

Business Innovation-Implementation of Blockchain in Business Use Cases

Varadha Pally Vinay Reddy¹, Chinthakunta Vineeth²

U.G Student, Department of CSE, MVSR Engineering College, Hyderabad, India¹

U.G Student, Department of CSE, MVSR Engineering College, Hyderabad, India²

ABSTRACT: Blockchain technology is emerging in every area. Blockchain is a chain of blocks which are connected with cryptographic hash of the previous blocks with distributed, decentralized and immutable properties with each block containing fields like block no, data, timestamp etc. Supply Chain Management is mechanism in which information about every object within the chain is maintained. With the implementation of blockchain technology in supply chain it provides data transparency, traceability, reliability across the supply chain. The paper explain different use case studies in which blockchain is implemented successfully. The paper shows creation of Simulated blockchain network and also elucidates how blockchain is implemented in supply chain by providing unique properties.

KEYWORDS:Blockchain, Healthcare, Supply Chain Management, Transparency, Scalability.

I. INTRODUCTION

Blockchain is a constantly growing list of records called blocks, which are linked and secured using cryptography [1]. Blockchain is the one of the most prominent technology that are being used extensively in supply chain industry. This is due to the fact that it provides reliability with its properties like Decentralization, Immutability and Transparency. Blockchain is revolutionizing every sector in which it is applied to. For example, Supply chain industry [2] in which every consumer should aware about the information of the product. And also blockchain provides necessary solutions in order to circumvent the problems that arises in supply chain like Quality of Service of the product provided to the Consumer, Data Manipulation of products involved in Supply Chain and illegal use of products for other purposes.

Other than these, a few other benefits of adopting Blockchain technology in the supply chain industry are:

1. Mitigate Frauds or errors in Product information.
2. Provides Transparency.
3. Provides Network Distribution of information.
4. Provides Decentralization.

How blockchain is extending its applications to different sectors?

Blockchain is emerging at a rapid pace. It is providing its application in many sectors like Healthcare, sports, financial institutions, education, energy sector with its core properties like immutability, decentralization and distributed property. For example, in Banking sector when a user wants to make a transaction with the other person across the network. Firstly, the centralized authority for instance, bank needs to be validate the transaction made the person. so there is a centralized authority in a financial systems in order to eliminate the centralization of the authority. Cryptocurrencies with underlying technology blockchain makes a decentralized network in which miners will validates the transaction with the help of consensus protocols like SHA-256(Secure Hash Algorithm)[8].

Blockchain in collaboration with machine learning models makes an effective mechanism in forecasting of weather with distributed and secured record keeping across the network. And also with decentralized machine learning which is the amalgamation of Machine Learning and Blockchain is used to reduce the computational cost involved in training and also to provide security of the dataset being used.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

II. MOTIVATION

We frequently visit supermarkets, shopping mallsto buy products like clothes, groceries, etc. I visited a cloth store to buy Branded item(Allen Solly) pant, then I contemplate how one would make sure that he got a legitimate product?. There has to be a certain technology that encompasses information about the product which gives information from the point of inception until it reaches the destination. Then, I found Blockchain is one of the technologies which is extensively used in the supply chain industry for the reliability of the product to the customers.

III. RELATED WORK

Blockchain is a distributed database of records or transactions across the network. Blockchain is used extensively in various use cases in society. Some of them are discussed below.

CASE 1: INDUSTRIAL IoT

IBM in collaboration with Samsung developed a concept known as ADEP (Autonomous Decentralized Peer-to-Peer Telemetry). As we know that IoT devices lack privacy, so to overcome the privacy issues in IOT devices blockchain provides decentralization of the network [3]. With the decentralized network, blockchain can act as the public ledger for all the IOT devices within the network. Toprovide communication with the devices eliminating central repository or hub.

CASE 2: HEALTHCARE

Health care institutions are ineffective in sharing secure data across the network platform. To provide better collaboration between providers which would eventually lead to a higher probability of accurate diagnoses, higher likelihood of effective treatments and overall increased in the ability of healthcare systems to deliver cost-effective care. With the use of blockchain technology hospitals, payers and others in the health chain can share access to their health chain network without compromising data security and integrity. Trerion, a startup company that built a platform for storing health data and verification of stored data. And also Gem and trerion collaborated with Philips Healthcare in the Philips Blockchain Lab [4].

CASE 3: ENERGY MANAGEMENT

Energy management is one of the many industries in which transaction in energy is done through centralized power holding companies. With the use of blockchain core property distributed ledger could minimize the middlemen in the energy transaction process. Startups like Transactive Grid [5] in partnership with LO3 Energy and Brooklyn-based Ethereum are creating a new energy-exchange process [6].

CASE 4: VOTING

In traditional voting systems in a country like India with about 130 crores of the population takes a huge effort in managing the voting system. In a traditional voting system, the voter identity needs to be authenticated, secured record-keeping of the votes, tracking and tallies to determine the winner of the election. With the use of blockchain technology with properties like immutability and distribution eliminates voter fraud. To Cast the vote digitally, Agora an organization, developed a blockchain voting mechanism [7].

CASE 5: EDUCATION

In the Education sector verification of academic credentials is an onerous task to be accomplished which requires manual record verification process. With the use of blockchain deploying in education could reduce the human effort by streamlining the verification process and also reduces the fraudulent claims of un-earned educational credits. Learning Machine, a software startup in collaboration with MIT Media Lab created a tool in which verifies the academic credentials with the use of blockchain [8].

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

CASE 6: Intel's solution in the food supply chain

Intel with the use of Sawtooth hyper ledger technology tracked the seafood supply chain [10]. In the sawtooth hyperledger technology, when a fisherman caught a fish it is stored in a shared public ledger and upon successive supply of seafood is also stored like information about suppliers, location with the use of IoT sensors, etc. With the use of the above technology illegal supply of seafood is reduced greatly, which in turn increases the income of the country.

CASE 7: TagItSmart Safeguards Wine Supplies with a Blockchain Logistics Tool

It is estimated that nearly 30,000 bottles of illegitimate wine are sold every hour in China. Many of these wines are mixed with a variety of dangerous additives that can be detrimental to health. Original in conjunction with TagItSmart, conducted the first phase of their pilot program, which tracked more than 15,000 unique wine bottles [11]. The eventual goal is to put an end to illegitimate wine using blockchain transparency capabilities. By a simple scan of a QR code that will be placed on each bottle, consumers will be able to know every detail regarding their purchase. OriginTrail's decentralized, the blockchain-based protocol provides a foundation for tracking wine from the vineyard to the point of sale as a safety measure alongside TagItSmart's anti-counterfeit technology, utilizing photochromic ink together with unique QR codes.

Connecting Advanced Anti-Counterfeit Systems With Blockchain-Based Protocol:

In this pilot project, each wine bottle will get a unique digital identity and is equipped with a smart tag that uses a unique QR code with additional specific information printed using photochromic ink. By applying a relatively strong light source (such as the flash on a mobile phone) the photochromic properties of the ink enable the customer to see previously invisible information (like a particular character) that, when paired with the unique QR code and checked on the original platform, can be used to fully authenticate a specific bottle.

The original protocol keeps track of historical information about each bottle by interacting with the TagItSmart platform. Throughout the life cycle of the wine bottle, consumers can check its authenticity and get the details about that particular bottle of wine. Each scan of the QR code is logged, and the information about that particular bottle is updated and used by the solution's heuristics. For example, a consumer can check a bottle with their mobile phone while in a retail store—even when a smart tag is valid—and the anti-counterfeiting system will then identify a problem—like whether or not a bottle with that same tag has been previously labeled as purchased or consumed—if there is one. This pilot was performed in two phases, the data integration phase—which has been completed—and consumer-facing interface implementation, which will introduce original checks in the TagItSmart application [11]. Plantaze produces over 40 different wines, made of 26 wine grape varieties. It is the leading wine producer in the region with the production of 22 million kilos of wine grapes and sales of over 15 million wine bottles annually in 35 countries of the world. Original will start by tracing its premium product lines for export.

IV. SIMULATION AND RESULTS

In this paper, I developed a general blockchain network with the use of a postman framework. Postman, an HTTP client is a user-friendly interface that is used to interact with the blockchain. Flask - a web framework, is used to develop a web application that encompasses (contain) blockchain technology. I created a transactions.json file, which stores the sender and receiver address and the information to send. The following network shows how a blockchain is created and information or token passing mechanism between the people across the network. The methods used in creating the blockchain network are:

Get_chain request: This request invokes the get_chain method to get the entire chain of blocks that we have mined till now.

Mine_block request: This request invokes the mine_chain method to mine the block i.e. to add new blocks to the chain by solving the valid hash with the use of proof of work mechanism. The first block in the chain is called "Genesis Block".

Firstly, I created a block that has to be mined where proof of work mechanism operates in which miners across the blockchain network participates to find the valid hash for the above created block. If a miner solves the cryptographic

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

puzzle (valid hash) then, all the other miners in the network have to validate it. If the block is valid, it is added to the blockchain network.

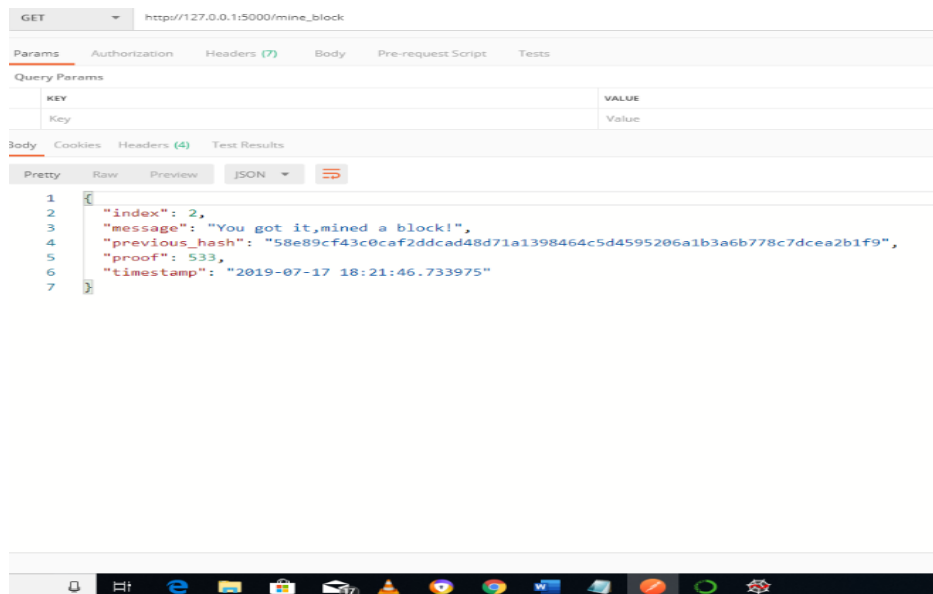


Fig 1.

Fig 1 shows output of mine_block method which gives message as “you have just mined the block”. With the use of Proof of work mechanism, the miner with the help of mine_block request method gets the required hash for the current block to make it as a valid block.

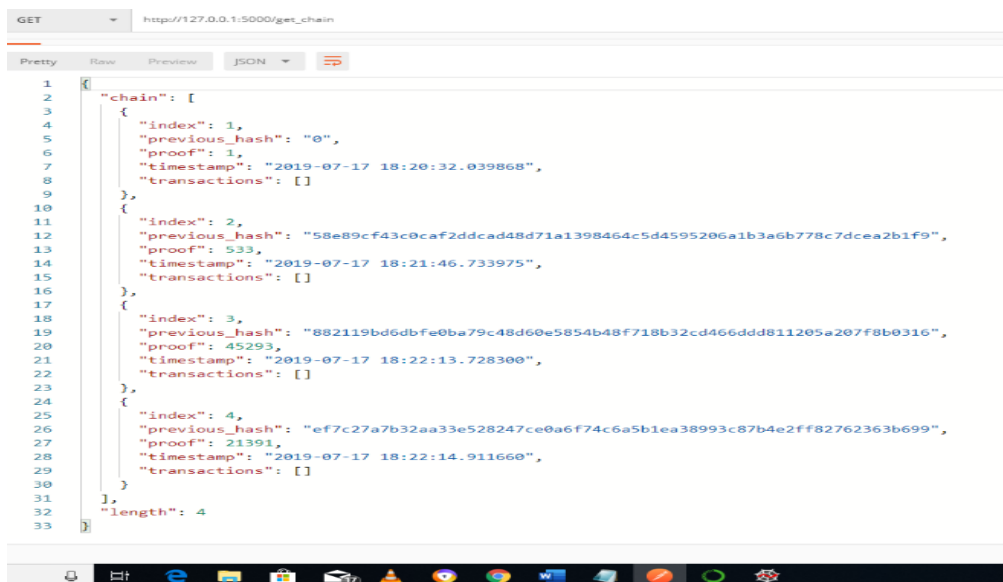


Fig 2.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

From fig 2, we can clearly observe the General blockchain network of length '4'. It also shows that after 4 mine_blocks requests then if we make get_chain request it gives the output as chain of blocks which are connected with previous blocks with Prev_hash field



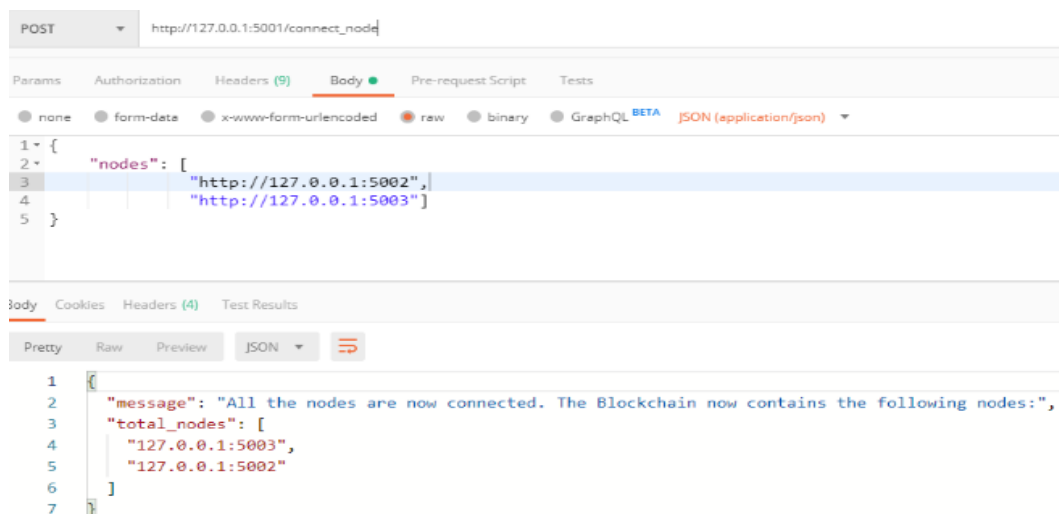
```
GET http://127.0.0.1:5001/mine_block

Pretty Raw Preview JSON

1 {
2   "index": 2,
3   "message": "Congratulations, you just mined a block!",
4   "previous_hash": "db5f4978ded48988835b980894a1907b74de023e83440cac725f00bdfbaf93f",
5   "proof": 533,
6   "timestamp": "2019-07-17 18:24:32.060554",
7   "transactions": [
8     {
9       "amount": 1,
10      "receiver": "vinay",
11      "sender": "688f372dcd2e4641986e11ba5fa5d7aa"
12    }
13  ]
14 }
```

Fig 3

Fig 3 shows output of mine_block method which gives message as “you have just mined the block” when request is made on “Vineeth” block.



```
POST http://127.0.0.1:5001/connect_node

Params Authorization Headers (9) Body Pre-request Script Tests
none form-data x-www-form-urlencoded raw binary GraphQL BETA JSON (application/json)

1 {
2   "nodes": [
3     "http://127.0.0.1:5002",
4     "http://127.0.0.1:5003"
5   ]
}

body Cookies Headers (4) Test Results

Pretty Raw Preview JSON

1 {
2   "message": "All the nodes are now connected. The Blockchain now contains the following nodes:",
3   "total_nodes": [
4     "127.0.0.1:5003",
5     "127.0.0.1:5002"
6   ]
7 }
```

Fig 4

We have created a nodes.json file which contains address of the nodes across the blockchain network. In the below example we created 5000(vinay),5001(Vineeth) and 50003 (surya) nodes in the nodes.json file. To connect the nodes in the network we have to make connect_node request method where we make request from one node to connect all the nodes across the chain. In fig 4, if we make connect_node request then it gives output as “All nodes are connected”.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

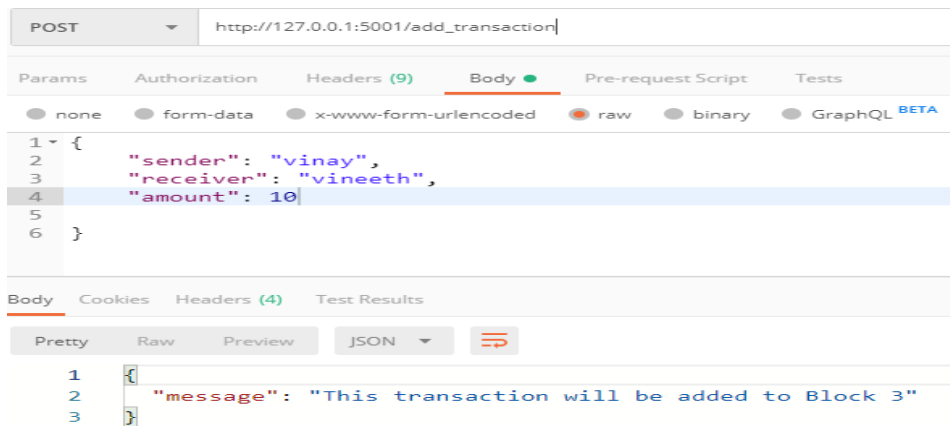


Fig 5

After connecting the nodes across the network, we have to make a transaction request from one of the node of the network. Transaction can be information in supply chain or healthcare industry, tokens(amount) in financial institutions. Here, transaction means amount in the form of tokens. We also created a another json file which has the information about sender,receiver and amount of the transaction.In Fig 5,we made transaction between “Vinay” and “Vineeth” it gives output as “transaction will be added to block 3”

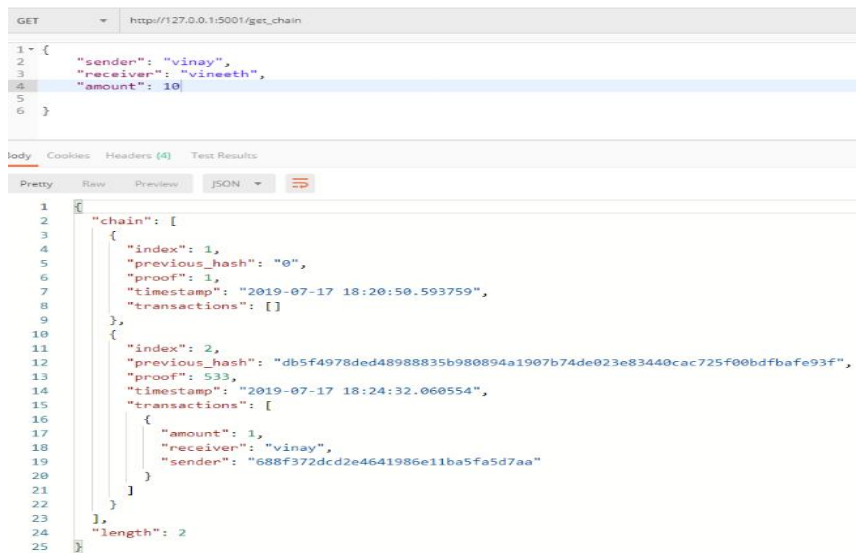


Fig 6

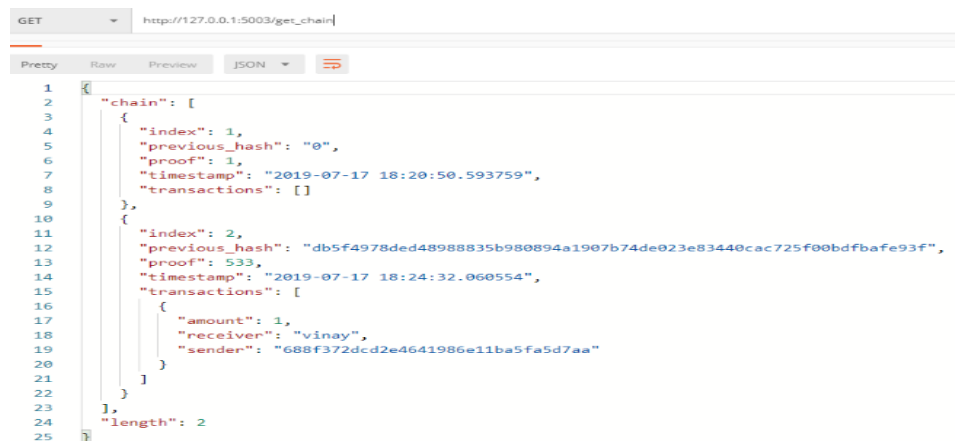
Fig 6 shows that If we make get_chain request from “vinay”(5000) node. We get the entire chain from the requested node. It will shows all the transactions that has happened chain on the node till now.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019



```

1 GET http://127.0.0.1:5003/get_chain|
2
3 {"chain": [
4   {
5     "index": 1,
6     "previous_hash": "0",
7     "proof": 1,
8     "timestamp": "2019-07-17 18:20:50.593759",
9     "transactions": []
10  },
11  {
12    "index": 2,
13    "previous_hash": "db5f4978ded48988835b980894a1907b74de023e83440cac725f00bdfbaf93f",
14    "proof": 533,
15    "timestamp": "2019-07-17 18:24:32.060554",
16    "transactions": [
17      {
18        "amount": 1,
19        "receiver": "vinay",
20        "sender": "688f372dcd2e4641986e11ba5fa5d7aa"
21      }
22    ]
23  }
24 ]}
25 "length": 2

```

Fig 7

In fig 7, Due to the transparency and distributed property of the blockchain even the transaction is done between “vinay”(5000) and “vineeth”(5001), when the transaction is made on 5003 node we got the output as “node had different chains so the chain was replaced by the largest one”.

In Fig 7, it depicts entire chain of the network when request is made by get_chain method due to the distributed and transparency properties of the supply chain.

LIMITATIONS OF USING BLOCKCHAIN

The Blockchain in Transport Alliance (BiTA) welcomed large industry leaders such as FedEx, BNSF Railway, UPS, and JD Logistics as new members [12]. Together, they discussed the challenges that they would face because of integrating blockchain technology to the supply chain industry. These include network effects, the current lack of blockchain standards in the industry, the issues concerning blockchain and scalability, and the scarcity of technical talent.

Blockchain provides efficacious results in terms of transparency, traceability, and distribution but it faces many issues that have to be addressed for efficient implementation of blockchain technology in supply chain management.

Limitations:

1. Complexity: The amount of complexity involved in maintaining the blockchain network through the some of the networks like supply chain is a daunting task. we have to develop efficient mechanisms for maintaining the blockchain across the network.
2. Lack of Scalability: Blockchain implementation requires high energy costs, which is one of the key reasons for its slow pace of development. Due to different economic statuses, many countries couldn't implement because of the entire computerization and energy costs.
3. Network affects: With the use of blockchain technology, the no of transactions that are processed is around(5 to 10) but with a conventional banking system provides approximately 2000 transactions or even more.
4. Computational Costs: To make the transaction within the network it requires huge energy which results in high energy consumption. It is estimated that for a mining rig the amount of electricity consumption is approximately equal for New Zealand country per day consumption.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 12, December 2019

V. CONCLUSION

Blockchain is emerging technology in many fields like Machine Learning, Financial institutions and also in the military sector, etc. Blockchain has given propitious results in Cryptocurrency, Supply chain industry, education sector, and voting systems. It also has certain limitations like immutability for certain applications in which information needs to be changed. one of the most important limitation in using blockchain technology is the energy costs incurred in mining the transactions to get the valid hash and also scalability involved across the network. Even with these limitations, we have to embrace and encourage the use of blockchain technology in every sector. we have to develop consensus protocol algorithms which are specific to the application involved in applying the blockchain technology. And also storing a voluminous amount of data and retrieving the relevant information for the specific task is a daunting job to be accomplished. so have to we to develop efficient information retrieval systems.

REFERENCES

- [1]. <https://en.wikipedia.org/wiki/Blockchain>.
- [2]. Enhancing Supply Chain Management Using Blockchain Technology, International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8 Issue-6, August 2019.
- [3]. <https://www.ibm.com/downloads/cas/2NZLY7XJ>
- [4]. <HTTPS://TOKENSALE.TIERION.COM/TIERIONTOKENSALEWHITEPAPER.PDF>
- [5]. <HTTPS://LO3ENERGY.COM/>
- [6]. Orsini, L., Kessler, S., Wei, J. and Field, H., 2019. How the Brooklyn Microgrid and TransActive Grid are paving the way to next-gen energy markets. Woodhead Publishing, The Energy Internet (pp.223-229).
- [7]. HTTPS://STATIC1.SQUARESPACE.COM/STATIC/5B0BE2F4E2CCD12E7E8A9BE9/T/5B6C38550E2E725E9CAD3F18/1533818968655/AGORA_WHITEPAPER.PDF
- [8]. Grech, Alexander, and Anthony F. Camilleri. "Blockchain in education." (2017).
- [9]. Emerging Of Blockchain Technology In Business Industry, International Journal of Innovative Research in Technology (www.ijirt.org), ISSN: 2349-6002, Volume 6, Issue 6, Page(s):227-230, November 2019.
- [10]. Del Castillo, M. (2017a). Intel demos seafood tracking on sawtooth lake blockchain. CoinDesk. Retrieved from <http://www.coindesk.com/intel-demos-seafood-trackingsawtooth-lake-blockchain/>.
- [11]. <https://openledger.info/insights/blockchain-in-the-supply-chain-use-cases-examples/>
- [12]. <https://www.bitastudio.com>