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CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGY

Abstract: cryptocurrency, a digital or virtual form of currency, operates on the principles of cryptography and blockchain technology. Since Bitcoin's debut in 2009, the market has exploded, giving rise to thousands of alternative cryptocurrencies and innovative applications. This article explores the fundamental aspects of cryptocurrency and the underlying blockchain technology, highlighting their significance and impact on the financial landscape.

Keywords: cryptocurrency, Bitcoin, blockchain technology

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КРИПТОВАЛЮТА И ТЕХНОЛОГИЯ БЛОКЧЕЙН

Аннотация: криптовалюта, цифровая или виртуальная форма валюты, работает на принципах криптографии и технологии блокчейн. С момента дебюта Биткойна в 2009 году рынок резко вырос, породив тысячи альтернативных криптовалют и инновационных приложений. В этой статье исследуются фундаментальные аспекты криптовалюты и лежащей в ее основе технологии блокчейна, подчеркивая их значение и влияние на финансовый ландшафт.

Ключевые слова: криптовалюта, Биткойн, технология блокчейн

A cryptocurrency is a digital currency, which is an alternative form of payment created using encryption algorithms. The use of encryption technologies means that cryptocurrencies function both as a currency and as a virtual accounting system. To use cryptocurrencies, you need a cryptocurrency wallet. These wallets can be software that is a cloud-based service or is stored on your computer or on your mobile device. The wallets are the tool through which you store your encryption keys that confirm your identity and link to your cryptocurrency. Cryptocurrency comes under many names. You have probably read about some of the most popular types of cryptocurrencies such as Bitcoin, Litecoin, and Ethereum [2]. Cryptocurrencies are increasingly popular alternatives for online payments. So called for their use of cryptography principles to mint virtual coins, cryptocurrencies are typically exchanged on decentralized computer networks between people with virtual wallets. These transactions are recorded publicly on distributed, tamper-proof ledgers known as blockchains. This open-source framework prevents coins from being duplicated and eliminates the need for a central authority such as a bank to validate transactions. Bitcoin, launched in 2009 by the pseudonymous software engineer Satoshi Nakamoto, is by far the most prominent cryptocurrency, and its market capitalization has peaked at more than \$1 trillion. Numerous others, including Ethereum, the second-most popular, have proliferated in recent years [3].

Once dismissed as a fringe interest of tech evangelists, cryptocurrencies—particularly bitcoin—have skyrocketed to mainstream popularity and trillion dollar

valuations. In November 2021, the price of bitcoin surged to more than \$60,000 for the first time, though it has since fallen. As of mid-2023, an estimated 17 percent of U.S. adults polled by the Pew Research Center had invested in, traded, or used cryptocurrency [4].



Figure 1-Total market value of cryptocurrencies [1]

Different currencies have different appeals, but the popularity of cryptocurrencies largely stems from their decentralized nature: They can be transferred relatively quickly and anonymously, even across borders, without the need for a bank that could block the transaction or charge a fee. Dissidents in authoritarian countries have raised funds in bitcoin to circumvent state controls, including to avoid U.S. sanctions on Russia [3].

Blockchain is a method of recording information that makes it impossible or difficult for the system to be changed, hacked, or manipulated. A blockchain is a distributed ledger that duplicates and distributes transactions across the network of computers participating in the blockchain. Blockchain technology is a structure that stores transactional records, also known as the block, of the public in several databases, known as the “chain,” in a network connected through peer-to-peer nodes. Typically, this

storage is referred to as a 'digital ledger. 'Every transaction in this ledger is authorized by the digital signature of the owner, which authenticates the transaction and safeguards it from tampering. Hence, the information the digital ledger contains is highly secure. In simpler words, the digital ledger is like a Google spreadsheet shared among numerous computers in a network, in which, the transactional records are stored based on actual purchases. The fascinating angle is that anybody can see the data, but they can't corrupt it [4].

Advantages of Blockchain:

1) Highly Secure

It uses a digital signature feature to conduct fraud-free transactions making it impossible to corrupt or change the data of an individual by the other users without a specific digital signature.

2) Decentralized System

Conventionally, you need the approval of regulatory authorities like a government or bank for transactions; however, with Blockchain, transactions are done with the mutual consensus of users resulting in smoother, safer, and faster transactions.

3) Automation Capability

It is programmable and can generate systematic actions, events, and payments automatically when the criteria of the trigger are met [5].

Applications of cryptocurrency and blockchain:

1)Blockchain in Money Transfer

Pioneered by Bitcoin, cryptocurrency transfer apps have exploded in popularity in the 2020s. Blockchain is especially popular in finance for the money and time it can save financial companies of all sizes.

By eliminating bureaucratic red tape, making ledger systems real-time and reducing third-party fees, blockchain can save the largest banks lots of money. These companies use blockchain to efficiently transfer money.

2)Blockchain in Healthcare

Blockchain in healthcare solutions have shown the potential to reduce healthcare costs, improve access to information across stakeholders and streamline business processes. An advanced system for collecting and sharing private information could be just what the doctor ordered to make sure that an already bloated sector can trim down exorbitant costs [1].

3)Blockchain and NFTs

Non-fungible tokens (NFTs) have been the hottest blockchain application since cryptocurrency. These digital items, like music, art, GIFs and videos, are sold on a blockchain, ensuring that a sole owner can claim full rights to it. Thanks to blockchain technology, consumers can now claim sole ownership over some of the most desirable digital assets out there.

4)Blockchain in Government

One of the most surprising applications for blockchain can be in the form of improving government. As mentioned previously, some state governments like Illinois are already using the technology to secure government documents, but blockchain can also improve bureaucratic efficiency, accountability and reduce massive financial burdens. Blockchain has the potential to cut through millions of hours of red tape every year, hold public officials accountable through smart contracts and provide transparency by recording a public record of all activity, according to the New York Times [2].

Blockchain may also revolutionize our elections. Blockchain-based voting could improve civic engagement by providing a level of security and incorruptibility that allows voting to be done on mobile devices.

Organizations in all industry sectors will face a complicated and potentially contentious array of difficulties, as well as new dependencies, as the blockchain ecosystem matures and additional use-cases arise [3].

There are numerous problems with blockchain and security issues are among them. So, what are the weaknesses of blockchain in terms of security? Blockchain technology designs, for example, differ in architecture. Some are more secure than

others. Decentralized blockchains are, for example, more susceptible to 51% attacks than centralized ones. This has caused a few problems for crypto enthusiasts who prefer to keep their assets on decentralized chains [4].

Delving a bit into the details of how 51% attacks work, they exploit an inherent loophole in decentralized systems that allows users to control a chain by wielding over 51% of the processing power. This usually happens on networks utilizing the proof-of-work (PoW) standard.

Permissionless blockchain systems with low hash rates are particularly prone to these types of attacks. Successful 51% attacks allow hackers to reverse transactions, invalidate new transactions and modify new blocks.

Blockchain technology has evolved over the years to become more scalable as use-cases increase. The first blockchain network was developed by Satoshi Nakamoto to underpin the Bitcoin network. The second decentralized network was the Ethereum network founded by Vitalik Buterin [2].

The Ethereum blockchain was a step ahead of the Bitcoin network because of what experts refer to as programmable money. The network was built to handle a large number of crypto transactions while at the same time supporting decentralized applications. However, scalability issues are plaguing both the Bitcoin and the Ethereum networks. As things stand, the Ethereum network is the more popular among blockchain developers. It is estimated that over 80% of blockchain projects are based on the Ethereum blockchain. The explosion of projects on the network in recent years has caused significant scalability problems. They include slow speed and high gas fees [3].

The Bitcoin and Ethereum blockchain systems are among the most popular. They are, however, energy-intensive proof-of-work systems that depend on mining to validate blocks and transactions. The concept is a bit dilapidated, considering the amount of power that they consume. BTC mining, alone, is estimated to use approximately 100 terawatt-hours of electricity every year. This is more than the amount of energy used in countries such as Finland.

Its carbon footprint is also significant and is estimated to be roughly 97 metric tons of carbon dioxide produced every year. This has become a major cause for concern for regulatory authorities. Consequently, major jurisdictions such as China have banned crypto mining. This is because of the needless and significant environmental damage that the mining activity causes [4].

Besides China, some nations such as Kazakhstan, a leading data center and crypto mining hotspot, are facing challenges in implementing blockchain regulations as miners from China and surrounding nations flock to the nation because of the cheap power.

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