Blockchain Technology

By: Deepanshu Jayswal
Roll No: 1728263
Branch: CSSE

What is Blockchain?

Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system.

A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain. Each block in the chain contains a number of transactions, and every time a new transaction occurs on the blockchain, a record of that transaction is added to every participant's ledger. The decentralised database managed by multiple participants is known as Distributed Ledger Technology (DLT).

Key Takeaways

- Blockchain is a specific type of database.
- It differs from a typical database in the way it stores information; blockchains store data in blocks that are then chained together.
- As new data comes in it is entered into a fresh block. Once the block is filled with data it is chained onto the previous block, which makes the data chained together in chronological order.
- Different types of information can be stored on a blockchain but the most common use so far has been as a ledger for transactions.
- In Bitcoin's case, blockchain is used in a decentralized way so that no single person or group has control—rather, all users collectively retain control.
- Decentralized blockchains are immutable, which means that the data entered is irreversible. For Bitcoin, this means that transactions are permanently recorded and viewable to anyone.

Transactions
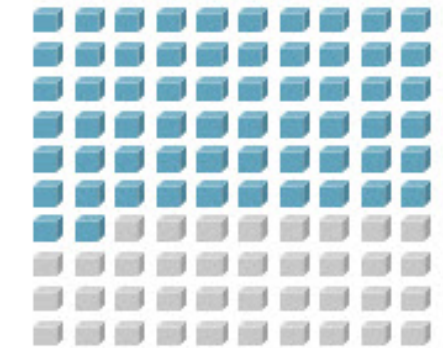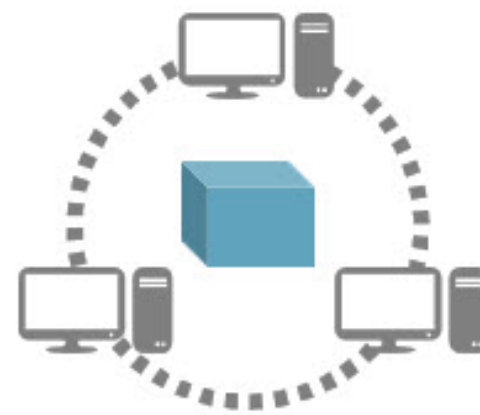
| P2P Network | ⇨ | Communication | ⇨ | Validation | ⇨ | Verification | ⇨ | Confirmation |

1 Someone in the Peer to Peer network requests a transaction.

2 The requested transaction is broadcast to the P2P network consisting of computers, known as nodes.

3 The network of nodes validates the transaction and the users status using algorithms.

A verified transaction can involve cryptocurrency, contracts, records or other information.

4 Once verified, the transaction is combined with other transactions to create a new block of data for the ledger.

5 The new block is then added to the existing blockchain, in a way that is permanent and unalterable.

The transaction is complete.

Decentralization

In blockchain, decentralization refers to the transfer of control and decision-making from a centralized entity (individual, organization, or group thereof) to a distributed network. Decentralized networks strive to reduce the level of trust that participants must place in one another, and deter their ability to exert authority or control over one another in ways that degrade the functionality of the network.

If one user tampers with Bitcoin's record of transactions, all other nodes would cross-reference each other and easily pinpoint the node with the incorrect information. This system helps to establish an exact and transparent order of events.

Benefits of Decentralization

- **Trustless Environment**

In a decentralized blockchain network, no one has to know or trust anyone else. Each member in the network has a copy of the exact same data in the form of a distributed ledger.

- **Reduces points of weakness**

Decentralization can reduce points of weakness in systems where there may be too much reliance on specific actors.

- **Optimizes resource distribution**

Decentralization can also help optimize the distribution of resources so that promised services are provided with better performance and consistency, as well as a reduced likelihood of catastrophic failure.

How is Blockchain Used?

- Banking and Finance
- Currency
- Healthcare
- Records of Property
- Smart Contracts
- Supply Chains
- Voting

Example: Banking and Finance

By integrating blockchain into banks, consumers can see their transactions processed in as little as 10 minutes, basically the time it takes to add a block to the blockchain, regardless of holidays or the time of day or week. With blockchain, banks also have the opportunity to exchange funds between institutions more quickly and securely. In the stock trading business, for example, the settlement and clearing process can take up to three days (or longer, if trading internationally), meaning that the money and shares are frozen for that period of time.

Example: Healthcare

Health care providers can leverage blockchain to securely store their patients' medical records. When a medical record is generated and signed, it can be written into the blockchain, which provides patients with the proof and confidence that the record cannot be changed. These personal health records could be encoded and stored on the blockchain with a private key, so that they are only accessible by certain individuals, thereby ensuring privacy.

Example: Voting

Blockchain could be used to facilitate a modern voting system. Voting with blockchain carries the potential to eliminate election fraud and boost voter turnout, as was tested in the November 2018 midterm elections in West Virginia. Using blockchain in this way would make votes nearly impossible to tamper with. The blockchain protocol would also maintain transparency in the electoral process, reducing the personnel needed to conduct an election and providing officials with nearly instant results. This would eliminate the need for recounts or any real concern that fraud might threaten the election.

Advantages

- Improved accuracy by removing human involvement in verification
- Cost reductions by eliminating third-party verification
- Decentralization makes it harder to tamper with
- Transactions are secure, private, and efficient
- Transparent technology
- Provides a banking alternative and way to secure personal information for citizens of countries with unstable or underdeveloped governments

Disadvantages

- Significant technology cost associated with mining bitcoin

- Low transactions per second

- History of use in illegal activities

- No Regulation

Blockchain Vs Bitcoin

- Blockchain is a technology and many cryptocurrencies like bitcoin using blockchain for secure and anonymous transactions.
- Blockchain is a transparent mechanism, whereas bitcoins operate on anonymity.
- Blockchain has a much more extensive use, while bitcoin is only restricted to exchange in digital currencies.
- Bitcoin is only used to transfer digital currencies, while blockchain transfers proprietary information, digital assets, rights, etc.

Blockchain Vs Banks

- **Payments:** By establishing a decentralized ledger for payments (e.g. Bitcoin), blockchain technology could facilitate faster payments at lower fees than banks.
- **Clearance and Settlement Systems:** Distributed ledgers can reduce operational costs and bring us closer to real-time transactions between financial institutions.
- **Fundraising:** Initial Coin Offerings (ICOs) are experimenting with a new model of financing that unbundles access to capital from traditional capital-raising services and firms.
- **Securities:** By tokenizing traditional securities such as stocks, bonds, and alternative assets — and placing them on public blockchains — blockchain technology could create more efficient, interoperable capital markets.

Blockchain Vs Banks

- **Loans and Credit:** By removing the need for gatekeepers in the loan and credit industry, blockchain technology can make it more secure to borrow money and provide lower interest rates.
- **Trade Finance:** By replacing the cumbersome, paper-heavy bills of lading process in the trade finance industry, blockchain technology can create more transparency, security, and trust among trade parties globally.
- **Customer KYC and Fraud Prevention:** By storing customer information on decentralized blocks, blockchain technology can make it easier and safer to share information between financial institutions.

Summary

Allows untrusted parties to reach a consensus on a common digital history without intermediaries.

Provides more security measures through the transaction verification, inability to delete transactions, and the difficulty of hacking thousands of computers at once.

Can be applied to any ledger types (financial transactions, records management, voting, supply chain, etc.)

Thank You

DEEPANSHU JAYSWAL
1728263
CSSE