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IoT based Sharing Economic Services in a Smart City

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***Abstract*: In this industrial age, the need for electricity keeps on increasing rapidly. The concept of smart grid was proposed in order to provide more efficiency in distribution of power and to maintain low loss level and high level of quality. Smart grid is useful in enabling small and separate private scale to generate the consumption and selling it to a grid. In this paper, we use block chain as a tool to maintain the generated transactions in the smart grid. Transactions are performed with smart contracts, and the network acts as a transaction verifier. The block chain provides immutability of the transactions, which ensure every transaction between generators and consumers will always be executed. It also provides immutability to transaction history, which can be used for audit or solving a transaction dispute.**

***Keywords*: Blockchain, Encryption, Transformer, Arduino, Current.**

1. Introduction

As we all know the current IoT devices implied in the smart cities, smart houses leads to a privacy issue. In order avoid the third parties or hackers from stealing our information and predicting our pattern of usage leading to many problems. The smart grid concept is a framework that implements the concept of advancement in urbanization. This project makes use of block chain technology to overcome this security issue paying more attention in securing the data rather than collecting it. We make use of the existing infrastructure investment providing the highest quality in the day to day life of the people. A conductive investment climate that allows transparency and utilization of resources in business and government sectors. This can be assumed as a organic system integration in social, business, physical and IT infrastructure. This architecture works as a whole so it generates actionable and intelligent decision making. The block chain– based smart meters help us to accelerate the real– time enforcement of differential pricing models. These models contain the usage of energy. Such models promote the self- dependency on energy locally. These smart meters use block chain to implement smart grids that contain renewable energy micro grids. The micro grids are connected to the main grid helping local communities manage power supply and load whatever the people require. It also provides the result in the fast and precise way. This system will reduce a burden of analysis of energy consumption.

Fig. 1. Smart meters

Fig. 1 represents the current smart meters, in which security and verifiability are questionable. Maintenance problem will arise in these electronic smart meters. By using block chain technology, we can overcome these disadvantages. It not only allows noting the readings instantly and conveniently, but also helps in preserving the security in that location. By using the advancements made in the existing system, one could deduct if any values are being changed. Moreover, the changes are intimated to other blocks and require their approval to proceed further. Hence by using this system, we can reduce time, cost, and maintenance issues. It ensures the security of an electronic smart meter after the readings are noted. Hence it builds the trust among the people. Thus it provides a solution for the problems we are facing in the current electronic smart meters.

2. Literature Survey

Y. Zhang, et. al., [1] presented Smart Contract-Based Access Control for the Internet of Things. This paper investigates a critical access control issue in the Internet of Things (IoT). In particular, we propose a smart contract-based framework, which consists of multiple access control contracts (ACCs), one judge contract (JC), and one register contract (RC), to achieve distributed and trustworthy access control for IoT systems. Each ACC provides one access control method for a subject-object pair, and implements both static access right validation based on predefined policies and dynamic access right validation by checking the behavior of the subject. The JC implements a misbehavior-judging method to facilitate the

dynamic validation of the ACCs by receiving misbehavior reports from the ACCs, judging the misbehavior and returning the corresponding penalty. The RC registers the information of the access control and misbehavior-judging methods as well as their smart contracts, and also provides functions (e.g., register, update, and delete) to manage these methods. To demonstrate the application of the framework, we provide a case study in an IoT system with one desktop computer, one laptop and two Raspberry Pi single-board computers, where the ACCs, JC, and RC are implemented based on the Ethereum smart contract platform to achieve the access control.

K. Yeow, et. al., [2] presented Decentralized Consensus for Edge-Centric Internet of Things: A Review, Taxonomy, and Research Issues. This system states, with the exponential rise in the number of devices, the Internet of Things (IoT) is geared toward edge-centric computing to offer high bandwidth and low latency. In contrast, legacy cloud-centric platforms offer deteriorated bandwidth and connectivity that affect the quality of service. Edge-centric Internet of Things-based technologies, such as fog and mist computing, offer distributed and decentralized solutions to resolve the drawbacks of cloud-centric models. However, to foster distributed edge-centric models, a decentralized consensus system is necessary to incentivize all participants to share their edge resources. This paper is motivated by the shortage of comprehensive reviews on decentralized consensus systems for edge-centric Internet of. Decentralized consensus systems adopt either block chain or block chainless directed acyclic graph technologies, which serve as immutable public ledgers for transactions. This paper scrutinizes the pros and cons of state-of-the-art decentralized consensus systems. With an extensive literature review and categorization based on existing decentralized consensus systems, we propose a thematic taxonomy. The pivotal features and characteristics associated with existing decentralized consensus systems are analyzed. Finally, several open research issues on decentralized consensus for edge-centric IoT are presented, which should be highlighted regarding centralization risk and deficiencies in block chain/block chainless solutions.

T. M. Fernández-Caramés, et. al., [3] presented A Review on the Use of Block chain for the Internet of Things. This method proposes the paradigm of Internet of Things (IoT) is paving the way for a world, where many of our daily objects will be interconnected and will interact with their environment in order to collect information and automate certain tasks. Such a vision requires, among other things, seamless authentication, data privacy, and security, robustness against attacks, easy deployment, and self-maintenance. Such features can be brought by block chain, a technology born with a crypto currency called Bit coin. In this paper, a thorough review on how to adapt block chain to the specific needs of IoT in order to develop Block chain-based IoT (BIoT) applications is presented. After describing the basics of block chain, the most relevant BIoT applications are described with the objective of emphasizing how block chain can impact traditional cloud-centered IoT applications. Then, the current challenges and possible optimizations are detailed regarding many aspects that affect the design, development, and deployment of a BIoT application. Finally, some recommendations are enumerated with the aim of guiding future BIoT researchers and developers on some of the issues that will have to be tackled before deploying the next generation of BIoT applications.

B. K. Barman, et. al., [4] presented IOT Based Smart Energy Meter for Efficient Energy Utilization in Smart Grid. This system proposes, efficient energy utilization plays a very vital role for the development of smart grid in power system. So, proper monitoring and controlling of energy consumption is a chief priority of the smart grid. The existing energymeter system has many problems associated to it and one of the key problem is there is no full duplex communication. To solve this problem, a smart energy meter is proposed based on Internet of Things (loT). The proposed smart energymeter controls and calculates the energy consumption using ESP 8266 12E, a Wi-Fi module and uploads it to the cloud from where the consumer or producer can view the reading. Therefore, energy analyzation by the consumer becomes much easier and controllable. This system also helps in detecting power theft. Thus, this smart meter helps in home automation using IoT and enabling wireless communication which is a great step towards Digital India.

3. Methodology

For ensuring more security to the information and to avoid fraudulent activities, the concept of smart city has been evolved. In this implementation, hyper ledger block chain is used to achieve the above needs.

Here, we used the algorithm called consensus (proof of work) to achieve block chain generation in fast manner. Thus hyper ledger block chain is utilized here. Also, we used the Arduino board to collect the real time data.

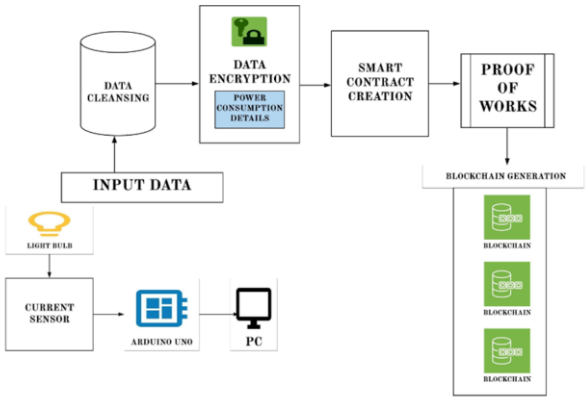

Fig. 2. Architecture of the proposed system

Under smart city, we specified the concept of electricity to collect the real time data from the transformer. Since, we cannot able to do the project using transformer, we are using electric bulb in the project. The electric bulb consists of power, voltage,

time; unit. Since the bulb consumes normal voltage. Therefore, the voltage is set to default 230v.Here, the real time data are frequently generated. To compress the flow of current data, Arduino kit has been used. To manage the needed data, time has been formulated and fixed as the interval of 1 second.

Now, the Arduino kit act as an interface to carry a data to the computer (pc). Power calculation has been done after the data process and those data will be stored in the form of Structured Query Language (sql). Basically, these data have been coded in python language but it is less secure. To improve the efficiency of the data, we implemented the concept of Blockchain. By using Blockchain, it is impossible to change the data without the domain authentication. Finally, Blockchain report has been generated according to the received data. These reports ensure the high efficiency which makes our project reliable.

4. Module Description

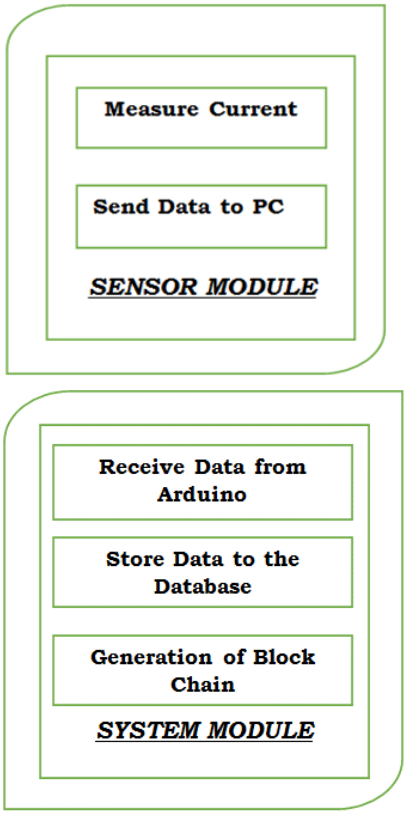

Fig. 3. Modules of the proposed system

Fig. 3 represents the modules present in the proposed system.

A. *Sensor module*

Following are the processes that are done in the sensor module:

1) Measure current

In this module, the ACS712 sensor is used to measure current using the Hall Effect principle. This sensor could measure both AC and DC current. The sensor is interfaced with an Arduino Uno board through simple connections in order to get an accurate reading.

2) Send data to PC

In this module, the data collected by the ACS712 sensor is being sent to the PC. The values are calibrated according to the need of the user before proceeding with the further calculations.

B. *System module*

Following are the processes that are done in the system module:

1) Receive Data from Arduino

To measure dc direct current with Arduino. The ACS712 current sensor connected to your Arduino board through a series of jumper wires. We using Arduino Icd shield to avoid messy circuit and easy to handle circuit. Arduino needs assistance from a dedicated current sensor.

2) Store Data to the Database

In order to protect sensitive data confidentiality, we design a data authority management method to regulate the access to sensor data. It achieves higher throughput then provides accuracy on measurement. It contains high speed data transmission.

3) Generation of Block Chain

A block chain system with Credit based consensus mechanism, we propose a credit-based proof-of-work (POW) mechanism for IoT devices, which might guarantee system security and transaction efficiency simultaneously.

5. Conclusion

For making the smart city process to be more secure and cost efficient manner, we introduced this block chain based electronic smart grids concept. To meet the above needs, the proposed system will be helpful. The proposed system also helps to maintain the privacy of the user's information. It ensures that no data/values could be changed without the knowledge of the other blocks that participate in the block chain. Smart Grids private block chain will support hundreds of transactions per second. To manage the load on the block chain, smart contracts will be used. For countries with higher power consumption, several extra features must be needed to carry higher throughput of transactions per second.

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