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Design of an Automated Pollution Monitoring System with Blockchain

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Abstract - *This paper propose an automated air quality storage using Blockchain. There is an old solution of air quality detection in that their are some limitations and possibilities. To overcome those we are developing a new system with more security and cost effectiveness. In this proposed system we are using a pollution reated data and a Blockchain to store data indecentralised fashion and retrival of the data that was taken from the pollution related data. In this proposed system data will be collected automatically without any third party interfacing in between.*

Key Words: IoT, Blockchain, Automated.

1. INTRODUCTION

Air pollution is perceived as a modern- day curse .Air pollution has many negative effects, including on human health, damage to ecosystems, food crops and the built environment. The World Health Organization (WHO) stresses that air pollution is the biggest risk to human health. Air pollution takes many forms and provides many parameters for measuring and tracking changes over time. Long-term historical pollution data can be difficult to reconstruct or estimate - for many pollutants, our global data range is limited to recent decades. Air pollution is very big factor of human life because of that some solution are needed to check the quality of air. Many organization has proposed the solution but those solution have some problem regarding security, cost. In the old system the data was collected manually and their was third party interference. To over come that System we proposed a system which will be cost effective and will be decentralized.

1.1 Literature Survey

1.11 Carbon monoxide(CO) detection

In this system we detect the harmful gas which is the carbon monoxide with the use of MQ-7 sensor and then forward the data via the use of loragateway to The Things Network where the gathere encrypted data is decrypted and then send the data to the distributed block chain from where the data can be made available to the user.

1.12 Temperature detection

In this system we detect the temperature with the use of LM35 sensor and then forward the data via the use of loragateway to The Thing Network where the gathered encrypted data is decrypted and then send the data to the distributed block chain from where the data is made available to the user.

1.13 Distributed block chain based storage

A block chain is like a diary which cannot be tampered with. It consist of a hash which is a string of numbers and letters produced by the hash funtion. A hash funtion is nothing but a mathematical function that takes a variable number of characters and converts it into a string of fixed length. Even if their is a small change in the string, it will create a complete new hash. Each transaction generates a hash, transaction are entered in the order in which they occured. In blockchain order is very important.

2. IMPLEMENTATION

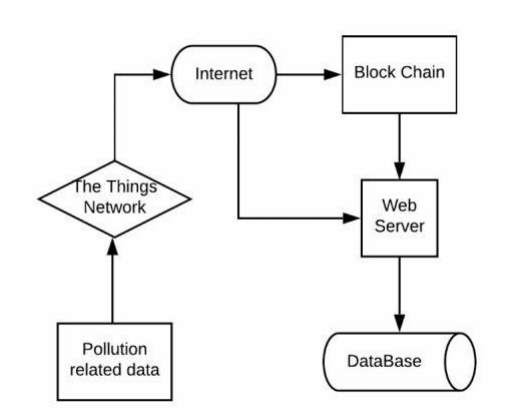

Fig. 1. Architecture of the system

In the above architecture first the data is collected from the pollution related data file and the data is sent to TTN where the collected data is decrypted and through the internet the

data is sent to the blockchian and to the local database. The collected data is made available through the web server.

Software:

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Two types of algorithm which have been used in the software part:

SHA-256:

SHA stands for Secure Hash Algorithm. This algorithm is used to generate a crytographic hash function which are mathematical operations run on digital data by comparing the hash to know a unexpected hash value, by using this a person can determine the data integrity. The SHA-256 compression function operates on 512-bit message block and a 256- bit intermediate hash value.SHA-256 is a 256-bit which encrypts intermediate hash value.

In simple words SHA-256 is one of the cryptographic hash function which will have digest length of 256 bits it is basically a keyless hash function it. In this system SHA-256 used to generate the hash function, first the data will be taken from the pollution related file and then the data will be passed throught this hash function so that this hash function generates the required hash of fixed length, any tampering of the data will result in change of the hash value which will make the users know that something has been changed in the data.

RSA:

RSA stands for Rivest-Shamir-Adleman is an algorthims which are being used in modern the computers for encrypting and decrypting message, it is an asymmetric cryptographic algorithm. Asymmetric means that there are two different key which have been used one is the public key which is exposed to all the users and the other is the private key which is user specific .In this a user encrypts the message using the public key and send the message to the user at the other end where the encrypted message is decrypted using the private key.

```
def generate_keys():
private = rsa.generate_private_key(
public_exponent=65537,
key_size=2048,
backend=default_backend()
)
public = private.public_key()
pu_ser = public.public_bytes(
encoding=serialization.Encoding.PEM,
format=serialization.PublicFormat.SubjectPublicKeyInfo
)
return private, pu_ser
```

After getting the data which we have received from the sensors, it is compared with the standards available and message is released for any violation. The contract deployment shown in the code over the network it is required to connect the remix portal to the IP address on which the Geth is running and then we need to run the minors on the node. After the smart contract which is ready, it is deployed on the network via the remix portal online. In some case offline SolC compiler can be used. In the presented solution the remix portal is used for smart deployment. The contract will be extracted into the web application via the use of Web3.js module. This permits to read and write the data over the smart contract by following regulations on the Web#JS website, it also gives an interface between the NodeJs server and the Ethereum node.

3. EVALUATION

Reliability are provided with the security in data transmission. In this case, the data received from the pollution related file were lower than other approaches and transacted into the BC directly from the gateway itself. As a result, this approach ensures integrity and accuracy of the data made available in the public domain. The scalability of the proposed PMS system can be divided into three Back-end, front-end and sensors. The scalability of BC depends on the Things Network. At moment, verification time of the Blockchain transaction takes 10 seconds maximum, meeting the temporal requirements.

4. FUTURE SCOPE

In this paper we have proposed an air pollution monitoring system using block chain. The main aspect of this application is to detect air pollution from the environment, calculate the data and store it in a distributed block chain so that the stored data is secured and cannot be tampered. So basically this system in the coming time can be used for the detection of harmful pollutants and store the data in such a manner that the data remain secured and if the amount of pollution crosses a given threshold then take appropriate measures.

5. CONCLUSIONS

In this work, a decentralized block chain is used for storage of data in a secured manner and allowing access

to the data only to the valid users via the webserver and aslo providing a backup storage of the data.

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