Hyperledger Implementation for Real-Time Asset Tracking in the Supply Chain Industry

Application: A platform for real-time tracking of assets using Blockchain and IoT data

Services Offered: Full stack development, Blockchain development, IoT Data Analytics

Tools: Hyperledger Fabric, AngularJS, NodeJS, MongoDB

Client

The client is a Logistics and Supply Chain Management Platform provider that allows shippers & transporters to increase sustainability, security, productivity, and profitability in their supplier networks.

Key Highlights

Key Success:
Optimized use of resources in the SCM process, reduced payment time & increased customer delight

Domain:
IoT, Supply Chain

Duration:
4 months

Team:
1 Blockchain Architect
2 Blockchain Engineers

Challenges

- Tracking of adherence to compliance policy for transportation, storing etc.,
- Individual ledgers maintained by the different parties pose a challenge to localize a problem efficiently.

Additional Features

- ✓ Customized dashboard for the users to view information and interact with the application.
- ✓ Admin dashboard to enable user management and other functionalities.
- ✓ Securely track consignment status.
- ✓ Capture the sensitive information in a secure and transparent manner.

Solution

Indium's Approach and Implementation

To overcome the mentioned challenges the following solution approach is being followed:

- ✓ User registration and dashboard features were implemented in a web application using Angular JS.
- ✓ Web application allows for user registration. User can be registered in the following categories:
  - Buyer
  - Seller
  - Handler
- ✓ Once registered, the user can log in to view their respective dashboard.
- ✓ Using the dashboard the users can view reports and statistics in real-time and make calculated decisions.
- ✓ Tracking of the goods is done with the help of a GPS device which transmits the location constantly, and is available for the different parties to see on the application.
- ✓ The environmental information is tracked by different sensors and the data is fed live into a database. Since the data was unstructured in nature, it was decided to go with MongoDB for storing the sensor and location data.
- ✓ The transactions in the Blockchain captures the following data:
  - Current Owner ID
  - Unique Contract ID is created in a dynamic field that is auto generated with a 17 digit ID
  - Trip Name
  - Description of Freight
  - Weight, volume, or measurement of freight
  - Number of packages
  - Assets in Waypoint or Asset Host ID in Waypoint
  - Handler Name
  - Consignee phone (Recipient Phone)
  - Sensor location data from beginning address to ending address, and is constantly updated inside the contract
  - Date and time (along with the location data, the date and time is also captured) is constantly updated - Time stamped with time zone
  - Trip Progress % is updated when location data is updated
- ✓ Bearing in mind the requirement of private Blockchain network with a process framework support, Hyperledger Fabric was chosen.
- ✓ Apache Kafka is used as a consensus mechanism.
  - Leader does the ordering
  - Provides crash fault-tolerance
  - Finality happens faster
  - Implementation of ACL
- ✓ Smart contract was written in NodeJS for actions like,
  - Contract creation
  - Change of ownership
  - Event based update (Location and Sensor reading)
  - Final delivery and return
- ✓ Fabric SDK was used as a means for interacting with Client application and the Smart contract.

Business Impact

- ✓ Real-time tracking of the goods and a history of the location is maintained in a tamper proof and secure manner.
- ✓ Order delivery history is maintained in a transparent fashion.
- ✓ It enabled decision-making based on real-time data availability.
- ✓ Combined with IoT, it enabled efficient usage of logistic resources.