GOVERNMENT FUND TRACKING SYSTEM

Dissertation submitted to

Shri Ramdeobaba College of Engineering & Management, Nagpur

in partial fulfillment of requirement for the award of degree of

Bachelor of Engineering

In

COMPUTER SCIENCE ENGINEERING

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SHRI RAMDEOBABA COLLEGE OF ENGINEERING & MANAGEMENT, NAGPUR

(An Autonomous Institute Affiliated to Rashtrasant Tukdoji Maharaj Nagpur University Nagpur)

Department of Computer Science Engineering

CERTIFICATE

This is to certify that the Thesis on **"Government Fund Tracking System"** is a bonafide work of **Aryan Pandharipande, Chaitanya Kapre, Dev Paliwal, Rajat Chandak, Ritik Parashar** submitted to the Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur in partial fulfilment of the award of a Bachelor of Engineering, in Project 1- CSP360 has been carried out at the Department of Computer Science & Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur during the academic year 2020-2021.

Date: 29th April 2021

Place: Nagpur

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DECLARATION

We, hereby declare that the thesis titled "**Government Fund Tracking System**" submitted herein, has been carried out in the Department of Computer Science Engineering of Shri Ramdeobaba College of Engineering & Management, Nagpur. The work is original and has not been submitted earlier as a whole or part for the award of any degree / diploma at this or any other institution / University.

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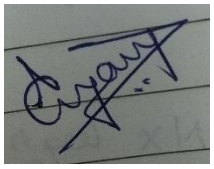
Place: Nagpur



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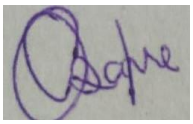

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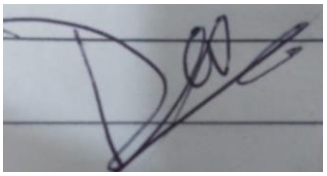

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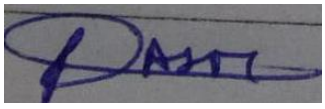

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APPROVAL SHEET

This report entitled "**Government Fund Tracking System**" by Aryan Pandharipande, Chaitanya Kapre, Dev Paliwal, Rajat Chandak, and Ritik Parashar is approved for the degree of Bachelor of Engineering.

Name & signature of Supervisor(s)

Name & signature of External. Examiner(s)

Name & signature RRC Members

Name & signature of HOD

Date: 29th April 2021

Place: Nagpur

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ABSTRACT

Corruption constitutes a major part in the problem of society. Government spends a ton of taxpayers' money towards betterment of society. This is done in various forms such as projects, maintenance works, tenders, economical schemes, subsidiaries, etc. This involves transaction of billions of rupees taking place within different tiers of government like Central Government, State Government, Municipal corporation, etc. Tracking and keeping record of each and every transaction taking place is a tedious task involving lots of resources. For every project a budget is declared and a bidding process takes place. Now after a contractor's bid is accepted, lot of unethical tasks take place such as embezzlement of funds, delivering the client a poor-quality project, etc. Due to this large amount of funds are lost through either corruption or Government inefficiency. The solution to this problem is Blockchain.

In order to solve this problem, we came up with idea of Government Fund Tracking System with the use of blockchain technology and smart contracts. Blockchain is characterized by its decentralized nature, integrity of the data stored in the chain and its openness. Due to these characteristics, another place where Blockchain can be used is to release government funds for a project. This revolutionary blockchain technology will bring transparency to the system and security to each transaction as the funds move through different stages. This will help in keeping a clear record of who all were involved in the transaction and maintain details of the transaction.

This system will help in keeping a proper track of all the transactions and this transactions will be secured and no tampering can happen with this transactions. This system will allow for a full proof, secure and authentic fund allocation and fund tracking system to help form an incorruptible government process.

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Chapter 1
INTRODUCTION & TECHNOLOGY

1.1 Introduction

Today the world is getting digital in all aspects. Blockchain technology is an upcoming technology and said to be one of the most promising technologies which would revolutionize the world. Blockchain technology, for many, is considered to be as revolutionary as the rise of the Internet and has been referred to as a new “trust machine” because of its ability to allow people to interact and conduct transactions even though they may not know each other or have a pre-existing trust-based relationship. Blockchain technology is a form of distributed ledger technology that acts as an open and trusted record (i.e., a list) of transactions from one party to another (or multiple parties) that is not stored by a central authority. Instead, a copy is stored by each user running Blockchain software and connected to a Blockchain network—also known as a node. Instead of a central authority maintaining a database, all nodes have a copy of the ledger, and updates to a Blockchain ledger are propagated throughout the network in minutes or seconds. Ledgers on the blockchain may be permissionless (or “public”) and permissioned (or “private”). Anyone with access to a public network (such as Bitcoin) can propose transactions, while in a private network, only specific licensed users can participate. Permissionless ledgers most often use either the proof of Work or proof of Stake consensus model is what allows mutually distrusting users (i.e., users who do not know each other or do not have an established trust-based relationship) to perform transactions among themselves. Permissioned ledgers, on the other hand, restrict contributions to a small group of users with exclusive permissions. Depending on the ledger's settings, accessibility to display transactions on permissioned ledgers can be limited or open to the public. Depending on the intent of the ledger and its users, Permissioned ledgers employ consensus models such as Proof of Authority or Round Robin. Some crucial characteristics of Blockchain include its transparency, decentralized nature, immutability, consistency and security of data, non-corruptibility, low cost, and

speed. Blockchain use in the government sector can bring some revolutionary changes in the administration and management. It can decrease corruption by providing transparency in almost every transaction, which could help in the reduction of corruption to a great extent.

The main objective of our project is to create a web application with the use of Blockchain technology to govern the transaction of the various transaction between different tiers of government. This system will help in keeping proper track of all the transactions and make sure that all transactions will be secured and there is no tampering with these transactions. In this project, we have used the Ethereum network which is a decentralized, open-source blockchain with smart contract functionalities. Since the mode of Peer Participation in Ethereum is a public network and runs the Smart Contracts on the EVM (Ethereum Virtual Machine) for applications that are attributed to being decentralized and are for mass consumption, therefore we chose the Ethereum network. We have used Ethereum Ganache which is a set of developer tools to recreate blockchain environments locally and test smart contracts. Smart contracts are used to make government contracting more efficient by eliminating a significant amount of overhead and automating processes that lend themselves to the logical "if/then" workflows of smart contracts. We have used more than one functions in our smart contract, which is to govern the transaction between different tiers of Government and between government and contractors. We have even created a smart contract function for a tender system to automate the Government tender system. We have used MetaMask which is a software cryptocurrency wallet used to interact with the Ethereum blockchain. It allows users to access their Ethereum wallet through a browser extension or mobile app, which can then be used to interact with decentralized applications. We have used Web3 which is a collection of JS libraries for integrating our smart contract with front end. We have used MERN stack for our frontend implementation. Our web application is capable of reducing the funds embezzlement but different tiers government and reducing the corruption at great extent by providing transparency in the system.

1.2 Technologies Used

1.2.1 Ethereum Blockchain

Ethereum is a decentralized, open-source, blockchain-based software platform that runs its own cryptocurrency, ether. It allows SmartContracts and Distributed Applications (Apps) to be designed and run without the risk of downtime, fraud, control, or third-party intervention. Ethereum is both a framework and a (Turing-complete) programming language that runs on a blockchain, allowing developers to create and publish distributed applications.

Need of Ethereum –

- The Ethereum blockchain can disintermediate any multi-party application that currently relies on a central server.
- Through its virtual machine (EVM), it supports scripting and the development of decentralized applications and 'smart contracts' (EVM).
- It is an open-source computing platform and operating system.

1.2.2 Solidity

Solidity is a high-level, object-oriented programming language for smart contract implementation. It's inspired by C++, Python, and JavaScript, and it's designed for the Ethereum Virtual Machine (EVM).

Need of Solidity –

- It provides object-oriented programming attributes in contracts including multiple level inheritance properties.
- It consists of ABIs which allow users to check if the data returned from a feature is appropriate and of the appropriate kind.

1.2.3 Web3

Web3 is a collection of JS libraries that allows you to communicate with an Ethereum node either remotely or locally. Simply, it provides us with an API from which we can conveniently interact with the blockchain. Web3 acts as a wrapper for JSON RPC, allowing you to connect to a remote or local Ethereum

node via HTTP or IPC. Web3 is basically a bridge that connects the Ethereum network to the smart contract.

Need of Web3 –

- It provides an abstraction of the Ethereum json-rpc interface which helps in interacting with an Ethereum node using plain JavaScript.
- Provides with API to interact with Blockchain.

1.2.4 Ganache

Ganache is a component of the Truffle Suite, a set of development tools that allows users to simulate blockchain environments and evaluate smart contracts locally**.** It is a local in-memory blockchain that is intended for development and research. It mimics the functionality of a real Ethereum network, including the availability of a range of accounts supported with test Ether.

Need of Ganache –

- It reduces reliance on Ethereum wallet applications, which needs a large amount of resources to run the local blockchain case.
- It provides users with test accounts for their Ethereum network and all the details of the transaction.

1.2.5 MetaMask

MetaMask is a cryptocurrency wallet that uses software to communicate with the Ethereum blockchain. It provides users with access to their Ethereum wallet through a browser extension or mobile app, which can then be used to communicate with decentralised applications.

Need of MetaMask –

- Users may use MetaMask to store and manage their account keys, broadcast transactions, and send and receive Ethereum-based cryptocurrencies and tokens.
- It enables users to securely link to decentralised applications using a compatible web browser or the built-in browser of the mobile app.

Chapter 2

LITERATURE REVIEW

1. In the article the author fragmented the prototype in major 3 parts defining our assets, participants, transactions and access control. The logic behind transactions was written in JavaScript as a transaction processor function. Asset was considered as funds, ProjectParticipants - the people involved in the project and the fund transaction was considered as paying money for different commodities required for the project. Initially Total Funds were declared from which other funds are withdrawn by project participants. An asset (Fund) was created for every participant. Whenever Fund Transaction was submitted, the transaction processor function was called. The function would then pass a transaction instance which would specify the involved participant and the amount of fund to be transferred. If the transaction parameters satisfy all the constraints then the transactions are ledged in the registry. This transaction entry would also contain a transaction ID along with a timestamp when the transaction was submitted. The assets registry and participants registry are updated after the submission, so that the data is consistent. We can attain the same by public permissioned blockchain and, this could be deployed (presented) on web app using MERN stack, MEAN stack, etc.

2. According to the article Author states that there are global discussions which recognise the need for more development aid with jurisdictions such as the EU unveiling increased foreign aid budget for 2021–27 to deliver large increases in aid spending and eliminating the bureaucratic barriers. However, this increased flexibility gives rise to growing concerns on where aid is sent and that whole chain of custody in terms of tracking, traceability, and reporting. The fear is monies are raised, approved, and sent, but there is uncertainty where and if those monies have reached the persons most in need of development aid. Therefore the author stoutly said that more desire for openness, transparency, and method of governance for accurate monitoring and use of evaluation tools in development aid will help secure the chain of custody and for all to realise project outcomes.

Recent studies have shown that the utilisation of technology presents opportunities for advancement and particularly the use of blockchain and its attributes of immutability, transparency, audit control through smart contracts, and security.

3. It primarily focuses on how effective we can use blockchain in logistics, procurement and trackability. Blockchain technology is especially adept at simplifying complicated and fragmented processes -as it records transactions that are associated with the terms of an agreement between parties, tracks assets and creates a clear and economical system for managing all documents concerned within the provision method. Every dealings becomes a permanent ledger record that's simply valid by anyone with access to the chain. Ambiguous or erroneous information in the blockchain will get validated by network members thus making a clear and economical system for managing all documents and transactions concerned within the provision and provide chain method. As the audit is conducted automatically, so, neither there'll be need of continuously sharing operational data nor some person to cross check the details. Blockchain also reduces contention between retailers and customers for lost receipts, unreadable receipts and track history of proprietorship.

Chapter 3

IMPLEMENTATION

3.1 Basic Idea

The main idea behind the project is to track the funds hierarchically i.e from central government to the common man including in this chain. We have considered four hierarchical components which are: Central government, state government, Contractor, resource provider/dealer. In the beginning, the budgets which would get finalized in the house will be uploaded according to their respective category. After funds allocation state government will instigate the required projects by documenting them and will send the document to the central government. Now the Central government will verify the project details and if satisfied, they will grant the project funds to the state government else they can reject the project. After receiving funds from the central government, the state government will open the tenders for the contractor and by proper bidding system the contractor will be chosen for the specific project. As bidding and tender allocation will be carried out by an automation bidding system with no human intervention involved, it would res corruption. Government committee will check the amount of work done synchronously and will mark every progress by submitting a brief report to the hierarchical officer, who will add it to the blockchain. In this report the progress can be portrayed in the form of images, videos, written plan of the building or structure, etc. To get the payment the contractor will have to submit a form of his total spendings with proper distribution over the duration. This form details will then be checked by the respective authority of the state government and then will initiate the payment to the contractor. In this way doing work over a period gets paid, this process will repeat until a particular work is being done completely.

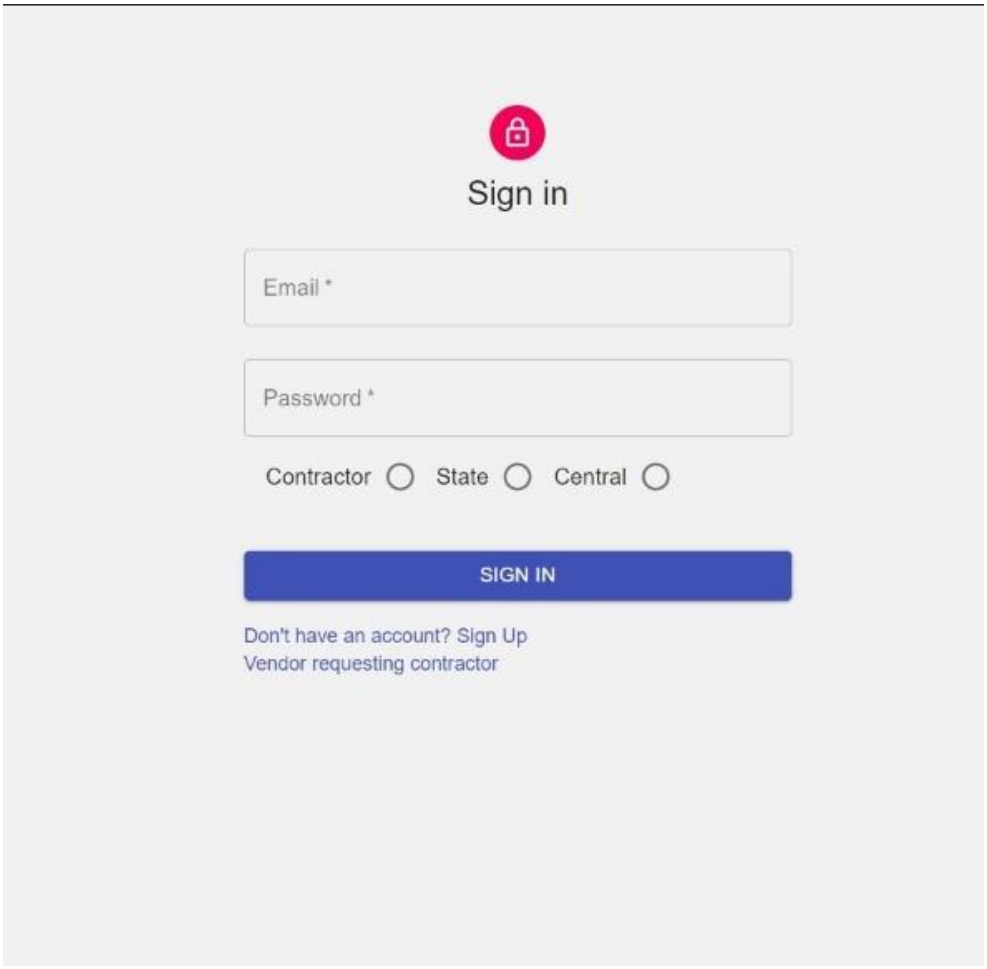

Fig. 1

This is layout for the sign in page. Central Government, State Government and contractors will all login through this page. Any new user can sign up by filling all the necessary details.

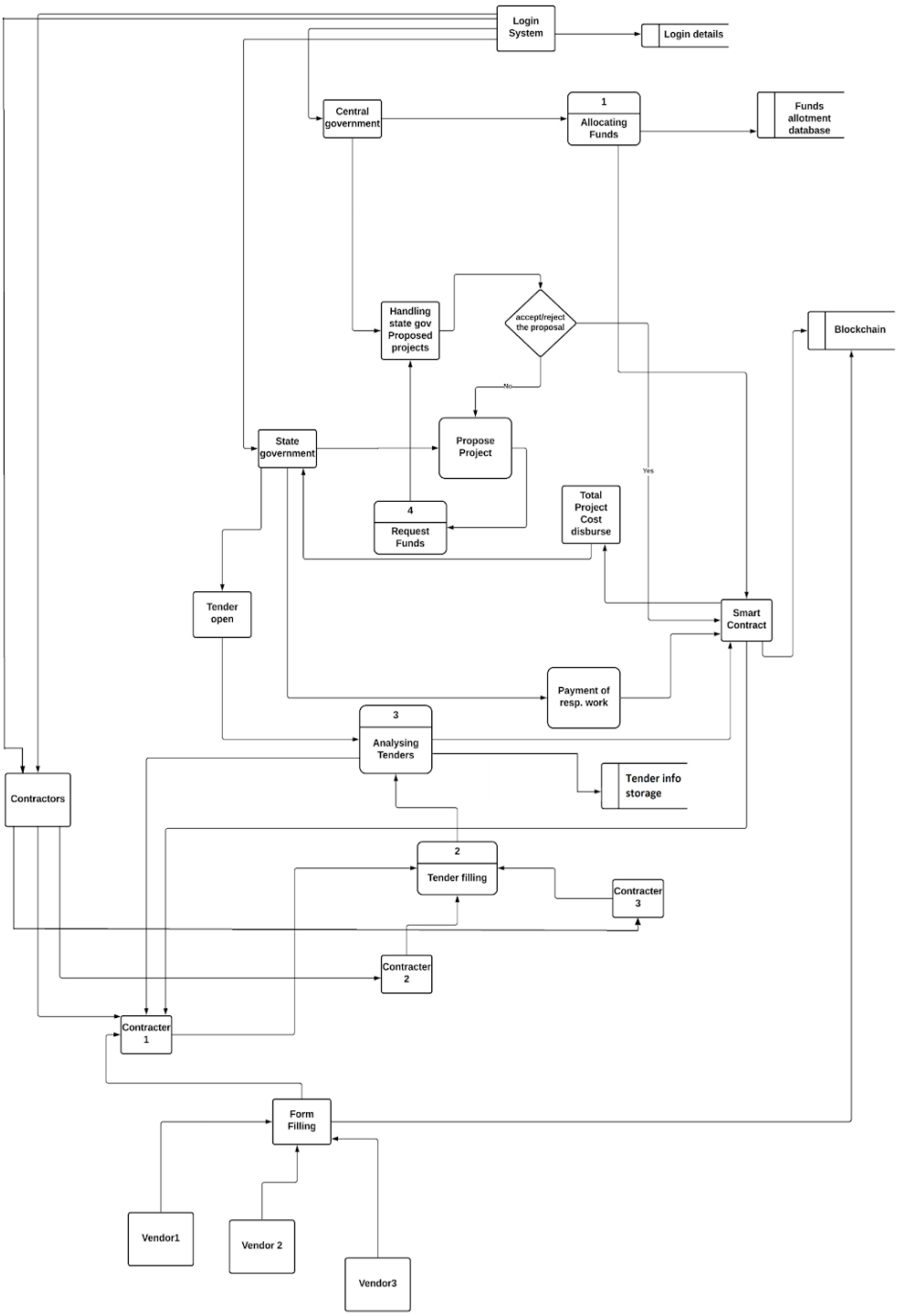

Fig.2

This is the dataflow diagram for Government Fund Tracking System.

3.2 Budget Allocation

After the budget is presented and finalized in the house of Parliament, the Finance Ministry is given the authority (admin would be Finance Minister) in our web application to enter the details and the amount of funds allocated for different departments (like Healthcare, Education, Agriculture, etc.).After these details are added to the applications, the state government can propose their project and request funds from the central government through our web application. Once the proposal gets approved by the central government funds are allocated to the state government and the amount is transacted to the state government and the details of transactions are stored in the blockchain network.

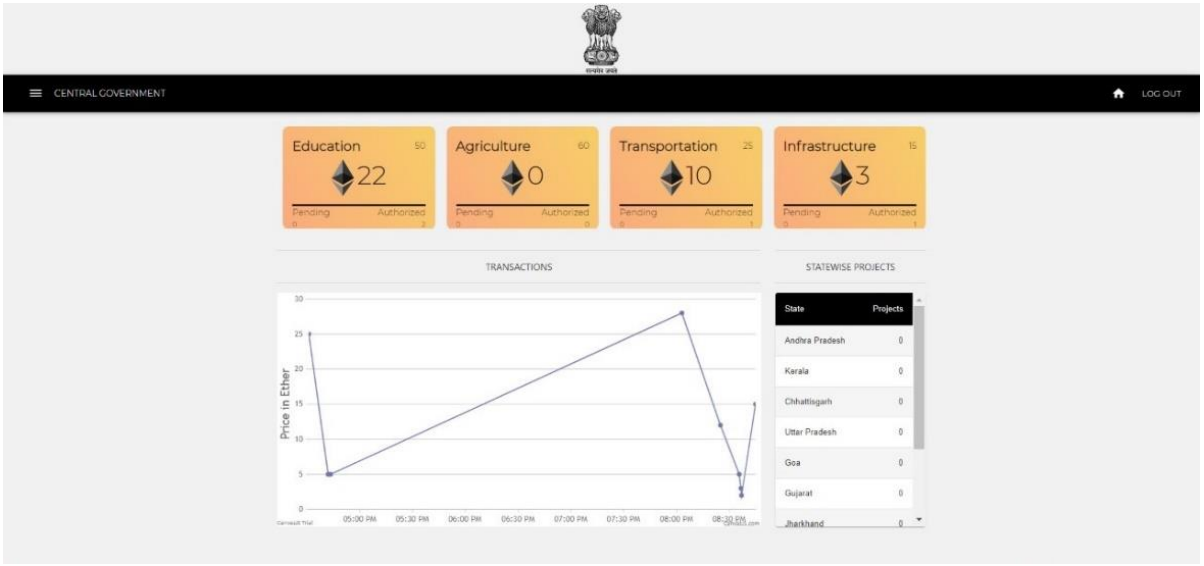

Fig.3

This figure represents the layout of Central Government after logging in. This web page shows various fields of projects, graph of transaction in ether for different fields and a dropdown table showing projects assigned to different states.

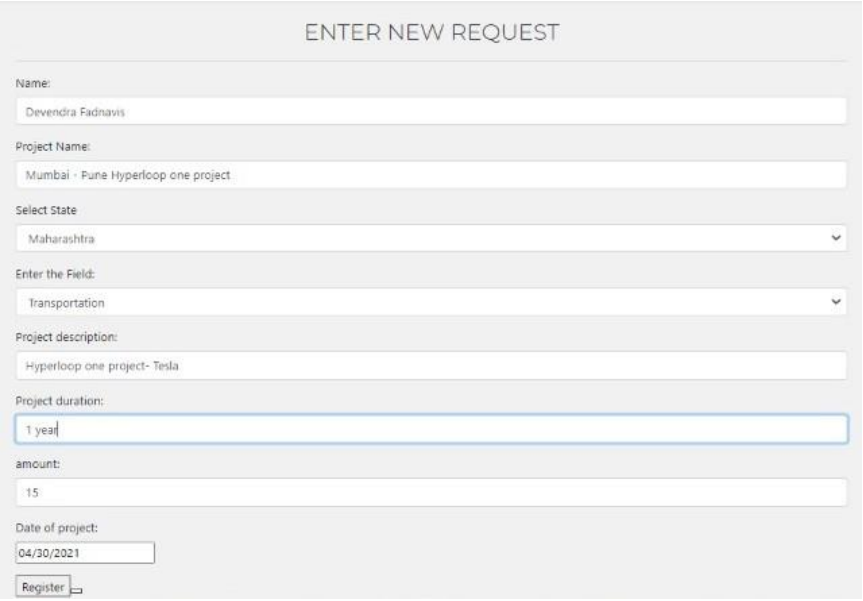

Fig.4

This figure represents the web page for state government for requesting funds for different projects.

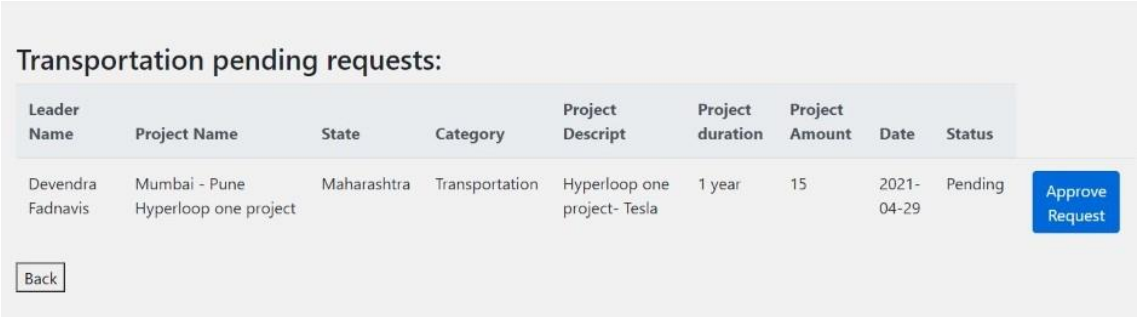

Fig.5

This figure represents the web page for Central government for approving requests for different projects.

3.3 State Government Opens Tenders

After the budget is sanctioned to the state government, the state government opens up tender. A document regarding the tender is released and an online portal (known as E-tender) is made where all the contractors can submit their bids.

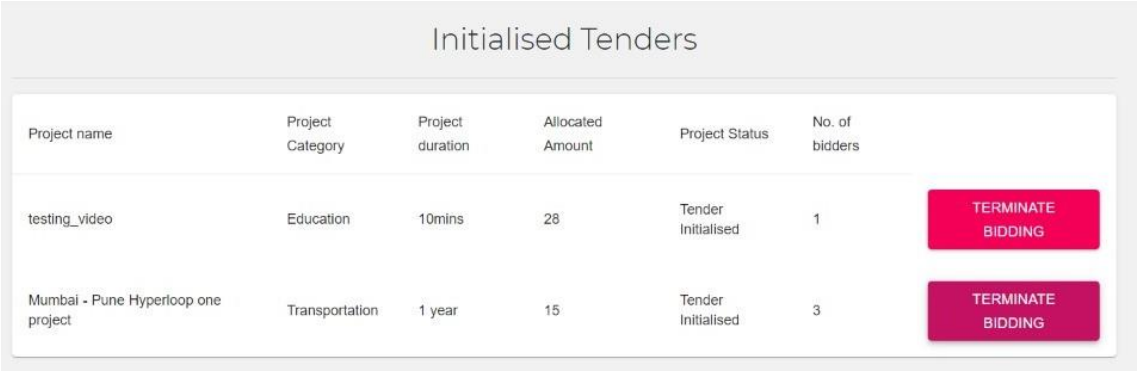

Fig.6

This figure represents the web page for Central government for initializing tenderds for different projects.

3.4 Bidding Process

The contractors are asked to submit their bids before a specific date and time. The bids are opened on the specified date before a panel of selected officers of the buyer and all the representatives of contractors who submitted their bids. Bids are read out and noted in a file. After this, the concerned office will tabulate all the bids to determine who quoted the lowest price. Purchase contract is usually awarded to the lowest bidder.

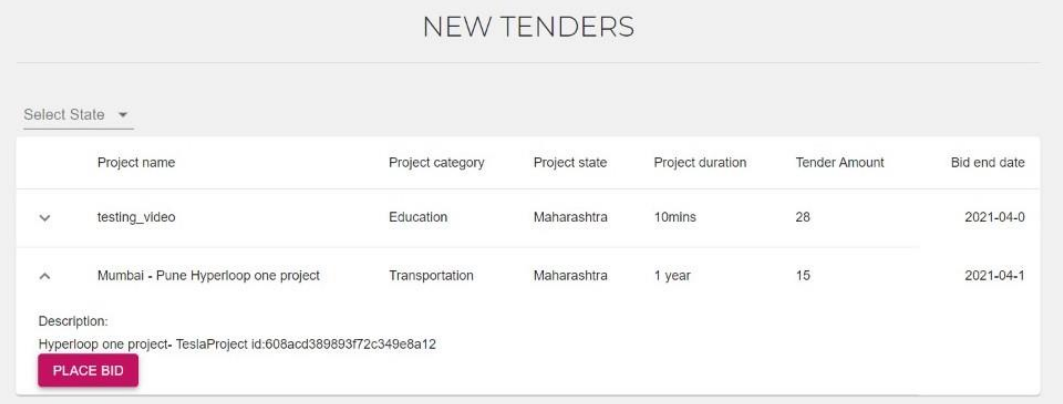

Fig. 7

This figure represents the web page for Contractors for placing bids for different tenders.

Fig. 8

This figure represents the web page for State government to see different contractors selected for different projects and other details related to them

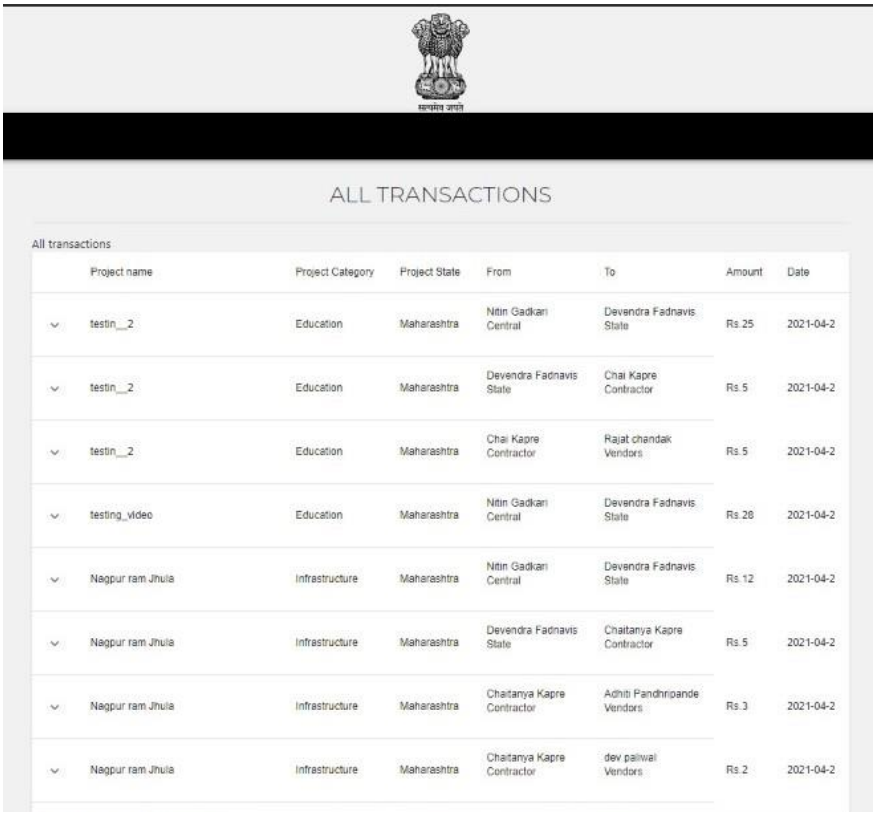

Fig. 9

This figure represents the web page for Central government transactions to State Government for every project category with details.

3.5 Inspection

After a certain period the inspection committee will visit the site to verify the progress and will submit the report on the progress(till date) to the higher officers in order to add the details in the blockchain, If satisfied the transaction will be carried out by the smart contract in the backend.

Following is the code responsible for transferring the amount to the contractor. Here the parameters are contractor's address and the partial amount which the state government has to pay for his respective work.

```
uint part_amount;


function funds_To_Contractor(address payable _contractor_address_topay,uint _part_amount) payable external
{
    part_amount = _part_amount;
    address payable contractor_address_topay = _contractor_address_topay;
    contractor_address_topay.transfer(msg.value);

}
```

Fig. 10

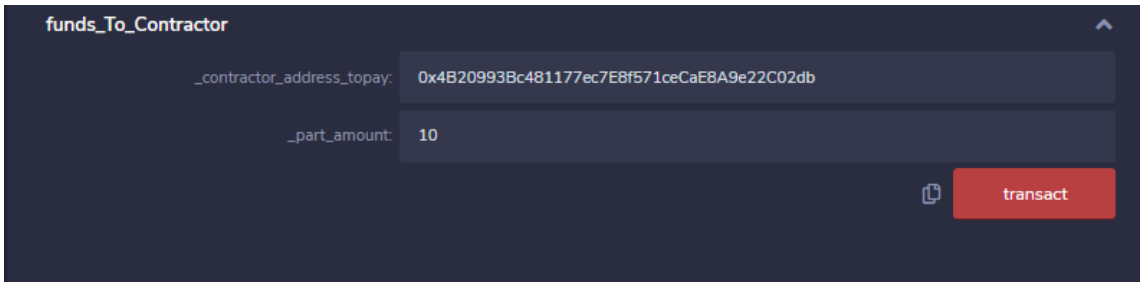

Fig. 11

Transferring 10 ether from one account to contractor's account.

3.6 Successful Transfer of Funds

The following illustrations show the successful transaction from state government to the contractor.

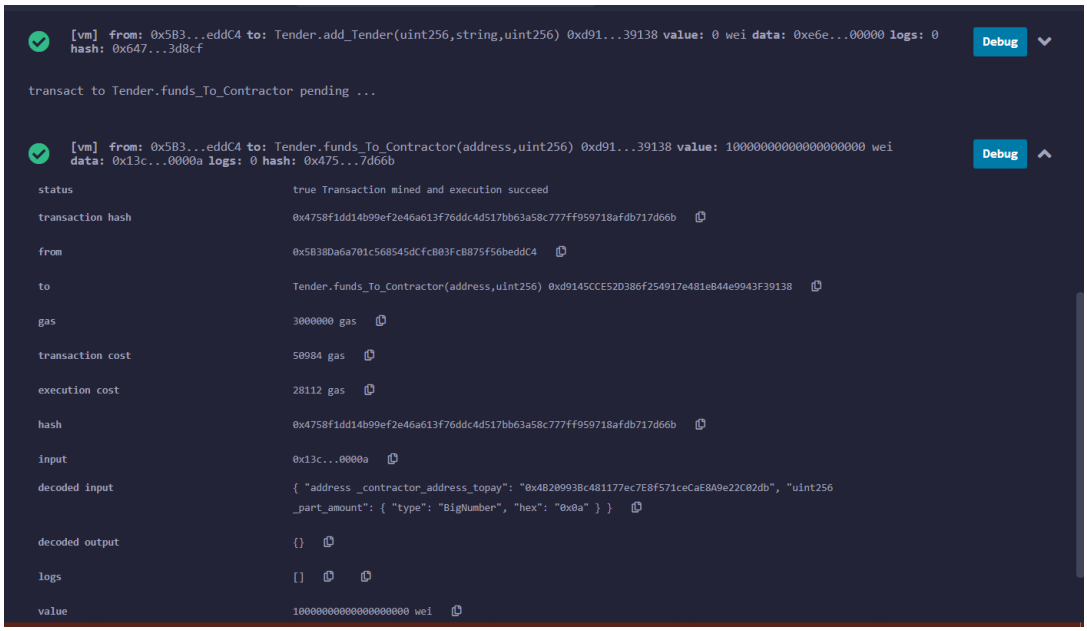
[vm] from: 0x5B3...eddC4 to: Tender.add_Tender(uint256,string,uint256) 0xd91...39138 value: 0 wei data: 0xe6e...00000 logs: 0 hash: 0x647...3d8cf
Debug
transact to Tender.funds_To_Contractor pending ...
[vm] from: 0x5B3...eddC4 to: Tender.funds_To_Contractor(address,uint256) 0xd91...39138 value: 1000000000000000000 wei data: 0x13c...0000a logs: 0 hash: 0x475...7d66b
Debug
status
true Transaction mined and execution succeed
transaction hash
0x4758f1dd14b99ef2e46a613f76ddc4d517bb63a58c777ff959718afdb717d66b
from
0x5B38Da6a701c568545dCfcB03FcB875f56beddC4
to
Tender.funds_To_Contractor(address,uint256) 0xd9145CCE52D386f254917e481eB44e9943F39138
gas
3000000 gas
transaction cost
50984 gas
execution cost
28112 gas
hash
0x4758f1dd14b99ef2e46a613f76ddc4d517bb63a58c777ff959718afdb717d66b
input
0x13c...0000a
decoded input
{ "address _contractor_address_topay": "0x4B20993Bc481177ec7E8f571ceCaE8A9e22C02db", "uint256 _part_amount": { "type": "BigNumber", "hex": "0x0a" } }
decoded output
{}
logs
[]
value
1000000000000000000 wei

Fig. 12

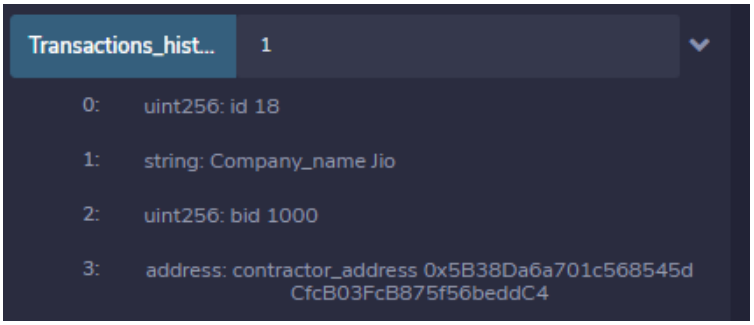
Transactions_hist...
1
0: uint256: id 18
1: string: Company_name Jio
2: uint256: bid 1000
3: address: contractor_address 0x5B38Da6a701c568545d CfcB03FcB875f56beddC4

Fig. 13

Chapter 4

RESULTS

As we have deployed the smart contracts on local (public) blockchain for testing purposes the below pictures are the examples of what transaction details are stored in the blockchain. We can notice senders' address, receiver's address, date and time at which block is mined (added in the blockchain), hash value(sensitive), the gas fee for the transaction and the value/amount that is being transferred.

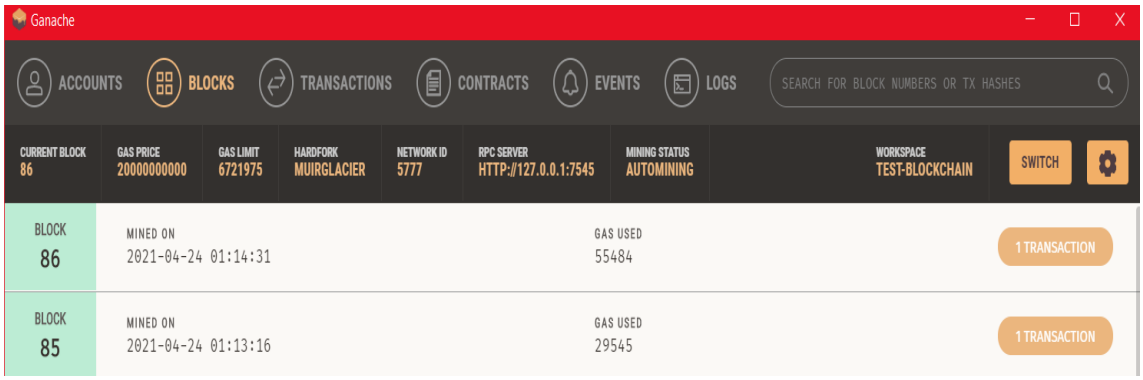

Fig. 14

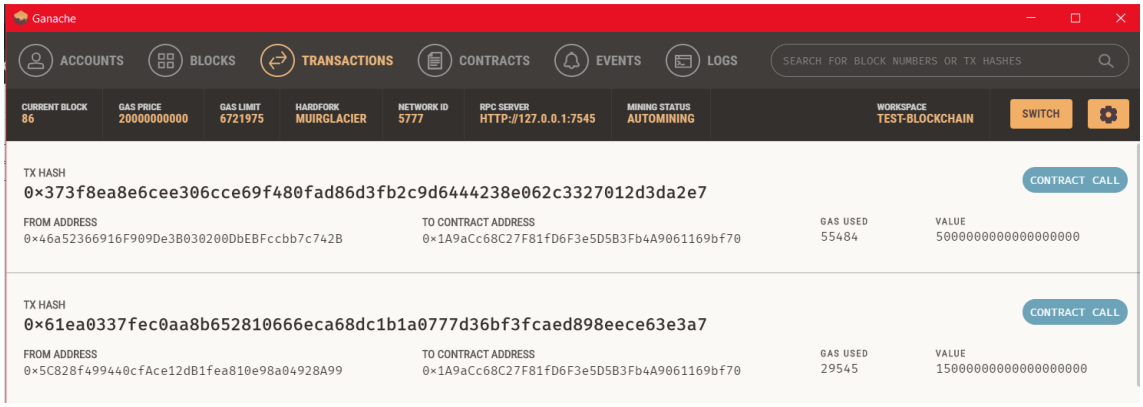

Fig. 15

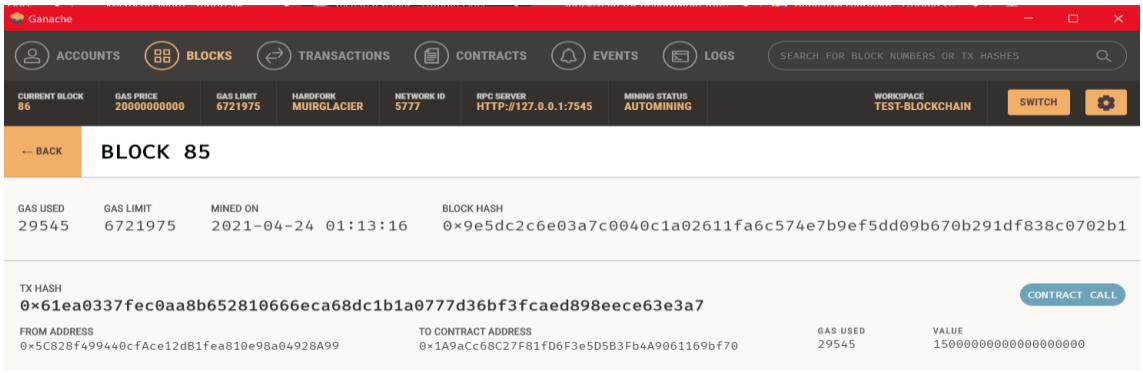
Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 86
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MUIRGLACIER
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE TEST-BLOCKCHAIN
SWITCH
← BACK
BLOCK 85
GAS USED 29545
GAS LIMIT 6721975
MINED ON 2021-04-24 01:13:16
BLOCK HASH 0x9e5dc2c6e03a7c0040c1a02611fa6c574e7b9ef5dd09b670b291df838c0702b1
TX HASH
0x61ea0337fec0aa8b652810666eca68dc1b1a0777d36bf3fcaed898eece63e3a7
CONTRACT CALL
FROM ADDRESS 0x5C828f499440cfAce12dB1fea810e98a04928A99
TO CONTRACT ADDRESS 0x1A9aCc68C27F81fD6F3e5D5B3Fb4A9061169bf70
GAS USED 29545
VALUE 15000000000000000000

Fig. 16

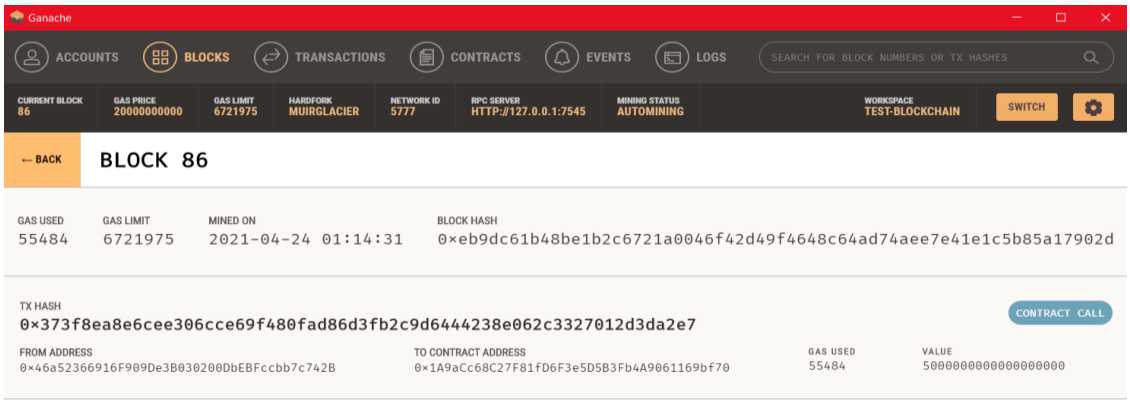
Ganache
ACCOUNTS
BLOCKS
TRANSACTIONS
CONTRACTS
EVENTS
LOGS
SEARCH FOR BLOCK NUMBERS OR TX HASHES
CURRENT BLOCK 86
GAS PRICE 20000000000
GAS LIMIT 6721975
HARDFORK MUIRGLACIER
NETWORK ID 5777
RPC SERVER HTTP://127.0.0.1:7545
MINING STATUS AUTOMINING
WORKSPACE TEST-BLOCKCHAIN
SWITCH
← BACK
BLOCK 86
GAS USED 55484
GAS LIMIT 6721975
MINED ON 2021-04-24 01:14:31
BLOCK HASH 0xeb9dc61b48be1b2c6721a0046f42d49f4648c64ad74aee7e41e1c5b85a17902d
TX HASH
0x373f8ea8e6cee306cce69f480fad86d3fb2c9d6444238e062c3327012d3da2e7
CONTRACT CALL
FROM ADDRESS 0x46a52366916F909De3B030200DbEBFccbb7c742B
TO CONTRACT ADDRESS 0x1A9aCc68C27F81fD6F3e5D5B3Fb4A9061169bf70
GAS USED 55484
VALUE 5000000000000000000

Fig. 17

Chapter 5

BENEFITS

4.1 Immutability

This is considered as one of the key characteristics of blockchain which means when a block is added in the blockchain then no one has the authority to change or alter data. This is because every node on the blockchain network has a copy of the digital ledger. So, to add a transaction the majority of nodes should validate, then only it will be added to the ledger. Immutability promotes transparency and thus makes it a corruption-proof solution to the current system's problem.

4.2 Decentralized

The network is decentralized meaning it doesn't have any governing authority or a single person looking after the framework. Rather a group of nodes maintains the network making it decentralized.

4.3 Less Failure

Blockchain works in an organized manner so there is no need to depend on human calculations, and hence it involves no risk and is highly fault-tolerant.

4.4 User Control

With decentralized nature, users don't have to rely on any third party to maintain their assets. All of them can do it simultaneously by themselves.

4.5 Zero Scams

As the blockchain system runs on cryptographic algorithms to store data(i.e hash key), thus nobody can utilize it for their personal gains and thereby impede scams.

Chapter 5

FUTURE WORK

5.1. Making the Project Open for Private use

In this project, we worked solely on the Government system. But this project can be used by various other private companies. Private companies MNC's need to keep track of their transactions can make their own blockchain network.

5.2. Expanding the Project To Financial Industry

The traditional banking system is less efficient, unsecure and has slow transaction time with changeable records. Blockchain unlike this can be used for storing digital transactions at a single place in a way which makes it difficult or impossible to change , hack or cheat. Blockchain increases the speed of processing transactions. We can upgrade this project to suit the banking sector.

5.3. Setting up NGOs with this System

NGO's face a lot of problems due to lack of funds. People don't like to donate to a place where it is difficult to track their donations. We can setup NGO's with our project, thus helping by giving them a proper structure for their transactions which will keep records of donations and their expenditures. Since our project is transparent, people will trust the system and thus help with the donations. This system also offers unchangeable transaction records which makes it secure from frauds and corruption.

5.4 Insurance Sector

The insurance sector lacks automated administrations. An insurance claim takes almost months to get processed and paid. Smart contracts can be used to streamline the process by making a system which automatically triggers when certain events occur. Then blockchain can be used to record other specific details in order to determine the exact amount of compensation.

5.5 Supply Chain Management

Nowadays trading is not famous due to frauds and non-transparency. Blockchain and Smart contracts can be used to make this system transparent by smooth movement of goods and restoring the trust in trade. Smart contracts can record ownership rights and show how products move through the supply chain showing who is responsible for the product at any time.

Chapter 6

CONCLUSION

The Ethereum Blockchain provides a platform to deploy our prototype as it allows for scripting and the building of decentralized applications and 'smart contracts' (EVM).

As Blockchain technology is simply a decentralized ledger system, so in our prototype, we were able to trace all the transactions among the central government, state government, and the contractor Any transactions can be validated and cannot be changed due to the decentralized ledger and if a malicious user tries to modify or alter the data in the blockchain, then the block would not be added as every block contains a cryptographic hash of the preceding block.

The funds that are disbursed can be traced, and everyone can know how the money is being spent. It would have a significant impact on a country's economic growth

Blockchain has now become a more welcome technology in the field of the public sector because of security, effectiveness, and speed. We can extend this project by adding more complex features and can solve other problems like a land registry, etc. Thus, we can say that blockchain has the potential in making more robust and complex solutions in the public sector. Thus blockchain has the power to transform the infrastructure of government and essential roles such as identity authentication, asset register, and transaction certification.

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