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Blockchain: Recent Use Cases and Future trends

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Abstract: The recent innovation which has definitely created a buzz in our way of life is Blockchain. Within the near future, Blockchain technology will convert the way we live, associate, and perform businesses. As of late, industrialists and analysts are examining distinctive perspectives of Blockchain for developing innovations in numerous fields. In this paper, we present a comprehensive study of Blockchain technology's advancement in numerous fields, design, and security issues. While Bitcoin is still one of the major actors that utilizes Blockchain, the authors of this paper also want to present an insight into other underdogs in Blockchain applications. It is well understood that these novel use cases may be investigated by analysts to encourage progress in this field.

Index Terms **- blockchain, blockchain architecture, smart contracts, blockchain applications, development frameworks, blockchain security.**

I. INTRODUCTION

On the off chance that you have never heard about blockchain, we are going to attempt to clarify it in basic terms. A Blockchain is simply an arrangement of peers/hosts who can connect, communicate, and exchange data without being dependent on a centralized controller. The key highlights of blockchain incorporate peer-to-peer architecture, security, immutability, and decentralization. A blockchain also utilizes a consensus algorithm that guarantees that the exchanges done inside the blocks are agreed upon by all parties before committing.

II. BLOCKCHAIN CHARACTERISTICS

This section endeavors to bind together the characteristics and any conceivable issues related to them. The current issues with the Blockchain innovation are distinguished and key inquiries about challenges are highlighted. Key characteristics that have been distinguished for the Blockchain technology are as follows:

1. Immutability

Once you've agreed on a transaction and recorded it, it can never be changed. you'll subsequently record another transaction of that asset to vary its state, but you'll never hide the first transaction. This provides the thought of provenance of assets, which suggests that for any asset you'll tell where it's, where it's been and what went on throughout its life.

2. Decentralized

The network is decentralized meaning it doesn't have any governing authority or one person taking care of the framework. Instead, a group of nodes maintains the network. This is one of the important features of blockchain technology that works perfectly. Blockchain puts us users during a straightforward position. Because the system doesn't require any governing authority, we will directly access it online and store our assets there.

3.Enhanced Security

Added with decentralization, cryptography lays one more layer of security for users. Cryptography may be a rather complex mathematical algorithm that acts as a firewall for attacks. All information on the blockchain is hashed cryptographically. In simple terms, the knowledge on the network hides the true nature of the info. For this process, any input file gets through a mathematical algorithm that produces a special quiet value, but the length is usually fixed.

4.Distributed Ledgers

It is designed to be distributed and synchronized across networks, ideal for multi-organizational business networks such as supply chains or financial corporations. It also encourages organizations to get behind their firewalls and share data.

5. Consensus

Before a transaction can be executed, all relevant parties must have an agreement that the transaction is valid. For instance, if you're registering the sale of a cow, that cow must belong to you otherwise you won't get an agreement. This process is understood as "consensus" and it helps keep inaccurate or potentially fraudulent transactions out of the database.

6. Anonymity

In a blockchain, it's imperative that the identity of the members and therefore the transactions between them remain anonymous. However, anonymity mechanism must not preclude verification of the transaction, which is required for blockchain update, hiding a real-world user's identity doesn't meet the need of anonymity.

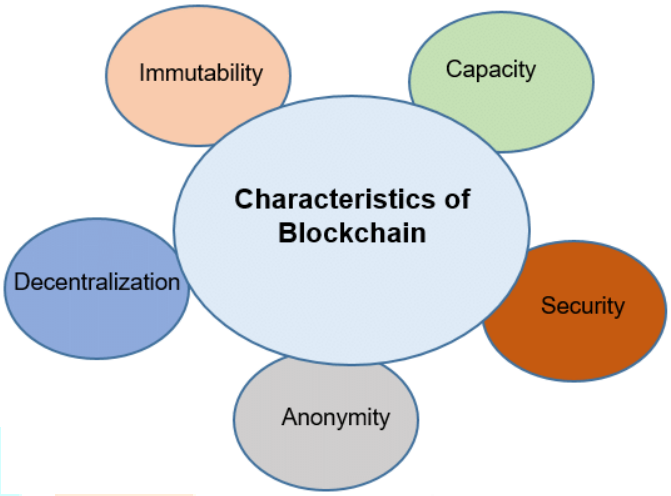

Fig. 1. Blockchain Characteristics
image source: https://www.researchgate.net/figure/Characteristics-of-blockchain_fig3_325486515

III. BLOCKCHAIN ARCHITECTURE AND TYPES

In this section, we will be diverging into different layers of a blockchain [1][2]. The following figure 2 displays the layered architecture of blockchain.

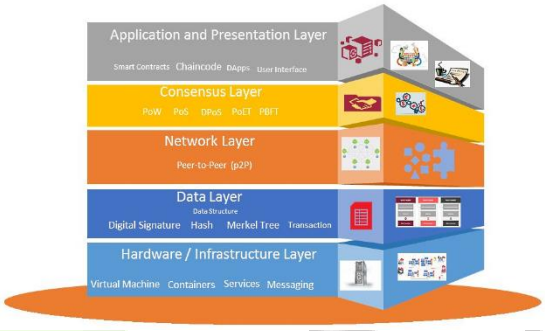

Fig. 2. Blockchain layered architecture

In this section, we will acquaint ourselves with a typical blockchain structure. The following figure 3 displays the chains of blocks.

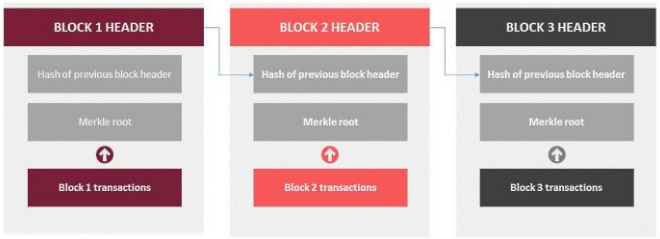

Fig. 3 Blockchain structure

Blockchain got its title from the arrangement of blocks which store transactions related information. In a blockchain, the information is bundled into "blocks" with a hash value of the current block and the preceding block as shown in figure 4. These blocks then form a chain with other blocks of data, resulting in the shape of blockchain. Table 1 shows different types of blockchain currently in the news.

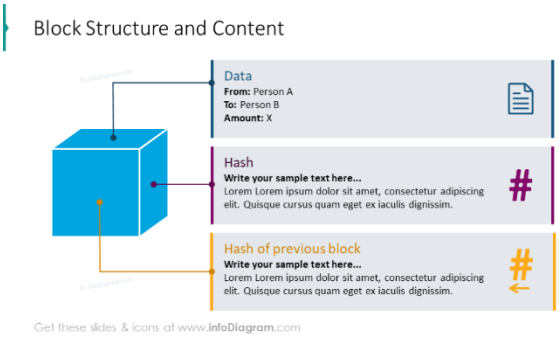

Fig. 4 Block structure
image source: https://www.infodiagram.com/slides/what-is-blockchain.html

IV. BLOCKCHAIN USE CASES IN 2021

The growth of blockchain since the advent of Bitcoin has been phenomenal. Blockchain can give us numerous benefits. Just like any other technology, many believe that the evolution process of the technology may go even further [3][4]. As shown in figure 5, Decentralized public blockchain applications are thriving, but successful permissioned enterprise blockchain projects are scarce.

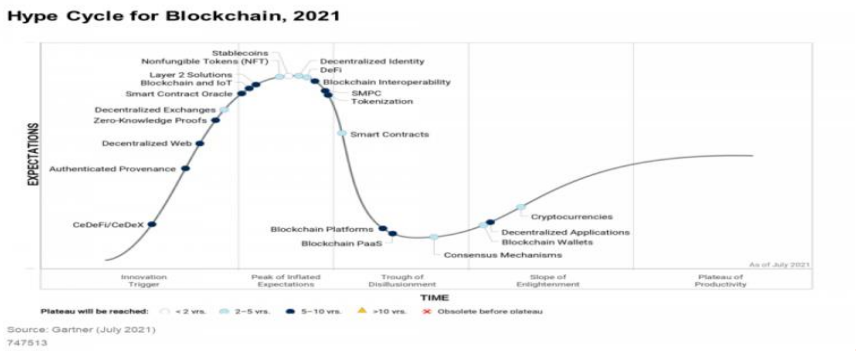

Fig. 5 Blockchain hype cycle for 2021
image source: https://blogs.gartner.com/avivah-litan/2021/07/14/hype-cycle-for-blockchain-2021-more-action-than-hype/

Users must understand how the integration of enterprise requirements with public blockchain innovation is supported by new advances. A few of them are listed below.

1. Central Banks Digital Currency

This is a digital form of central bank money that offers central banks unique advantages at the retail and wholesale levels, including increased financial access for individual customers and a more efficient infrastructure for interbank settlements.

2. Digital Identity

A unified, interoperable, and tamper-proof infrastructure of blockchain-based digital identity system provides key benefits to enterprises, users, and IoT management systems. The solution provides individuals greater control over their data and protection against theft and provides.

3. Supply Chain Monitoring

Supply chain monitoring is one of the best practical use cases of blockchain. The supply chain is a vital part of our economy. Blockchain for supply chain provides immutability and the ability to monitor the supply chain products throughout its journey. It offers transparency for the companies to track their products. Fraud elements in the supply chain can be monitored by companies and find out the inefficiencies that are part of the supply chain. Companies can improve the supply chain by monitoring it through blockchain. Supply chain monitoring is the most practical use-case of blockchain.

4. Real Estate

Enterprise Ethereum makes the digitization of assets and financial instruments possible. This improves fractionalization of ownership, expanded access to global markets, increased liquidity, and democratized access to real estate investment opportunities.

5. Royalty Protection and Copyright

One of the most ideal ways to provide copyright and royalty protection is by using blockchain. Blockchain has a unique approach by providing content through the network. Because the blockchain is a vast network that provides transparency, anyone who tries to break copyright can be reported automatically and be tried in court according to the copyright laws. The same is true for the royalty protection where the creator gets paid for their creations.

6. Cyber Security

Cybersecurity can be improved with the use of decentralized storage solutions provided by the blockchain. Since the data is stored in a decentralized manner, there will not be a single point of attack for hackers. Most of the time, businesses depend heavily on a centralized system which is not an ideal way of storing data from a security point of view.

7. Digital Voting

Voting systems have always been subjected to scrutiny all around the world for transparency or the speed at which voting takes place. People have to stand in line for hours before they get their chance to vote. This is not an ideal way to vote, especially for special people who are unable to stand in line for so long. This is where Digital voting comes in. The idea of digital voting comes from the blockchain. Blockchain offers transparency, immutability, and security, therefore it is an ideal system for conducting the voting.

8. Healthcare – Medical Recordkeeping

With blockchain, everything can be accessed from anywhere. Patients' data can be recorded in the blockchain. It can be accessed and updated anytime patients visit their doctor. Doctors can likewise be sure when they take a look at the patient's data. Overall, it is a benefit for both patients and practitioners. Blockchain usage also covers one more problem of healthcare. It can help to track medicines. In this way, fake medicines can be removed from the medicine supply chain. This is possible because of the way in which blockchain stores data. Whenever a new medicine is recorded with the supply chain, it generates a wealth of information, including a hash number which is stored in the blockchain.

9. Education

The candidates can now obtain digital certificates and degrees. With the help of blockchain certificates are digitally generated. Since they are associated with the digital identity of the candidate they can be verified at any time. The certificates can be accessed by the person from anywhere, which makes them more manageable and easier to access.

10. Logistics

Blockchain can come with an authentication process and help in validating all the data. All the more along these lines, as nobody can truly change the data, every single element will be beyond the bounds of any malicious parties. Blockchain can also help in tracking all of the demands and make the deliveries in time.

V. Blockchain challenges and solutions

Few challenges faced by early blockchain adopters are mentioned here along with steps taken to overcome them [5].

1. Blockchain Lack of Awareness:

The major hindrance to Blockchain adoption being lack of awareness, the first step undertaken by the business houses was to form an internal team focused to understand the technology, its impact, and areas of usage. In some cases, employees were sent for external conferences and industry working groups or internal knowledge sessions and Hackathons were conducted. Some firms even included Blockchain as part of their Strategic investment.

2. Identifying the right platform, vendor, and partner for PoC:

After the use case had been identified, the next obstacle was to identify the right platform, vendor and partner firms for conducting a successful test. Organizations created cross-functional teams, conducted focused group discussions with the IT team of the partner firm identified to overcome this challenge, and developed a detailed project charter with milestones and metrics defined.

3. Integration and data security challenges:

To make sure that integration and data security challenges (e.g., customer data encryption) don't present a threat to the execution of PoC, early blockchain adopters ensured only a minimum workable product was being built to test out the potential of Blockchain and identified alternate strategy for data purging/masking (e.g., destroy the key to the data block to ensure nobody can access it).

TABLE 1. TYPES OF BLOCKCHAIN

BLOCKCHAIN TYPES & EXAMPLES		
Public Blockchain	**Private Blockchain**	**Consortium Blockchain**
Anyone can join and participate in the action. Everyone can see what's going on inside the blockchain. All peers have equal say in adding new transactions.	A single entity governs the action. Used only when the participants of the network are known to each other.	Combines the features of public and private blockchains. It may not be accessible to the public. Multiple parties will be part of the network. Access to the network will be restricted.
bitcoin	ripple	HYPERLEDGER

VI. Blockchain future in India

Blockchain innovation is rapidly getting to be one of society's most powerful methods for sparing costs and streamlining strategies that are for the most part not streamlined at all, it is much appreciated by governments and organizations alike who root for legitimate exchanges. The standard with blockchain innovation is peer-to-peer exchange confirmation, which could be a great thing. Blockchain innovation has the potential to transform the way we think about cash, retail, and administration. In case this modern framework takes off, there will be no avoiding it from proliferating information on the web. Blockchain innovation is planning to not only offer assistance to individuals with their funds, but moreover to astonish us with societal changes.

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