Blockchain & Cloud-based, Digital Object Identifier System for better Environment Management

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Abstract - Almost all the products manufactured in the 21st century are shipped with some amount of packaging material, the packaging material can cause pollution if not recycled. Therefore, there is a need to create an efficient, decentralized, reliable, and transparent system. Such a system can help us to track the packaging material for its entire lifecycle, such that we can recycle it when it reaches the end of its life cycle. Also, we have researched how we can integrate this system with another system that we are working upon that would calculate the Environment impact factor (EI) and Green Environment points (GEP).

Key Words: Digital Object identification, Blockchain, Cloud, Environment management, Asset, and Liability tracking, and product tracking. Green environment points

1. Introduction:

With the beginning of the Industrial revolution environmental degradation started at a greater pace. One of the main reasons for the increase in wastage of material is mass production and the use of non-biodegradable material for packaging and shipping of the products.

The government of various states has banned single-use plastic but still, the problem remains with non-biodegradable recyclable plastic, because all type of plastic cannot be recycled together, different type of plastic is made with different material and manufactured with different process and hence different way of recycling.

The process of sorting is resource expensive and cannot be economically viable. Hence we are coming up with another methodology for tracking the product from day zero, such that we Can record and track the product for its entire lifecycle.

2. Objective:

1. To build a reliable and transparent system for efficient management and recycling of recyclable waste.
2. To make available data in the public domain such that it doesn't hamper the privacy of the user.
3. To make each entity responsible for protecting the environment.
4. Tracking revenue and profit in supply chain management.

3. Literature Review:

The following literature is based on the research paper published in various national and international journals and review articles.

3.1 A systematic review of blockchain by author, Min Xu, co-author: Xing Tong Chen, and Gang Koo.

This paper was published by authors: Min xu and co-authors: xing Tong Chen and gang Koo. This literature is a systematic review of blockchain. Includes the ongoing research conducted by various organizations across the globe.

The key finding of this research paper are as follows:

1. Application of blockchain in smart trading.
2. Possible use of Blockchain in Supply change Management.
3. Data storage and hashing in the blockchain.

3.2 The Digital Object Identifier (DOI) System by author Norman Paskin.

This paper was published by Norman Paskin, A Researcher, and an engineer at Tertius Limited Cooperation in Oxford, United Kingdom. This contains the detailed analysis of the following points in Digital Object Identification System

1. Identifier Concepts
2. DOI system architecture
3. Future scope of DOI
4. History of DOI System
5. Social Infrastructure of Digital Object Identifier System.

3.3 A systematic Literature review on cloud computing security threats and mitigation Strategies

This Paper was published by author Bader Aloff and sub-author Abdullah Al Hajri, Abdullah Alharbi, Wael Alosaimi Taif University, Taif, Saudi Arabia this paper is a detailed review of security Threats and possible solutions.

This includes a study on all cloud models including viz.

1. Software as a Service (SaaS)
2. Platform as a Service (PaaS)
3. Infrastructure as a Service (IaaS)
4. A container as a Service (CaaS)

This paper also has detailed information about the Intrusion detection system and its three-tier.

4. Problem Definition

A lack of proper ways or standard ways to recycle old devices, electronics, furniture, and other consumer goods. If we can recycle most of the packaging material, it could reduce the impact on the environment and also reduce the cost of raw materials. For that, there is a need for a tracking and management system for trash and waste packages.

There is a need to create an efficient, decentralized, reliable, and transparent system.

5. Methodology:

Every product is made of raw material. The raw can be made of a new resource or it could be made of recycled material. We aim to track the product from day zero of its Lifecycle.

Step 1: Labeling down the components at level 0. (i.e: From day zero).

Step 2: Creating a unique id for each component.

Step 3: Updating the database with a unique id of blockchain Ledger and on centralized encrypted cloud backup and creation of Digital Object Identifier.

Step 4: When the new product is made it should be assigned in the new id and all the raw material ID should be mapped with it.

Step 5: The product should be tracked for its movement from the day of manufacturing till it reaches the customer.

Step 6: Once the product reaches the customer the product should be mapped with its customer account. And packaging which is not required by the customer anymore should be shipped back to the recycle unit. The recycle unit may recycle it or ship the package to the raw material provider that has manufactured it.

6. System Architecture

4 Tier Architecture of Blockchain & Cloud-based Model

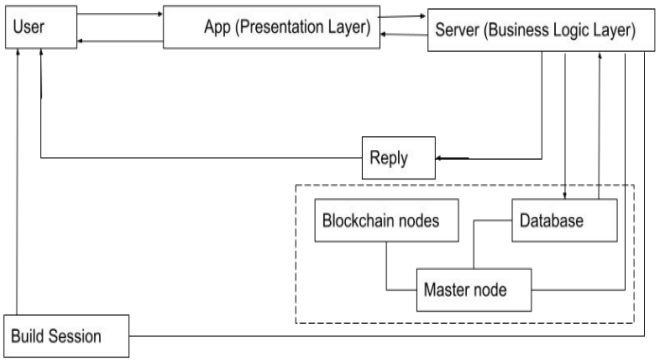
The Architecture is divided into 4 tiers:

1. **Presentation Tier:** This layer or tier is responsible for taking user input and validating the input on the client-side. The Presentation is a Decentralized App (DAPP) built using python. The user interacts with this tier.

2. **Cloud Tier:** The Cloud Tier or Master Node or Centralized Server is responsible for viz.
   a. Validating the data coming from the presentation tier.
   b. Established, Manage and monitor the communication between blockchain nodes.

3. **Cloud Database Tier:** This Tier is Responsible for Keeping a backup of data on the cloud database in a secured format.

4. **Blockchain Tier:** This tier is responsible for saving data on the decentralized ledger on multiple nodes for public records.



7. Integration with Green Environment Point

We have created a Diagrammatic representation of Product Tracking for the Entire Lifecycle For better recycling for better understanding and visualization.

The diagrammatic representation describes the entire lifecycle of the product and how the proposed green environment point can be allocated.

The Environment Impact point can be allocated depending upon the choice of raw material used, source of raw material, type of manufacturing process used, type of energy used for the manufacturing, type of packaging used, etc.

Following is the detailed Diagrammatic representation of the working of our proposed system. Detailed research will be done in near future for allocation of the environment factor point for raw material used, source of raw material, type of manufacturing process used, type of energy used for the manufacturing, type of packaging used, etc.

Here, EI stands for Environmental Impact Factor postfix with n, where n stands for the number of iterations.

The Green Environment point also can be called GEP can calculate as follows:-

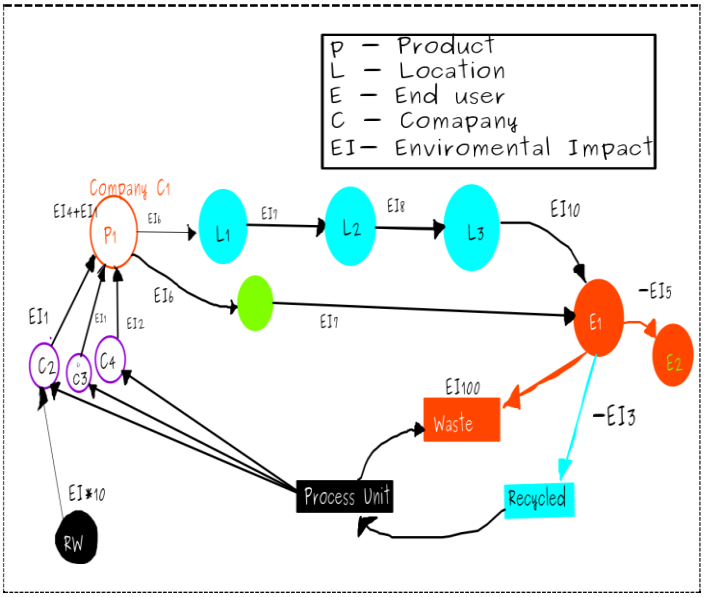
GEP calculation for Consumption:

→ Following this the Calculation of Green Environment points, for Consumption

→ whenever the EI is positive, it is a consumption, and EI should be deducted from GEP.

GEP = GEP - (EI1+ EI2 + EI3 + EI4)

The calculation of Green Environment points, for Recycling



Architecture of Blockchain and Cloud-based Digital Object Identifier System for better Environment Management

Fig -1: Figure

GEP calculation for Recycling and Reselling:

→ When Customer Recycle the product or resell the product there is a positive impact on GEP

I.e: GEP = GEP + (EI3)

8. Conclusions

We have laid down the road map for Blockchain & Cloud-based, Digital Object Identifier systems for better Environment Management. This Solution can solve environmental problems like soil pollution, air pollution, and water pollution.

We are working on the Implementation part, following are the screenshot of the implementation

We are also looking at the possibility of integrating technologies like Machine Learning, Artificial Intelligence, and big data to make this solution more robust.

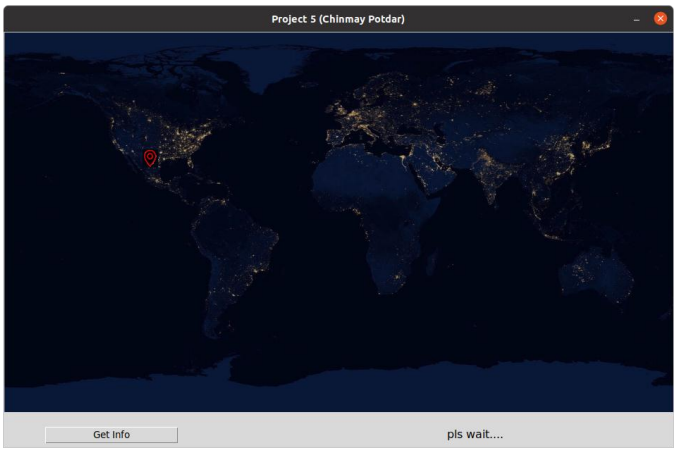


Fig 2. Blockchain-based DApp connecting with master node

Fig 2 is the screenshot of the module in which the blockchain-based decentralized app is connecting with the master node

Fig 3. Blockchain-based DApp connecting with master node

Fig 3 is the screenshot of the module in which the blockchain-based decentralized app where Seller can map the product with the customer.

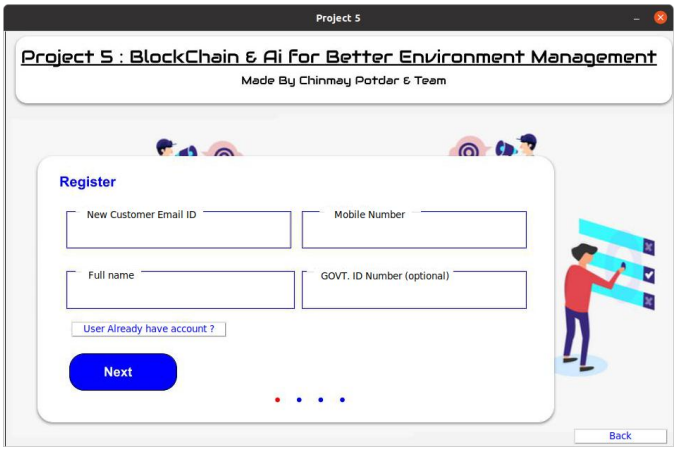


Fig 4 is the screenshot of the module in which the blockchain-based decentralized app where the Seller can register the customer to this blockchain system

9. Acknowledgment

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