



## Next Generation Blockchains

### What is Blockchain Technology?

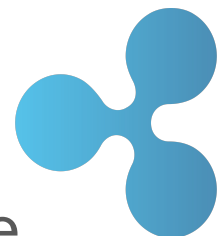
Blockchain is a distributed ledger that uses mechanism design to ensure correct functioning. Unlike the Visa Network or centralized banking systems, a blockchain is maintained by a decentralized network of nodes.

Instead of using a central authority, it incentivizes participants to run and secure the underlying consensus protocol. Thus, it becomes crucial to ensure that the nodes that maintain the ledger are appropriately incentivized in order to prevent them from behaving maliciously.



### Blockchain Scalability

Although cryptocurrencies like Bitcoin and Ethereum are quite popular today, they still lag behind centralized payment systems like Visa in terms of transaction rates and time to finality. As of March 2021, Bitcoin and Ethereum process an average of 3-4 and 10 transactions per second (TPS), respectively. In contrast, Visa handled a reported 1,700 TPS. For a cryptocurrency to be adopted universally, it must be able to scale to process transactions at much higher throughput, i.e., TPS rate.



#### Mneme

A distributed ledger designed for mobile devices that uses Proof-of-Context (based on geographical location) instead of Proof-of-Work [1]

#### ASHWACHain



A committee-based blockchain protocol that offers 100x better performance than Bitcoin [2]

### Game Theoretic Issues in Blockchains

In a blockchain protocol, each node must be incentivized to act honestly. To ensure that not only the network of nodes as a whole is provided enough incentives, but each node in the network should also be provided the correct incentive. Hence, the blockchain protocol must be fair to the participants.

#### Fairness

Our research indicates that existing blockchain protocols will not remain fair at higher throughputs. [3]

We also proposed a protocol, BitcoinF for fair processing of transactions in Bitcoin. [4]

#### Reward Schemes

Our research suggests that any blockchain protocol should rely on block rewards instead of transaction fees to reward miners to keep them faithful. (Unlike Bitcoin, which plans to go to a Transaction Fee-Only Model). [5]

3. We might walk together, but I run faster: Network Fairness and Scalability in Blockchains. Anurag Jain, Shoeb Siddiqui, Sujit Gujar. AAMAS '21
4. BitcoinF: Achieving Fairness for Bitcoin in Transaction-Fee-Only Model. Shoeb Siddiqui, Ganesh Vanahalli, Sujit Gujar. AAMAS '20
5. Block Rewards, Not Transaction Fees Keep Miners Faithful In Blockchain Protocols. Anurag Jain, Sujit Gujar. GTIB@WINE 2020

#### Research Paradox

Blockchain is a field where practice seems to be ahead of the theory, researchers are beginning to realize various limitations and issues in existing blockchain protocols. We at MLL, are actively working on few of the major challenges in blockchains: Blockchain Scalability and Game Theoretic Issues in Blockchain



#### Our Publications

1. Towards Mobile Distributed Ledgers, Dimitris Chatzopoulos, Anurag Jain, Sujit Gujar, Boi Faltings, Pan Hui. arXiv preprint arXiv:2101.04825, 2021
2. ASHWACHain: A Fast, Scalable and Strategy-proof Committee-based Blockchain Protocol. Sanidhay Arora, Anurag Jain, Sankarshan Damle, Sujit Gujar. GTIB@WINE 2020