

Scalability: One Of The Main Challenges Of a Blockchain



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Introduction

Blockchain is a distributed peer-to-peer network, which is connected using nodes throughout the globe. Each node has a transactions ledger, which maintains the whole record of transactions. In blockchain data is stored electronically in digital format which is amazing. A database ordinarily stores its data in tables, whereas in blockchain data is stored in chunks as referred by its name blocks. They are **better for maintaining secure and decentralized transactions** because in blockchain blocks are connected as a single network. In blockchain transactions can be done between two parties without the involvement of a third party, which means one can maintain their own money without depending on others. Bitcoin is one of application of blockchain, where bitcoin goes through many confirmations on the blockchain before it is cleared because the unconfirmed transaction can be reversed or crypto-currency can be spend twice. Average confirmation time on bitcoin network for a BTC payment is about 10 minutes, which seriously needs be scaled for real-time applications.

Proposed System

It's very challenging to keep user's attention, if response is not returned within 10 seconds for any real-time application. There are few ways with which bitcoin transactions can be scaled like by increasing transaction fees and by using Lightning network, which adds another layer that is micro payments which are cheap and faster aiming to solve scaling issues.

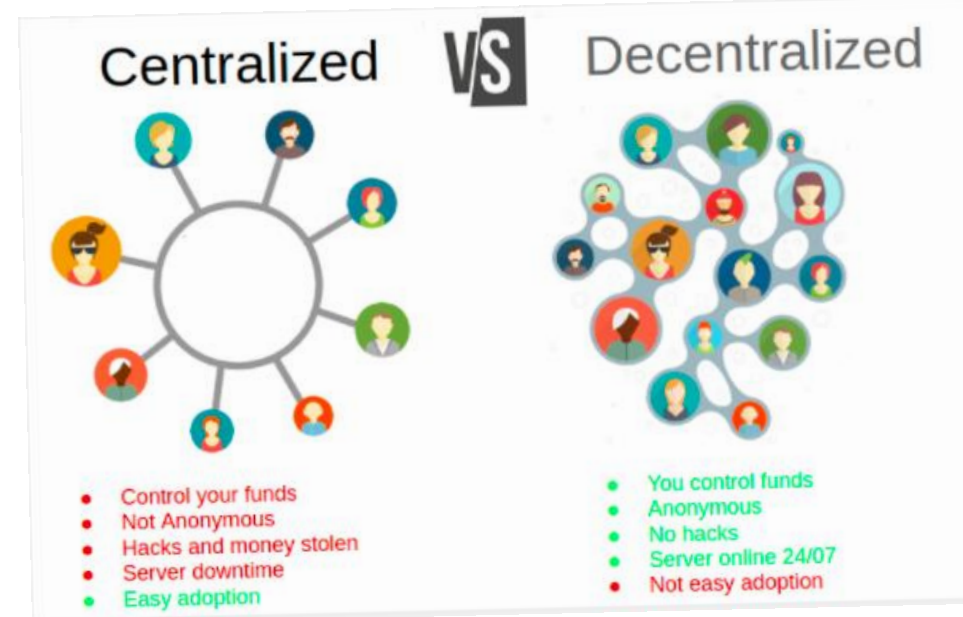
Other blockchain applications which are good alternate for bitcoin are Ethereum and litecoin, which are also know for faster confirmation after any transfer. Below table depicts few blockchain applications with respect the TPS (Transaction per sec)

Applications	TPS
Bitcoin (BTC)	7
Ethereum (Eth)	15 - 45
Solana (SOL)	50000
Cardano (ADA)	250
Shiba Inu (SHIB)	13
Dogecoin (DOGE)	33
Polygon (MATIC)	65000
Polka Dot	166

Centralized vs Decentralized DB:

It's often debated to use centralized db rather than going with decentralized data which solve scaling issue massively, as central validator has enormous power.

Centralized vs De-Centralized



Above figure depicts Centralized vs Decentralized along with the advantage and disadvantage of using them. By looking at the figure, it's clear that de-centralized has overwhelming advantages over centralized solution.

In order to solve scalable issue, is it worth taking risk to damage decentralization and security by adopting centralized solution? since, blockchain is designed and developed keeping them as key-factors to achieve robust and secure transaction over distributed peer-to-peer network.

Various Blockchain scalability solutions:

Layer 1 scalable solution:

This layer enhances the blockchain attributes like increase block size limit and decrease verification time. Apart from that there are other alternate methods like Sharding, segregated witness, Hard forks.

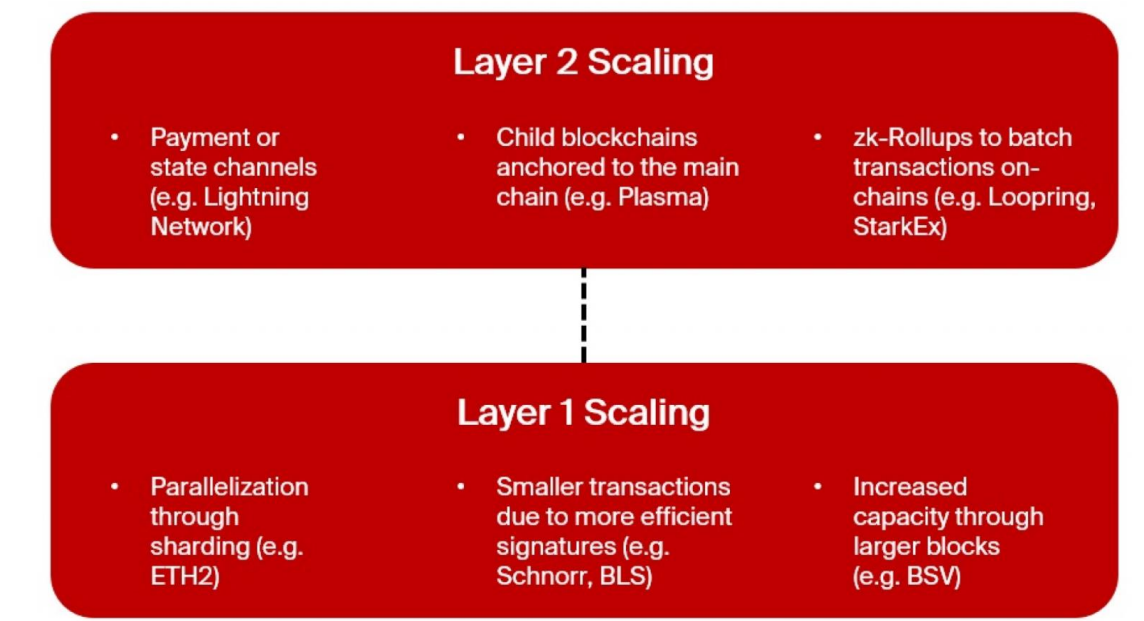
1. Sharding: This is one of the best way to scaling technique used widely in may Databases. It break down blockchain network into smaller and more manageable chunks called shards. Sharding removes the need of performance of a node to achieve quicker and much efficient transaction throughput.

2. Segregated Witness(SEGWITH):

It mainly focuses mainly changing the way and structuring of data. It removes the digital signature, which free-up additional space for the addition of new transaction.

3. Hard Fork:

Is a procedure making focusing in making structural or fundamental change in blockchain network properties. It might raise the block size and decrease the time taken to create new blocks.



Layer 2 scalable solution:

State channels, Sidechain, Plasma, Lightning network.

- 1. State Channels:** It enable two way communication between off-chain transaction with blockchain network through various approach.
- 2. Sidechain:** It uses unique consensus technique, operates as a transactional chain next to the Blockchain in big batch transactions
- 3. Plasma:** Consider as Ethereum native sidechain contracts and Merkle trees to create an unlimited child chain. Childchain are replica of Ethereum with it's own consensus mechanism and basic logic
- 4. Lightning Network:** It utilize smart contract functionality through private, off-chain over main blockchain n/w.

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