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PRIORITY ROUTING OF SHIPMENT USING IOT SENSOR DATA FROM SHIPMENT PACKAGES

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ABSTRACT

Techniques are provided to prioritize shipping containers using sensor data by monitoring the health of the package being shipped. Based on smart contract terms, the priority of the shipment is dynamically elevated and the package is shipped faster.

DETAILED DESCRIPTION

Blockchains are playing a huge role in improving transparency, ensuring security, and also in improving efficiency in logistics (e.g., <https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-blockchain-trend-report.pdf>, <https://www.enno-motive.com/blockchain-applications-in-logistics/>).

The present techniques utilize the presence of blockchains in the logistics/shipping industry. Logistics is a key part of the shipping industry, with an estimated 90% of world trade carried out by the international shipping industry every year. However, the logistics behind global trade is highly complex as it involves many parties, often with conflicting interests and priorities as well as the use of different systems to track shipments. Therefore, achieving new efficiencies in trade logistics is likely to have a significant impact on the global economy.

Blockchain technology can help alleviate many inefficiencies in global trade logistics including procurement, transportation management, track and trace, customs collaboration, and trade finance. Various entities are exploring the use of blockchain networks in the shipping industry (<https://www.logistics.dhl/content/dam/dhl/global/core/documents/pdf/glo-core-blockchain-trend-report.pdf>). Most of the

existing techniques are focused on using blockchains to reduce paperwork, track shipments, and ensure that service contracts are met, for example, using smart contracts of blockchain. However, none of the current methods appear to focus on using the health of the product/item being shipped to dynamically modify the shipping priority.

Priority shipping is an important service in the logistics and shipping industry. Priority shipping helps ensure that critical shipments (such as goods that have a limited shelf life, including vegetables/fruits/meats and other perishables) reach their destination on time. With advancements in technology and usage of IoT sensors for tracking shipment packages and blockchains for tracking shipping pipelines (<https://www.ennomotive.com/blockchain-applications-in-logistics/>), the shipping process has become more robust and efficient. Transit port hubs that handle multiple shipments need to sort and transport goods to destinations efficiently. The following example of the Hamburg Port Authority showcases the use of technology to make its transit operations faster <http://www.itssa.org/wpcontent/uploads/2015/06/Filbey-ITSAApplicationsinthePortEnvironmentWorkshopTSystems.pdf>). While such techniques may locate parking for container trucks, these techniques do not use location-based information to track shipments, ETA for deliveries, etc. nor do these techniques prioritize shipments and delivery based on sensor data. Thus, current approaches do not elevate the priority of the shipment dynamically to ship them faster. In contrast, the techniques provided herein prioritize shipping containers using sensor data.

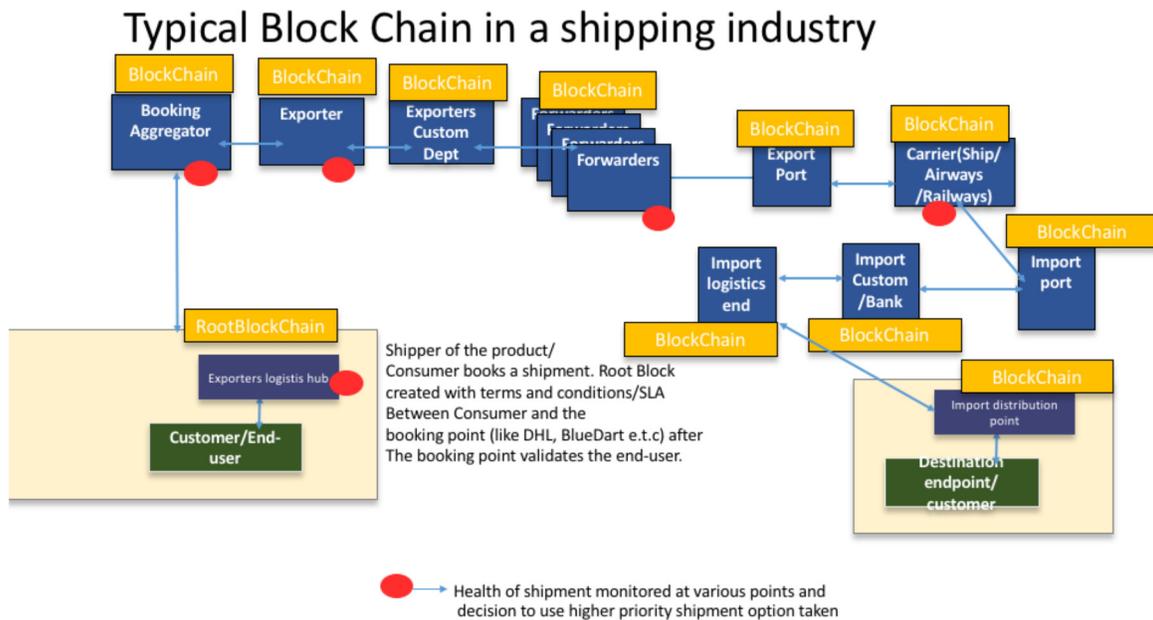


FIG. 1

As shown in FIG. 1, a typical blockchain network used in the shipping industry may include various parties, such as:

- Exporter (shipper of the product or customer)
- Exporters logistic hub that takes the shipment after validating the identity of the exporter (e.g., by creating a root block to sign smart contract, etc.)
- Exporters customs department
- Forwarders (e.g., aggregators from various logistic companies like DHL, BlueDart, etc.)
- Telemetry application service providers (e.g., providers that give technology that monitors the packages, report their health data back to cloud, etc.)
- Export port (e.g., Hamburg port, etc.)
- Carriers (e.g., various parties like shipping companies, rail companies, airways, etc.)
- Import port
- Import aggregators/hubs

- Importer

Blockchain networks may be permissioned blockchain networks with smart contracts wherein only a set of parties (in this case, various players involved in the shipping industry) are included. The smart contract will designate the threshold levels of the package being shipped and actions to take at each level.

FIG. 2 shows how each point subscribes to IoT sensor data associated with the package and uses that data to apply the smart contract terms when the data reported reaches a particular threshold level.

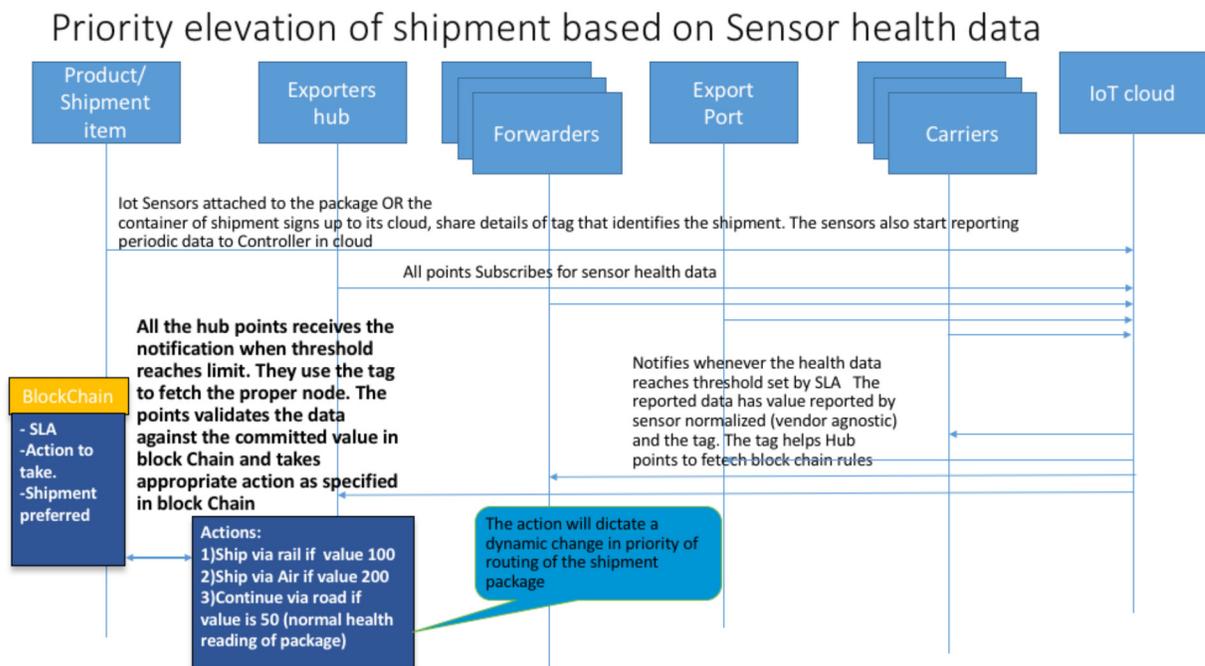


FIG. 2

Flow:

1. Customers (exporter) wanting priority shipping may enter an agreement (e.g., a blockchain smart contract) with the logistics hub. Among other things, the smart contract covers details around estimated delivery and other factors that may influence delivery (e.g., quality of goods, etc.). The contract also defines threshold levels for goods after which the logistics and shipping pipeline elevates the priority of the package.

2. The hub takes the product to be shipped, tags the product using a unique tag, which is added to the root block of the blockchain. The tag will uniquely identify the product and also helps the relevant parties retrieve the SLA (smart contract) from the blockchain to ensure that the terms of the SLA are met.
3. The product may be shipped using the existing pipeline via forwarders and various carriers. At each transit port, the smart contract is executed and validated before forwarding the package as per the agreed upon terms and conditions in the smart contract. IoT sensors attached to the package monitor the health of the package while transmitting health data back to the logistics hub. The telemetry application in the cloud (e.g., which may be part of the blockchain network) accesses and retrieves the data from the smart contract to determine if health parameters of the package are within a threshold level.
4. If the parameters of the package exceed the threshold level, the IoT cloud application notifies the interested parties (e.g., port transit hubs, carries, forwarding agents, etc.) to prioritize shipments. The tags associated with the packages, which are monitored by the IoT sensors will be used to locate shipments that require attention. These shipments are then placed at the head of the queue, thus speeding up their delivery.
5. Further, based on the blockchain smart contract, the shipment may be shipped via a faster path (e.g., airways over rail/roadways etc.).
6. At the destination hub, the import logistics hub will be notified of the tags that need immediate attention. The logistics company will ensure that those packages are delivered ahead of other ones.

The present techniques provide several advantages. A customer may choose the cheapest/best route to ship the product, while having the ability to dynamically elevate the priority of the shipment via a much expensive faster path, if the health levels of the goods require attention. The actual levels are agreed upon as part of a smart contract which is visible to all the parties that are part of the permissioned blockchain network. This includes the end-user who will be notified of elevated priority for the shipment. Additionally, priority orders cannot be changed once they are committed to the

blockchain. So, if a shipping service is late in delivering a package, the service cannot alter the records to lower the priority.

In summary, techniques are provided to prioritize shipping containers using sensor data, by monitoring the health of the package being shipped. Based on smart contract terms, the priority of the shipment is dynamically elevated and the package is shipped faster. For example, a customer may have booked shipment via a normal path but based on health status, it may be shipped much faster (via air or other route) to reach its destination in a shorter period of time with a smart contract.