

Ensuring Block Production in a 6-Node IBFT Hyperledger Besu Network: What Happens When a Node Goes Offline?

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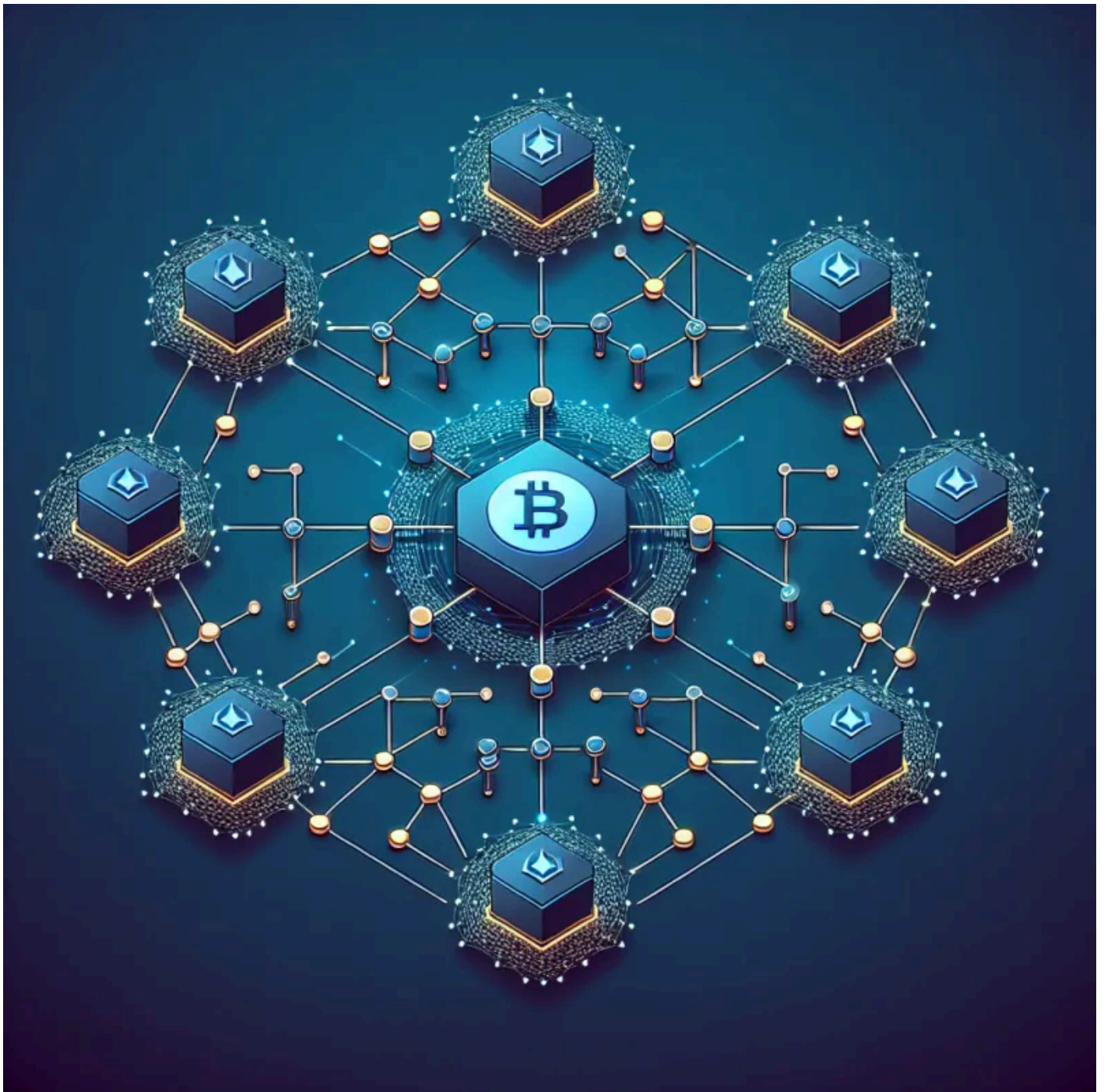


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Introduction

Hyperledger Besu is a popular Ethereum client that supports the Istanbul Byzantine Fault Tolerance (IBFT) consensus protocol. IBFT is designed for permissioned blockchain networks, offering strong guarantees of finality and resilience against node failures. But what happens to block production if a validator node goes offline in a 6-node IBFT network? This article explains the behavior of Hyperledger Besu's IBFT consensus in such scenarios, including startup requirements and ongoing fault tolerance.

Startup Requirements: All Validators Must Be Online

When you start the first node in a 6-node IBFT network, it expects to see 5 peers—one for each of the other validators. This is by design: IBFT requires all validators to be present and connected at startup to establish the initial consensus and begin producing blocks. If some validators are missing at this stage, block production will not start.

What Happens When a Node Goes Offline?

After the network is running and blocks are being produced, IBFT's resilience comes into play. The protocol can tolerate up to one-third of its validators being offline or faulty. In a 6-validator network, this means up to two nodes can be offline before the network stalls.

- **Block production continues:** If only one node goes offline, the remaining five validators can still reach the required super-majority (at least two-thirds) signatures to finalize new blocks. The network remains fully operational.
- **Block production stops if too many go offline:** If three or more validators are offline, consensus cannot be reached, and block creation halts until enough validators return.

Summary Table: Block Production in a 6-Node IBFT Network

Validators Online	Block Production?
6	Yes
5	Yes
4	Yes
3 or fewer	No

Key Points to Remember

- At startup, all validators must be online and peered for block production to begin.
- After startup, the network continues to create blocks as long as at least four validators (two-thirds) are online in a 6-node IBFT network.
- If only one node goes offline, block production is unaffected. If three or more go offline, block production stops until enough validators are back online.

Citations

- Hyperledger Besu Documentation: <https://besu.hyperledger.org/en/stable/>
- IBFT 2.0 Consensus Protocol: <https://besu.hyperledger.org/en/stable/Concepts/Consensus-Protocols/IBFT/>
- Ethereum IBFT Specification: <https://eips.ethereum.org/EIPS/eip-650>

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