PROJECT PLAN

Blockchain-based Battery Traceability System

CHEN Honghao, 119010014

CHEN Yanyu, 118010029

LI Jingyu, 118010141

ZHANG Mingzhe, 118020526 (Team Leader)

Project Overview

The sponsor of our project is an electronic tool company, which is focusing on group purchase of battery-related raw materials and electronic instrument selling business. Due to the potential risk of explosion, the company needs an efficient and reliable battery traceability system to monitor the production and logistics status of batteries throughout the supply chain. Also, the visibility of the battery is vital in agile event management, responsibility assignment, and recycling.

Our team proposes a blockchain-based information system to trace the movement of batteries along the supply chain for the listed main reasons:

- First, blockchain is a decentralized system, and it is a reliable medium to share battery information to supply chain entities and boost trust.
- Also, blockchain has the properties of efficient and automated transaction processing, plus tamper-proofing data storage, which benefits the company by cutting labor costs and operations lead time.
- Moreover, blockchain is ultimately an information system to improve supply chain transparency/visibility. The visibility of battery status empowers the company to monitor and control the production and logistics process and equips the company with information needed to execute the battery recycling process.

The above features match the requirements of the battery traceability system. Therefore, we propose applying blockchain technology to implement this traceability system for our client.

Team Composition & Responsibilities

The Project is initiated by the Chief Technology Officer (CTO) of the company, with four professional IT managers from the IT department and the Supply Chain manager. This crew is called **Digital Transformation Team**, with the primary goal of leading the digital revolution of the battery company by employing advanced blockchain technology.

The Digital Transformation Team is cross-functional, composed of one project coordinator and three task leaders. Each task leader will be in charge of the direction, work assignment, control & monitor their functions. The coordinator is responsible for organizing the entire time and monitoring the overall project progress.

Detailed member roles:

Mingzhe ZHANG

Project Coordinator (Team Leader). Mingzhe is responsible for organizing the project team and ensuring the overall blockchain project goes smoothly. He is also responsible for aligning the technology with business and supply chain strategy.

Honghao CHEN

Blockchain Tech Leader. Honghao is responsible for developing blockchain security technology, including public/private key design, decryption, encryption, smart contract, etc. He is also in charge of developing the distributed database, including defining data content (E-R diagram, index design, data import) and database function (Create, Delete, Record, Query).

Yanyu CHEN

Front-end Design Leader. Yanyu is responsible for the design of the front-end and Graphic User Interface.

Jingyu LI

Integration Leader. Jingyu is responsible for the integration of the separate systems, including Login, Identity Management, testing.

Project Objectives

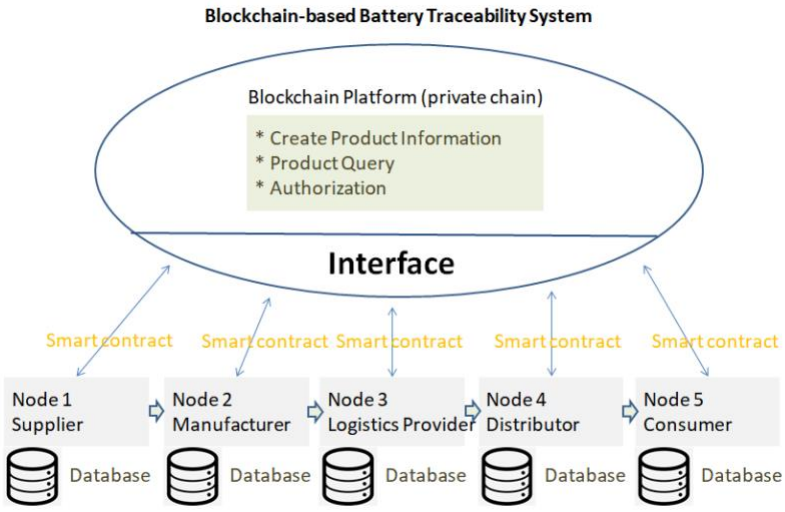
The main business objective at the **strategic level** is to **make the movement of battery traceable and therefore enhance efficiency, cut cost, and lift customer satisfaction.**

To achieve the ultimate business goal, we expect the blockchain-based system to accomplish the following five sub-objectives,

- Be able to monitor and control the battery production and selling process
- Ensure the records are reliable and easily retrieved, and clear the allocation of responsibility.

- Share real-time logistics status to entities, enhancing supply chain visibility and trust.
- Deploy smart contract system to trigger logistics event alerts and reinforce supply chain responsiveness.
- Empower the recycling process of the wasted batteries and boost sustainability.

Blockchain System Components



Our Blockchain System will be implemented through Hyperledger Composer. It allows Participants to to send transactions to exchange assets easily. Above is the component diagram of our Blockchain-based Battery Traceability System.

Generally speaking, the ellipse represents the blockchain platform where different roles can perform the corresponding function to influence the chain (e.g., create product information). The five nodes (**participants**) are listed below. Each node represents a role during the battery processing procedure and possesses a distributed database containing all product information (**assets**). The databases are identical among different nodes. Individual nodes have interactions (**transactions**) with the blockchain platform interface through the smart contract mechanism.

Assets represent products. More specifically, they can include products' different status like raw materials (aluminum, iron, copper, plastic), semi-product (battery pack), standard product

(bearing, converter, switch, consumables), and final product. Each asset owns information like a unique ID, produce time, weight, size, location, and so on. This information is stored in the chain for tracing. Assets support the business activities by defining each stakeholder's contents and making the information meaningful and valuable.

Participants are members of the business network. Here we define five roles throughout the process:

- *Supplier:* Provide the raw material for production, maybe multiple.
- *Manufacturer:* Assemble the material to make marketable products.
- *Logistic provider:* Provide logistic services, transport products.
- *Distributors:* Sell products.
- *Consumers:* Purchase products.

Participants support the business activities by identifying the potential users of the blockchain system and who enjoy the benefits.

Transactions are based on Smart Contract, and we define the following transactions:

- **Create product information:**
  Record new information about the product and add it to the chain. In the actual scenarios, products may include:
- **Trackable product** (like battery, ...): Use RFID to supervise the production, update information once the product moved from one node to another
- **Untrackable products** (like iron, ...): Use OCR and NLP techniques to recognize information from the contracts, followed by updating the information through the front-end or apps. For instance, the user could upload the receipts on the front-end or apps, and the information will be collected and updated to the database.
- **Query product origin**: Query information regarding the product, trace the origin. Utilize Oracle (预言机) to fetch the request from the user and gather all information on the chain. Finally, a report will be produced and presented to the user
- **Authorization**. Authorize to enter the system. Identify the participant role (supplier, consumer ...). Provide relative functions interface regarding the role. For example, consumers can query information but not create product information.

Transactions support business activities by allowing the interaction between the blockchain system and participants. The different parties can add product information to the chain for others to trace, and blockchain technology can ensure information security, not tampered with by anyone. Also, our blockchain system would allow suppliers or manufacturers to create products in our blockchain through a smart contract. Downstream customer could query product origin to determine the part that possibly error would occur.

Project Timeline & Milestones

Our project will strictly follow the pre-set schedule, dynamically adjusting the plan according to the actual situation.

Task	Expected Time
Finish project plan	Feb 20
Finish database content design	Mar 1
Finish database function design	Mar 15
Finish smart contract design	Mar 31
Finish front-end GUI	Apr 12
System Integration	Apr 25
Finalize project report	May 5

Decision Protocol & Contingency Plan

To enhance the effectiveness and efficiency of team communication, we define the following protocols as communication methods.

- Weekly meetings (Sat 600-630 pm): Team meet every week to synchronize the progress and share the achievements during the week. The meeting better lasts less than 1 hour. But try to make sure that everyone attends. We will also assign the tasks for the next week to define the expected output for the next meeting.
- Shared documents: The team uses the shared documents system Shimo, as the progress monitor.
- Task management tool. The team employs Trello to dynamically manage task progresses.

To mitigate predictable group behaviors, we set the contingency plan as a reference when inappropriate behaviors occur.

- Disagreement and dispute. Both sides present their views in public for five minutes at weekly meetings, and team members collectively decide on a better option.
- Communication breakdown. Anyone who falls out of the project loop needs to check the shared document and briefly present the current stage in the weekly meeting to prove they have caught up.
- Free riding. If any free-riding behavior is perceived, the project coordinator should arrange a small talk with the free-rider to inform the free-rider and then provide improvement suggestions. After one-week observation, if things do not work better, the project coordinator should publicly present the situation in the weekly meetings. Still no improvement; the free-rider will receive mandatory tasks from other team members. The job quality will be reviewed in every team meeting. If the free riding is irreversible, Professor will finally be informed of such behavior.