

Introduction to Block Chain

* Core Components of Block Chain

=> There are main Four component of the Block chain,

1 Distributed Ledger:

Distributed Ledger is the foundation of Block chain.

It is a digital record of transaction that is shared, replicated and synchronized across the multiple node in network.

It is not controlled By a single central authority and ensure transparency, immutability of the data.

2 Peer-to-Peer Networks:

The P2P network allows direct intersection between nodes without the need for central server.

Each node in the network has copy of the entire blockchain network.

This decentralized approach enhances the system's security and resilience against failures or attack.

3 Consensus Mechanism:

Ensures that all nodes agree on the valid validity and order of transaction in network.

Protects the network from double-spending and some other attack.

Consensus Algorithms determines how quickly and effectively transaction are processed and recorded.

4 Incentive Mechanism:

Provides rewards to nodes for validating transaction and maintaining the network.

Nodes are incentivized to follow the rules, as dishonest behavior

leads to penalties.

Help Balance resource by rewarding those who contribute more to the network's security and operation.

* Features of Blockchain:

=> This are the main Features of the Block chain.

- 1 **Faster Settlement:** Block chain allows for near-instantaneous settlement of transactions for reducing the time needed for processing.
- 2 **Secure:** Block chain uses cryptographic techniques to secure the transaction and protect the data in the network.
- 3 **Decentralized:** In Block chain Network, control is distributed across the network for reducing the risk of centralized failure or manipulation.

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- 4 Consensus : Consensus protocol ensure that all nodes agree on the validity of transaction before they are record and prevent network from double-spending the attack.
- 5 Distributed : The ledger is distributed across all nodes in the network for ensuring transparency and redundancy of data or network.
- 6 Unanimous : All network participants must agree on the transaction data before it is added to the block chain network.
- 7 Immutable : Once data is added to the network, it can not be altered or deleted, that ensure permanent and unchangeable record of the transaction.

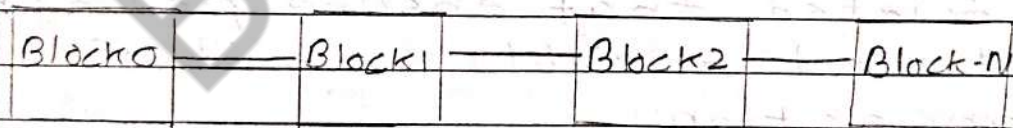
* Genesis Block:

=> The Genesis Block is the First Block of the Block chain network.

Genesis Block contain unique characteristics that is distinguish from the other Block of the Block chain network.

There is no Block, Before the Genesis Block in Blockchain

The creation of the Genesis block is mainly done by the blockchain's creator or network's agreement algorithm.



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Genesis Block

=> Characteristics:

1 No Previous Block

2 Fixed Block Reward: Only Block that has Fixed block price.

3 Unique Block Hash :

4 Special Transaction

=> Components :

1 Block Header: The Block header contains critical information such as version, Merkle root, timestamp or more, which is required for manage the blockchain.

2 Coinbase Transaction: The Genesis Block is the first block of the block chain, so it contains first transaction which is known as Coinbase Transaction.

3 Network Parameters: Genesis Block defines,

- Difficulty Target -> How hard it is to mine subsequent block.

- Maximum Block size -> Size of all the blocks in network.

- Protocol Rules: Rules and protocol of the network.

4 Embedded Message: Some Genesis Block contain message for mark significant historical or contextual events.

5 Genesis Block Hash: The hash of the Genesis Block acts as its unique identifier and different from the other blocks in network.

6 Genesis Allocation: It identifies initial stakeholders address, who may have a important role in the early development of the Blockchain.

* Orphan Block :

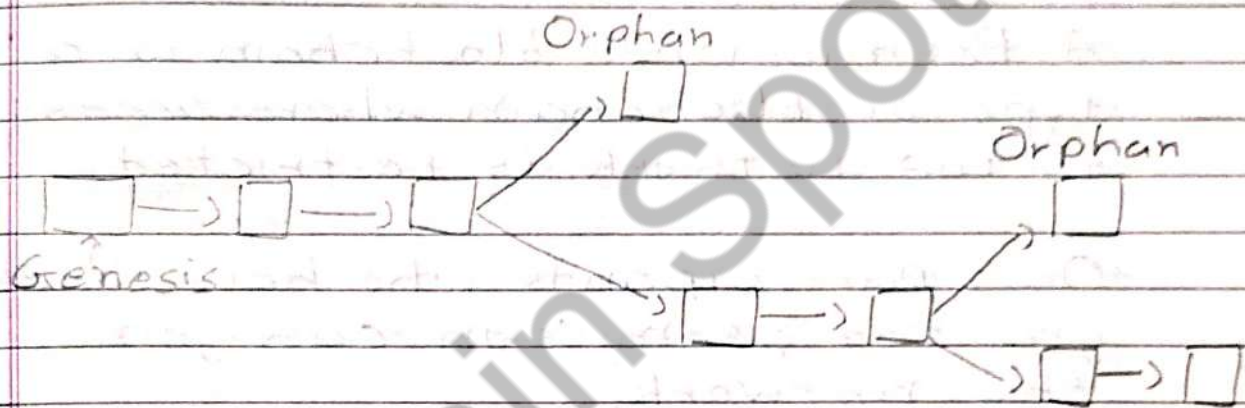
=> Blockchain serves as a transparent, distributed public ledger where all transaction made on a recorded and stores in Block.

Each block is linked to the previous one using a hash value.

There will be some blocks which

are created but Not accepted by the block chain network it is called Orphan Block.

Orphan Block are valid and verified blocks that are created but not accepted by blockchain due to a time lag for acceptance.



Orphan blocks occur when two miners produce identical blocks at the same time, where one block is accepted and one is orphaned.

Orphan Block are particularly common in bitcoin cryptocurrency networks.

Orphan block remain as detached entities within the cryptocurrency network.

* Permissioned and permission-less Model.

=> Permissioned and Permission-less blockchains are two types of blockchain network,

1 Permissioned Blockchain:

A Permissioned blockchain is a type of blockchain where access to the network is restricted,

Only participants who have been granted permission can join the network.

This Type of Blockchain often used when enterprise required more privacy and control.

=> Characteristics:

(i) Access Control: Only approved participant can access.

(ii) Governance: Central Authority can manage the network.

ciii) Privacy : Transaction are private

civ) Transparency

cv) Scalability and Performance.

2 Permission-Less Model :

A Permission-less blockchain is a type of blockchain where access to the network is public.

Any participants can join the network and execute transaction without needing approval.

⇒ Characteristics :

ci) Open Access

cii) Decentralization

ciii) Governance

civ) Scalability

* Difference between Distributed Ledger and Block chain.

=> Distributed Ledger Block Chain

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|---|---|---|
| 1 | Decentralized database which shared across multiple node. | A specific type of distributed ledger that arranges data into blocks. |
| 2 | Can be organized in various formats. | Structured in a linear sequence of block. |
| 3 | May or may not use consensus mechanism | Always uses consensus mechanism. |
| 4 | Immutability is not a built-in feature. | Immutability is the core feature. |
| 5 | Ex. Ripple's Consensus Ledger. | Ex. Bitcoin |