

SMART CONTRACT TECHNIQUE TO BUILD DATA AGGREGATION FRAMEWORK ON LARGE SCALE IOT SYSTEMS

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Abstract—

Building scalable and secure Industrial IoT (IIoT) system is the need of the hour in Industrial 4.0. However, existing IIoT systems are vulnerable to a single point of failure and malicious attacks. To address the security and efficiency issues of the massive IIoT data, blockchain is widely considered as a promising solution to enable data storing, processing, and sharing in a secure and efficient way. To meet the high throughput requirement, this paper proposes an optimization framework for blockchain-enabled IIoT systems. The proposed framework exploits blockchain innovation as far as its straightforwardness furthermore, sealed nature to help reasonable merchandise trade among shippers and providers. Moreover, the decentralization and pseudonymity property will assume a critical part in safeguarding the protection of members in the blockchain.

Keywords— *Industry 4.0, IIoT, Bloch Chain, Smart Contracts, Large Scale IoT, data aggregation.*

1. INTRODUCTION

Internet of Things because of its end points susceptible to cyber threats, block chain has come as a solution to address this. Block chain being decentralized and distributed format stores information in digital forms blocks. Whole information is stored in blocks. A block has pre-defined capacity to store. When one block is full, it creates a new block and links with the previous block. The data recorded in these blocks are immutable. This unique feature resolves the issue of authorizing transactions. It validates transaction in a decentralized fashion which is distributed. This distributed and validation algorithm is the most powerful, and it executes very fast avoiding any delays in processing. Incorporated frameworks depend on a confided in outsider (e.g., banks) to permit non-confiding in members to impart and send monetary exchanges between one another. Depending on a confided in outsider, nonetheless, could bring about security and protection issues just as high conditional expenses. Blockchain innovation expects to address this by permitting non-trusting members to arrive at an agreement on their exchanges and correspondences without the association of a confided in third party. Blockchain can be considered as an appropriated data set that keeps up with the historical backdrop of all exchanges that have ever happened in the blockchain network. Blockchain is the underlying advancement behind the primary dispersed electronic instalment framework and Bitcoin. Blockchain has advanced to help several decentralized applications past monetary applications. Large numbers of these applications depend on the execution of brilliant contracts on top of the blockchain. A smart contract is a system program that encodes the arrangement between non-confiding members and is executed considering some pre-characterized rules. A brilliant agreement is sent or executed on blockchain frameworks as a component of a blockchain exchange. Excavators, extraordinary kind of members in the blockchain network, are answerable for conveying new agreements and executing existing ones. Diggers get compensated for this work dependent on the computational expenses needed to execute the contracts. The most well-known stages that help sending furthermore, executing shrewd agreements are Ethereum and Hyperledger Texture.

LITERATURE REVIEW

Smart contract approach in IoT really makes blockchain technology more powerful. Due to

Research paper

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this it is used in various applications namely land registrations, supply chain management, medical data processing, and academics are all possible applications of blockchain technology. There are nearly 6,000 block chain projects currently running. Several professionals are contributing to this in open platforms such as GitHub. As per analysis, many of the developers are motivated towards the development of block chain-based systems as they are decentralized. A survey indicated that block chain projects are open-source projects. Development of a block chain project is different and difficult. But still many developers prefer this keeping in view its enhanced security. In addition, block chain projects are more reliable when compared with others. Maher Alharby et al. have written that Blockchain based smart contracts are system programs that encode an understanding between non-trusting participants. Smart contracts are executed on a blockchain framework whenever determined conditions are met, without the need of a trusted outsider. Blockchains and brilliant agreements have gotten expanding and blasting consideration as of late, likewise in academic circles. They have prepared this project mainly for safe transaction security, privacy, and fast transactions. Edi Surya Negara et al. have written This literature is on smart contract on various domains Right now, there have been many advances in the improvement of innovation that upholds savvy contracts, while there is minimal agreement regarding their utilization in different organizations. Issues of framework security and data innovation, trust in information exchange frameworks, and straightforwardness of information trade between various associations are new challenges for associations. Min Xu et al. has written this Blockchain is considered by numerous individuals to be a problematic center innovation. Although numerous specialists have understood the significance of blockchain, the exploration of blockchain is yet in its early stages. Moreover, we lead a bunching investigation and recognize the accompanying five examination subjects: monetary advantage, blockchain innovation, introductory coin contributions, fintech upheaval, and sharing economy. Zibin Zheng et al. has written this Blockchain has various advantages like not-centralized, namelessness, security, and reliability. There is a wide range of blockchain applications going from digital money, monetary administrations, hazard the board, web of things (IoT) to government and societal administrations. Lin William Cong et al. have written that Blockchain innovation gives decentralized agreement and possibly broadens the contracting space utilizing brilliant agreements with alter proofness and algorithmic executions. We break down decentralization

means for agreement viability, and how the quintessential elements of blockchain reshape modern association and the scene of rivalry. We further examine hostile to believe strategy suggestions designated to blockchain applications, for example, isolating agreement record-guardians from clients. Yongshun Xu et al. have written that It was proposed during the 1990s by Nick. smart contracts were covered and neglected to draw in the consideration of the industry and the scholarly world for a long while as there was no way to execute savvy contracts before the rise of blockchain innovation in 2009 On the other hand, the prime of brilliant agreements has as of now started. Particularly since the establishment of Ethereum dependent on blockchain innovation, blockchain-based stages for executing by savvy contracts.

METHODOLOGY

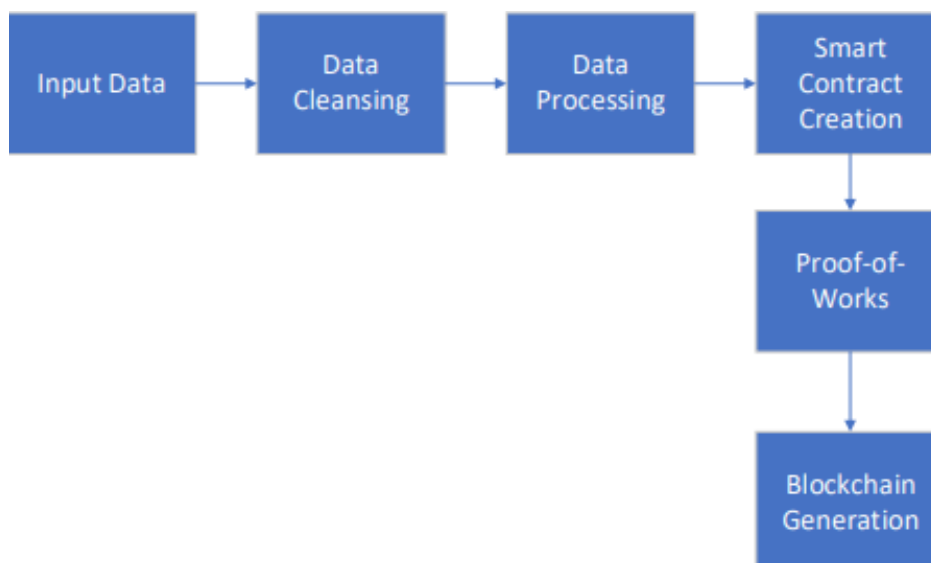


Fig 1: Proposed Architecture

Each module shown in the figure is described below.

- Data Uploading: Data will be uploaded as excel file in the form of .csv
- Authentication: This module will authenticate user credentials.
- Smart Contract Creation: this smart contract can speed up the transaction and make safe transactions.

- d) Proof-of-work: after completion of the transaction, we get the acknowledgement that is call proof of work.
- e) Block-chain creation: after completion of the work the data will be stored in the blockchain in blocks.

The technical jargons related to work are presented below:

Data Aggregation: This involves collecting data and summarizing. Gathered data is summarized such that several descriptive statistics can be applied. Summarized data will then be ready for pre-processing.

Large Scale IIoT systems: While IoT is for consumer applications, IIoT is targeted specifically for industry purposes. IIoT is expected to increase productivity, performance, and safety. Controlling home appliances is an example of IoT whereas indicating mal function of equipment and checking inventory at a remote location ca be Industry IIoT applications. IIoT uses sensors as input. These sensors can be heat, light, pressure etc. These are given to PLC which further analyses using intelligent techniques. This feedback can be used to optimize and improve the performance of several controllers. Although these IIoT systems are reliable, safe, and economic, they are susceptible to cyber-attacks. This is because end point systems are not securely configured. As we are aware, IoT is a connection of several devices. Any device may be vulnerable to security threats. This problem elevates with nodes at homes such as refrigerators, washing machines and air-conditioners. Other end point devices may also be installed at public places, transport locations, office premises etc. Hence instead of providing facilities to the public, IoT has introduced several security threats. A comparison indicated that the cost of IoT facility is less and the cost to address security threat is so high in IoT.

To overcome the following measures can be taken.

Network security shall be provided to increase security for network and end point nodes communication as well. In all places, ensure authorization and authentication measures. Role based access control is also a counter measure. Device scanning is the key activity for identifying unauthorized activities through endpoint nodes. In Industry 4.0, IIoT is in place. When it is in place the risk quantum is slightly higher than normal IoT. All the resources used in industry are costly and scarce. When they are connected through IIoT, a robust security mechanism needs to be in place which may include device updates, scanning etc. The main issue is ending devices vulnerability. This analysis shall be done properly to refine protection.

- Intrusion detection systems shall be deployed across IoT points to detect anomalies.
- IIoT systems shall be dealt with specially and more robust authentication measures shall be designed and deployed.

To provide cyber security block chain based smart contracts are promising.

Block chain: In the era of industry 4.0. block chain technology is a promising cyber defense provider as it operates in decentralized and distributed format. It stores information in digital forms blocks. Whole information is stored in blocks. A block has pre-defined capacity to store. When one block is full, it creates new block and links with previous block. The data recorded in these blocks are immutable and cannot be altered in future. This model is referred to as distributed ledger technology.

Smart Contract: These are programs which run with if -then -else logic. These programs run automatically when certain conditions are met. For example, to book a ticket, a smart contract is initiated, and the records are updated after completion. Updated results can be visualized by authorized persons only.

2. RESULTS AND DISCUSSION

The proposed tool is equipped with several features. Users must register and create credentials to establish authentication. Every time the user needs to provide valid credentials to access the tool features. Once authentication and authorization are successful, user will be able to view dashboard which contains several functionalities such as

- Data Uploading Functionality
- CSV to database
- Displaying smart contract
- Block chain generation

After uploading data into database, the following can be generated using tool.

Research paper

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```
Solidity Smart Contract  
  
contract IndustrialIoTContract {  
  
    ufixed demandResponse  
    ufixed area  
    ufixed season  
    ufixed energy  
    ufixed cost  
    ufixed pairNo  
    ufixed distance  
    uint public iotEndTime;  
  
    address public iotDevice;  
  
    mapping(address => uint) iotDevices;  
  
    bool ended;  
  
    event HighestEnergy(address energy, uint value);  
    event HighestCost(address row, uint amount);  
}
```

Blockchain Report



Blockchain Generation

No of Blocks Are Created	0
No of Blocks Yet to be Created	5

CONCLUSION

This paper discussed the application of smart contract methods to address challenges of industrial internet of things. The malicious nodes are dealt with and identified using block chain based smart contract mechanism. This approach has enhanced the security of IIoT systems and is found to be better. This approach has the advantage that security is enhanced, reliability is improved, data privacy is protected, and system performance is drastically improved. This mechanism also has further advantage that all end point performance is improved, and no device performance was degraded because of these security measures.

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