



Blockchain

— Simply explained —

BLOCKCHAIN TECHNOLOGY FOR MARITIME DOMAIN

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ABSTRACT

This article introduces the basics of Block Chain Technology (BCT) which is being used at various platforms of Maritime Domain. Basic components, its application and advantages are explained. This technology is going to influence the Maritime fraternity in a big way.

One of the main benefits of introducing Blockchain to the maritime industry is cutting down processing time. For international shipments, companies and customs officials are forced to fill out over 20 different types of documents (most of them paper-based) to move goods from exporter to importer. BCT can be effectively leveraged by the shipping industry in a major way as many shipping companies are looking forward to make information flow more smooth across business categories and making trade-related office procedures swifter and more efficient.

Though there are several challenges for implementation of this technology, considering industry standards, meeting regulatory expectations as well as the emergence of a leading BCT platform, the shipping industry participants need to be prepared for BCT, as this is making swift inroads and companies need to be ready to be able to take advantage of this game-changing technology.

INTRODUCTION

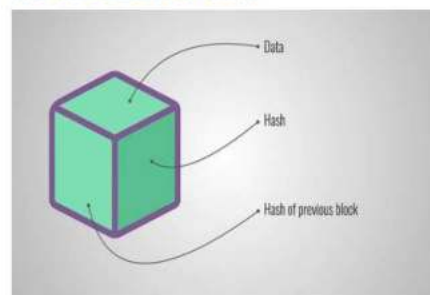
Blockchain is a safer way to perform monetary transactions without any involvement of third parties in the process. Despite numerous technological advancements that are constantly impacting just about every industry, the shipping industry relies heavily on the traditional methods. In today's world these methods are quite old fashioned and fail to meet the required efficiency that is needed in the increasingly competitive processes. Most shipping transactions involve a lot of documentation e.g., charter party agreements, sales contracts, bills of lading, etc. They pass through several hands as cargo makes its way from origin to its final destination and tracking of this paperwork would be a time-consuming task.

In efforts to minimize these inefficient procedures, Blockchain was introduced. Blockchain is a fundamental component of how the Bitcoin system works, and it has the potential to revolutionize shipping.

BLOCKCHAIN

Blockchain is a distributed ledger that is completely open to anyone. It has an interesting property; once some data is recorded in the Blockchain it becomes very difficult to change it!

HOW DOES IT WORK?

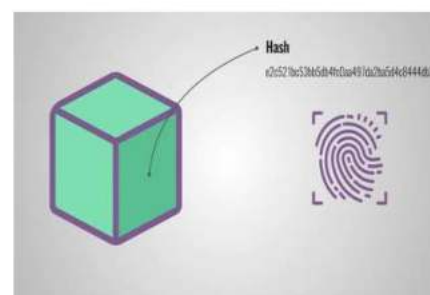


Let's take a closer look at a Block. Each Block contains 3 basic components

1. Data
2. Hash
3. Hash of previous Block

Data contained in a Block may differ based on the use of Block. For example, a Bitcoin block contains details of the monetary transaction performed between sender, receiver and amount.

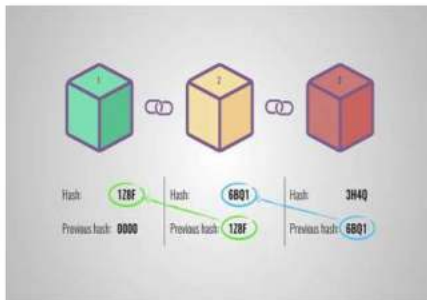
Hash is just like a fingerprint of a person. It identifies a Block and all of its content and is unique. Simply put, a Hash is a mathematical function that converts an input comprising letters and numbers into an encrypted output of a pre-determined fixed length.



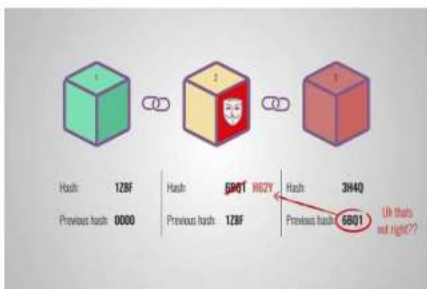
Once a Block is created, its Hash will be calculated. If the fingerprint of a Block changes, it no longer remains as the same block. Hash of every previous block is stored in the upcoming block. This process is what makes Blockchain so secure.

If we tamper any data from any block, its hash changes, but the hash this block had stored (in the upcoming block) remains the same and the rest of the Blockchain becomes invalid.

You can effectively tamper any block and recalculate all the hashes of the upcoming blocks since computers are faster now-a-days. To mitigate this, a mechanism called **"PROOF OF WORK"** has been devised to slow down the creation of new blocks. In the case of Bitcoin, it takes 10 minutes to add a new block. This makes the process to change hash of each block really hard since there are actually large numbers of blocks.



Instead of using a central entity, Blockchain uses a P2P (Peer-to-Peer) network where everyone is allowed to join. Each person in the network has a copy of the ledger. This is called as a **"NODE"**. If a new block is added to the chain it gets added up to every node.



Each user in the network will validate

the block and if not accepted by any single user the block is then said to be "invalid" or "tampered" and is removed from the chain. All the nodes in this network create "consensus". That implies that they agree about which blocks are valid and which aren't.



So, if you want to successfully tamper any data in the Blockchain:

1. Tamper all the blocks on the chain.
2. Redo the Proof-of-Work of each block.
3. Take control of more than 50% of P2P network.

Only then the tampered block will become valid in the Blockchain. This being a very lengthy process which can get very tedious in case of large chains, tampering is almost impossible.

DEVELOPMENTS IN BLOCKCHAIN

· SMART CONTRACTS

Smart contracts are a type of contracts which exist in the form of a computer program. These are programs in the Blockchain that help to exchange digital currency in the chain directly based on certain conditions. The program runs and is self-executed in Blockchain and automatically implements the terms and conditions of any existing agreement between the involved parties.

Terms and Conditions of Charter-party and bill of lading are a standard part of the program, and they cannot be modified by the Parties involved in the contract. This allows the Charterer or the Owner to negotiate the price of the cargo directly within the Blockchain network.

Prior to the use of Blockchain, this type

of smart contract was not possible because the parties in the agreement would have needed to maintain separate databases. A shared database that runs Blockchain protocols causes smart contracts to execute automatically, and all involved parties validate the document instantly.

USEFULNESS

Can be used for various purposes like:

1. E-notary
2. Collecting taxes
3. Medical records

EFFECTS OF BLOCKCHAIN IN MARITIME DOMAIN

1. FASTER PROCESSING

The time-consuming paper-works, bills, ledgers can be signed off (attended to/disposed off) by the respective authorities/those concerned within minutes rather than mailing the paper-work and waiting for the authorization of particular party. The automation also helps in providing real time updates.

2. COMPLETE TRANSPARENCY

When using Blockchain, all information is stored in a location that may be viewed by anyone with the necessary access key. This ensures full transparency to all participants. It also makes it easier to perform counter-party risk evaluations since everyone has access to all of the transactions previously performed by every party.

3. SECURITY

With Blockchain, all of the information is encrypted, which adds a strong layer of security. In addition, the system prevents users from interfering with it or changing the information stored in Blockchain. This protects the market from document manipulations and fraudulent activity.

The use of Blockchain also has the potential to prevent fraud. With

Blockchain, the possession of a shipment or package - be it a shipping drum or corrugated box, is tracked at each step. When coupled with auto-identification verification technology, Blockchain can help eliminate any questions regarding the chain of custody.

4. COST REDUCTION

Much of the expense associated with the shipping industry is related to documentation. In addition to the cost of sending paperwork from one location to the next, there is always the risk of loss or damaged paperwork. There can also be errors or discrepancies that cost shipping partners money or result in procedural delays. Blockchain eliminates the need for physical documentation and can drastically reduce this particular expense for businesses in the shipping industry. Experts estimate that the cost savings could be visible on companies' financial statements within as little as two years after implementing Blockchain technology for their processes.

5. STREAMLINED DATA EXCHANGE

As cargo makes its way through the supply chain from its point of origin to its ultimate destination, it leaves behind a trail of hard copy and electronic documents. Each document serves its own financial, legal, or regulatory purpose, but the way it is currently shared is not efficient. But BCT allows all of this data to be transmitted in a regulated and secure manner. It will be available from the Blockchain in the context that each trading partner requires, thus eliminating filing, conflicting integration standards, and other issues.

6. IMPROVED CARGO CARRIER COMPLIANCE

The shipping and cargo industry were once highly regulated and developed

strict standards for documentation, rating, and Electronic Data Interchange (EDI). Now the industry is better known for its lack of standards. This makes it difficult for new carriers and shipping companies to break into the market because it requires proprietary integration with various systems to automate ratings, tracking, and manifesting.

E-commerce is now driving the demand for faster new delivery methods, including same-day couriers. The market is more than ready for big changes in the shipping industry and Blockchain could provide the new technology standard needed to reduce complexity while improving compliance and the integrity of shipping transactions.

7. IMPROVED DELIVERY QUALITY

Once in a while, shipments are damaged or lost while in transit. When this happens, it can have a major impact on how customers perceive the shipping company. Blockchain has the potential to provide better asset management for customers by allowing them to see exactly where their cargo is at all times.

Shipping customers may review company transactions and Blockchain information to view the certificate of origin from the manufacturer to ensure that quality materials were used in the production of the products. They can also review documentation from the distributor to see events in the logistics chain. Blockchain information can also be used to determine where the supply chain process failed in the event of a problem.

This digital technology allows customers to hold shipping companies liable for damaged or missing products. It also makes it easier for customers to make more informed decisions regarding their supply chains to ensure improved delivery quality

and maximum efficiency.



CONCLUSION

By introducing Block Chain Technology, the advantages gained may be summarized as follows: -

- Eliminates paperwork
- Faster processing
- Complete transparency
- Increased security
- Cost reduction
- Hassle free data exchange
- Improved compliance
- Improved delivery

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ABOUT THE AUTHORS

Mr. Hare Ram Hare is working as Assistant Professor with Indian Maritime University, Mumbai Port Campus. He has more than 22 years of experience as Chief Engineer and Technical superintendent. He is also a Fellow member of IME(I). His areas of interest include Artificial Intelligence, Zero emission from vessels and Blockchain Technology.

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