

QBFT vs. IBFT: A Besu Consensus Comparison

Unveiling QBFT's Superiority in Besu

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Agenda

- Consensus Algorithms in Besu
- IBFT
- QBFT
- Comparative Analysis
- Production environment
- Performance Testing - how to?
- Conclusions

Consensus Algorithms in Besu

Consensus is a set of rules and protocols that helps blockchain nodes agree on the validity of transactions and the order in which they are added to the blockchain.

- Proof of Stake
- Clique
- Ethash (PoW)
- IBFT 2.0
- QBFT

IBFT 2.0

- Inherits PBFT's three-phase consensus mechanism: pre-prepare, prepare, and commit
- High Byzantine Fault Tolerance
- Fast Finality
- Chain Reorganisation Prevention
- Round-Based Consensus
- Leader Rotation
- Efficiency
- Secure and reliable



QBFT

Prominent enterprise consensus: QBFT, an enhanced version of IBFT, designed for private networks in collaboration with ConsenSys and JP Morgan.

- Byzantine Fault Tolerance
- Fast Finality
- Permissioned Network
- Chain Reorganization Prevention
- **Practical for Enterprise Use**
- Improved Security
- **Efficient Consensus**
- Enhanced for Ethereum
- Consensus Algorithm Choice

QBFT: The Efficient Consensus

- **Optimized for Enterprise Use** - focusing on performance and efficiency
- **Reduced Communication Overhead** - minimizes network traffic and reduces latency
- **Faster Block Proposal and Verification** - can reach consensus on a new block with fewer steps compared to IBFT
- **Ethereum Compatibility** - ensures a seamless integration of smart contracts and tools from the Ethereum ecosystem
- **Resilience to Sybil Attacks** - helps ensure the integrity of the consensus process

Comparative Analysis

Aspect	IBFT	QBFT
Performance	Fast finality, but may involve more communication rounds	Fast finality with reduced communication overhead
Block Proposal & Verification	May involve more steps and complexity in the consensus process	Streamlined block proposal and verification process, resulting in quicker transaction throughput
Ethereum Compatibility	Not optimized	Enabling seamless integration with Ethereum tools and smart contracts
Security	Provides strong security and fault tolerance	Enhanced security features, making it more resilient to Sybil attacks and other threats
Network Type	Works well in networks with known and trusted participants	Ideal for networks with known participants and high-security requirements
Enterprise Suitability	Suitable for private and consortium blockchains	Optimized for enterprise use cases

Minimum Production Environment

What is needed to run a QBFT/IBFT production environment?

- Besu 4 nodes network - 4VMs each 4CPUs and 8GB RAM
- Chainlens, Grafana, Prometheus - better observation of nodes metrics

Performance

How to do it?

1. Chose test data - Choose several workloads (ERC-20, ERC-1155, MarkerDAO etc.) that will be submitted to network
2. Find the right tool to stress Mempool - Hyperledger Caliper / design your own small project using Web3J
 3. Set up a goal - find the max ups, throughput, etc.
 4. See the results and get the conclusions.

Performance experiments - Observations

Depends by the environment!

Observations from Mentorship Program related to performance:

- For both QBFT and IBFT no matter how much gas was set for the block, they were filled only up to 25M.
- MarkerDAO workload has the max TPS on average (156.35).
- For fresh networks even in TPS results on QBFT are similar to the IBFT results, difference can be spotted only in big environments.

Conclusions

- QBFT streamlines operations, providing high efficiency for handling enterprise-level transaction volumes.
- QBFT's compatibility with Ethereum simplifies the integration of essential tools and smart contracts, saving enterprises time and effort.
 - QBFT's enhanced security and focus on enterprise use make it a simplifies the integration of essential tools and smart contracts, saving enterprises time and effort

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