

# Carrier Centered Implementation of Logistics using Smart Contract in Blockchain

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**ABSTRACT:** Now-a-days, blockchain is the cutting edge technology adopted by various organisations in the area like financial technology, supply chain and logistics, healthcare, e-voting etc. As blockchain is decentralized and distributed system, many organisations are adopted blockchain for its exceptional features. Today the performance of logistics system is retarding inventive developments and lacking transparency towards a connected, efficient ecosystem. This paper proposes a smart logistics system using smart contract in blockchain network. Logistics using smart contracts gives more reliable, transparent way of transporting goods from warehouse to destination. In this paper, we have proposed a new approach for carrier system of transporting goods from source to destination which results in fast moving of goods efficiently.

**KEYWORDS:**Blockchain, Smart contract, decentralization, immutability

## I. INTRODUCTION

In Logistics, various steps are to be performed after product is purchased by the customer. The purchased product can be transported from point of source to the destination.

Traditional systems along with newly updated technologies are merged to form new digital ecosystems. The recent advances in the blockchain technology are the reason for the usage of it in logistics domain. And also blockchain has a unique property known as immutability, once any information or details saved in it, they cannot be changed or alterable. We have smart contract in blockchain, it is digital contract that directly controls digital currencies transactions or transfer of anything value between parties under certain conditions. Smart contract is deployed in the blockchain network by the contract owner. So in case if owner want to do any modifications in the smart contract or any irregular activities in the contract can be traced. Smart contracts usage in blockchain network makes working of the system efficient and fast. As decentralized applications development increasing day by day, many organisations is looking to adopt decentralized system.

Blockchain technology and their implementation make it possible for all intervening parties to share an open and trustworthy information system, thus reducing the risk of failures or fraud. Blockchain has transactional database which is distributed among nodes linked in peer-to-peer network. Each node contains a database of historical and valid transactions, which are sent among the nodes in the network. Although every node has a copy of the ledger, those users who has permission only can access the information.

In this we have many users involved, they are supplier, carrier and customer. Traditional process involves the above users in which based on the carriers availability movement of product takes place. Carriers are the one who transport items or goods from source to destination. Sometimes there is a chance of happening the shortage of carriers, it results in delay of the product. To overcome this, we choose carriers in users connected in that network. i.e., everyone connected as node in the blockchain network have the chance to become a carrier. Based on the location of user and the product, carrier can be assigned as per certain conditions to carrier for the product security purpose. Dynamic way of implementing carriers in the process of transporting goods from source to destination makes the entire process fast and also reduce the cost.

The rest of the paper is organized as follows: Section II provides literature survey related to the different issues in the paper. Section III illustrates the overview of the proposed system, it mainly covers smart contract in logistics, carrier

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selection and giving authorization. Section IV shows how proposed system gives results. Finally the conclusions are drawn in section V.

## II. LITERATURE SURVEY

Based on the papers analysed, it gives knowledge about to implement logistics in blockchain technology. Mainly in many of the papers adoption of IOT with logistics is done.

According to the paper [1], the authors give systematic solution to the smart logistics and also discuss the challenges in logistics area such as transparency, traceability, accountability and liability. It gives information to implement logistics using smart contract in blockchain technology. Its main objective is to digitize the paper based procedure of contracts as smart contract. Mainly to analyse how to write smart contracts and deploy smart contracts in blockchain network. Blockchain allows users to have distributed peer to peer network where participants can collaborate with each other anonymously without involvement of third party. Normally for a traditional contract, third party can be involved for the trust management. Because of the involvement third party, it takes more time and fee. But with the use of smart contracts, no third party can be involved. So time delay can be reduced.

## III. OVERVIEW OF THE PROPOSED SYSTEM

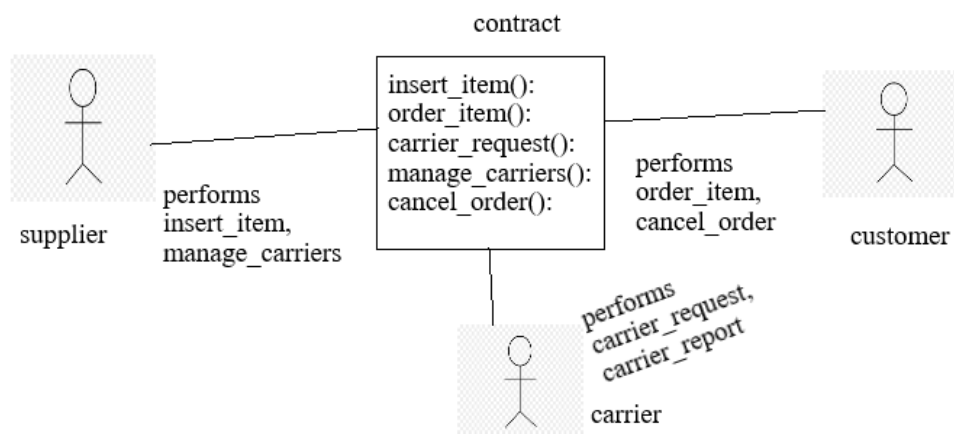
Figure 1 illustrates the parties that plays major roles in the smart logistics system:

**Supplier** is the one who deploys smart contract in the blockchain network and inserts products available in the system for the customers.

**Carriers** are the general parties connected in blockchain network, who requests to the supplier for carrier authorization. Then carries product from source to destination.

**Customer** are the persons who order the product by checking the availability of the products.

**Contract** plays the role of trusted third parties to resolve disputes between supplier and other parties.



1. figure shows decentralized contract between supplier, carrier, customer

### Smart contract in logistics:

Our proposed system is to use new carrier system for the implementation of smart logistics system. Smart contract is just like an agreement between entities, it cannot be altered. A smart contract is defined and executed in distributed

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blockchain network. Smart contract can be deployed by the supplier (the one who supplies the products) by connecting as a node to the blockchain network.

For performing logistics all the parties such as supplier, carrier and customer are connected as peers in this decentralized, distributed platform. Because of the decentralized system, every transaction happened in the system can be shared to every node connected in the network. If any node loses its information, it is available at other nodes.

### Carrier selection and give authorization:

In this system anyone who connects to the blockchain network can perform as carrier. Based on the location of the product and distance between the source and destination, carrier and no of carriers can be assigned respectively.

After customer order a product. It was seen by carriers. If the carrier and product are at same location then carrier have the chance to put request to become authorized carrier for the product. Supplier gives permission as authorized carriers based on conditions for security purpose. In the below diagram, it shows interaction between different objects in a sequential order. Here contract is also the object and the interaction with remaining objects such as supplier, carrier, and customer is clearly given.

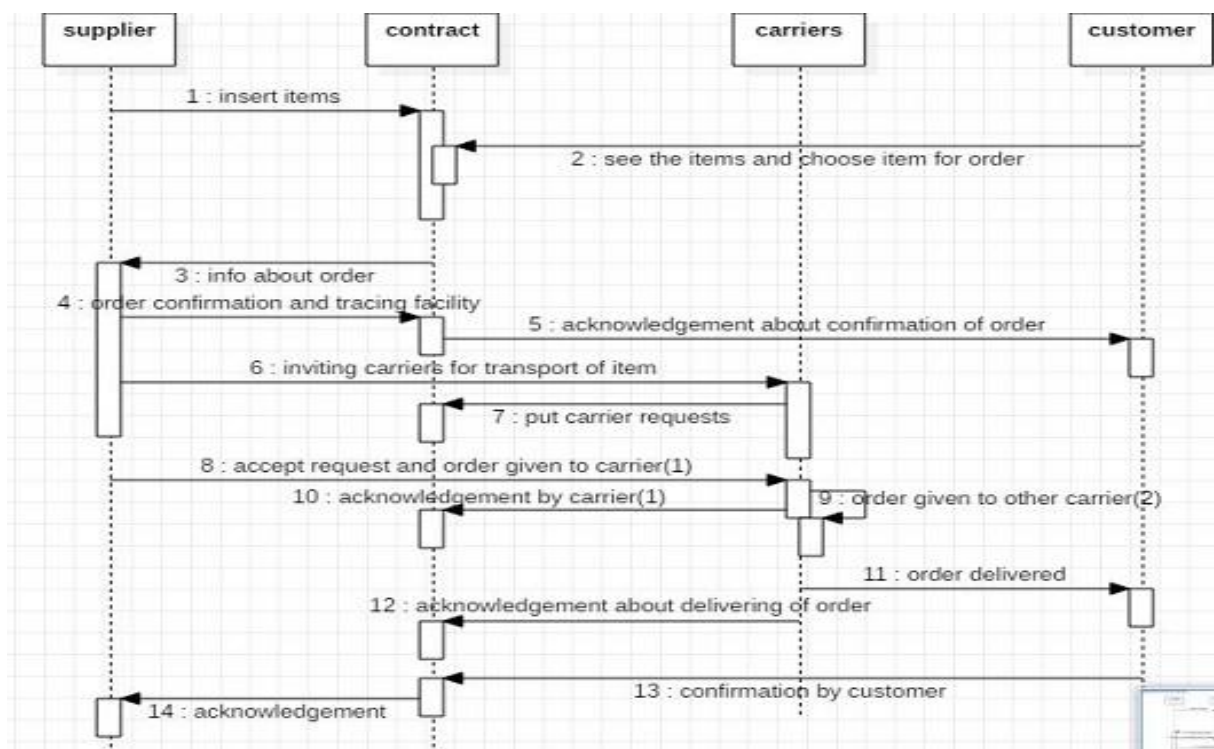


Figure 2: Activities involved in the logistics system

With the implementation of logistics using smart contracts, makes it more efficient, fast transporting, transparency, and traceable. After deploying smart contract by the supplier in blockchain. Access modifiers are used for accessing particular functions by authorized users only. The following methods are used for performing different operations in logistics system: Insert item (): this method is used only by the supplier for inserting available items. Order item (): it can be used by customer for ordering the item by seeing the available items in the list. Carrier request (): this function used by users who wants to become carriers for transporting particular item. Manage carriers (): this function used by supplier for giving authorized carriers permission to users who make request for transporting the items. Carrier report ():

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this function can be done by the carrier after transporting the product to another carrier or destination. As per below figure gives decentralized contract between supplier, carrier and customer.

A prototype implementation of above discussed system is done. With this system we have seen how logistics system adopted to blockchain technology with smart contract. How transactions between different nodes connected in blockchain network. It also adopted to other use case such as drug traceability, today in the market many of the drugs are counterfeit. Because we don't have a systematic supply chain information of drugs. Due to this many of the patients health is in dangerous situation. If we use blockchain technology for drug traceability, it gives transparent and efficient way of supply chain information about drugs. It will reduce the counterfeit drugs.

## IV. RESULTS

From the proposed system, we have to perform transportation of products as fast as compared to ongoing traditional systems by using carrier centred system. Also get result as how different nodes connected as peers in private blockchain network and how transactions takes place between the nodes. We see how owner of the contract gives permission to carriers (who are nodes connected in network) for requests put by carriers. Also the product changes from hands of one carrier to other carrier, they give carrier reports about status of the product.

## V. CONCLUSION

From the above work, we have implemented the logistics system using smart contract with users connected in blockchain as carriers for transporting of goods. Because of using smart contracts, it gives transparency, less delivery fees, traceability for the logistics system. As usage of blockchain technology is increasing day by day and also large cargo transport system moves to blockchain technology in supply chain and logistics domain, more scope of research work opens door in this area.

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