AN INTRODUCTION TO BITCOIN

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RWRI # 14

August 19, 2020


An introduction to Bitcoin

1. Electronic gold
2. The blockchain
3. The Bitcoin Network
4. The Byzantine Generals Problem
5. Bitcoin addresses
6. Monetary Theory
7. Why bitcoin is money?
Bitcoin paper

S. Nakamoto, November 1st 2008,
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“Bitcoin: A peer-to-peer electronic cash system”
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“Bitcoin: A peer-to-peer electronic cash system”

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 transmits transactions by bundling them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without making the proof-of-work invalid. 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 will generate the longest chain and prevent attacks. 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 ruling out the possibility of small casual transactions, and there is a broader cost in the loss of ability to make non-reversible payments for non-commercial purposes.

Bitcoin offers an alternative solution. Secure, non-reversible payments can be made by anyone, anywhere in the world, with no need for a trusted third party. Transactions that are computationally impossible to reverse would protect sellers from fraud. Each transaction is verified by the network and each node, so there is no need to trust any form of central authority.
Transparency Theorem

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**Theorem**

**Transparency Theorem:** An electronic decentralized currency must rely on a public ledger.
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- The blocks are generated by “miners” that validate current transactions.
The Trust Machine

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- The mechanism of consensus: “The trust machine”.

![The Economist](image-url)
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Reaching consensus

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**The Byzantine Generals Problem.**

The situation can be described as the siege of a city by a group of generals of the Byzantine army. Communicating only by messenger, the generals must agree upon a common battle plan. However, one or more of them may be traitors who will try to confuse the others. The problem is to find an algorithm to ensure that the loyal generals will reach an agreement.
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- The problem is difficult to solve, but the solution is easy to check.
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- The miner that solves it receives an award in newly created bitcoins.
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- Public address: 14xuSZXtfGw5XqfYxEjp4crwYGYQDWmZ12
Monetary mass

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• Each bitcoin is composed by 100 million satoshis (basic unit).
Monetary inflation

Bitcoin monetary inflation tends to 0
What is money?

Anything can be money

• Confidence to be able to spend it in the future keeping its value.
• Good money is backed by universally recognized structures:
  1. Fiat money is backed by the state and central banks.
  2. Gold is backed by its physical properties.
  3. Bitcoin is backed by mathematics and the computation power of the network.
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- Good money is not volatile.
Bitcoin volatility

Bitcoin exchange rate volatility is high but decreases over time

![Bitcoin Year Volatility](image-url)
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