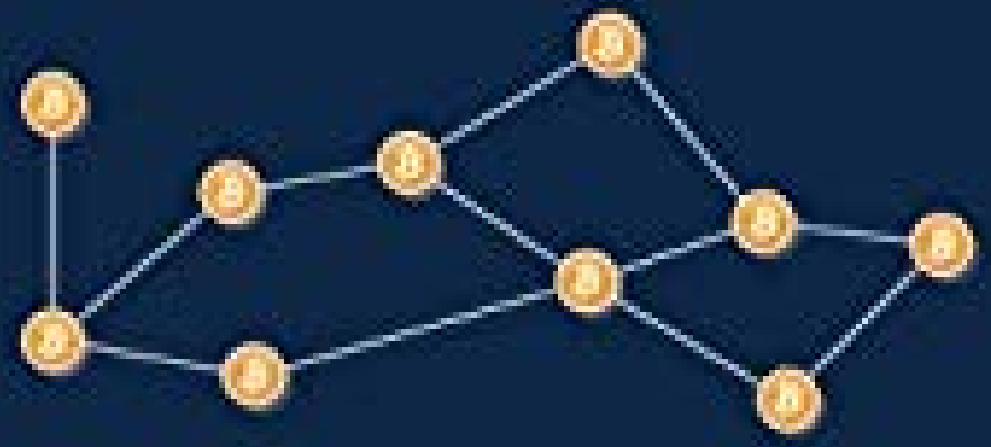
Series in Distributed Computing Volume 25

On the Scalability and Security of Bitcoin

Christian Decker



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On the Scalability and Security of Bitcoin (Distributed Computing Series) (Volume 25)

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Since its inception in past due 2008, Bitcoin has loved an instant growth, both in value and in the amount of transactions. We present PeerCensus, a subsystem that functions as a qualification authority, manages peer identities in a peer-to-peer network and does not store application specific data in the blockchain.s lifecycle - from creation to its transfer between users. It offers a public transaction history, allowing trustless auditability, and it introduces many brand-new and innovative use-cases such as smart property, micropayments, agreements, and escrow transactions for dispute mediation. Bitcoin offers cash-like transactions that are near-instantaneous and nonrefundable, while at the same time enabling truly global transactions, processed at the same velocity as local ones.However, the same features that make Bitcoin attractive for its end-users are also its main restrictions. Its decentralized nature limits the amount of transactions and the velocity at which transactions can be performed and confirmed.Bitcoin also shifts the responsibility of managing and securing money from a trusted third party to the end-consumer, which might not have the necessary tools to protect her funds. Finally, we present a prototype of a secure device that stores private keys in tamper resitant storage space and allows an individual to independently verify a payment before authorizing it. We find that Bitcoin will not level, because its synchronization mechanism, the blockchain, limitations the maximum price of transactions the network can procedure. The first novel real estate is that the deal history, in the form of the blockchain, can be public and accessible by anyone.e.Another type of scalability problem is the fact that a lot more blockchain based applications are being created, each with their own little isolated blockchain, and susceptible to attacks. Its achievement is mostly due to innovative usage of a peer-to-peer network to implement all aspects of a currency' Using PeerCensus, a variety of applications can share a single blockchain, decoupling confirmations from block generation rate and improving Bitcoin and equivalent systems with strong consistency.Being a fairly new technology, Bitcoin includes a amount of new security issues and innovative properties. We evaluate these properties and challenges in the second area of the thesis. In order to address the scalability issue we propose Duplex Micropayment Stations, which raise the rate of which Bitcoin transfers can be performed by several orders of magnitude, by moving the transfers off the blockchain and using the blockchain solely for dispute mediation. Making use of the open nature of the blockchain, we were able to dispell promises by MtGox, after the globe's largest Bitcoin exchange, that a bug in the Bitcoin protocol was used in a large scale strike to defraud them. We after that utilize the blockchain to build a prototype of an audit process that allows a fiduciary, such as a Bitcoin exchange, to show that its property cover its liabilities, without resorting to trusted third celebrations. The issue with the sluggish confirmations can be compounded with the semantics of the confirmations which are not final, requiring multiple confirmations and further delaying acceptance of a transaction. We show how a merchant may accept fast-obligations, i. , transactions without waiting for confirmations, with reasonable secure deposit against doublespending attacks by observing how transactions propagate in the network.In the initial part of this book we analyze if the current Bitcoin protocol scales and what the scalability limits are.

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