



QuarkChain - A High-Capacity Peer-to-Peer Transactional System

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Blockchain Scalability Problem

- Low transaction per second of Blockchain compared to its centralized counterpart
- Bitcoin ~ 3 TPS, Ethereum ~ 10 TPS
- VISA 56,000 TPS (Aug. 2014)
- Alipay 120,000 TPS (Nov. 2016)



Solution 1: Multiple Blockchains

- Multiple blockchains run independently (Bitcoin, Litecoin, BCH, Ethereum)
- Limited cross-chain transactions
- Maintain multiple accounts/addresses on different blockchains



Solution 2: Lightning Network

- Offload on-chain transactions to off-chain
- Number of off-chain transactions per second could be infinite in theory
- Generally require two transactions to create/destroy a channel
- Doesn't improve on-chain capacity



Solution 3: Sharding

- Ethereum adopts sharding to address scalability problem
- Cross-shard transactions are not supported in 1.0
- Need to manage multiple accounts in different shards



QuarkChain - Design for Scalability from Beginning

- Support 1,000,000+ on-chain transactions per second
- Trustless
- Smart contract




Two-Layered Blockchains

- QuarkChain consists of two layers of blockchains
- First layer contains elastic sharding blockchains
- Second layer is a root blockchain that confirms the blocks from sharded blockchains
- Support adding more shards in active network



Collaborative Mining (or Minting)

- Design incentives from game-theoretic perspective
- Hash powers are incentivized to distribute evenly among shards
- Prevent double spending: Requires 25%-40+% percentage of overall hash power regardless the number of shards



Cross-Shard Transactions as First-Class Citizen

- Cross-shard transactions can be issued at any time
- Cross-shard transactions can be confirmed in minutes
- Scalable: the TPS of cross-shard transactions increases linearly as the number of shards increases



Simple Account Management

- One account for all shards
- Smart wallet - a user doesn't be aware of sharding



Scale Horizontally

- A super-full node can be extremely expensive when TPS goes high
- Enable running a cluster of honest nodes as a super-full node



Summary

- Two-layered blockchains
- Collaborative mining
- Cross-shard transactions as first-class citizen
- Simple Account Management
- Scale Horizontally



Competitor Comparison: LightChain

- ICO in Jan. 2018 with 50,000 ETH (50% tokens)
- TPS target: 100,000 TPS
- Cross-shard transaction: Not supported
- Sub chain and main chain synchronization: 1 hour, 6 hours, or 1 day