



# Sale Trails and Ownership Transfer Record Management Using HyperledgerBlockchain Technology

Ashutosh Srivastava<sup>1</sup>, Manu Sharma<sup>2\*</sup> and Pradeep Joshi<sup>3</sup>

<sup>1,2</sup> Department of Management studies, Graphic Era (Deemed to be University), Hyderabad, India.

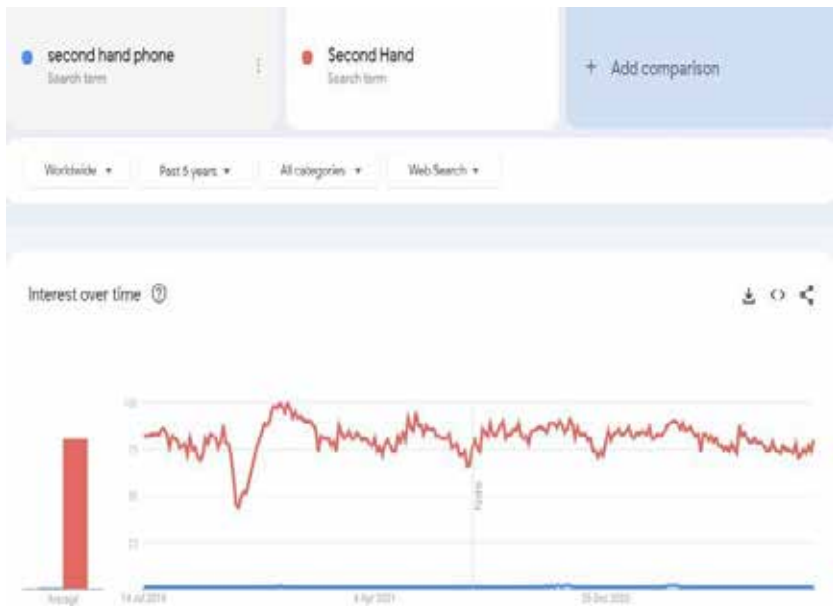
<sup>3</sup> Department of Management Studies, Graphic Era Hill University, Hyderabad, India.  
[manu.sharma@geu.ac.in](mailto:manu.sharma@geu.ac.in)

**Abstract.** The global supply chain sector has seen a significant growth, still the tracking, verification of the ownership and tracing the history of resale of various products is very difficult. This issue is evident in industries such as electronics, land records, clothing etc. This research focuses on the application of Hyperledger and private blockchain system in enhancing the trust and transparency in sales and resales of various types of objects and assets (any item stored on blockchain) by assigning the unique HASH IDs to all the assets ensuring that each asset is easily traceable and blockchain network ensure the security for the overall system. The methodology involves setting up of Hyperledger blockchain, deploying the chain code (Smart Contract), and interacting with the blockchain through NODEJS APIs. The study also discusses about the methods to store Multimedia files and documents in the most efficient and safest ways possible. The study further discusses about challenges related to scalability, storage, and the handling of various types of assets. The research aims to inform policy makers and stakeholders about the various applications of Hyperledger blockchain in this sector to enhance security and transparency of data related to resale of various assets. The future research may explore the possibilities of managing the data related to resales of divisible and assembled assets and optimizing the techniques for blockchain storage and processing.

**Keywords:** Blockchain; Transparency; Record management; Sale trails; Tracabilty.

## 1 Introduction

The trends in various field aligning to blockchain is increasing[i] with that the global supply chain sector has grown dramatically in The trend of resales in various markets is increasing every day and still the sales of various items are untracked and there is no possible way to track sales and resales of many products which also results in confusion of ownership and may lead to false selling like in Land records. In case of ownership of Land in India, it is mainly managed and created through legal documents, sales deed underneath the current legal system and Indian Jurisdiction. A document which is legal and that contains the data about the buyer and seller's and the transaction between them is a sale deed.



**Fig.1.** Interest Over Time for 'Second Hand' vs. 'Second Hand Phone'.

Alongside the selling deed there are some more documents that shows the ownership over a property like the register of rights which is a document containing information about properties), tax receipts of the property, governmental survey documents, etc. These documents are served as the records of property transfers and not the rights of ownership on the property. Eventually, it becomes the buyer's responsibility to investigate the record of property for the past ownerships and real current owner. [ii] Similarly in the refurbished industry there is no possible way to track the previous ownership of Electronic devices and appliances. The resale of objects like Mobile phone devices, Tablets, Television are untracked and there is no possible way to trace the number of resales and define the actual current owner of the objects concerned. In the clothing industry the market of resale, thrifting and donations increased from 11B USD to 51B USD in 2023[iii]. Similarly the other second hand markets are still in trend as in fig 1.

The technology in the automobile industry is getting better day by day which is improving the overall experience in the industry. The research will aim to increase the trust and transparency for the buyer to be assured about the owner and resale number. As a solution, Hyperledger is an enterprise-level blockchain technology used for its application in various fields across the Globe. NFT – Non-Fungible token has been one of the most popular topics in 2022 which made the use of Blockchain Technology to keep up the track of Ownership and to keep up the process of ownership. Transfer more transparent and easier for everyone to trace in a more efficient way possible. Similarly, Hyperledger Blockchain can be used as a medium to store and process transactions for Tangible and non-tangible products and records. For example: Walmart is utilizing the blockchain technology to track many food items and managing its supply chain using

the blockchain technology [ii] alongwith Everledger uses blockchain to keep the tracks of the diamonds, wine & spirits, and other luxury goods [iii].

## 2 Related works

In the recent time Blockchain has gained popularity in various field where we may find its importance in fields like Healthcare, tracking of tangible asset ownership and provenance, Land Record Management, Supply chain management etc. The Research by Barikisa Owusu Ansah a, Winrich Voss a, Kwabena Obeng Asiama b and Ibrahim Yahaya Wuni c, published in 2022 aimed to identify institutional success factors for adopting blockchain-based land administration where The study focuses on adopting the land projects based on Blockchain technology and it can be improved by understanding the main factors important to adopt this new technology.[iv]

The Research by Mark D. Sheldon published in 2022 focuses on blockchain being initially used just to keep track of the ownership of some digital assets but now blockchains is used to keep the track of the ownership, origin and track of all physical and tangible assets. The study focuses on the use of blockchain technology to track the ownership and origin of tangible assets in four steps, that are:

- Design and development of the blockchain network,
- Creation and initialization of the asset,
- Transfer of ownership
- Retirement / Deletion of the assets. [v]

The Research by M. Niranjanamurthy, B. N. Nithya l and S. Jagannatha in 2018 where in this paper the main topic of discussion was about what exactly Blockchain is, about its SWOT analysis, its Types and how it works along with all its pros and cons. The study also states that The Blockchain technologies has six main key feature which are:

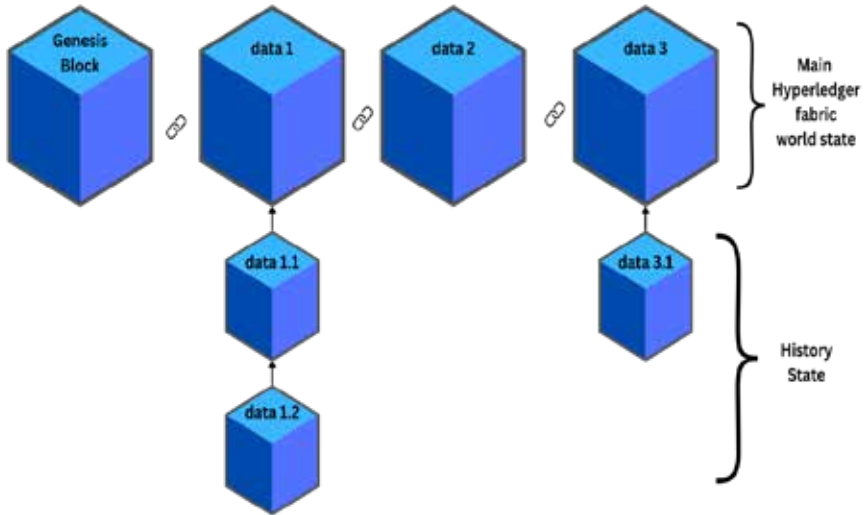
- Transparency
- Decentralization
- Anonymity
- Open Source
- Immutability
- Autonomy

This study also states the main merits of blockchain which are that it cuts out the middle man(entity), Empowers the users, maintains the quality of the data, durable in nature, reliable and endure, there is integrity in the process, it is transparent and immutable, have a simplified ecosystem, is efficient, auditable, traceable, transparent, and has faster transactions and low transaction costs. [vi]

## 3 Methodology

To get started we first have to assign a unique ID or HASH ID for every asset where every asset is considered a block in the Hyperledger. During the initial mining of the block, the owner assigned by the ORDERER peer is the actual first owner and every

unsold product is considered unregistered without the actual hash and is not registered on the blockchain. For every transfer of the asset the asset is updated in the ledger and the new asset is added to the ledger pushing the previous state in the history using the CFT (Crash Fault tolerance) algorithm as in Fig 2.



**Fig.2.** Hierarchical Blockchain Structure.

The world states define the current status of the fabric and in this case, will depict the current owner of the data and on the transfer of the ownership the data block is pushed to the history state as shown above. Keeping in mind some of the factors limiting blockchain are Scalability and storage, the documents related to this can be processed and stored in two ways.

- Directly Storing the data into the blockchain (Weakness of blockchain is not addressed).
- Using Simple Filesystem such as AWS, GCP, Firebase etc (some of the drawbacks can be overcome here).

Steps of setting up Hyperledger

### 3.1 Setting up the Environment

- Install necessary software like Docker, Git, and Node.js.
- Verify installations and set up Docker to run without sudo permissions.

### 3.2 Installing Fabric Binaries

- Create a directory for Fabric and download Fabric binaries using provided scripts.

### 3.3 Setting Up a Test Network

- Create a blockchain network and channel.
- Install and set up chaincode (smart contracts) on the network.

### 3.4 Chaincode Package Creation

- Develop and package the chaincode in JavaScript.
- Install the chaincode on the network for both organizations in the network.

### 3.5 Chaincode Operations

- Perform operations like committing the chaincode to the channel and querying committed chaincodes.

### 3.6 Interacting with the Chaincode

- Initialize and interact with the ledger using chaincode functions.
- Perform actions like querying and updating the ledger

### 3.7 Creating a Node.js Project

- Set up a Node.js project to interact with the blockchain network.
- Implement helper functions for operations like creating a wallet and connecting to the network.

### 3.8 Administrative Actions

- Develop functions for administrative actions like enrolling admins and registering users.

### 3.9 Performing Ledger Actions

- Implement functions to perform actions on the ledger, such as asset creation and querying.

### 3.10 Add API implementation

- The gateway is active after the ledger action now the gateway can be added to the backend frameworks for the APIs.
- New shareable port on specific peer can be shared as the public IP for the database CRUD operations.

The schema of every block here in this Hyperlydger blockchain shall be as Fig 3.



Fig.3. Hyperlydger blockchain.

In the update of every block in the Hyperledger the block from the world state is pushed to the History state which can be queried in the network and will have a structure like Fig 4.



Fig.4. Hyperlydger blockchain.

Note – The ID parameter shall remain same for the identification of history states mapped to the world state. This will give finally attain a structure that will be demonstrated as Fig 5.

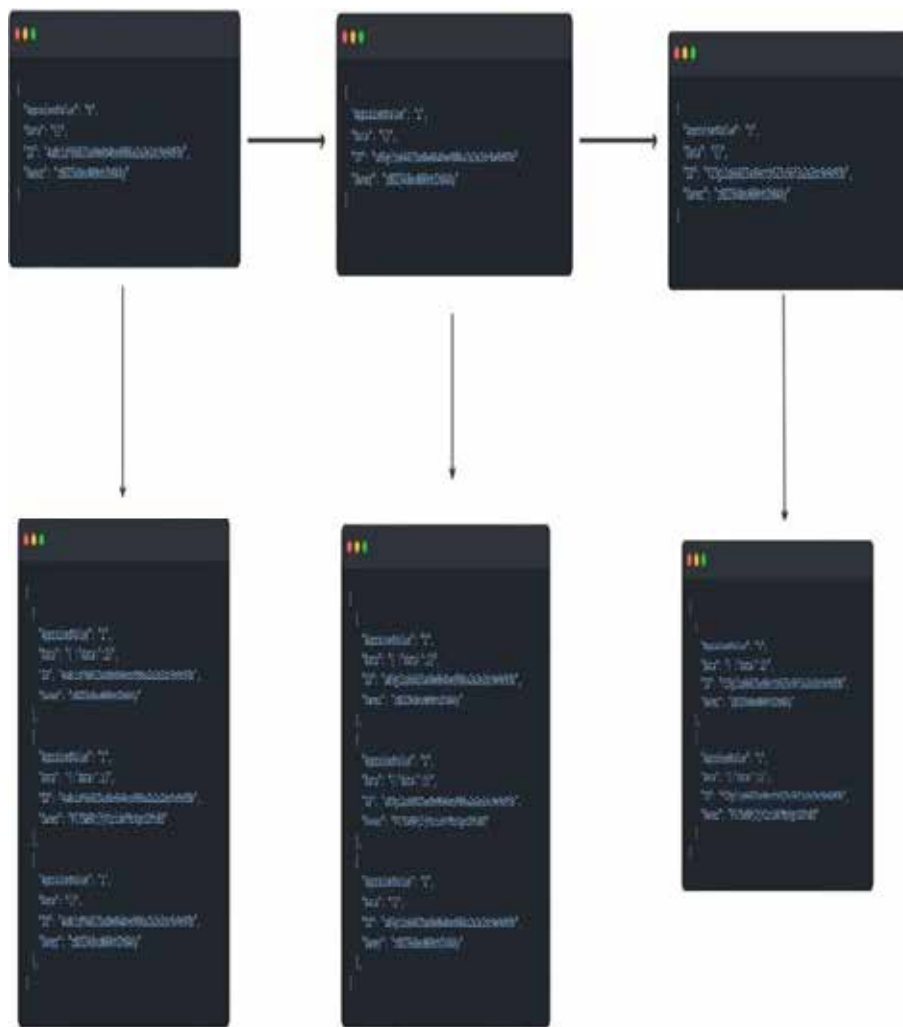


Fig.5. ID Parameter.

The world state shall contain the actual owner of the asset and the world states are connected with the history states for previous owners.

The Documents files can be stored as

Directly Storing the digital media files data into the blockchain (Fig 6). This process is safe and will help in solving the vulnerability issues but will impact the storage process. Here we may directly convert the media file into base64 and send the base64 via the API created which can be directly stored in DATA field of the asset block. The verification of the file is also much easier in this process but the file support is limited.

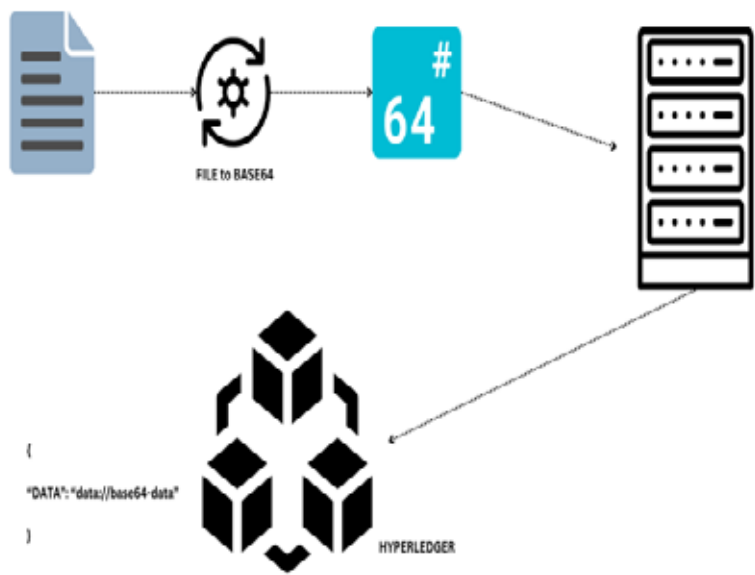


Fig.6. Digital Media Files.

Using Simple Filesystem such as AWS, GCP, Firebase etc. (Fig 7). This process can be used as this will help us in reducing data repetitions and will also result in supporting more types of files. The file stored is saved to a normal file system like Amazon Web Service, Google Cloud Platform, Firebase or even any other custom file system. The file the hashed and the FILE URL is concatenated with the hash. The Concatenated string is hashed again to receive a final hash. This Final Hash is sent through the API with the File URL in the API which stored into the DATA field of the asset block.



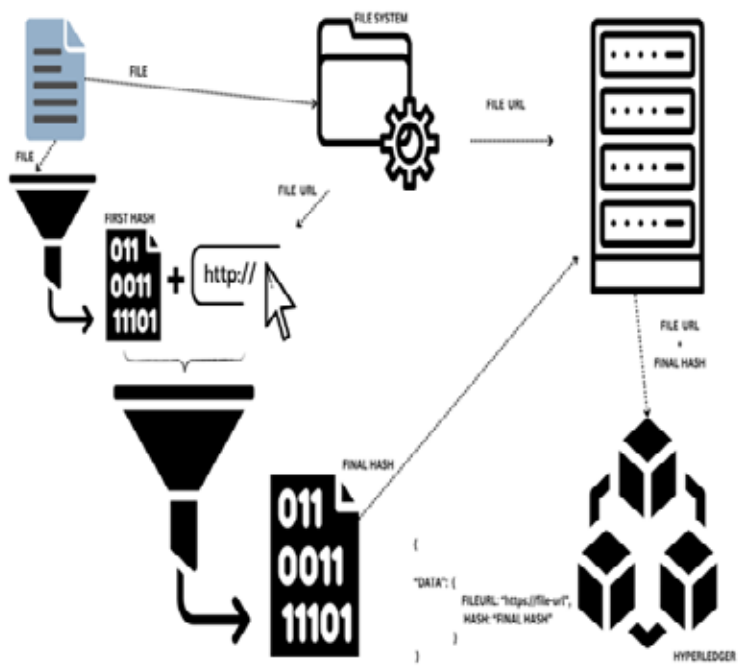
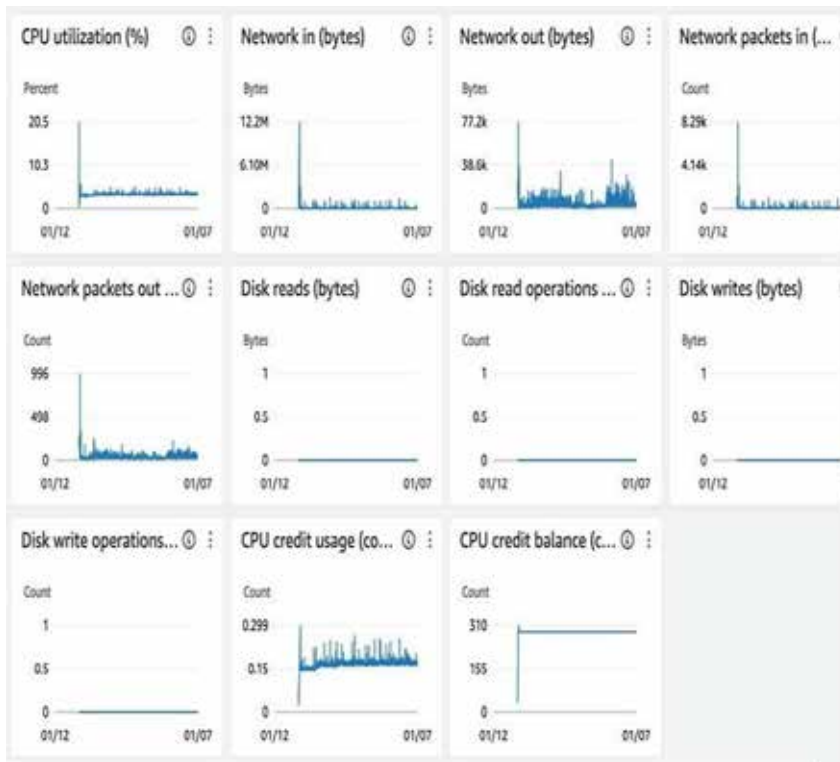


Fig.7. Using Simple Filesystem.

At the time of verification the same the Final Hash is computed using the same hashing algorithm with the same FILE URL and is matched which actual HASH string in the DATA field of the asset.

4 Conclusion

On AWS T2 Small Ec2 instance a network is set up and on that instance, here is a result of the utilization graph in Fig 8.



**Fig.8.** AWS T2 Small Ec2 instance a network.

During the 12-month period depicted by the utilization graphs for the EC2, instance, we can understand several vital information like CPU Utilization, Network Bytes, Disk Utilization. The spikes show the minting of 5,000 block. This was a stress test aimed at evaluating the robustness of the system and the server under l oad conditions, This EC2 instance was setup up with Ubuntu 20.04 LTS and configured as a T2.small type — suitable for low to moderate baseline performance needs with the capability to burst to higher performance as required [vii]— has demonstrated a significant capacity for handling demanding blockchain operations, as evidenced by the resource consumption metrics This result may further be optimized by using CBSI system to handle Realtime situations.[viii]

The study may help the policy makers to enable blockchain as a technology for managing the sales and resales of the products like Mobile Phones, Electronic Appliances, Automobile Vehicles, etc. This can be a useful technology to manage the Land records and to manage the ownership of the land with few alterations in the chain code and some optimizations on the cloud network [ix]. The study identifies that the sales of various items are untracked and there was no possible way to track sales and resales of many products which also results in confusion of ownership and may lead to false. The study explores the usage of blockchain technology to track the ownership , sales trail of any asset. The study aims to develop a system that helps user to add and manage the records for assets and ensures that the sales and resales history remains intact and are easily traceable. The research help policymakers, industrialists, and researchers to explore scopes with the ease and trust of blockchain[x].The study

focusses on the setup of the Hyperledger network and the APIs to maintain the blockchain and the sales trails.

- The study is also subjected to some limitations like:
- The study only speaks about the assets that are not divisible or assembled.
- For the sales of assets that requires large number of documents; Larger storage and processing servers will be required.
- Assets without unique Identification number or text will remain untracked.
- Acceptance for sales done with traditional methods is comparatively difficult and the transfer of historical sales data may be a challenge.

Future researches may consider more range of assets and may enable the users to store and track data for the assets that are divisible or assembled. The future research may also enable solutions for the storage, memory and process optimization techniques for Hyperledger chain code and network. The study also may have applications in IOT, IoVT [xi] and cryptocurrency [xii].

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