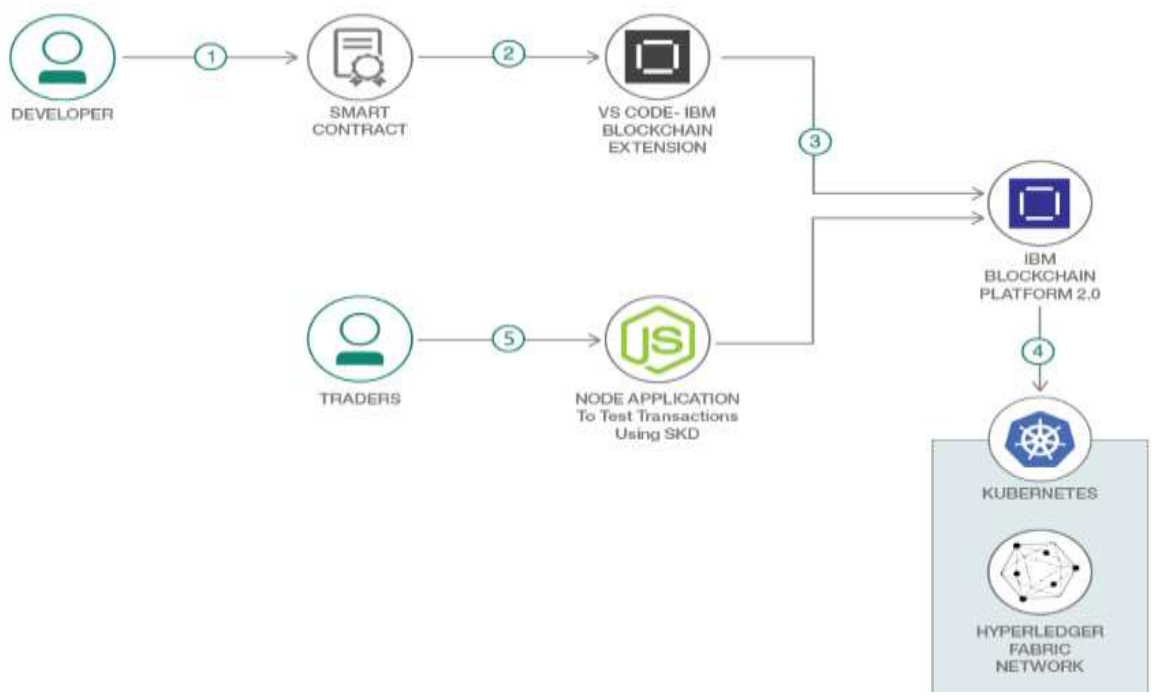
To address the research questions proposed in this work, we have conducted a detailed review and discussion about the use of blockchain technology in trade. Our review adopts the methodological approach proposed by Tanfield et al., which mainly consists of three main steps: planning, execution, and reporting. In the planning step, we determine the search keywords and the protocol for execution. In addition, we determine the databases to execute our search. In the execution step, we follow the planned protocol to obtain the desired articles and information. In the reporting:

1. Planning

The search criteria are designed to help in addressing the research questions presented in this work. Accordingly, the main terms that are used in the research questions have also been used in the search criteria. These terms are "trade supply chain", "blockchain", "customs", "trade monitoring", "counterfeit trade" and "trade facilitation"..

2. Execution

1. All technical papers that address the security component in blockchain technology were excluded from our work. Additionally, general papers that describe blockchain technology were also excluded from consideration. Then, we removed survey papers, and we performed a quality assessment to make that the selected paper contributes to the research question The developer develops a smart contract using Node.js.
2. Use the IBM Blockchain Platform Extension for VS Code to package the smart contract.
3. Setup and launch the IBM Blockchain Platform service.
4. The IBM Blockchain Platform enables the creation of a network onto a IBM Cloud Kubernetes Service, enabling installation and instantiation of the smart contract on the network.
5. The Node.js application uses the Fabic SDK to interact with the deployed network on IBM Blockchain Platform and issues transactions.



BLOCKCHAIN AND TRADE SUPPLY CHAIN (REPORTING)

In this section, we discuss proposals from the related literature that have investigated the use of blockchain technology to facilitate the (international) trade supply chain. In this trading scenario, the type of the employed blockchain solution is usually associated with the application domain. For instance, blockchain-based e-commerce solutions are generally deployed on a public blockchain, since anyone should be able to join the network, and all participants are expected to have the same authority privileges (all participants are equal).

On the other hand, blockchain solutions that address the trading of highly regulated goods are expected to be deployed on a private blockchain. This deployment mechanism is crucial since participants in such trade processes are expected to perform several types of confirmation and validation steps. Accordingly, in this situation, the permission of each participant must be predetermined by an administrative participant. For instance, to address the food safety problem, a private blockchain architecture is required, since blockchain-based solutions to address this problem usually involve a predetermined set of participants.

Additionally, to ensure the quality of the food, several critical processes must be employed to ensure the authenticity and correctness of the uploaded information. Regarding blockchain solutions which are designed to improve components' supply chain performance, the environment where these solutions are deployed depends on the targeted processes. If the public customers do not interact mainly with the targeted processes, we expect such solutions to be deployed on a private blockchain.

IV. Literature survey

In paper [1] "Design of a software architecture supporting business-to-government information sharing to improve public safety and security: Combining business rules, Events and blockchain technology,

In paper [2], Block-Supply Chain: A New AntiCounterfeiting Supply Chain Using NFC and Blockchain," in Proceedings of the 1st Workshop on Cryptocurrencies and Blockchains for Distributed Systems

In paper [3] Securing Physical Assets on the Blockchain Linking a novel Object Identification Concept with Distributed Ledgers

In paper [4] Hyperledger fabric Hyperledger fabric: a distributed operating system for permissioned blockchains," in Proceedings of the Thirteenth EuroSys Conference, 2018

In paper [5] Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review* Introduction: the need for an evidence- informed approach

In paper [6] A Privacy-Preserving BlockchainBased Fair Transaction Method for Sharing Economy," in Proceedings - 17th IEEE International Conference on Trust, Security and Privacy in Computing and Communications and 12th IEEE International Conference on Big Data Science and Engineering, Trustcom/BigDataSE 2018

V. Future Scope

In the validation category, the solutions normally consist of two parts, the query engine part and the validation part. The validation part represents the process that must be implemented between the participants to perform the examination (validation) task. The query engine part is used by the user to check the validation results. Compared to electronic trading solutions, the number of participants in each process is relatively high. However, the number of transactions generated in these types of solutions on a daily basis is expected to be lower compared to electronic trading solutions. Although the number of participants in the supply chain of this categorify is higher than the electronic trading solution category, the validation solution is expected to have fewer scalability issues compared to the electronic solutions since the number of transactions is lower.

VI. Conclusion

Blockchain technology has the advantage of optimising the trade supply chain by simplifying the monitoring component and ensuring the integrity of the exchanged information. The data integrity and traceability features of this technology underline the benefits of using this technology in trading highly regulated goods such as pharmaceutical goods. Such features can help in detecting counterfeit goods and monitor the transportation environment. Blockchain technology can contribute significantly to the optimisation of the international trade supply chain compared to the local trade supply chain. In international trade, the number of participants is very high in contrast to the local trading scenario. Compared to the local trading domain, in international trade, a high number of rules and conditions must be applied to ensure the lawfulness of the trade. These factors highlight the significance of employing blockchain technology in the international trading domain.

As part of the international trade supply chain, customs administrations play an essential role in protecting the local society and economy. Accordingly, from a customs authority perspective, the data integrity and traceability features of the blockchain technology have a significant impact on simplifying the goal of protecting the society and economy. Accordingly, joining blockchain-based informationexchanged mechanism is expected to optimise the processing model of customs authority to facilitate international trade further.

References

[1]. World Customs Organization, “WCO SAFE Framework of Standards,” June, 2018.

[2]. D. W. E. Allen, C. Berg, S. Davidson, M. Novak, and J. Potts, “International policy coordination for blockchain supply chains,” Asia Pacific Policy Stud., vol. 6, no. 3, pp. 367–380, 2019.

[3]. C. A. McDaniel and H. C. Norberg, “Can Blockchain Technology Facilitate International Trade?,” , 2019 Mercatus Research Paper. [Online] Available at SSRN: https://ssrn.com/abstract=3377708 or http://dx.doi.org/10.2139/ssrn.3377708 019,

[4]. M. G. Belu, “Application of Blockchain in International Trade: An Overview,” Rom. Econ. J., vol. 22, no. 71, pp. 2–16, 2019.

[5]. Y. Chang, E. Iakovou, and W. Shi, “Blockchain in global supply chains and cross border trade: a critical synthesis of the state-ofthe-art, challenges and opportunities,” Int. J. Prod. Res., pp. 1– 18, 2019.

[6]. C. Xu, K. Wang, G. Xu, P. Li, S. Guo IEEE International Conference on Communications (ICC), 2018, pp. 1–6.

[7]. S. Van Engelenburg, M. Janssen, and B. Klievink, “Design of a software architecture supporting business-to-government information sharing to improve public safety and security: Combining business rules, Events and blockchain technology,” J. Intell. Inf. Syst., pp. 1–24, 2017.

[8]. M. Rauchs, A. Blandin, K. Bear, and S. Mckeon, “2nd Global Enterprise blockchain benchmarking Study”, 2019 [Online]. Available https://www.jbs.cam.ac.uk/facultyresearch/centres/alternative-finance/publications/2nd-globalenterprise-blockchain-benchmarking-study/,

[9]. C. Technologies, Blockchain (E-Book). 2018.

[10]. B. T. A. BTA, Developing on Hyperledger Fabric 1 . 1. 2018