

Blockchain Study Notes Day 1:

Chapter 1 - What is Blockchain

Introduction to Blockchain

Block chain is a distributed ledger technology that allows data to be stored globally on thousands of servers while enabling anyone on the network to see everyone else's entries in real-time.

- **Key Characteristics:**
 - **Decentralization:** Data is not stored in a central location but distributed across nodes in the network.
 - **Immutability:** Once data is written into a blockchain, it cannot be altered or deleted.
 - **Transparency:** All transactions are visible to participants, ensuring trust among users.
 - **Security:** Blockchain uses cryptographic techniques to secure data.

Why Use Blockchain?

- Provides a **trustless system**: No need for intermediaries or trusted third parties.
- Ensures **data integrity**: Data cannot be tampered with.
- Enables **traceability**: All transactions can be traced back to their origin.
- Facilitates **automation** through smart contracts.

Types of Blockchain

1. **Public Blockchain:**
 - Open to anyone.
 - Examples: Bitcoin, Ethereum.
2. **Private Blockchain:**
 - Restricted access; only specific participants.
 - Examples: Hyperledger, Corda.
3. **Consortium Blockchain:**
 - Controlled by a group of organizations.
 - Examples: Energy Web Foundation, R3.
4. **Hybrid Blockchain:**
 - Combines elements of public and private blockchains.

Blockchain Structure

- **Blocks:**
 - Each block contains data, a timestamp, and a unique hash.
 - Blocks are linked to previous blocks using a hash of the prior block.

- **Ledger:**
 - A record of all transactions.
- **Nodes:**
 - Computers that participate in the blockchain network.

How Blockchain Works

1. **Transaction Initiation:** A user initiates a transaction.
2. **Validation:** Nodes validate the transaction using consensus mechanisms.
3. **Block Creation:** Validated transactions are grouped into a block.
4. **Hashing and Linking:** The block is hashed and linked to the previous block.
5. **Distribution:** The block is distributed across the network.

Consensus Mechanisms

- **Proof of Work (PoW):**
 - Miners solve complex puzzles to validate transactions.
 - Example: Bitcoin.
 - **Proof of Stake (PoS):**
 - Validators are chosen based on their stake in the network.
 - Example: Ethereum 2.0.
 - **Delegated Proof of Stake (DPoS), Proof of Authority (PoA), etc.**
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Common Blockchain Use Cases

1. **Cryptocurrency:**
 - Digital currencies like Bitcoin and Ethereum.
 2. **Supply Chain Management:**
 - Track goods from origin to delivery.
 3. **Healthcare:**
 - Secure and transparent patient records.
 4. **Voting Systems:**
 - Ensure transparency and prevent fraud in elections.
 5. **Smart Contracts:**
 - Self-executing contracts with terms written in code.
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Conclusion

Blockchain is a revolutionary technology with applications beyond cryptocurrency. By decentralizing data and enhancing security, it has the potential to transform industries ranging from finance to healthcare. Understanding its core concepts, types, and applications is crucial for anyone looking to leverage this technology.

Day 1 Notes

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