BLOCKCHAIN SOFTWARE AND ALGORITHMS THAT IMPLEMENT LOGISTICS TRACKING

Azimov Dilmurod Turdiboyevich
Senior Teacher of the Department of “Digital economy and information technologies”, Tashkent State University of Economic
dilmurod.azimov@gmail.com

Karimov Botir Ulugbekovich
Senior Teacher of the Department of “Digital economy and information technologies”, Tashkent State University of Economic

Mirzaakhmedov Dilmurod Miradilovich
Senior Teacher of the Department of “Digital economy and information technologies”, Tashkent State University of Economic

Blockchain technology is seen as a modern tool for building trust in unreliable systems. It is a valuable transaction management system for various applications that require transactions from untrusted parties across the network. Transactions are recorded in a ledger that is distributed electronically to all participating blocks in the peer-to-peer network. These transactions are usually stored as hashes and generated using modern cryptographic hash algorithms. The ledger is stored in a block, which is almost impossible to form and can only be updated through a protocol agreed upon by all connected blocks in the blockchain network. Bali et al. [1] proposed a solution to combat product counterfeiting by tracking ownership transfer using blockchain technology. The first practical solution provided by blockchain technology is the Bitcoin cryptocurrency. According to Hileman and Rauchs [2], blockchain's current popularity can be attributed to its 600% increase in value since its introduction in 2009. In the past, researchers have done a lot of work in logistics using new technologies such as artificial intelligence, Internet of Things, blockchain machine learning, and big data ([3], [4], [5]).

Blockchain is a public and private ledger containing various transaction data. This ledger is implemented as a series of cryptographically linked blocks, which are stored and served by each block of the blockchain network, which is peer-to-peer. The integration of distributed consensus algorithms and asymmetric cryptography work as components to achieve data integrity, transaction consistency, non-repudiation and authentication. It improves vision and hearing even more. Transactions registered on the blockchain and stored in the ledger cannot be changed after they have been verified by authorized blockchain network partners. In addition, durability and reliability are key features that can make blockchain a reliable platform that works on a network of distrustful peers.

A contract is a way of defining the terms of the deal and the relationship between any two parties. A smart contract is a hard-coded computer protocol to enforce the terms of a policy or contract. Automated and secure transactions can be made using computer codes without the intervention of a trusted third party. Business logic can be implemented using smart contracts to ensure trust in the application layer. The consensus algorithm determines how blockchain systems work. Bambara et al [6] proposed that core consensus algorithms ensure the security and efficiency of blockchain systems. These algorithms must be robust against block failures and able to effectively deal with malicious blocks.

Blockchain has some features that make it suitable for this job. First, it is decentralized, which means that no single authority can control it. The second is consensus, which means that each participant has the same copy of the registry, and data is added based on the majority. New data must not conflict with current data available on the blockchain. Any participant can access information stored on the network. A third reason for choosing blockchain is that it has secure storage and ensures

data integrity. Data has its own nature and confidentiality. This allows data to be shared in a way that ensures traceability and accountability.

Researchers argue that data transparency and transaction verification are two important features of blockchain. The focus here is on providing secure and transparent access to transaction data. A blockchain system demonstrates a high level of accountability with these features, which help ensure data privacy and access control.

Digitization of physical products is an exclusive feature of blockchain, including producer-to-consumer traceability and data tracking. The process of representing physical products as digital tokens is called asset tokenization. The use of this technology to provide a mechanism to support the management, storage and sharing of created digital assets was proposed by Leita, Albuquerque and Pineiro [7].

Maouchi, Ersoy proposes a blockchain-based tracking system for the logistics supply chain and is known as Free [99] TRADE. The TRADE system uses blockchain technology to obtain transparent and reliable traceability in the supply chain. Participants can access all the information they need to track and verify products in the supply chain. Each participant or participant can create a transaction to transfer assets consisting of complete product information according to a product identifier (PID), also known as a token. Active transactions are digitally signed to maintain integrity. As a result, consumers can see the entire process cycle from its origin to its consumption.

Khanna, Nand, and Bali [8] proposed a permissioned blockchain model for supply chain traceability. Researchers consider a product in the supply chain as a chain of transfer operations that occur at the beginning of the entire supply chain.

Babich and Hilary [9] categorize four important features of blockchain technology that enhance coordination and integration between all members involved in the supply chain. The main features are:

- Transparency
- Validation
- Tokenization
- Automation

Transparency is concerned with the shared ledger of data collected from the various actors and sources that make up the network. In this ecosystem, transparency is ensured by providing due rights to its common participants. For example, a customer may be entitled to inspect products according to their provided ID. Likewise, the head of the merchandise department can track all his products by license number or ID, which gives transparency to the system.

The properties of immutability and consensus-based verification together enable verification of data stored and retrieved from Internet of Things (IoT) devices. Active check in the system is done by presenting a user interface (UI) to the user for inspection. This is done by entering the product identifier and tracking the origin of the products.

Automation to verified data on the blockchain defines the ease of execution of smart contracts based on For example, Bali, Kumar, and Gangwar [10] used automation to forecast wind speed using deep learning models and wrote a smart contract to do so. Also, when an asset is transferred from one player to another, a smart contract is invoked. As a result, the owner of the asset is automatically changed.

Chen [11] introduced virtual tokens (tokenization), which represent a claim to any physical assets in the real world and their associated transactions between blockchain participants. In this case, there are tokens, and the author specified the product as a token and assigned a unique identifier to them. When a product is transferred from one participant to another, the owner of this identifier changes and the token moves forward in the system.

Currently, there are many algorithms for blockchain technology is being used. So, for comparison, we take some commonly used algorithms like Proof of Work (PoW), Proof of Stack (PoS), Proof of Importance (PoI), delegated Proof of Stack (dPoS), Practical Byzantine Fault Tolerance and Ripple Transaction Protocol.

References

1. Bali, V., Kumar, A., & Gangwar, S. (2020). A novel approach for wind speed forecasting using LSTM-ARIMA deep learning models. International Journal of Agricultural and Environmental Information Systems, 11(3),13–30. doi:10.4018/IJAEIS.2020070102
2. Hileman, G., & Rauchs, M. (2017). 2017 Global Blockchain Benchmarking Study. Cambridge Centre of Alternative Finance. doi:10.2139/ssrn.3040224
3. Sharma, T., Banerjee, K., Mathur, S., & Bali, V. (2020). Stress analysis using machine learning techniques.International Journal of Advanced Science and Technology, 29(3), 14654–14665. http://sersc.org/journals/index.php/IJAST/article/view/31952
4. Yadav, N., Banerjee, K., & Bali, V. (2020). A survey on fatigue detection of workers using machine learning.International Journal of E-Health and Medical Communications, 11(3), 1–8. doi:10.4018/IJEHMC.2020070101
5. Nagar, R., Aggarwal, D., Saxena, U. R., & Bali, V. (2020). Cancer prediction using machine learning techniques based on clinical & non-clinical parameters. International Journal of Advanced Science and Technology, 29(4),8281–8293. http://sersc.org/journals/index.php/IJAST/issue/view/263
6. Bambara, J. J., Allen, P. R., Iyer, K., Lederer, S., Madsen, R., & Wuehler, M. (2018). Blockchain: A practical guide to developing business, law, and technology solutions. McGraw Hill Professional. https://www.oreilly.com/library/view/blockchain-a-practical/9781260115864/
7. Leite, G. S., Albuquerque, V. B., & Pinheiro, P. R. (2020). Process Automation and Blockchain in Intelligence and Investigation Units: An Approach. Applied Sciences (Basel, Switzerland), 10(11), 3677. doi:10.3390/app10113677
8. Maouchi, M., Ersoy, O., & Erkin, Z. (2018). TRADE: A transparent, decentralized traceability system for the supply chain. Proceedings of the 1st ERCIM Blockchain Workshop, Reports of the European Society for Socially Embedded Technologies. 10.18420/blockchain2018_01
9. Khanna, T., Nand, P., & Bali, V. (2020). Permissioned blockchain model for End-to-End trackability in supply chain management. International Journal of e-Collaboration, 16(1), 45–58. doi:10.4018/IJeC.2020010104
10. Khanna, T., Nand, P., & Bali, V. (2020). Permissioned blockchain model for End-to-End trackability in supply chain management. International Journal of e-Collaboration, 16(1), 45–58. doi:10.4018/IJeC.2020010104
11. Chen, Y. (2018). Blockchain tokens and the potential democratization of entrepreneurship and innovation.Business Horizons, 61(4), 567–575. doi:10.1016/j.bushor.2018.03.006