Blockchain & IOT: Revolutionizing the Freight Claims

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INTRODUCTION

With ever increasing online purchases and other factors like globalization, freight transportation continues to increase every day. According to Bureau of transportation, shipments business rose to all time high in Aug-2019. This business is expected to grow further in coming years.
With this boom in transportation one problem is also becoming larger than ever. That is freight claims. It is estimated that almost 8% of world's total shipment are damaged/lost. Damaged or missing freight is expensive and time-consuming for all stakeholders. Shippers file for freight claim. Carriers either pay or fight that claim. Each freight claim takes time and resources at part of shipper and carrier both. This problem is big to extent that there are dedicated agencies to file claims at end of shippers and there are dedicated teams to handle claims at the end of carriers and insurances companies. This whitepaper explores the possibility of reducing all these manual interventions and have an automated system (with help of technologies like blockchain and IOT) in place which takes care of all the stakeholders.

For carriers, freight claims results in monetary loss, decline in brand value and sometimes it leads to legal battles. Before going into details of the problems, let us first have brief understanding of what freight claims are.
Freight Claims

A Freight claim is a legal demand by a shipper or consignee to a carrier for financial reimbursement for a loss or damage of a shipment. Freight claims are also known as shipping claims, cargo claims, transportation claims, or loss and damage claims.

The freight claims process is initiated by the shipper or in some cases by agency who specialized in freight claim management. The shipper can be a retailer, manufacturer or distributor. The goal of the claim is to provide monetary compensation for the damage or loss of shipment. There are different types of freight claims.

**Damage** - Shipment is damaged during transit. Damaged freight is the most common claim. The damage must be visible and noted on the BOL (bill of lading) or delivery paperwork.

**Loss** - Freight loss occurs when the product is lost during transit. In this case, the shipper and receiver must verify the counts on the bill of lading and receiving paperwork.

**Shortage** - In this case some part of shipment is lost. This is a sub-set of freight loss.

CARMACK Amendment

The Carmack Amendment is a revision to the Interstate Commerce Act of 1877, which regulates the relationship between shipping companies and the owners of goods under shipment. The Carmack Amendment limits liabilities of these shipping companies, known as carriers, to loss or damage of the property itself. The Carmack Amendment, sometimes only referred to as Carmack, was enacted in 1906, and applies to insurance coverage for cargo.

One of the most important features of Carmack is that it does not require the shipper to provide proof of negligence, only that the goods were damaged. This makes the carrier liable for the damage, regardless of how the damage was caused. The shipper is required to make sure that the items being shipped are in good condition when they were picked up by the carrier, that the goods were damaged after they were received and that the amount of damages can be quantified.
Concealed Damage - This is type of damage which not seen immediately on delivery. This occurs when there is no physical damage, but items inside of shipping containers are damaged or missing. For example, a box has opened and some parts fell out, then the box was re-taped. Damage can include contamination from water, bugs, etc. This claim is harder to prove and the claim must be made quickly.

These damages are covered by either carrier (as part of carrier liability mentioned in CARMACK amendment) or covered by insurance company. In both the cases there are multiple parties and terms and conditions involved which make this process complex.

*Out of total freight business major chunk is by Trucks and truck freight is covered by CARMACK amendment.*

*North American Freight by Mode, October 2019*

![Graph showing freight business by mode with Truck at $68.2B, Rail at $14.5B, Vessel at $8.1B, Pipeline at $6.3B, and Air at $5.0B.]

Source – Bureau of Transportation Statistics
PROBLEMS IN CURRENT SYSTEM

Although with the current system of shipment handling in place, the chances of damage are very low but still damages and events of lost shipment occur and these cost millions of dollars each year. Also, there are many other shortcomings or areas of improvement in current system which are now visible in the light of new revolutionary technologies like Blockchain and IOT.

No Real Time Monitoring
In traditional system, apart from location, there is no mechanism for real time monitoring of container environment parameters like temperature, humidity, pressure etc. There is always a chance of damage especially fragile or perishable goods, with change in any of these environment parameters. This becomes more complex with involvement of 3\textsuperscript{rd} party carriers.

No alert mechanism
There is no alert/notification mechanism for the driver or any concerned teams. For example, if the container’s refrigerator broke during ongoing trip, the driver will not know it before the next stop. The next stop can be many hours away and by the time drivers reaches there, all the perishable goods can be ruined.

Difficult to determine exact point of failure
In case of any damage, it becomes very difficult to determine the exact point of damage. There are multiple possible avenues where damages can occur like from 3\textsuperscript{rd} party carriers, from multimodal carriers, during drayage, at last mile etc. Damage is seen only when shipment arrives at its destination. It becomes difficult to identify that from starting of shipment at what point exactly the damage occurred.
Lack of evidence to determine accountability
In many shipments, there are multiple parties involved to deliver the product to final location. As mentioned in previous point, it is very difficult to identify that exact point where the damage took place during entire journey of shipment. So, there is generally lack the evidence to fix the accountability for any damage. And this can lead to loss of trust between shipper, carrier and Insurance provider.

Freight Loss Coverage challenged by Insurance companies
There are different types of insurance policies like Land Cargo Insurance, Marine cargo insurance etc. providing coverage such as All Risk, Named perils, General average. Difficulty in finding exact point of failure makes it difficult to determine if the specific freight insurances policy covers it or not. Due of lack of evidence, the freight loss coverage is often challenged by insurance companies.

Damage to Brand Name
Even if customer get full money for freight claim still no one is happy by losing a shipment or getting damaged shipment. Each damage to shipment is in fact a damage to carrier’s brand name. Only thing carriers can do this case it to fix the accountability and pay the shipper as soon as possible.

Complex system
Because of involvement of multiple parties like shipper, carrier, insurance provider etc. there is a lot of communication back and forth. There are many terms and conditions at both carrier and insurance provider’s end and all those must be assessed to fix the final accountability and claim settlement. This makes the whole system very complex.

Time consuming
Because of involvement of multiple parties and a lot of documentation, the whole process becomes time consuming. There are multiple steps involved in any freight claim as explained earlier and all these steps have time limit of their own. This makes the overall process very long. It can go up to months or even years in some cases.
Resource Consuming
All the different steps of freight claim process require human resource involvement. Each party end up spending a good amount of human resources on claim settlement process.

Strict Timeline to file the claim
In some cases, the time to file the claim is short. And freight claim filing requires proofs and other documentation, which takes time. There is always a chance of missing the deadline.

Legal Issues
Many times, the shipper is not liable for claim and carrier must reject their claim. Many of shipper choose to go to court against the carrier. This further increases the spending of carriers on legal matters.

Impact on operations due to law suits
Involvement of carriers in lawsuits impacts their day to day operations.
To address the problems related to Tracking of cargo containers and Claim Settlement Process, I propose IOT and Blockchain based solution. There are 4 major elements to this solution:

**IOT enabled containers**

IOT will help in tracking environmental parameters of container in real time. This will help in monitor the condition of material being transported and alert mechanisms will help to notify concerned teams.

**RFID tagged boxes or pallets**

RFID tags on the boxes will help to locate and track equipment in case they are lost. These tags can be scanned without opening the container. The whole container can be scanned together.

**Distributed Ledger using Blockchain**

Blockchain network will be created for all the parties involved in overall shipment process. This blockchain network will have data entry from all the parties like shipper, carrier, 3rd party carrier, insurance provider, consignee, banks etc. Data will be captured at each stage of Transit with help of IOT enabled carriers.

**Smart Contracts to Automate Claim Processing**

Smarts contracts will be created as per the terms and conditions of participants, Carmack Amendment and other government rules and regulations. If any damage or loss occurs, smart contract will be executed and Claim Processing will be done automatically with very less human resource involvement.
Let’s understand this with an example:

A company sends a container from China to USA. Shipment is carried by carrier company and insurance is provided by Insurance company. A blockchain network will be created involving carrier, 3rd party contractors, insurance provider, banks etc. A smart contract is formed based on the agreed terms and conditions entered by all the parties and installed over blockchain network.

**Block Chain Network**
As the shipment proceeds from one point to another, real time environment parameters will be captured by IOT enabled containers. This data will be entered into IOT monitoring tool and further into the blockchain.

Now during the transport if any damages occur, Smart Contract will be automatically executed and claims will be settled as per the defined agreement in contract. Banks will act as a guarantor for automatic payment processing thereby reducing the need of human intervention in claim settlement process.
Creation of Blockchain network and installing smart contracts will be one-time activity which will be done at the time of initial configuration. Below are the data entry points from each of the parties into Blockchain network -

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<th>Party</th>
<th>Data entry in Blockchain network</th>
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| Shipper                       | Shipper can enter below details of shipment  
• What kind of material is being shipped.  
• Is it fragile?  
• Is it perishable? If yes, what are different environment parameters for shipment  
• How much pressure it can bear. |
| Carrier                       | Carrier can enter the details from the time the shipment is in his possession. For example, if shipment is packed properly and what are environmental parameters in which shipment is being transported. |
| 3rd party carriers (if applicable) | They will enter same details as main carrier.                                                        |
| IOT enabled containers        | This will be real time data. Container will enter actual environmental parameters like temperature, pressure, humidity etc. This data will help in determining if any damage occurred during transportation. |
| Insurance Provider            | They will act as viewers for data entered in Blockchain Network.                                   |
| Consignee                     | The final part of blockchain. Consignee will be viewer of data for most part. Finally, when shipment arrives, he can enter delivery data like if it reached successfully or can report any concealed damage. |
BENEFITS

This solution will benefit all the parties. Below are the major benefits:

IOT enabled containers & RFID scan data

Measure environment variables
IOT enabled containers can measure the environmental variables like temperature, humidity, pressure etc. while the container is on the move from one place to another. This information will be added to blockchain network and it can also be provided to any concerned team which can monitor these parameters real time basis. This will provide constant visibility

Identify problem and malfunction and alert drivers and concerned team
These IOT enabled containers can identify if any environment parameter is going out of set limits. They can send timely alert and notification to driver as well as any respective team.

Early resolution of malfunctions for perishable goods
Once the driver receives the alert, he can stop the truck at any nearby service center and can get the problem resolved with minimum damage to the whole shipment.
Blockchain based Distributed Ledger & Smart Contracts

End to End Traceability
Blockchain network will provide the complete end to end traceability of the shipment. All the data will be entered using IOT enabled containers and RFID scans on real-time basis.

Fix Accountability
The blockchain-based network with data entry from different parties will make it much easier to fix the accountability in case of any damage.

Claim Settlement
Once the accountability is fixed, the claims can be settled much easier and faster. The smart contracts will automate claim processing and settlements.

Reduced Claim settlement expenses
With smart contract in place, the amount of manual work will reduce to a large extent. It will be virtually zero.

Reduced number and quick resolution of law suits
The clear and transparent system will help in reducing the number of law suits by large. Also, if there are lawsuits, those will get resolved very quickly based on the facts and data available in blockchain network.

Reduced legal expenses
Reduced lawsuits will help in reducing legal expenses.

Transparent and Single source of truth
This blockchain network will be single source of truth. One of the major benefits of blockchain network it will help to bring more trust among all parties.
CONCLUSION

Once this blockchain network matures with time, it will have all terms and conditions in form of smart contracts, it will have all data related to carriers, repeated shippers, insurance providers etc. Also, it will get real time data from IOT containers and RFID scans. Once it happens then,

✓ The damages will reduce

✓ If damage occur, there will be no issue in fixing the accountability

✓ Automatic liability calculation by smart contracts

✓ Automatic payments to in grieved parties
✓ Instant payments

✓ Zero lawsuits for claim settlements

✓ No human resource involvement at any step

I know, this sounds a little unrealistic but that is what technology is – it continuous to create new possibilities which earlier seemed impossible.