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Transparency in Oil and Gas Industry Using Blockchain

Nikhil Pathak, Abhishek Chaurasiya, Manish Chaurasiya, Asst. Proff. Sachin Kumar
Department of CSE,
Tula's Institute,Dehradun,India
nikhilpathak0620@gmail.com, abhishek201704070@gmail.com, manishchaurasiya879@gmail.com,
sachin.kumar@tulas.edu.in

Abstract- The following paper is ennobled as "TRANSPARENCY IN OIL AND GAS INDUSTRY USING BLOCKCHAIN". Stress is laid on indispensable issues viz. data record, keeping an eye on the workflow inside the industry, transaction and cross border payments in an oil and gas industry. The industry triggers its functions in three junctures, namely, upstream, midstream and downstream. Earlier, the employees that were involved in the trading process were oblivious to the iniquity present in the former mentioned stages; also, the departments were connected via central node. Now, through the introduction of blockchains, decentralized networks have been established in the system. In ratiocination, the percipience of blockchain technology in the oil and gas industry is quite slim. Applications are still in a blossoming stage and investments are not enough. Blockchain has considerable latitude in the oil and gas industry. For instance, it can heavily reduce the transaction costs, improve efficiency with copious amounts of transparency and so on and so forth. Being in its infancy period, the technology encounters various hurdles associated with regulation and system transformations. Slowly and gradually, with proper advancements in the field, a paradigm change would enforce the current blockchain system towards a hybrid blockchain architecture combined with various multi-technological resources incorporating cross chain swaps, hybrid consensus mechanism and more interdisciplinary innovations. Reading along further in the paper, the issues discussed in the former paragraphs would soon appear to be resolved to a great extent.

Keywords:- Blockchain technology, Oil and gas industry, Midstream, Downstream, PoS algorithm, SHA-256, Peer-to-Peer, Cryptographic Keys, Transparency, Digital Signature, Public Key, PrivateKey.

I. INTRODUCTION

Blockchain technology is the cynosure of our research work. It is a continuously growing technology. Blockchain is defined as a list of blocks linked with each other, where the blocks are a growing list of records. It is a core technology for cryptocurrencies. A blockchain cinches the probity of cryptocurrencies by enciphering, vindicating and recording transactions indelibly. Because of its alluring pros, the technology has managed to grasp The attention of every technical pioneer. In this paper, we have focused our attention to use this technology to make resources (like important documents, currency, data records) secure by providing a digitized course using blockchain technology.

II. MOTIVATION

According to 61% of respondents as suggested by the stats of Deloitte's 2018 blockchain survey (globally) [1], blockchain is only a monetary database

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and a financial service application. After further more survey it has been established that only 15% of respondents have applied blockchain to practice.

It's been about 10 years when the blockchain started to influence the market but is still in its budding stage in the oil and gas industry.

Therefore, the basic gist of this paper is to bring oil and gas industry face to face with the concept of blockchain and to avail maximum advantage of it.

There were many traditional way for transaction in oil and gas industry which create inevitable error and was prone to fraud and comparison.

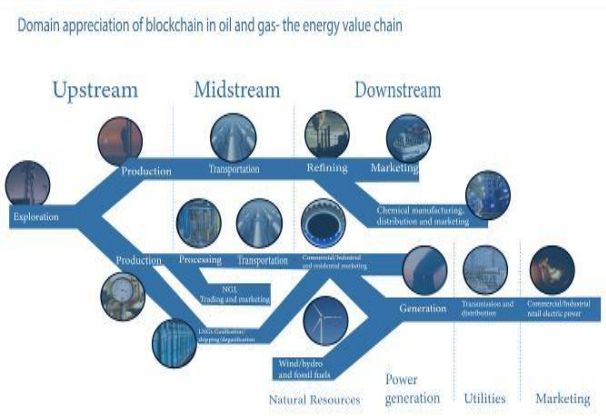

Fig 1. Domain appreciation of blockchain in oil and gas-the energy value chain [6]

Minerals like oil and gases are usually transacted in large quantity, especially between countries and sub-continents which have high transaction frequency. These transactions were totally different from scale of transaction between banks.

We had known from our research work that oil and gas pipeline network occupied a virtual position. This pipeline network is complicated and difficult to manage.

Generally, these resources are stored, transported, ordered through various channel as a result it can cause decline in productivity & production level which lead to serious cases of loss of goods. [8]Blockchain technology will tract these products supply chain and will also provide audit trails of equipment use throughout the lifecycle as a result all the aspect of the apply chain will be more transparent operation efficient and save logistic lost. [3]

III. THE NOTION OF BLOCKCHAIN

Many literatures have been written using familiar platitudes but all diverge in defining it. Basically, blockchain is a method of person to person transaction while incorporating transparency, unforgeable and non-tempering encryption so as to ensure a full tried-and-true connection. In conclusion, both parties achieve a sure-fire transaction.

IV. KEY CHARACTERISTICS OF BLOCKCHAIN

Above all decentralization is the principally the most important features of blockchain. In this, the central processing is eliminated completely from the system thereby enforcing third party removal in the chain of data transfer.[4][10] After the completion of verification process, the added data in the blockchain cannot further be altered. This is called immutability.[4][10]

The basis for a successful data transfer lies in trust between the users. This accomplished by assuring that the data process is end-to-end encrypted. This features labeled as transparency. [4][10] Blockchain improves the transparency and reduces the latency in the system. Thereby, making it more efficient in terms of risk, cost etc.[4]

When the central node is under attack, the other node prone to the malicious under transfer. To avoid this, blockchain introduce the concept of decentralization in which the central node is eliminated from the network chain, and as an end result, if any node is pounced with any malice intent, the nobility of other nodes is not perturbed.[4] Anonymity in the transaction process using the hash codes does add certain transparency as the algorithm used can validate the legitimacy of the users.[4][10].

V. METHODOLOGY

Blockchain is formed by combining three technologies:

1. Peer to Peer networking with a shared tally:

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Originally, contractors, subcontractors, etc. Were connected via client-server model. If anyone gimmicks with the system with any malice pretense, the other connected members remain ignorant of the feat.

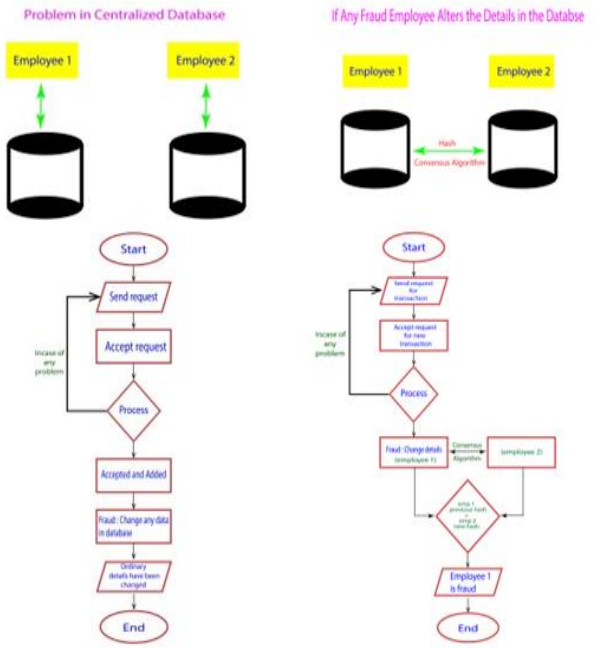

Fig 2. How to remove centralized system using blockchain.

Now, through the introduction of P2P networking, everyone is decentralized. In this system, if someone tampers the data, other would be made aware of the fact that the previous hash of the trickster mismatches with the current hash of the next peer.

Mathematical verification processes are used to authorize the deal between peers.

2. Cryptographic Keys:

Cryptographic keys are of two types: Private Key and Public key. For every peer in the network, there is a scope to procure the public key while keeping back a sui generis private key to fortify the digital identity.

The digital identity is the "Digital Signature" in the blockchain used for authentication of the user and controlling the transaction.[5]

A well-established computer network for storing and keeping track of the transactions;

Let's consider some basic system requirements:

- Atleast 2GHz processor
- Windows 7/8/10
- RAM 1GB
- HDD space 350 GB
- Download 250MB per day(8GB/month)
- Upload 5GB per day(150GB/month)
- Graphic Card Nvidia GTX1070

3. Inception of Blockchain:

To begin with, producers, suppliers, contractors, subcontractors, distributors and retailers in the oil and gas industry, were a part of centralized system which resulted in frauds, oil tracking and all. Data record handling in this system was kind of ants in your pants.

To resolve these issues, we assign a separate block to every individual node respectively. Hence, establishing routes for Blockchains in the system.

The process goes like this:

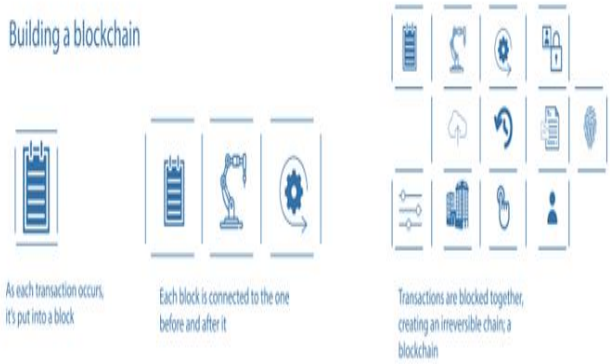

Fig 3. Building a blockchain. [7]

3.1 The first block (or genesis block) contains previous hash (initialized with zero):

Hash block (or node) is totted up to the genesis block by ascribing the current hash of genesis block to the recently created raw block.

3.2 Current Hash

3.2.1 Hash Value: It is a numeral value of a fixed magnitude that uniquely scrutinizes information. Every block has a hash value called current hash which is generated whenever a new block is added in the chain.

3.2.2 Timestamp: It refers to the data stored in every block with specific serial whose crux is in determining the precise moment and authenticated in the blockchain network.

3.3.3 Length: It specifies the number of blocks mined.

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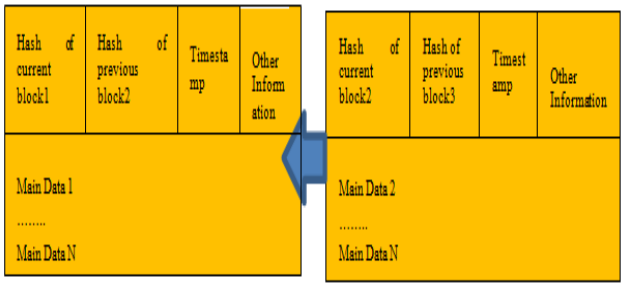

Fig 4. Structure of Blockchain. [9]

3.3 PoS:

It is an ilk of consensus mechanism through which a blockchain network employing cryptocurrencies achieves transparency.

The regulatory authority of currency exchange (banks), on an average, took abundant time during cross-border payments. When this mechanism is used, only one type of currency would be exchanged, time and cost of currency exchange is saved. Another purpose of this algorithm is generation of a new block.

Erection of a new block is done by wielding a process called mining. It is employed by using PoS algorithm. Miners compete with each other and the first miner avails the reward after the valid transaction and the new block gets added in the chain indemnifying the address of first miner.

3.4 SHA256:

This algorithm is used to generate a unique hash value (also called digital signature).

To cipher the trading process, SHA256 algorithm is employed. The characteristic feature of this algorithm is that it operates on 256 bit long string which is analogous to 64 bytes in hexadecimals system.[2]

hash_operation = hashlib.sha256 (str(proof2 - previous_proof**2).encode()).hexdigest()**

VI. RESULT

Transparency, which was missing earlier, is now embedded in the system. Decentralization establishes end-to-end encryption and eliminates the central nodes. Crypto currency eliminates the risk of cross border payments, also makes the process more efficient and cost effective.

VII. CONCLUSION

As suggested by the survey conducted in 2018 by Deloitte [1], only 15% out of 61% of respondents have employed blockchain network into the system. The problems encountered were data tempering (or manipulation), non- encrypted data transfer leading to leakage. All of these would be resolved completely when the whole system gets enslaved with blockchains. Furthermore, latency is made redundant.

VIII. FUTURE SCOPE

Blockchains can streamline management-related affairs and construct a scientific model for further improvement and analysis.

Since oil and gas pipeline networks engross a paramount position; also being quite arduous to manage because of resource allocation, the appurtenant data (demand and supply) could be uploaded to the blockchain as smart contracts. When this happens, the steadfast management of the pipe network becomes more successful and scientific in its approach.

REFERENCE

[1] Deloitte's 2018 Global Blockchain Survey, Deloitte, Phoenix, AZ, USA, 2018. [Online]. Available: https://www2.deloitte.com/us/en/pages/consulting/articles/blockchain-digital-oil-and-gas.html.

[2] Pushkar Mishra,"Study of Blockchain Technology and Uses in Different Sector" International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 09|Sep 2020 https:// www.irjet.net/archives/V7/i9/IRJET-V7I95 5.pdf.

[3] Hongfang Lu, Kun Huang, Mohammadamin Azimi,and Lijun Guo "Blockchain Technology in the Oil and Gas Industry: A Review of Applications, Opportunities, Challenges, and Risks" IEEE Access,vol.7,p.9, March 2019[ONLINE]. https://ieeexplore.ieee.org/document/8675726.

[4] Hongfang Lu, Kun Huang, Mohammadamin Azimi,and Lijun Guo "Blockchain Technology in the Oil and Gas Industry: A Review of Applications, Opportunities, Challenges, and Risks" IEEE Access,vol.7,p.4, March 2019[ONLINE]. https://ieeexplore.ieee.org/document/8675726.

International Journal of Science, Engineering and Technology

An Open Access Journal

[5] Seung Jae Pee, Eung Seon Kang, Jae Geun Song, and JuWook Jang''Blockchain based smart energy trading platform using smart contract" IEEE Access, p.1, 11-13 Feb. 2019 https://ieeexplore.ieee.org/document/8668978.

[6] "Oil and Gas Industry – Blockchain, the Disruptive Force of the 21st Century" Accessed: 2018 https://www.google.com/search?q=upstream+and+downstream+infosys&rlz=1C1GIGM_enI N834IN834&sxsrf=ALe Kk03M9CZM0j7wnQV5 SmvogVISCQsrnA:1614253273228&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiIkraHoTvAhWYA3IKHfvAADsQ_AUoAnoECAQQBA&biw=1396&bih=68 6#imgrc=U_qR9p4zGm5HUM

[7] "The_practice_and_potential_of_blockchain_technologies_for_extractive_sector_gover" Accessed: Sep.01,2020" [Online]. Available: https://resourcegovernance.org/sites/default/files/documents/the_practice_and_potential_of_blockchain_technologies_f or_extractive_sector_governance_with _annex_0.pdf

[8] Konstantinos, Christidis, Michael Devetsikiotis, "Blockchainsand Smart Contracts for the Internet of Things", IEEE Access, vol. 4, pp.2292-2303, 2016. https://ieeexplore.ieee.org/abstract/document/7467408/auth ors#authors

[9] Nadir Abdelrahman Ahmed Farah, "Blockchain Technology: Classification, Opportunities, and Challenges" International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 05 | May- 2018 [Online]. Available: https://www.irjet.net/archives/V5/i5/IRJET-V5I5659.pdf

[10] Samar Al-Saqqa, Sufyan Almajali, "Blockchain Technology Consensus Algorithms and Applications: A Survey",International Journal of Recent Technology and Engineering (IJRTE),Vol. 14, No. 15, 2020 https://online-journals.org/index.php/i- jim/article/view/15893/7769