

DECRYPTING CRYPTO: BLOCKCHAIN TECHNOLOGY

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KEY INSIGHT

Blockchain technology is a revolutionary innovation for digitally transmitting data, enabling value-transfer to occur without centralized intermediaries. The decentralized software technology also supports **smart contracts** that enable transaction programmability which can be applied to manage financial and non-financial data on the internet.

SUMMARY

A blockchain is a software protocol that produces a decentralized immutable ledger that records transactions across a wide set of computers within a network. The record of transactions is organized into blocks that are linked cryptographically so that data within the blockchain can not be changed and is available to be viewed and evaluated in real-time. Blockchains ensure that recorded transactions can not be altered and their transparency makes them useful for documenting the exchange of digital assets. Cryptocurrencies are actually units of ownership assigned to blockchain addresses, controlled by whoever has access to the address's private cryptographic key. There are various types of blockchain protocols using different mechanisms to confirm transactions and maintain the protocol's functionality and reliability. Many blockchains utilize smart

contracts to automate the execution of transactions and enable sophisticated programming within the blockchain's ecosystem. Although the most popular blockchain use-case is for acquiring, holding, and sending cryptocurrencies, the technology's transparency and real-time availability of data offers improved efficiency and resiliency for managing and analyzing various types of online data. However, regulatory uncertainty around the technology—especially in the financial sector—has hindered wider adoption for both financial and non-financial applications.

KEY FACTS

A blockchain consists of permanent data blocks added in sequential order that are assigned a hash based on the timestamp, with each block linking the previous blocks' hash. Blockchains operate by various types of software **consensus mechanisms** to ensure that all the computers validating the network agree upon the data set and only accept one specific, authentic record of transactions. While storing and sending cryptocurrency tokens is the most popular use of blockchain technology, other use cases for the technology are still in the early exploration phase and span many industries. For example, blockchain can be used to simplify and automate the supply chain process by increasing data transparency and accuracy.

Blockchain's immutable data storage process can assist with the protection of intellectual property, particularly through **non-fungible tokens (NFTs)** which act as digital receipts within a distributed ledger system. Currently, NFTs are primarily used by artists seeking to document and monetize their creative intellectual property in fields such as music or art. Lastly, there is significant research and piloting in using blockchain to verify credentials.

KEY INSTITUTIONS

Financial institutions such as BlackRock and Goldman Sachs have ongoing efforts to educate investors and the public on blockchain technology as well as build trust in the space. Other leaders in the space include IBM, Nvidia, Block, Oracle, and Amazon, who are all investing in the technology for their business lines. Notable companies providing blockchain-related services include digital asset exchanges like Coinbase and Binance, payment providers like Ripple and Circle, blockchain infrastructure like ConsenSys, and blockchain analytics like Chainalysis and Elliptic.

BACKGROUND

The concept of a cryptographically secured chain of blocks was first described in 1991 by Stuart Haber and W Scott Stornetta. The first successful deployment of public blockchain software was implemented in 2009 by a developer operating under the pseudonym Satoshi Nakamoto. This blockchain system enabled users to send and receive unit values known as **Bitcoin** in an online public ledger. In 2014, the Ethereum blockchain system introduced computer programs known as smart contracts into the blocks, enabling more sophisticated applications beyond the sending and receiving of tokens.

POLICY AND REGULATION ISSUES

Blockchain technology industry faces regulatory challenges which differ from other parts of the software sector. This is especially true for the cryptocurrency use-case where much of the blockchain activity functions as a transaction in value, triggering certain financial regulatory requirements. This is complicated by the fact that, in the U.S., there is a lack of legal clarity around whether various tokens may fall under securities or commodities laws. Blockchain-related activities also raise some legal questions around personal data privacy, intellectual property, and the enforcement of smart contracts. For example, one standing question surrounds the legal validity of financial instruments issued in blockchains and whether these can be used as evidence of possession.

GLOSSARY

Bitcoin: The first cryptocurrency, which also was the first practical application of blockchain technology, launched in 2009 by the pseudonymous software developer Satoshi Nakamoto.

Blockchain: A decentralized public ledger that records transactions across a network of computers, known for its immutability, security, and transparency.

Consensus Mechanism: A software program in which computer nodes in of a distributed ledger system agree on the correctness of a new block before it is added to the chain of records on the network.

Non-Fungible Tokens (NFTs): Unique digital assets stored on a blockchain, primarily used to verify ownership and authenticity, often used for creative works like music or art.

Smart Contracts: Software code programmed on a blockchain that is automatically executed when predetermined terms/conditions are met.

HOW DOES BLOCKCHAIN WORK?

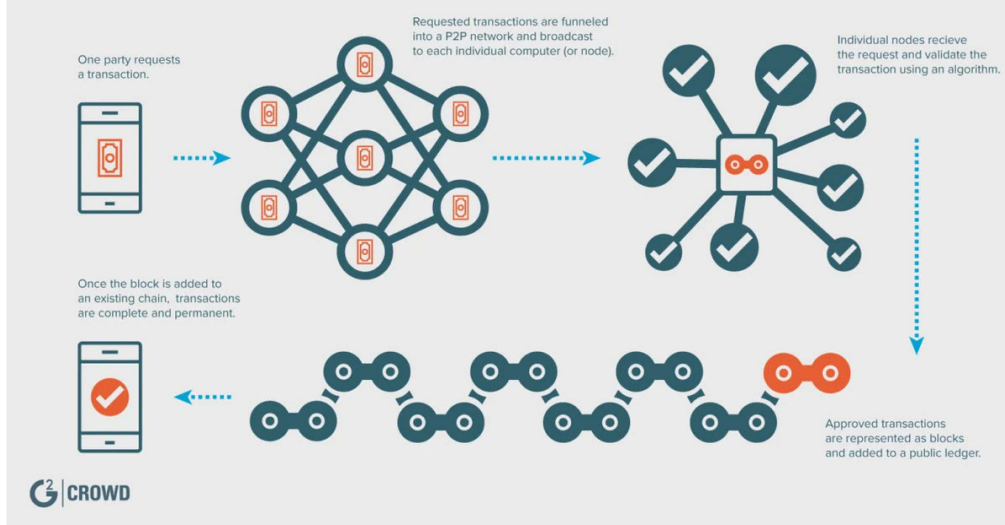


Image courtesy of Walker, Aaron. *How Does Blockchain Work?* 2018. G2, <https://learn.g2.com/trends/blockchain-security>.

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