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Swirlds Hashgraph: A Revolutionary Consensus Algorithm for Blockchain

What is the Swirlds Hashgraph Consensus Algorithm?

The Swirlds Hashgraph consensus algorithm is an alternative to traditional blockchain consensus mechanisms like Proof-of-Work and Proof-of-Stake. It operates as a gossip network, where nodes communicate and exchange information.

Data Structure Protocol

Hashgraph uses a gossip protocol called the Directed Acyclic Graph (DAG) to record transactions. Each node maintains its own copy of the DAG, which serves as a distributed and permanent record of transactions.

Who is Swirlds?

Swirlds is a private company founded in 2015 that developed the Hashgraph consensus algorithm and the Hedera Hashgraph platform.

How Does Hashgraph Work?

Hashgraph follows these steps for consensus:

1. **Transaction Submission:** Nodes receive and broadcast transactions.
2. **Gossip:** Nodes randomly communicate with each other, exchanging timestamps and transaction information.
3. **Event Ordering:** Nodes build consensus on the order of events (transactions).

4. **Virtual Voting:** Nodes "vote" on events by exchanging gossip.
5. **Consensus:** When a quorum of nodes agree on the order of events, consensus is reached.

Best Consensus Algorithm in Blockchain?

There is no definitive answer to which consensus algorithm is the best. However, Hashgraph offers several advantages over traditional mechanisms:

- **High Throughput:** Can handle millions of transactions per second.
- **Low Latency:** Transactions are confirmed quickly, typically within seconds.
- **Fairness:** All nodes have an equal voice in consensus.
- **Fault Tolerance:** The network can continue to operate even if some nodes fail.

Drawbacks of Hashgraph

- **Centralization:** Hedera Hashgraph is a permissioned network controlled by a group of governing council members.
- **Not Open-Source:** The Hashgraph consensus algorithm is not available as open-source software.

Hashgraph vs. Blockchain

- Hashgraph uses a gossip-based DAG, while blockchain uses a linked list of blocks.
- Hashgraph achieves consensus through virtual voting, while blockchain relies on mining or staking.
- Hashgraph is designed for high-throughput applications, while blockchain is more suited for applications requiring security and immutability.

Programming Language

Hedera Hashgraph uses the Solidity programming language, which is also used by Ethereum.

Consensus in Hashgraph

Consensus is achieved when a quorum of nodes agree on the order of events. A quorum is typically 2/3 of the active nodes in the network.

Crypto Based on Hashgraph

Hedera Hashgraph (HBAR) is the native cryptocurrency of the Hedera Hashgraph platform.

Immutability

Hashgraph is not immutable in the same way as blockchain. While transactions are recorded in the DAG and cannot be altered, the DAG itself can be modified if there is a consensus to do so.

Difference between Hashgraph and Ethereum

- Hashgraph is a gossip network based on DAG, while Ethereum is a blockchain based on a linked list.
- Hashgraph uses virtual voting for consensus, while Ethereum uses Proof-of-Work or Proof-of-Stake.
- Hashgraph is designed for high-throughput applications, while Ethereum is known for security and smart contracts.

Most Advanced Blockchain

The concept of "most advanced blockchain" is subjective. Hedera Hashgraph is among the most advanced blockchain platforms in terms of throughput, latency, and fairness.

Fastest Blockchain Consensus

Hashgraph is one of the fastest blockchain consensus mechanisms, with the ability to confirm transactions within seconds.

Types of Blockchain Consensus

The three main types of blockchain consensus are:

- Proof-of-Work (e.g., Bitcoin)
- Proof-of-Stake (e.g., Ethereum 2.0)
- Byzantine Fault Tolerance (e.g., Ripple)

Hashgraph Users

Hashgraph is used by various organizations, including Boeing, Airbus, and IBM.

Difference between Hedera and Hashgraph

Hedera Hashgraph is a public distributed ledger platform that uses the Hashgraph consensus algorithm. Hashgraph is the underlying technology for Hedera Hashgraph.

Why Hedera is So Good

Hedera Hashgraph is highly efficient, secure, and scalable, making it suitable for high-throughput applications.

Consensus Algorithm for Ripple

Ripple uses the Byzantine Fault Tolerance consensus algorithm.
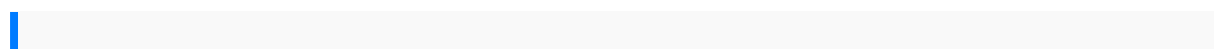
Consensus Algorithm for Ethereum

Ethereum currently uses the Proof-of-Work consensus algorithm, but is transitioning to Proof-of-Stake.

Consensus Algorithm for Cardano

Cardano uses the Ouroboros consensus algorithm, which is a Proof-of-Stake algorithm.

Consensus Algorithm for Zcash

Zcash uses the Equihash Proof-of-Work consensus algorithm.

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