A Study on Applications of Blockchain

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ABSTRACT
Blockchain technology has changed the revolution of data storage and privacy. Decentralized data storage technique in Blockchain introduced the dependent ledger system. The main motive of Blockchain is to avoid the third party authorization and validation process and intermediaries. This research process shows the different areas where Blockchain can be implemented and some guidelines. And what are the factors need to be considered while deploying the distributed ledgers.

KEYWORDS: Blockchain, Bitcoin, Ledger, Validation

1. INTRODUCTION
The current data storage and processing methods which is centralized and involvement of intermediaries is not trustworthy as the data creation and storing is increasing rapidly. The Blockchain introduces the decentralization data and ledger maintenance. Blockchain was invented by a person (or group of people) using the name **Satoshi Nakamoto** in 2008 to serve as the public transaction ledger of the cryptocurrency Bitcoin. Finance industry is the primary area where Blockchain is more focused. Bitcoin (Satoshi Nakamoto invention) was the first cyptocurrency which is deployed on the Blockchain technology. The current finance industry has some challenges over the ownership maintenance and retracing records. As there is high growing rate of financial assets is leading to new problems. in every transaction there is involvement of intermediaries (merchants/banks) which authorizes and validates the user credentials before successfully completing the transaction, this process is time consuming and less efficient. Instead of third-party validation process, the Blockchain helps the participants to validate the request and append the transaction detail to their ledger and here the network itself is validating. The Blockchain mechanism can be deployed in many areas where it can easily eliminate the fraudulent possibility[7].

1.1. Public and Private Blockchain
Decentralized distributed ledger on the Blockchain network is the heart of every transaction in it. Centralized data storage and processing is not efficient compare to distributed, avoiding the failure of central node, backup and there will be very less down time, but the cost is high than centralized. And there should be redundancy control need to be done. The cryptocurrency Bitcoin uses public key (Asymmetric method) to make the transaction happen, example the sender need public key of receiver which is available in the network without real world identity mapped to it to maintain the anonymity, the sender sends the transaction detail over the network (broadcasting) to append on the ledger over every node(participant) in the Blockchain network, this process is little challenging as every participant need to validate the transaction, finally the value(coin) will be transferred[9][10].

Basically the Bitcoin is generated using mathematical function (hash) and using Proof-of-work and using the same it's able to verify the transaction, if these requirements is fulfilled then the Bitcoin is accepted in the Blockchain network. The hash value of each Bitcoin is also maintained in the ledger (mapped to the wallet address) for traceable purpose. The Blockchain network can be public or private. Public Blockchain network is open to everyone, anyone can participate to make and validate the transactions on the internet, here the participant authorization and access control is poor as compare to private, everyone has write permission. But in private Blockchain network there are limited participant can take part, if the purpose is something where the public needs more access, then the write permission is only authorized to some nodes in the network

like validating process[8][7]. The node which has write permission can restrict the data appending to participants. The objective of the business defines the need and level of decentralization. As the market is getting hype on Blockchain implementation the restriction should be created thoroughly. In simple terms the data which is not necessary for the normal users should not be shared, which may lead to future loss for the business.

Integration of different technologies with Blockchain can extend the limit of areas of implementation. Like between Blockchain and Artificial Intelligence (AI) and Big data Analytics is likely to reshape the current and future operational and management practices in most of the organizations. The most important area of implementation of Blockchain can in information security to store network log and monitor the entire organization IT infrastructure [1].

2. General Operational Architecture of Blockchain
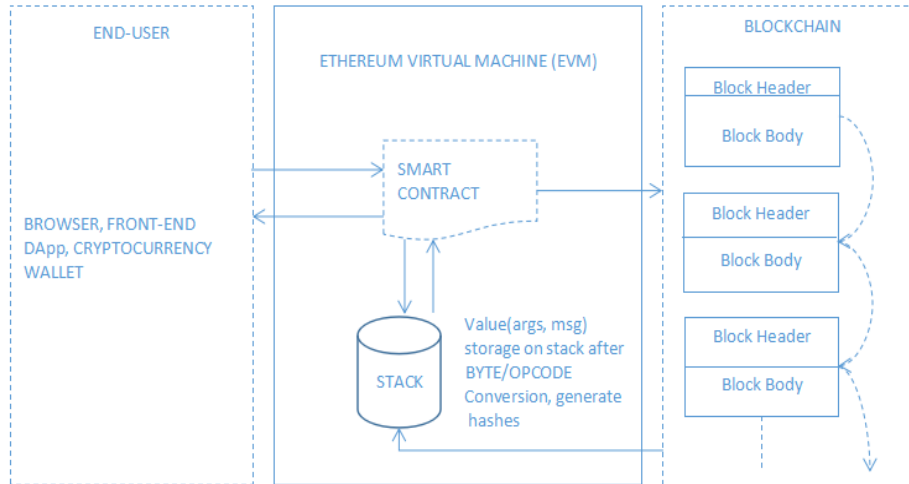
Fig 1 Ethereum's Blockchain general architecture

The architecture of sample working Ethereum Blockchain illustrates the operations carried out throughout a trasanction cycle. The deployed smart contract(one-time and written in Solidity programming language) acts as predefined operation functions that are called by external or internal object's, based on the request EVM handles all the bytecode, opcode, and generate hash of values/variable to carry further CRUD(create, read, update, delete) operations. User directly sends trasanction comission fee to smart contract address for making changes on existing data or creating a new one, and for viewing the data the smart contract doesn't charge. The smart contract must go under testing for serveral times because once the smart contract is deployed, the team cannot modify or fix any later found bugs, or else the complete network should be reset and re-deploy the new smart contract. And its possible to deploy multiple smart contracts on single network for an appication. In general the smart contract is the main object to interact with blockchain network and with its data, and its responsible for complete validation of trasaction's. The architecture does also shows the commonized way of most of the Blockchain development platform [5][10].

3. Applications Of Blockchain Technology
3.1. Finance Industry
There are tons of challenges that are currently the Banking/Finance sector is facing, as service provider needs to maintain the customer privacy, accountability and able to trace back the transaction ownership because the digital assets from the customer is rapidly growing which comes with new problem for maintenance and ownership chaining. The biggest problem that Blockchain technology can solve is it provides the ability to trace back the transaction and initial fraudulent activity. It can revolutionize the finance industry completely. And current start ups working on developing the Blockchain based private network connecting to partnered organization. Like Fintech, Linux Foundation, IBM which is

working on open sourcing their Blockchain architecture and many more. Another Financial factor can eased with Blockchain is to develop the global Blockchain public ledger to perform any financial operation across the countries with the help of an application integrated with decentralized mobile network[3][4].

With the help of Smart-contract mechanism can easily create the user level of operational applications on the Blockchain network, It completely avoid the third party validation process that can save plenty amount of time and cost authorization. The Smart-contract can also be customized to the specified requirement of the organization.

3.2. Healthcare
The patient's data is very confidential, the information on wrong hands can risk the patient's life. The Blockchain technology can fulfill all the need by deploying privately, because the private Blockchain network can avoid the third party or any external organizations to access the patient's current disease information, the business can use users data for their benefits like promotions and advertisements. The private network can give the privilege to user on data control. Only the physicians can access with updated (last append on ledger) information this can save lot of resource's cost. All the physicians can access the patient's data anywhere differing from one hospital to another with user permission (private key required) [6].

Pharmacists can also access the patient's data from the decentralized database directly so the useful operations can be done with less cost. Pharmacist's can assist the patient's perfectly on the required medical course.

3.3. Supply Chain Management
The E-commerce companies facing the problem of product tracking from the manufacturing of products till the

customer delivery, which sometimes lead to loss in business, the Blockchain technology can help the business to track and store the position on the ledger. The product position details will be stored in decentralized areas where each node can validate each process, Proof-of-Work is electronically recorder on the ledger. Can save cost and it is more efficient compare to the existing storage.

3.4. Internet of Things (IoT)
Adopting a global standardized peer-to-peer communication to process the hundreds of billions of transactions between devices will effectively reduce the cost in installing and maintaining the large centralized data centers and will distribute computation and storage needs across the billions of devices that form IoT networks. This will prevent failure in any single node in a network from bringing the entire network down. Providing the security factors for each device in a network is very challenging like the data collected from the sensors observation should maintain the confidentiality and integrity. This problem can easily be solved using Blockchain technology with decentralized distributed data storage technique [1].

3.5. Cloud storage platform
The current cloud storage providers are concerned and focused on the user data privacy, which leads to time consuming authorization process, the decentralized distributed storage system can have peer-to-peer connection and information sharing.

3.6. Identity and Voting system
Global identity of a person is going to be must thing, trading between countries needs the legitimate person's identity from both the sides. This is a very concerned problem being faced by many people nowadays, the Blockchain technology can help to store the any person's identity details in a decentralized manner and it is easy to access from anywhere. The great initiative taken by Indian government, assigning a unique 16-digit number with person's identity details. It is very easy to access the refer between different platform. In the same way the global identity record can be implemented using Blockchain. It can save access time and cost involved in current systems. Here the user has also control on his/her personal details, with whom they can share the details and how much [2].

The voting system is very confidential, the person's vote should not be modified by anyone. The distributed ledger in a private network can eliminate this problem completely. The voting status is being shared in the Blockchain network, validated and appended to ledger, this way only authorized node in the network can legitimate the entire process.

4. Conclusion
There are plenty of other fields where the Blockchain technology can help to maintain the confidentiality and integrity of each operation over the network. Like student document submission records, smart home appliances, music industry to maintain the copy rights, insurance claiming process etc. Decentralized distributed data management is currently being used in many industries but there is validation and access control on each operation. The Blockchain technology has the ability to handle the usage databases with proper authorization and validation process. It introduces the global ethical standards with node-to-node data storing. In future this technology can help in improving the business, legitimate data sharing and trading and can also help the countries to democratizing the economy.

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