Block-chain Technology and Its Application against COVID-19

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Abstract -- **Block-chain technology was created for the digital crypto-currency bitcoin in 2008. However, its applications are much wider than alternative currency. The blockchain is an undeniably ingenious invention – the brainchild of a person or group of people known by the pseudonym, Satoshi Nakamoto. This paper aims to let more professionals understand the block-chain and lead more thinking about how to apply the block-chain technology knowledge for betterment of society. Block-chains can support different applications. This paper first describes the origin of block-chain, its characteristics, types and then throws light how the block-chain is applied to fight against current ongoing global challenge COVID-19 for the welfare of common citizen.**

Keywords: Data Bitcoin, Block-chain, COVID-19, Crypto-currency, Decentralized, Immutability, Work of Proof.

I. INTRODUCTION

THE 21st century is about innovation. With the expanding requirement for modernization in our everyday lives, individuals are available to keep up with new innovations. From utilizing a remote for controlling gadgets to utilizing voice notes for providing orders, innovations like enlarged reality and IoT have picked up pace in the past. Another work that has gained the same hype is Block-chain Technology. The block-chain is an undeniably ingenious invention – the brainchild of a person or group of people known by the pseudonym, Satoshi Nakamoto. But since then, it has evolved into something greater, and the main question every single person is asking is: What is Block-chain?

Block-chain technology was created for the digital crypto-currency bitcoin in 2008 [1]. However, its applications are much wider than alternative currency and it is poised to be "the next big thing" in applied sciences. Marc Andreessen called Blockchain "one of the most important technologies since the advent of the Internet."

Block-chain can be depicted as an information structure that holds value-based records keeping in mind that it guarantees security, straightforwardness, and decentralization [2]. We can likewise consider it a chain of records put away in the type of blocks which are constrained by no single power. A block-chain is an appropriated record that is totally open to any and everybody on the system. When a data is put away on a block-chain, it is very hard to change or modify it. Every exchange on a block-chain is made sure about with an advanced mark

Figure 1. Origin of bitcoin.

that demonstrates its genuineness. Because of the utilization of encryption and advanced features, the information put away on the block-chain is carefully designed and can't be changed. Block-chain innovation permits all the system members to agree, usually known as agreement. All the information put away on a block-chain is recorded carefully and has a typical history which is accessible for all the system members. Along these lines, the odds of any fake movement or duplication of exchanges is wiped out without the need of an outsider. Block-chain has the ability to automate business logic. It may be too early to tell how prolific the growth and adoption of block-chain applications for social impact will be, but analysis showed that beyond the hype, potentially transformative block-chain applications for social impact are already emerging.

II. KEY CHARACTERISTICS

Block-chain technology has six main characteristics, including: decentralization, immutability, transparency, efficiency, security and anonymity.

Decentralization: Decentralization is the most essential feature of the block-chain-based system, which means that the block-chain-based system no longer depends on the central processing node, which realizes the distributed recording, storage, and update of data [3]. The status of each node is the same, and data blocks are maintained by the nodes with maintenance function in the entire system. Stopping any node will not affect the overall operation of the system.

Immutability: Information cannot be changed after it is verified and added to the block-chain. For example, in the Bitcoin's block-chain system, unless more than 51% of the nodes in the control system can be simultaneously controlled, the modification is invalid, so the data stability and reliability of the block chain are extremely high [4], [5].

Transparency: Transparency is the basis for block-chain to be trusted because data record and update are transparent to the nodes of the entire network. Therefore, network-wide nodes with high transparency can be used to review, track data records, and track operations [6].

Efficiency: The block-chain technology makes the system more transparent by distributing database records to users in the system, so it is more efficient in terms of risk, cost, and so on [7], [8].

Security: If a centralized network is attacked, it is likely to affect the whole system. However, block-chain-based system has the characteristics of decentralization. If a node is attacked, it will not destroy the security of the entire system. Moreover, block-chains use public key infrastructure to prevent malicious behavior from changing data, thus providing better security [3].

Anonymity: In block-chain systems, both parties can make the transaction anonymous because the program rules in block-chain can automatically determine whether exchange activities between nodes are valid.

III. TYPES OF BLOCK-CHAIN

There are several different ways to build a block-chain network these days. They can be public, private, permissioned, or built by a consortium.

Public Block-chain: A pubic block-chain is one that anybody can join and take part in, for example, Bitcoin. Downsides of such type may incorporate significant computational force that is required and also there is no protection for exchanges. The public block-chain is the ultimate embodiment of decentralization [9].

Private Block-chain: A private block-chain just like an open block-chain, is a decentralized distributed system, with the noteworthy distinction that only one authority controls the system. Which party is allowed, which party can execute an operation and how the mutual record will be kept is all decided by that authority. Such block-chain is run behind a firewall of the corporation and is only facilitated to use on premises. It does not fully solve the trust problem, but it can improve auditability [10].

Permissioned Block-chain: Organizations who set up a private block-chain, most commonly set up a permissioned block-chain system. Noted that open block-chain systems can similarly be made permissioned. Doing this it is easy to find limitations on who is permitted to participate in the system, and that too in specific commands. Members do need to acquire a greeting or authorization to join in such a system.

Consortium Block-chain: In another way different associations can share the obligations of keeping up a block-chain. These chosen associations define who may submit exchanges or access the information. Such a block-chain is best suitable for business when all members should be permissioned and have a common duty regarding operations. It is a combination of public and private block-chains [11].

IV. REGULATION COMPLIANT

Block-chain also needs to be compliant with the regulations that protect user data privacy. One of the activated regulations is GDPR (General Data Protection Regulation) [12]. An important aspect of GDPR is it requires the personal data can be forgotten. In other words, the users have the rights to erase their personal data. Such regulation does provide stronger and more unified personal data protection for Europe Union citizens, but it seems to be contradicted with the design of the block-chain, which guarantees immutable records. A major impediment in delivering privacy is the lack of frameworks that provide

	Public No Centralized Management	Consortium Multiple Organizations	Private Single Organization
Participants	Permissionless • Anonymous • Could be malicious	Permissioned • Identified • Trusted • Could misbehave	Permissioned • Identified • Trusted

Consensus
Mechanisms
	Proof of Work, Proof
	of Stake, etc..
	• Large energy
	  consumption
	• No finality
	• 51% attack
		Voting or multi-party
		consensus algorithm
		• Lighter
		• Faster
		• Low energy
		  consumption
			Pre-approved
			participants
			• Lighter
			• Faster
			• Low energy
			  consumption
			• Cheaper

Transaction Approval Freq.	Long Bitcoin: 10 min or more	Depends on number of nodes but faster than public blockchain	Short 100x msec

Figure 2. Comparison Table for Different Types of Blockchain.

accountability and transparency for distributed IT services; hence it becomes difficult for users to understand, influence and determine how their service providers honor their obligations. Therefore, it demands a shift in the data management paradigm which needs to put the user in the center of all operations performed on their data. Designing regulation-compliant block-chain solutions is becoming appealing but also challenging. As Vitalik Buterin, the co-founder and inventor of Ethereum, mentioned: "The main advantage of block-chain technology is supposed to be that it's more secure, but new technologies are generally hard for people to trust". Therefore, what is needed a more secure, privacy preserving, and regulation-compliant block-chain technology.

V. APPLICATION OF BLOCK-CHAIN: CURRENT SITUATION (COVID-19)

Block-chains can support different applications. Users of Block-chains trust these systems even though they may not trust other parties of transactions. Among many Block-chain use cases, Supply Chain Tracking (SCT) has risen high interest during past years due to the challenges of such integrated systems. Many financial and human resources are being deployed in the effort to fight the ongoing COVID-19 pandemic. Technologies are also being used in this fight: artificial intelligence for research, 5G to increase information transmission speed and many others. Block-chain is not being left out of this fight, as it now plays an important role in helping institutions and governments around the world respond to COVID-19, and is currently being integrated into healthcare and supply chains.

How blockchain platforms can help defeat a pandemic? Block-chain platforms can be used to monitor pandemic material distribution, donations, relief distribution and other responses in a fast and transparent way without the violation of user data. Digital identity is another way block-chain platforms can help defeat COVID-19. Companies can collaborate through block-chain platforms to help to research the best way to combat the coronavirus, and contact-tracing applications can be built on block-chain to allow anonymity. Block-chain can

bring reliability, transparency and security to medical data. Several organizations have been accused of manipulating data during this pandemic, block-chain can help to solve them by providing transparent and immutable medical data. A block-chain-based global pandemic map can be used to track the spread of the virus, the number of infected citizens and the number of recovered citizens. *For the most part, secure information exchange and capacity are the principle worries over IoT gadgets and so as to take care of the issue, different arrangements are being tried. Be that as it may, decentralized and secure structure like the block-chain could be an answer.*

VI. CONCLUSION

This paper is presented keeping in mind to let more professionals understand the block-chain and lead more thinking about how to apply the block-chain technology. Efforts are made to describe the origin of block-chain, its characteristics, types and then throws light how the block-chain is applied to fight against current ongoing global challenge COVID-19 for the welfare of common citizen. It may be too early to tell how prolific the growth and adoption of block-chain applications for social impact will be, but we can say that potentially transformative block-chain applications for social impact are already emerging.

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