The Most Secured Technology: Blockchain and Its application in Various Sectors

[1]Rafat Ara, [2]Rathindra Nath Mohalder, [3]Md. Abdur Rahim

[1, 2, 3] *Lecturer, Department of Computer Science and Engineering, German University Bangladesh, Gazipur, Bangladesh*

Abstract *— Blockchain is the most amazing technology for upcoming inflictions in computing. It is a decentralized, digitized, creative and innovative invention of the present world by an individual or a group work under the pseudonym, Satoshi Nakamoto in 2008. Distributed ledger of records is immutable and verifiable in Blockchain that's why it is impossible to manipulate any data in existing blocks. Although the most common assumption of blockchain is cryptocurrency, there are explorations in different other sectors. This paper analysis the scope of reviewing the blockchain technology which will introduce the latest research field of its applications. However, it will also highlight the opportunities as well as the challenges in front of the recent technology which is developing our digital world.*

Keywords *— blockchain, consensus, cryptocurrency, distributed ledger and decentralized.*

I. INTRODUCTION

A protected ledger technology called Blockchain has obtained more concern in current years. We need more accurate piece of news and a process to prove the origin of transaction of data is necessary in account of existing hacking, internet fraud and malware. As a result, it is urgent to have reputable systems which may be reliable and be protected. The integrity and quality of the data that are processing can be verified with a system called blockchain [1].This paper represents detailed information of blockchain technology and its opportunities.

II. BLOCKCHAIN TECHNOLOGY

Blockchain is based on distributed data structure which shares information among the members across the network. It is a database shared by every client in a particular system.

The block chain stores the complete transaction history of a cryptocurrency or other record keeping system [2].

Centralized architecture means the availability of a single or a group of entities which have control over the complete network. On the other hand, a centralized technology implies one-node connectivity to all clients across the network. In this approach, server stores all the record and easy to update.

In distributed decentralized blockchain structure, every client in the blockchain [3-5] network preserves and updates the recent transaction. In blockchain technology is not controlled by individual client or member in a network.

In this architecture, every client in the network of blockchain ensures that information's are obeyed in accurate order data integrity and indemnity [6].

Distributed Leger technology refers to a novel and fast-evolving approach to record and share data across multiple data stores or ledgers.

Figure 01 shows the centralized, decentralized and distributed ledger illustrations using nodes:-

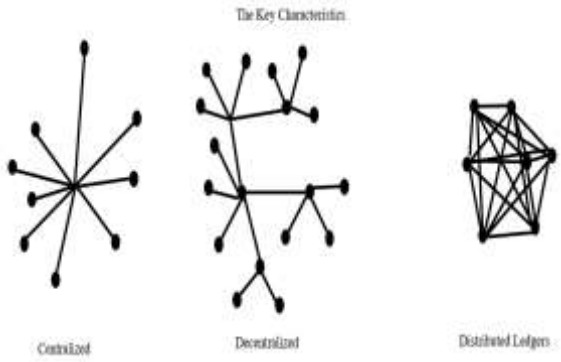

Figure 01: Centralized, Decentralized and Distributed ledger paradigm using nodes

The blockchain is a modern and revolutionary technique that's why it is getting more attention in every sector.

This technology provides many significant facilities like decentralized system, transparent system, provides the more security, faster and cost effective, immutable and so on.

The following figure 02 shows that how a blockchain technology can solve different problems.

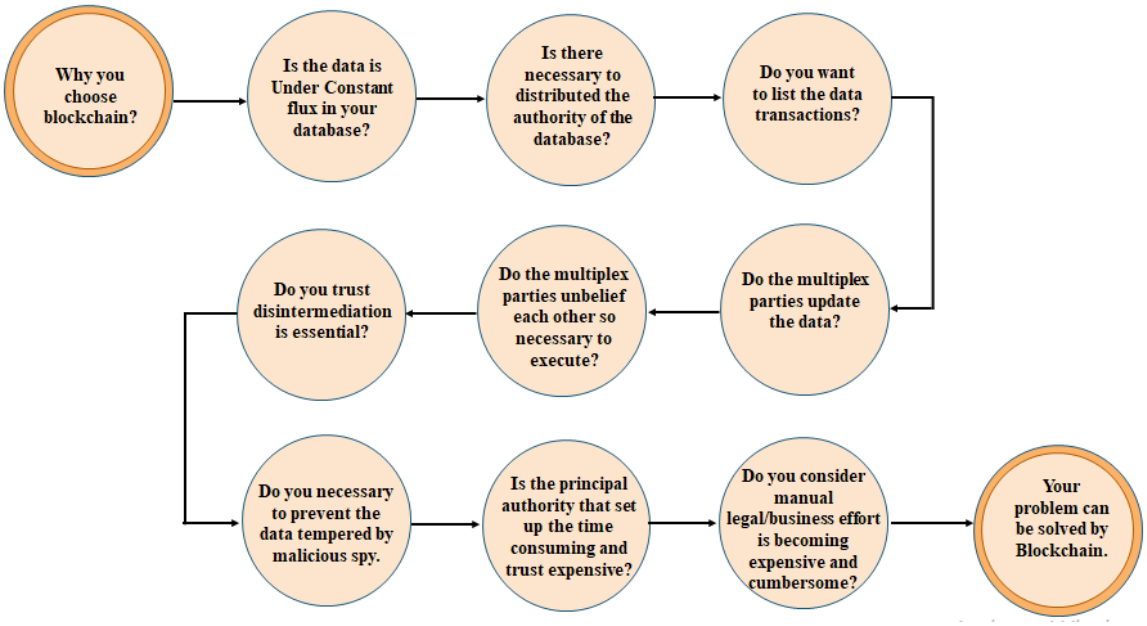

Figure 02: Reasons for choosing blockchain technology

III. HOW BLOCKCHAIN TECHNOLOGY WORKS

Usually the block obtains original data, theprevious block hash, current block hash, timestamp and all otherinformation.

Original data: The blockchaindepends on the service where it is appropriate such as, bank clearance records, transaction records, data of IOT record or contract records.

Hash of the Block: Hash is automatically generatedwhen creating a new block. Every block in the blockchain has two hashes such as one is previous hash and other is present hash. Previous hash is notifying that block which is immediate previous of the present block. Present block hash is not manually generates. Its hash is generated by autonomous approach.

Other Information: there are some others information storing such as signature of the block, other information or data which user can define, time of block creation and so on. Figure 03 represents the process of blockchain technology.

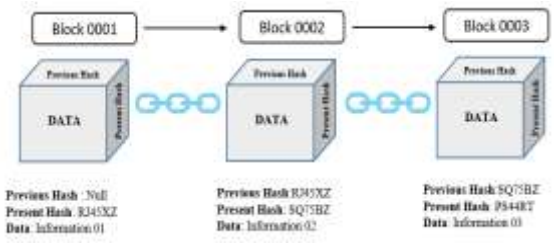

Figure 03: The structure blockchain technology

IV. BLOCKCHAIN CLASSIFICATION

The main conception of blockchain technology introduced by Satoshi Nakamoto [7] that was not centralized public ledger. So it has become the accomplishment of most famous blockchain, for example Ethereum, Bitcoin. Based on permission of blockchain it can be classified as follows.

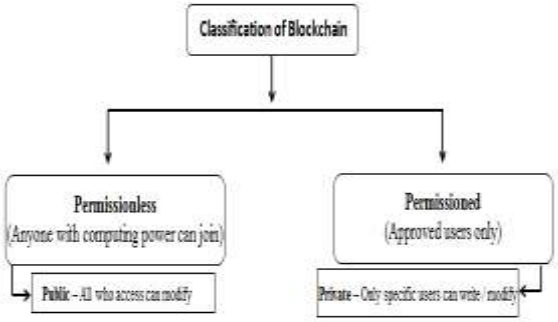

Figure 04: Classification of Blockchain

A. PERMISSIONLESS BLOCKCHAIN

It is an open network system where all the clients can easily access without having any permission. It is not necessary to have invitation for the clients from authorities. Public or Permissionless blockchain are published for all clients. Proof of Stake or Proof of Work is commonly used in blockchain for consensus technique. Since lots of clients perform their tasks perfectly for this architecture, it minimizes the probability of a 51% attack. According to Buterin and Vitalik [8], public blockchain promotes the level of

trust as well as also saves the applications of developer side.
As per the technique, it will lessen the transaction cost as compared to any other systems like third party dependent system for recording transactions. If Proof of Stake is involved, financial penalties may be needed in this technique.

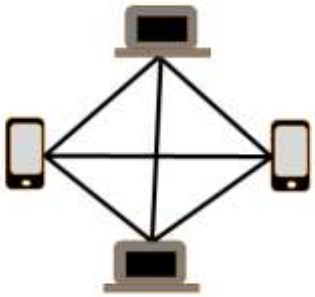

Figure 05: Permissionless blockchain

B. PERMISSIONED BLOCKCHAIN

Client needs to have permission by the blockchain authorities before he/she could access the network. If the client gets invitations, he will be permitted to join. Many organizations are now building permissioned blockchain for their special commercial demand. It is must to have fewer trusted members to sign off a new transaction for consortium blockchain that may be selected by the organizations. The permission for writing over the blockchain should be provided to a central organization in permissioned blockchain technique.
Since control technique is providing more flexibilities and benefits over the rules of transactions, lots of data are observed in permissioned blockchain. It is becoming better way than permission less blockchain in consortium blockchain. In security purpose, private blockchain should be used to gather simply the encrypted hash for connecting to different applications.

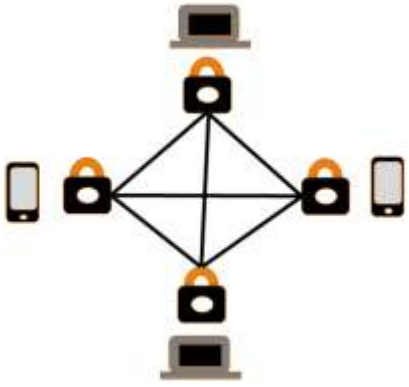

Figure 06: Permissioned blockchain

V. PROTOCOL OF BLOCKCHAIN

It is a common term of consensus algorithm. Hence we have mentioned two consensus algorithm like Proof of Work (PoW) and Proof of Stake (PoS)[9].Most of the time coins utilize one or a combination of both blockchain protocols.

A. PROOF OF WORK (PoW)

Proof of Work has introduced mining block which is an expensive computer calculation. A reward is offered to first one who finds out the solution for every block calculation. Many cryptocurrencies are using Proof of Work as their consensus algorithm comprising Bitcoin. In PoW system miners are taking part in network by contributing huge amounts of computing power.
To take part miners makes physical mining rigs which are normally consisted of many graphics card. Rigs may provide miners a better opportunity for conquering the next block as well as accepting the coins of the next block reward. It is a slower process where one block will be added within 10 minutes. To take the final decisions are little bit difficult because each decision will be final after the conformation of six blocks.

B. PROOF OF STAKE (PoS)

Based on wealth (Stake) the miner of a new block in the blockchain will be selected in a deterministic way in Proof of Stake. The miner will gather network fees as the reward instead of accepting a block reword. This system makes Proof of Stake mining more effective. Proof of Stake will not need its users to purchase physical mining rigs or spend large amounts of computing power to take part. It is less expensive in terms of energy consumption and faster than Proof of Work.

VI. APPLICATIONS OF BLOCKCHAIN

Recent innovation of blockchain has added an extra flavour in computer science and engineering world. There are many applications of blockchain in our real life like education, healthcare, smart cities, voting, banking history, taxation, digital identity, distributed cloud storage and so on. Some applications of blockchain technology are discussed below in brief.

Education
Since student's records like attendance, courses, payments, mark sheet, certificates are everlasting, it should be stored safely. So we can use here blockchain technology to store the student's records perfectly. With blockchain, no client can manipulate the record after it has been stored. If an error is occurred in a record, a new record must be created to modify it in a new block and both the new and old record will be visible [10].It will also play an important role for storing alumni student's records.

Healthcare

To store patient's data accurately is a vital issue for proper treatment in healthcare system. It is difficult to find out patient's medical history without having previous prescription. Due to human error, this system may take lots of time and provide false result. Using blockchain, a health card will be generated to store all information of specific patient [11].

Voting

Election is a vital issue in modern democracybut most of the people of the world do not believe their election process which has become a headache for the democracy. Hacking of the EVM, vote rigging election manipulation and polling are the main facts in the current voting system. The use of blockchain in voting system makes more apprehensible, transparent and dutiable of elections [12].

Banking System

Most of the banking systems are based on centralized system. Information is accessed by the central authority in centralized system. Since the authority has access over the information, they may manipulate the information. Even the intruders can get access over the central server. So it goes without saying that this system may be harmful for the bank. On the other hand, blockchain is based on decentralized technology which means no central authority will get the access power over the information individually. Information will be available to different users through the network in decentralized technology. In blockchain, if the intruders want to steal the information, he/she needs to get the access from every user available on the network to successfully hack the system. But it may be impossible to get the access from every user. So we can say that banking system will be definitely more secured using blockchain technology [13].

Digital Identity

One of the most popular applications of blockchain technology is the development of digital identity. Now a days, digital identity is used almost everywhere. It has increased the efficiency and also made our life easier. Digital identity based on blockchain technology will be more authenticated. It may be used for identifying the applications in different fields such as birth certificates, passports, online account login, E-Residency, and IDs.

Distributed Cloud storage

It is comprised of a peer-to-peer decentralized cloud storage technique. If blockchain technology and cryptography are used together, data will be protected on the nodes and in transmission. Benefits of distributed cloud storage are like tamper-proof data, verifiability and no more middlemen[14].

Money Transfers

Money transfer is probably the most popular blockchain application where clients are capable to transfer any payments easily**.** Bitcoin is used to exchange the currency globally. Cost of the money transferring using blockchain technology is lower. Since blockchain technology doesn't use third party to exchange money, it is faster than any other money transferring system. Blockchain technology is fully decentralized in manner. It will be completely difficult to hack the system [15].

VII. CONCLUSSION

In this paper, we have discussed on basic concepts, linking procedure of blocks, classifications, protocols of Blockchain technology. This paper also focuses on the applications of Blockchain technology in various sectors. Consensus algorithms are fields of thriving research for making blockchain more comfortable in the arena of businesses, health and education. Blockchain technology provides many benefits like constancy, transparency, safety, decentralization and so on. Due to the size of the permissioned or permissionless blockchain, the scalability issue is the main limitation of Blockchain technology. In future, implementation of blockchain can give significant result for the Internet of Things and also be used in various fields for eliminating deceptive and fake activities.

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