Blockchain
General Overview.

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PUBLIC

SAP Run Simple

INNOVATION CENTER NETWORK

Agenda

Blockchain Terminology

- Decentralizing Trust

Cryptocurrencies

- Cryptography and Consensus

Architecture

- Applications and Tradeoffs

Business Point of View

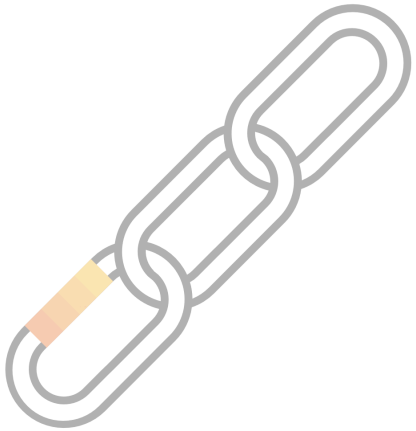
- Values Drivers and Caveats

Blockchain terms demystified

Bitcoin

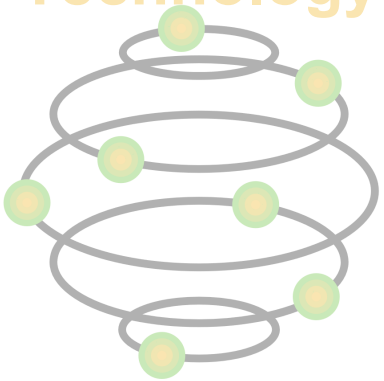
Cryptocurrency; encryption techniques are used to verify the transfer of funds; operating independently of a (central) bank.

Blockchain



Architectural concept that enables the decentralized, secure, direct, digital transfer of values and assets.

Distributed Ledger Technology



Distributed ledger; consensus of replicated, shared digital data spread across multiple sites, countries, or institutions. No central administrator or centralized data storage.

What is Blockchain technology?

Blockchain is the underlying technology of **Bitcoin** (2008)

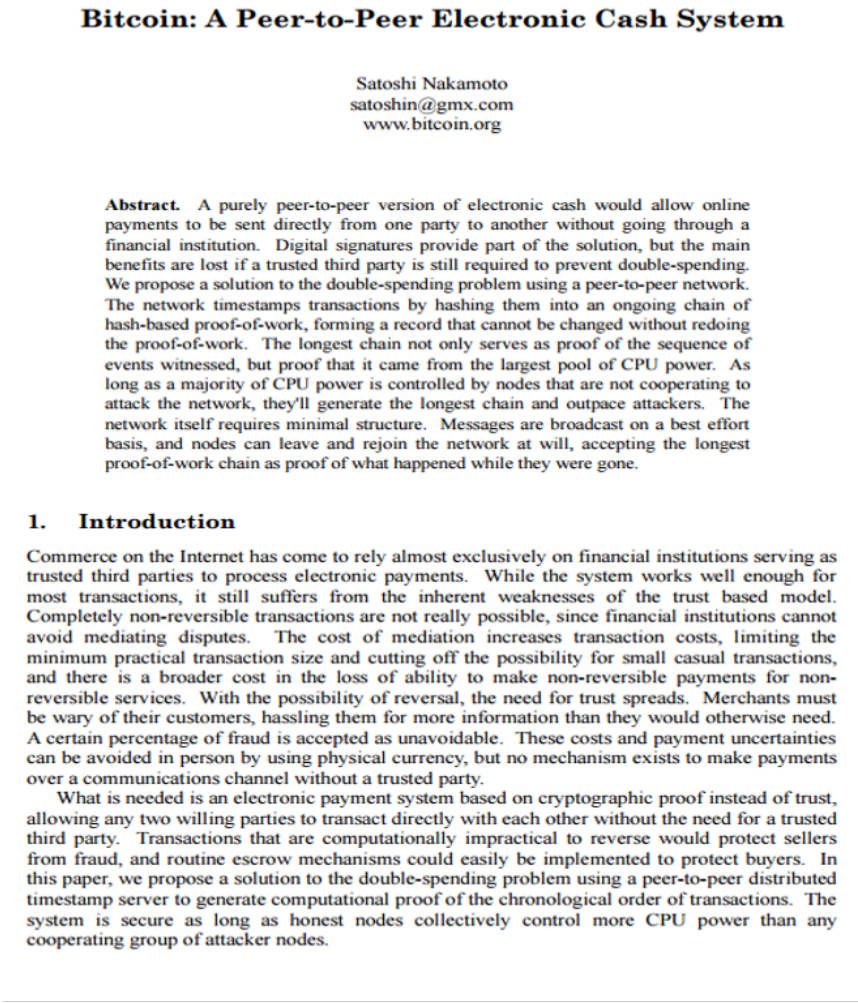
Composition of **existing technologies**

- Decentralized peer-to-peer technology
- Private/public key encryption
- Hashing algorithms

and **economic incentives**

- Rewards/penalties

Broader definition: Distributed ledger of an immutable chain of blocks of tamper-proof transactions



Bitcoin: A Peer-to-Peer Electronic Cash System

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Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. The longest chain not only serves as proof of the sequence of events witnessed, but proof that it came from the largest pool of CPU power. As long as a majority of CPU power is controlled by nodes that are not cooperating to attack the network, they'll generate the longest chain and outpace attackers. The network itself requires minimal structure. Messages are broadcast on a best effort basis, and nodes can leave and rejoin the network at will, accepting the longest proof-of-work chain as proof of what happened while they were gone.

1. Introduction

Commerce on the Internet has come to rely almost exclusively on financial institutions serving as trusted third parties to process electronic payments. While the system works well enough for most transactions, it still suffers from the inherent weaknesses of the trust based model. Completely non-reversible transactions are not really possible, since financial institutions cannot avoid mediating disputes. The cost of mediation increases transaction costs, limiting the minimum practical transaction size and cutting off the possibility for small casual transactions, and there is a broader cost in the loss of ability to make non-reversible payments for non-reversible services. With the possibility of reversal, the need for trust spreads. Merchants must be wary of their customers, hassling them for more information than they would otherwise need. A certain percentage of fraud is accepted as unavoidable. These costs and payment uncertainties can be avoided in person by using physical currency, but no mechanism exists to make payments over a communications channel without a trusted party.

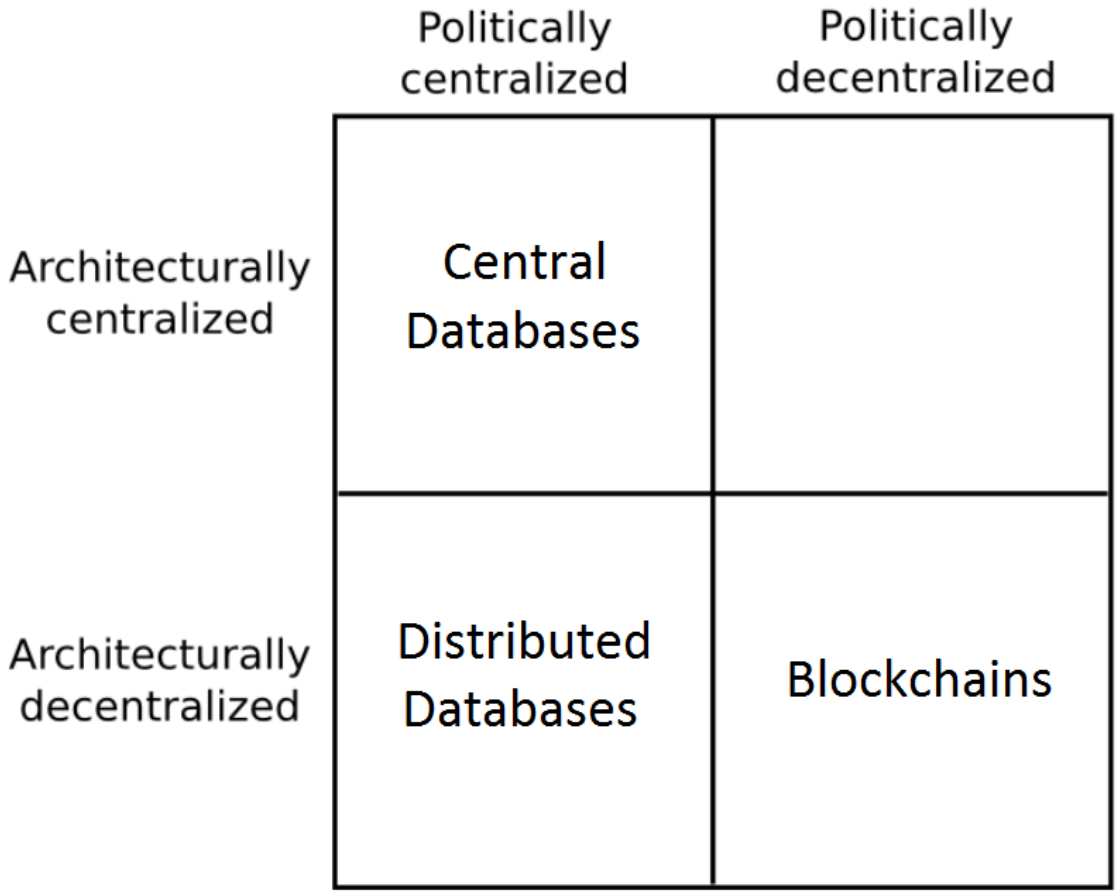
What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party. Transactions that are computationally impractical to reverse would protect sellers from fraud, and routine escrow mechanisms could easily be implemented to protect buyers. In this paper, we propose a solution to the double-spending problem using a peer-to-peer distributed timestamp server to generate computational proof of the chronological order of transactions. The system is secure as long as honest nodes collectively control more CPU power than any cooperating group of attacker nodes.

Cryptoeconomics and decentralization

Cryptoeconomics: Cryptography and economic incentives to achieve information security goals

- **Cryptography** can prove properties about what happened **in the past**
- **Economic incentives** defined inside a system can encourage desired properties to hold **into the future**

Decentralization adds fault tolerance and security



Source Vitalik Buterin