

# VehiChain: Blockchain-based Service for Storing Vehicle Records.

Shivani Neharkar<sup>1</sup>, Ganesh Ingale<sup>2</sup>, Shraddha Jatte<sup>3</sup>, Mitil Jawale<sup>4</sup>, Anuradha Deokar<sup>5</sup>

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**Abstract** This proposed model aims to forbid illicit vehicle frauds revolving around sharing the details of the vehicle by using **blockchain technology** that is decentralized system which provides security, reliability, authenticity, immutability and transparency. It consists of an open distributed ledger that records all the data such as ownership, corroboration of insurance history, registration details, records of previous owners and transaction made between parties during reselling of vehicle which cannot be forged. The problem of falsifying documents is an issue within government bodies. The purpose of this model is to develop a private permissioned blockchain network where vehicle's official documents can be shared by government bodies, vehicle's manufacturing company and insurance company. It will thereby help to prevent fake documents, number plate frauds and illegal selling of the vehicle.

**Key Words:** Blockchain, Ethereum, DApp (decentralized application), smart contract.

## 1. INTRODUCTION

In today's world, there are illegal numerous apps that give away details of the automobile. By entering the details of the registration of the vehicle it is possible to get the name of the owner. Not just the name of the owner but also details like chassis number, location, engine number, registration date, insurance expiry, related RTO (Regional Transport Office) details, challan details etc show up. So, the question arises that where do these third-party apps get the access to such private data? Therefore, the data that RTO retains is been hacked or leaked. Hence, there is a need of technology that assures the security of data.

In this case Blockchain technology comes to rescue. Blockchain ascertains the security of this data. All that happens on the blockchain is **encrypted** and it can be proven that the information has not been tampered. If the details of automobile are stored on blockchain then it is assured that data is not changed because of its distributed existence, on all the nodes in the network, you can search file signatures through all the ledgers and verify that they have not been changed.

In present times, reselling of vehicles is troublesome process. In India, it takes at least 21 to 30 days to transfer the vehicle to different owner and to verify the documents and complete the model work. Reselling of vehicle is a tedious process, which requires the seller to fill numerous forms and collect various documents. This elongated process inclines the seller to hire a broker- "The middle man". These third-party people charge heavy brokerage and take advantage of the gullibility of the seller.

However, by using blockchain reselling will become easier. By using this pragmatic approach seller can sell his/her vehicle without the interference of third party. Blockchain will retain the detailed information of pervious users, history of vehicle which will help the buyer. Therefore, transparency and reliability are developed by using this technology. Moreover, the time required for transfer will be reduced.

The advantages and challenges of using blockchain technology in education are presented in some of the recent papers such as [1], [2], [3], [4], [5]. Thus, there is a need to apply this approach for automobile details as well.

The model is distributed in three folds.

- System architecture- This helps to understand the contributors connected to the blockchain.
- Implementation- This helps to understand the technicality on which the model is been built. Ethereum platform is used along with many others such as Metamask, DApp, Node.JS, Ethereum, Web3.JS and IPFS (inter-planetary file-sharing).
- Diagrams- Corresponding diagrams which help in better understanding of this model are included. Diagrams such as entity diagram.

## 2. Background and Related Work

Blockchain has the potential to be the underpinning of the record keeping systems. In 2008, Satoshi Nakamoto came up with evolving technology- 'Blockchain' which ascertains reliability, immutability, security and transparency [6]. It stores data in blocks that are then chained together. It earlier was known for digital currencies that is before 2014, blockchain technology was concerned with currency but later on, blockchain 2.0 was born which distilled its focus on application beyond the financial industry. And thus, blockchain became cutting-edge technology that expedites trade settlements in minutes rather than days. In the later part of its accretion, it was followed by Ethereum which is an open-source platform.

Developers believed that blockchain could do more than just document transformation. Ethereum represents the second-generation blockchain technology which readily uses "proof of stake". It was Vitalik Buterin the founder of ethereum who believed the major innovation brought about by ethereum was the advent of smart contracts. Smart contracts are a crucial component of several blockchains or distributed ledger technology systems and applications being developed. 'Smart contracts' is a term used to describe machine code that automatically executes any or portions of a contract and is held on a platform built on a blockchain. On a peer-to-peer

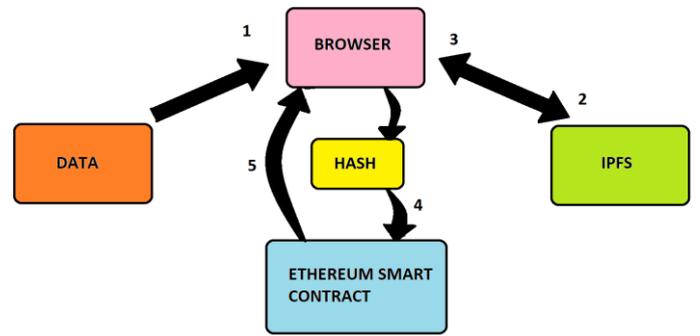
open network, a DApp has its backend code running. Contrast this with an app on centralized servers where the backend code runs. A DApp should have frontend code and user interfaces that can allow calls written in any language to its backend (just like an app). Furthermore, the frontend can be hosted on decentralized storage such as IPFS. IPFS is a decentralised planetary file storage system based on [7].

### 3. Analysis and related work

Stealing vehicle, changing its number plate are much often cases these days. These thieves try to resell the same vehicle at lower costs. To stop such malpractices this proposed system will help. Buyer will be able to confirm the real owner by searching the number plate and will also get to know data such as colour of the vehicle thus the buyer can rely on blockchain to know no such malpractices are conducted. This system will not just help the buyer to know details like colour, manufacturing date, registration date but also will help know the tickets(challan) that the vehicle has got or related cases if any.

While buying a vehicle the owner is binded to submit the documents to the dealers, RTO, insurance company, bank if loan is required but with help of this system there won't be multiple copies of the documents. As all documents will be stored with security on blockchain. This will ensure none of the document is getting forged. Thus, a secure and consisted way to submit data to various shareholders of blockchain.

Uploading data directly on the blockchain can be very time consuming, so the decentralize database called IPFS is used, then store data related to the vehicle such as vehicle papers, documents related to the owner on to the IPFS with the help of a browser and a Frontend. After uploading the documents, a unique hash is returned by the IPFS. This **hash** is then uploaded on the blockchain network using Ethereum smart contracts. When any Entity wants to access the data on the IPFS this hash will be retrieved from the blockchain and with the help of a browser will get access to the data stored on the IPFS.



1. Data is uploaded on the IPFS with the help of a front end.
2. Data is uploaded on the IPFS.
3. IPFS returns a unique hash.
4. Hash is stored on the blockchain.
5. Hash is retrieved from the blockchain to retrieve the data from the IPFS with the help of a browser.

Fig.1: Flow of data

### 4. The System Architecture:

System architecture consists of four contributors. These contributors play major role in transaction of data. Blockchain is a decentralized application with the help of **self-managing** smart contracts it controls the interactions between these contributors. Referenced through [8].

Following are roles of the contributors:

1. **Government Body (RTO):** After receiving documents the government body uploads these documents on server for that particular automobile. It registers the automobile onto the blockchain. Uploads the required document onto database. Assigns login credentials to the owner for future logins. Gives access to the owner.
2. **Automobile company:** It will upload the manufacturing details along with the automobile specifications such as colour, model, manufacturing date etc.
3. **Owner:** This contributor will upload important document such as Aadhar card, license, PAN number, PUC (pollution under control) etc. Owner grants access to insurance company. During the reselling, owner accepts the request of the buyer to view more details of automobile. More over when deal is sanctioned owner can send request to RTO for accepting the transferal of ownership.
4. **Insurance company:** Insurance company will send a surveyor to assess our vehicle damages and thus preparing a report regarding the costs and changes to the vehicle. After repairing vehicle and generation

of bills to the surveyor will forward report to the company. After checking the bills and changes insurance company will reimburse our bills.

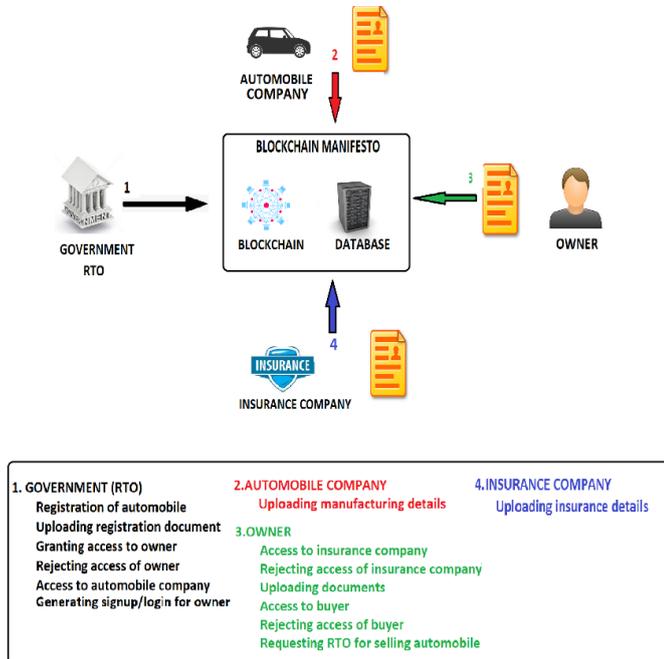


Fig.2: System architecture diagram.

### 5. Implementation

To build a prototype of the proposed system architecture this model make use of Metamask, Node.JS, Ethereum, Web3.JS and IPFS. The implementation of the following system architecture uses following modules - RTO, Automobile Company, User and Insurance Company. Each of these modules have different set of functionalities which are offered using the different dashboards of DApp.

When the required documents are acquired by the respective RTO by the vehicle dealers then RTO uploads the documents of the registered vehicle. Documents such as registration number of vehicles, identity proof of the owner, chassis number, passport sized photographs etc. Thus, creating the initial block in the blockchain. When the documents are uploaded by the government, they get uploaded on **IPFS (inter-planetary file-sharing)** thus generating new hash. Along with this hash data can be retrieved. RTO makes this hash available to the owner of the vehicle. Because of IPFS's decentralized approach there will be a single copy of the document which can be accessed by using hash. This copy cannot be tampered or forged cause it is stored on blockchain. During reselling of the vehicle RTO will generate a new hash and will share it with the new owner. Thus, ensuring security and privacy of documents.

Similarly, company of the vehicle can upload the information of the vehicle such as model number, registration date,

engine number, colour of the vehicle, vehicle type, manufacturing details. Likewise, insurance company will provide the blockchain will the details of insurance such as type of insurance, insurance expiry, insurance claim details etc. These contributors will not have access to the private details of the owner.

### 6. Proposed methodology

The proposed model of a blockchain based application will be used to serve as the front end as well as the backend. Front-end will be developed using HTML, CSS, JavaScript for the backend we use blockchain and the IPFS server. This system will get input from the user and get the output from the backend. The user will provide the details such as hash returned from the IPFS server. This hash will be available only to the permitted users.

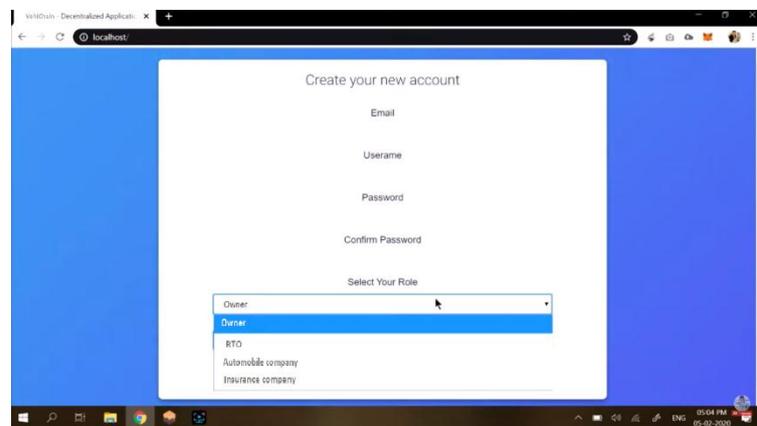


Fig.3: Sample image of frontend.

### 7. Advantages

- Increases transparency between the stakeholders of the blockchain.
- It helps to trade from peer to peer by eliminating the middle person(broker).
- Helps to expedite the transactions.
- Knowing the history of the automobile and previous owners is easier.
- Eliminates the ability to cheat.
- Security is ensured.
- Decentralisation ascertains the immutability of the data.

### 8. Drawbacks

- Blockchain requires high energy.
- Maintenance is a necessary.
- Implementation is costly

## 9. Conclusion

The pragmatic approach in this model helps to understand the blockchain based system architecture for transparent and secure transaction of documentation of the automobile. This model helps to cease the forging of documentation related to the automobile. Due to the lack of transparency between the buyers it leads to disputes and complications in transaction. This model is intended to solve this problem using blockchain based database ledger. In future the model can also be extended by including banks as entity for loans and servicing centers. Thus, by increasing the scope.

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## BIOGRAPHIES

**SHIVANI NEHARKAR***BE COMPUTER  
AISSMS COE, PUNE***GANESH INGALE***BE COMPUTER  
AISSMS COE,PUNE***SHRADDHA JATTE***BE COMPUTER  
AISSMSCOE,PUNE***MITIL JAWALE***BE COMPUTER  
AISSMSCOE, PUNE***PROF. ANURADHA  
DEOKAR***M TECH (COMPUTER)  
AISSMSCOE,PUNE*