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Asset Tracking System using Blockchain

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Abstract— The technique of following a product or a batch of things throughout the supply chain to ensure that the products that reach clients are authentic and tamper-proof is known as asset tracking. The ultimate goal of an asset monitoring system is to track products along the supply chain, verifying that they haven't been tampered with and, if they have, pinpointing where the tampering took place. Traditional tracking technologies, such as BLE (Bluetooth Low Energy Beacon), which works within a limited range, RFID, and above-mentioned systems, are expensive and centralised. So, for this project, we'll use Blockchain Technology, which is an immutable, tamper-proof, decentralised distributed ledger with security features that allows us to establish an asset tracker that can follow our product along the supply chain. Ethereum is used to implement the system. Unlike other methods, there are no hardware components or large gadgets that may be removed from the original object and attached to the copy.

Keywords— Blockchain, Supply Chain, Smart Contract, Keccak-256, Ethereum,GUI

I. INTRODUCTION

The majority of logistics operations rely on paper or easily editable internet documents.The finding of a fake item is currently the greatest challenge. Fake things have a huge negative impact on the business and the clients' health. As a result, item makers are facing significant difficulties. All of this is no longer an issue thanks to Blockchain technology. You can generate a document that is saved in a decentralized network and shared with all stakeholders in the supply chain, but it cannot be altered or manipulated once it is entered.The suggested system focuses on asset tracking between each two parties in a supply chain, as well as asset validation at each stage. The manufacturer, supply chain entities, client, and arbitrator are the system's major entities. Smart contracts allow buyers and sellers to conduct transactions independently. We propose a blockchain-based decentralised Asset Tracking System in which buyers and sellers engage via a contract that mimics an exchange.

II. LITERATURE SURVEY

This study employs Blockchain technology to track assets along the supply chain, ensuring that no product is tampered with at any point. Depending on the product, every product has either packaging or its own body that can be used to trace it throughout the supply chain. The ultimate purpose of asset tracking systems is to trace the path of products through the supply chain, ensuring that they have not been tampered with and, if they have, identifying exactly where the tampering occurred.This study employs a decentralized Blockchain technology technique to demonstrate that buyers are not entirely reliant on merchants to determine whether or not things are real. It describes a decentralized Blockchain system with anti-counterfeiting features, allowing manufacturers to supply authentic products without needing to run direct-operated outlets, potentially lowering the value of product quality assurance. Customers can use the recommended technologies to identify counterfeit goods in the supply chain. Customers can scan QR codes attached to products to get information like transaction history and current owner, which can be used to assess whether or not a product is genuine.

III.PROPOSED SYSTEM

A. User Interface Module

It's beneficial to have an interface where users or customers can check on the status of their assets and where the manufacturer may generate and transfer assets. The web portal contains many modules for producing assets, transferring ownership, and looking for assets. The Manufacturer is given a unique Ethereum address, and that address is the only one with the ability to manufacture the asset. The map API in the search asset module can display the asset's coordinates, allowing users to see where the object is located. PHP is used to develop the web interface, which also includes web3.js. Figure 1 shows the proposed system's architecture diagram, which shows how users (such as manufacturers, supply chain participants, and buyers) can communicate with blockchain and update the asset's state via the gui. The system design in Figure 2 depicts the application's flow as well as the verification requirements at each stage.

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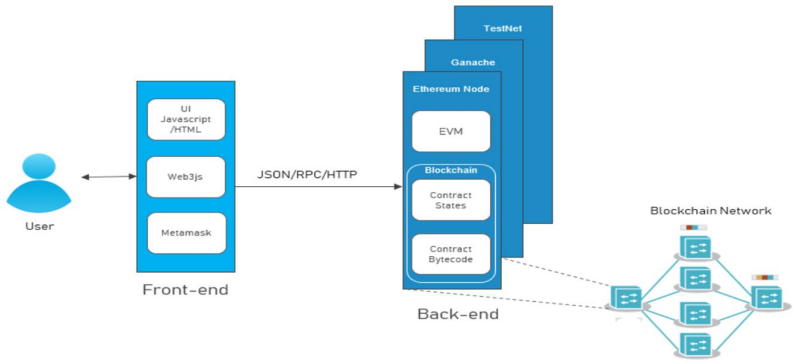

Figure 1: Proposed Architecture

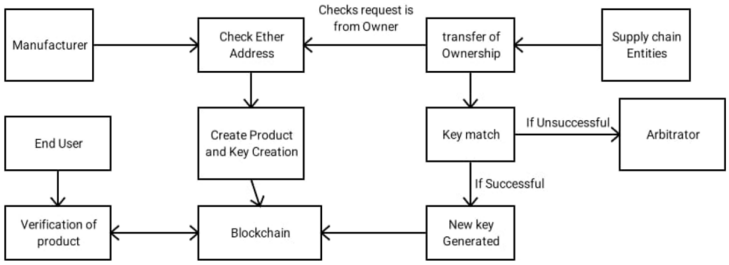

Figure 2: System Design

B. Smart Contracts Module

This module defines the Solidity smart contract that is used to carry out the core functionalities of Asset tracking such as product creation, product search, and ownership transfer. Smart contracts are conventional contracts written in lines of code that execute themselves when a condition is met. AssetLibrary.sol and AssetTracker.sol are two files in the AssetLibrary.sol and AssetTracker.sol folders, respectively. AssetLibrary.sol is a solidity code file that defines the common code that may be used in AssetTracker.sol, lowering the gas cost. AssetTracker.sol is used to create assets, move assets, track asset status, and create keys. This module is really useful since it checks whether the condition is met before running the code and adding it to the blockchain network.

IV. IMPLEMENTATION

A. Smart Contracts Module

In this module we have defined 4 important functionalities: create asset, transfer asset, asset status and asset store and all of this functionalities are present in Assettracker.sol

1) *Create Asset:* After successfully validating that the user producing the asset is the manufacturer using the ethereum address, this function assists in putting the asset to the blockchain. Figure 3 shows the result of the remix IDE's generate asset command.

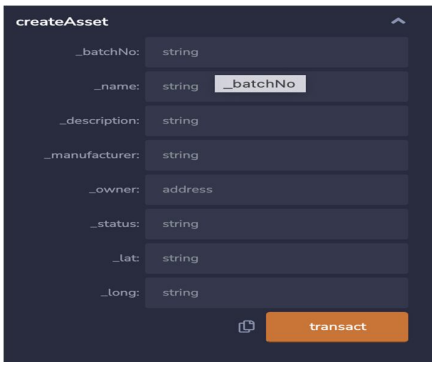

Figure 3: Create Asset Output

2) *Transfer Asset:* In this function the owner as shown in figure 4 only has right to transfer the product to different entities in the network and after successful verification of the owner the asset is transferred and the new owner is changed and the event is logged in the blockchain.

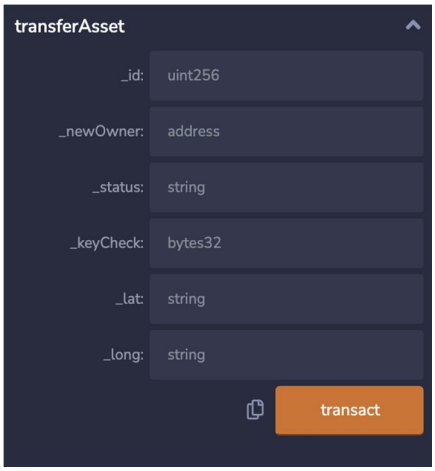

Figure 4: Transfer of Ownership Output

3) *Asset Store:* This contains the information of the asset stored in the blockchain as shown in figure 5

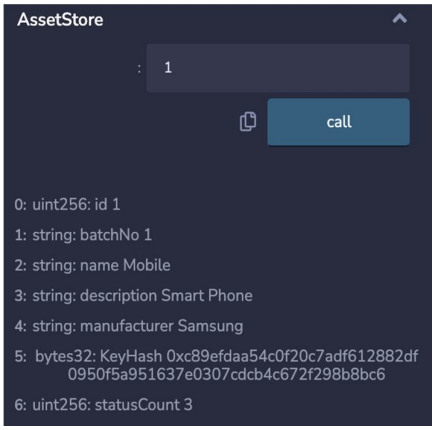

Figure 5: Asset Store

4) *get Status:* This function helps us to understand the current status of the product and the current owner of the asset and all the events are logged in the network as shown in figure 6

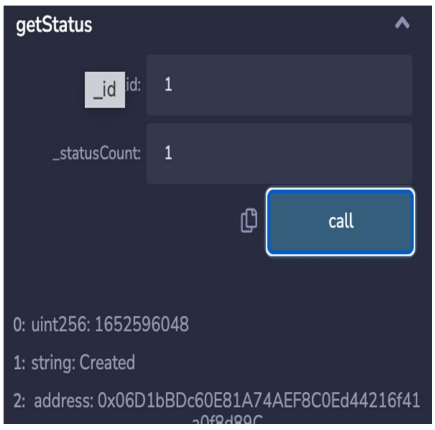

Figure 6: Status of the Asset

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B. User Interface Module: The Web application is developed using PHP and JavaScript. This helps the end users to interact with the blockchain network and also helps the manufacturer to add the assets and for the clients to view the status of the assets. There are mainly 3 modules: Create Asset, Transfer Asset and Search Asset.

1) Create Asset Page: This helps the manufacturer to create the asset using the gui as shown in figure 7 and verifies whether the request to create the asset is coming from the valid ethereum address (i.e manufacturer address).

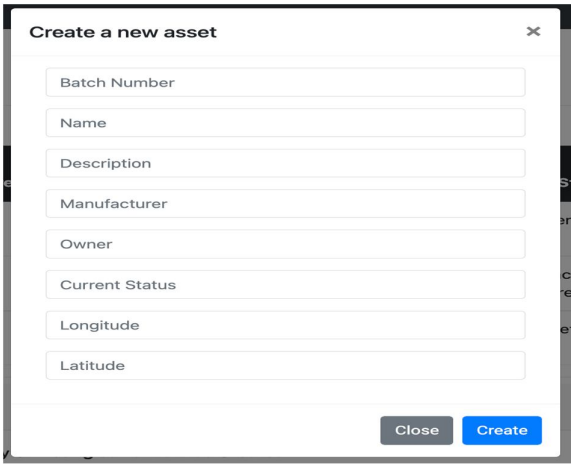

Figure 7: Asset Creation using GUI

2) Transfer Asset page: After the successful validations from the javascript code and the smart contracts, this helps to transfer the ownership of the asset using gui as shown in figure 8.

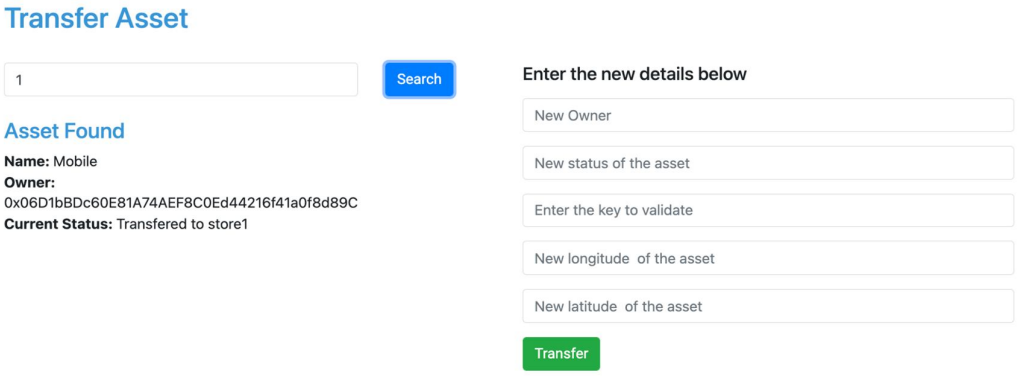

Figure 8: Transfer of Ownership using GUI

3) Search Asset Page: This allows supply chain members and customers to see where the product is and what its current status is. The asset is also visible on the map, as seen in Figure 9.

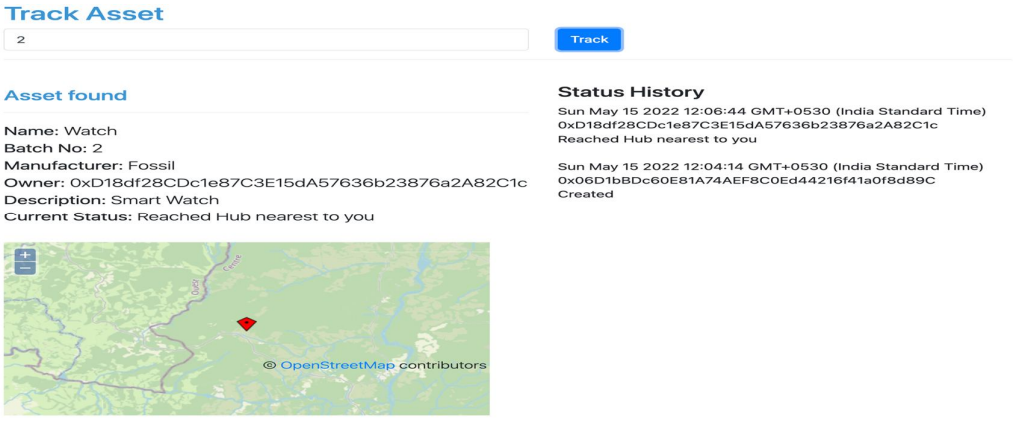

Figure 9: Tracking of Asset and the History of the Asset

V. CONCLUSIONS

In comparison to current asset tracking systems on the market, our suggested blockchain-based asset monitoring system will undoubtedly prove to be more dependable, transparent, and cost effective. Our users' and their items' privacy and security will be guaranteed by the decentralized system. All actions of all people in the supply chain will be tracked, and all activities will be logged with a timestamp, allowing us to pinpoint the exact moment and location where the product was tampered with. Customers may track the merchandise all the way back to the manufacturer to confirm that they are receiving an authentic product. This is our endeavor to correct the present system's flaws and ensure client happiness.The proposed approach can effectively replace the time-consuming and costly methods now in use. The system is self-contained, keeping track of the assets at all stages and preventing altered assets from reaching the market.

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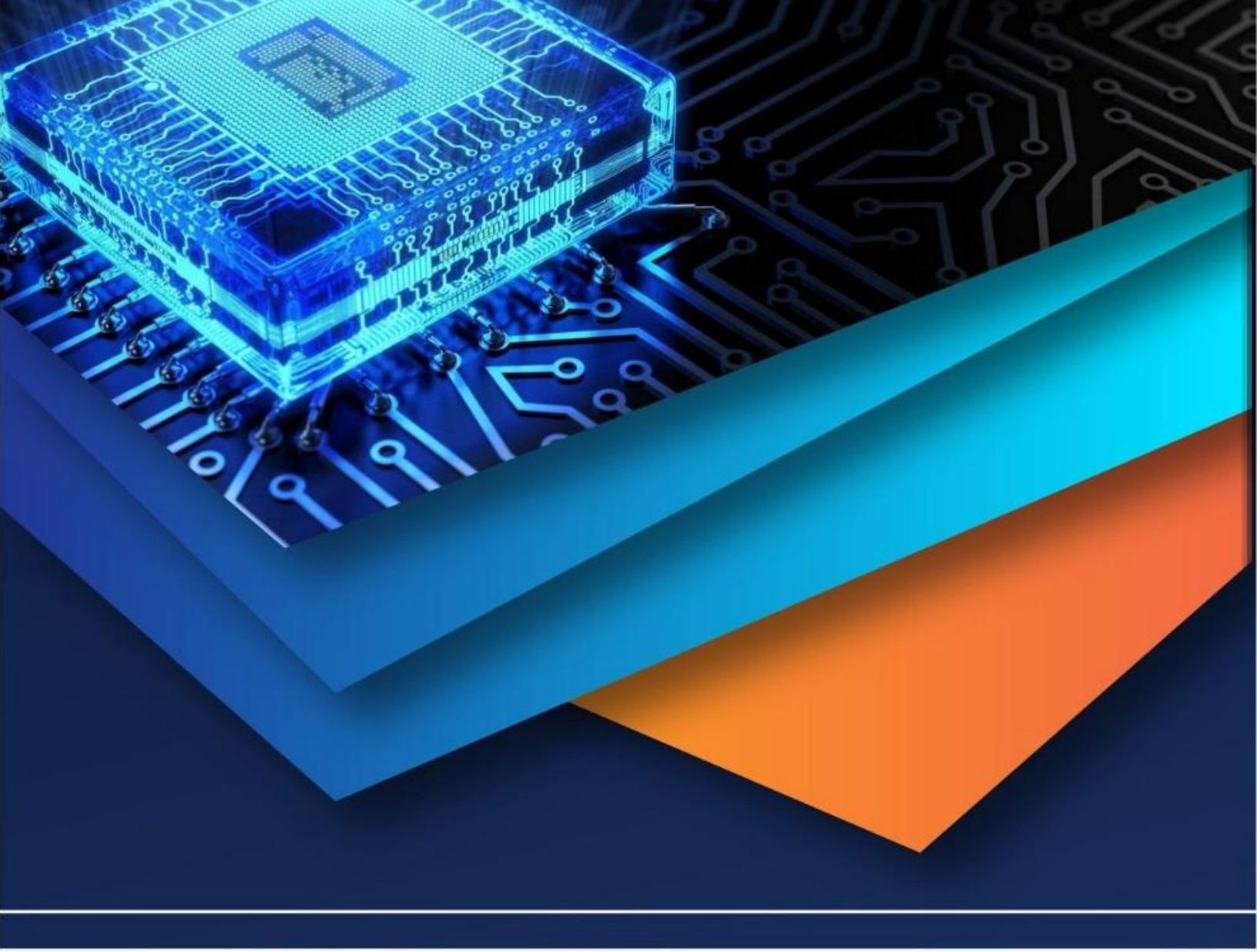

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