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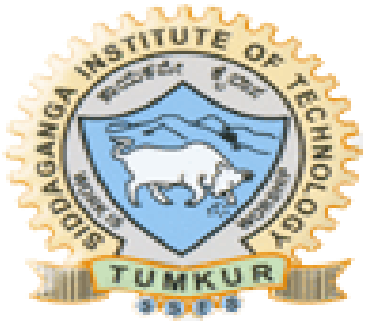

Report on

"Smart contract for logistics sector"

Submitted in Partial Fulfilment of the Requirements for the Award of Degree of

Bachelor of Engineering
in
COMPUTER SCIENCE & ENGINEERING

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Table of Contents

Smart contract for logistics sector

Logistics Blockchain Consortium

The purpose of the consortium is to standardize and digitize the freight documentation. It includes all the documents, including certificate of origin, consignment notes, and so on. By doing so, the firms will be able to automate 75 million processes per year. In return, they will save anything around 12 million paper sheets.

Manufacturer: The manufacturer is responsible for product manufacturing. Apart from that, they should provide a certificate of origin, processing data, barcodes, batch number, and shipment dates. All of the information needs to be stored and encrypted in a distributed ledger. To do so, the manufacturer systems should always be connected with the internet. The manufacturer should also utilize smart contracts to automate and orchestrate shipment transaction flow. The flow depends on multiple factors, including algorithms, codified parameters, and algorithms.

Supplier: The supplier receives all the necessary information from the manufacturer and creates its own set of documentation so that it can be shared with the next player in the logistic process. The supplier needs to create a packing list, batch number, order number, production date and shipment specifications(DIMS).

Logistics 3PL: The next player in the logistics is the 3PL. They are responsible for generating and automating routing instructions, bill of lading, commodity description, and shipment date.

Long-Haul Carrier: The information is then next passed to the long-haul carrier who is responsible for maintaining and generating temperature, shipment status, and delivery signature.

Warehouse: The Long-Haul carrier then dumps the goods to the warehouse. The warehouse then works on the routing instructions, packaging barcode, specifications, and pick date.

Short-haul carrier: The short-haul carrier then take the goods to the consignee by keeping the details automated and generated, including invoice number, receive date, customer ID, delivery receipt, and shipment status.

Consignee: The consignee receives the product with all detailed information stored in the blockchain.

In the whole process, there are three major steps.

- The manufacturers are responsible for transmitting goods to warehouses, suppliers, and 3PL providers.
- The 3PL provider, on the other hand, ensures that the shipment and capacity are optimized in real-time. It should also make sure that it optimizes itself correctly so that new loads can be received.

- In the last step, the 3PL providers are responsible for shipping the goods to the carriers. They should also make sure that visibility is provided at all steps. Lastly, the carrier should also offer the shipment status on all stages of shipment.

Why Blockchain is Required?

A decentralized public ledger system that documents all changes to a record in real time, Blockchain can help make logistics companies more efficient via a public ledger system that records the motions of each shipping container. Armed with that data, companies can implement faster routes and eliminate unnecessary steps in the delivery process.
Distributed and decentralized ledgers reduce bottlenecks and clerical errors, as well. Using smart contracts, retailers no longer need brokerages, lawyers or other third parties to complete tasks. Smart contracts enable retailers and logistics companies to enter binding agreements that will immediately dissolve if all agreed-upon stipulations aren't met. These ledger-based contracts increase transparency and profits while decreasing delivery time and costly errors.

The importance of block chain in Logistic Sector can be defined in 5 major aspects:

Improved Shipping Process Efficiency
With blockchain, the first thing that will improve in logistics is the shipping and freight. In short, it can be used to improve the delivery process internationally and locally. It will also make them improve their goods capacity and improve their process efficiency.

The blockchain-based supply chain will surely help save millions of dollars.

Better Transparency
Blockchain's one of the key features is transparency. If implemented right, blockchain offers better supply chain transparency, which in return, logistics transparency. It lets companies trust each other more credibly. By having better transparency, there will be fewer invoice disputes, fewer workers exploitation, and better auditing costs.
Apart from the end consumers, the B2B business will implode due to the improved credibility and integrity. The trust means that the auditing costs, invoice disputes, and other aspects of conflict will be reduced to a great level or even removed.

Inventory Tracking
Inventory tracking is complex. Companies spend a lot of money to make it perfect and efficient. And, even then, it offers a lot of problems. That's why inventory tracking is one of the main focuses of the industries out there. To manage it, companies spend millions of dollars.
Blockchain technology can help solve the problem by offering the ability to companies to not only manage their products at the macro level but also micro-level. For example, companies can keep full track of the logistics by monitoring it in a highly efficient manner.

The end consumers will benefit the most out of it as they will always get the food items that are fresh and ready for consumption. Also, the end consumer can also check the condition of the food before consuming it. If the food is expired during transit then the information can be found on the blockchain(even if someone tries to push it to the market for consumption).

Settling Disputes

Cargo transportation always suffers from disputes. This can happen if the goods are misplaced or delayed. Disputes are hard to resolve and can easily last weeks before they get resolved. All of these mean more resource expenditure from the company.

Blockchain can resolve disputes faster with the help of immutable data and real-time information about the cargo. With automation, many disputes can be solved within minutes, backed by trustable data. It also helps companies to solve customer disputes.

Invoicing and Payments

Blockchain can help improve invoicing and payments through an efficient and secure system. Invoicing can be a real challenge when it is done on a very large scale. That's why you will find systems that are efficient in invoicing and payments

Companies can use smart contracts to automate the whole process and make it error-free and transparent. This will make invoicing and payments super-efficient as well.

SMART CONTRACT:

A smart contract is a computer code which consists of a preprogrammed set of instructions and which stores the terms of the agreement of a contract between 2 (or more) parties and execute those terms automatically when certain pre-specified conditions have been met. To put it simply, it is a 'self-executing contract'. It can digitally verify as well as execute a contract without requiring any third party assistance or intermediation. It also sets the rules and penalties pertaining to the agreement; just like a regular, a traditional contract does. The key feature of a smart contract is that it runs on, and is stored in, a blockchain. Hence all the data pertaining to the smart contract and the underlying agreement is stored in a distributed form in a decentralized database (i.e. the blockchain). A smart contract thus inherits a lot of core features and benefits of a blockchain.

The basic structure and performance of smart contracts make them highly adept at smoothening, quickening, and simplifying a lot of functions and processes in the logistics industry. These benefits of implementing smart contracts in logistics would make their utility in the industry evidently clear.

- **Visibility and Clarity Of Agreement Terms**
  As smart contracts are based on a blockchain, the blockchain's transparency is conferred to its code. All agreement terms and conditions which are coded into the smart contract are always visible to the parties as well as the blockchain members and there is no confusion or hidden knowledge whatsoever.

- **Trustworthiness and Reliability**
  The immutability of smart contracts makes them extremely trustworthy and reliable. It is practically impossible to alter the terms of the contract. Besides, as the database is decentralized, even if a few members of the blockchain exit the network, it would still continue to function with the same efficiency and without the threat of a data leak.

- **Fraud Protection and Payment Guarantee**
  Another benefit of decentralization is that because no single individual or entity holds control of the blockchain (and hence the smart contract), no one can forcibly release funds or data without the consent of the blockchain members. Any such attempt would be noticed by the blockchain members and marked as invalid by them. So if a logistics company has provided services to its client efficiently and in line with the contract terms, it is assured to receive due payment.

- **Elimination Of Third Party Intermediaries**
  The supply chain and logistics industry are replete with middlemen and financial intermediaries. An IBM estimate suggests that a basic shipment of refrigerated goods originating from East Africa and heading to Europe switches hands between 30 people or organizations and it requires over 200 communications between these parties.

  Using smart contracts for supply chain and logistics eliminates these middlemen and allows truckers, shippers and freight operators to negotiate and deal directly with one another. As a result, a number of menial tasks and processes in the industry become redundant and operations become smoother and speedier.

- **Flexibility Of Operations**
  Conventional banking systems provide strictly basic mechanisms for money transfer between accounts. But a smart contract provides you tremendous flexibility for moving your money. You could create a smart contract to perform complex financial movements with minimum fuss. For example, if you as a trucking company, wish to split up a particular cash inflow into 2 separate accounts directly from the source then you code that requirement into the smart contract.

- **Low-Cost Contracts**
  The elimination of intermediaries removes a major chunk of the fees involved in the creation and execution of the contract. So logistics companies would not only be able to transact with their customers directly but they would also do so at very low costs.

- **Easy Record Keeping And High Accessibility**
  Suppose a trucker wishes to refer to a contract he previously made with a customer a while ago and create a new contract with the same (or even different) customer along the same lines, he can easily access the smart contract previously made as all contracts are perennially stored in the blockchain.

Smart contracts simplify and secure many of the processes in the logistics industry, including agreement terms, fraud protection, record keeping, payments, cash flow, and more. They also save money, since they eliminate the need for any third-party processors.

Smart contracts are being used in the transportation and logistics industry to improve business operations:

Documenting Shipment Data

Through the use of smart contracts, it's able to track shipments from the beginning to the end of their journey — as it leaves the factory and makes its way to the customer. All of the information about its travels are recorded in the blockchain, which triggers smart contracts once the terms are fulfilled.

Digitizing Letters of Credit

A letter of credit (L/C) is essentially a bank's guarantee that a buyer will pay a seller, in the correct amount and in a timely manner. This is an important aspect of international trade, but the way it has traditionally been processed can take several days up to more than a week. With smart contracts, this can easily be streamlined to happen more quickly and to facilitate the payment faster as well.

Upholding Sustainable Fishing Practices

The fish was caught legally and sustainably, and is a great example of how the tech can be used for product traceability. The fish can be traced all the way to the supermarket, where customers can scan a QR code with their smartphone to verify where the fish was caught, when, and by whom.

Tools and Technologies Used:

LANGUAGE:

- Solidity

IDE:

- Remix IDE