# Introduction to Blockchain

## Lecture 2: Bitcoin and Cryptocurrency

Ras Dwivedi

Indian Institute of Technology Kanpur

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# Outline


1. Recap
2. Hash Functions
3. Digital Signature
4. Cryptocurrency

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**What could we do now?**

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- it is impossible to find $x_1, x_2$, such that $x_1 \neq x_2$ and $f(x_1) = f(x_2)$

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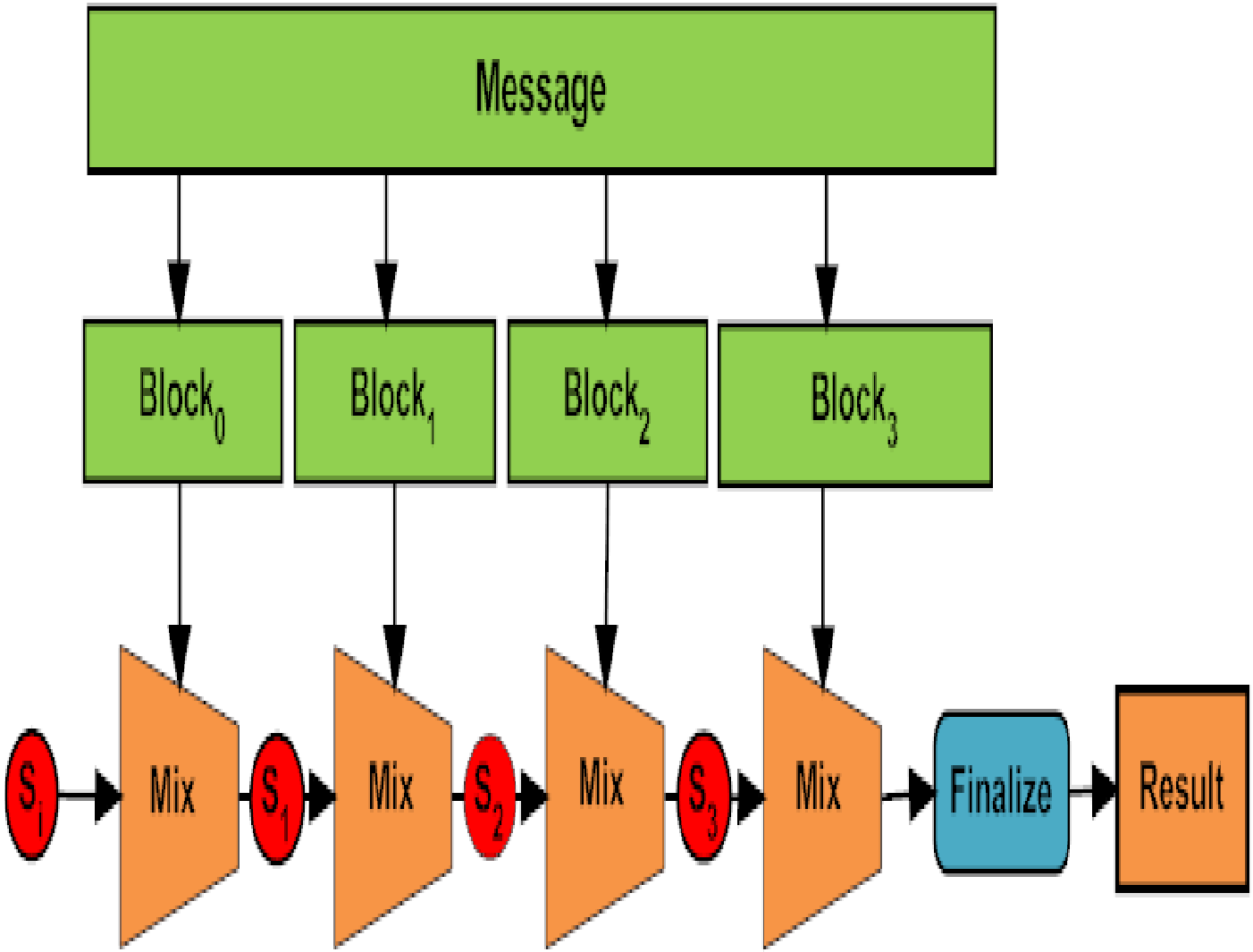


Figure: Hash Function

# Document integrity

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# Trade

Figure: Barter Trade

## Problem: Meet of Demand

# how to Meet Demand

- Medium of Exchange

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- Gold

# Meet of Demand

Figure: Coins

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Confidence of metal inside

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Problem: Difficult to carry

# Solution: Paper note


Figure: paper note

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problem: Paper alone do not have value

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Figure: PoS machine

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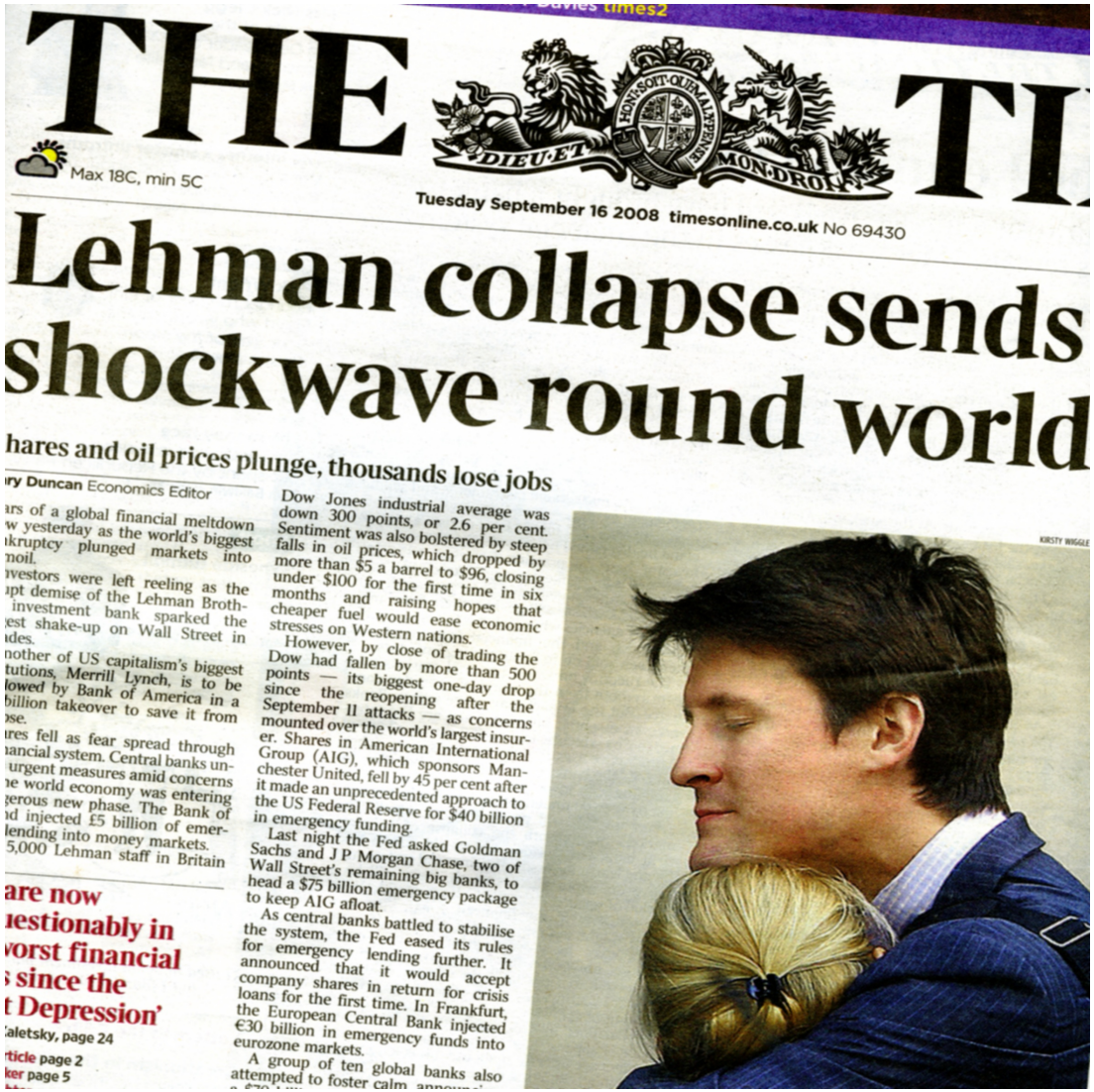
# 2008 Recession



THE TI

Max 18C, min 5C

Tuesday September 16 2008 timesonline.co.uk No 69430

## Lehman collapse sends shockwave round world

### hares and oil prices plunge, thousands lose jobs

ry Duncan Economics Editor

ars of a global financial meltdown w yesterday as the world's biggest ıkruptcy plunged markets into noil.

ıvestors were left reeling as the ıpt demise of the Lehman Broth- investment bank sparked the est shake-up on Wall Street in ades.

nother of US capitalism's biggest tutions, Merrill Lynch, is to be lowed by Bank of America in a billion takeover to save it from se.

ares fell as fear spread through ancial system. Central banks un- urgent measures amid concerns e world economy was entering gerous new phase. The Bank of d injected £5 billion of emer- lending into money markets. 5,000 Lehman staff in Britain

**are now uestionably in vorst financial since the t Depression'**

aletsky, page 24

rticle page 2
ker page 5

Dow Jones industrial average was down 300 points, or 2.6 per cent. Sentiment was also bolstered by steep falls in oil prices, which dropped by more than $5 a barrel to $96, closing under $100 for the first time in six months and raising hopes that cheaper fuel would ease economic stresses on Western nations.

However, by close of trading the Dow had fallen by more than 500 points — its biggest one-day drop since the reopening after the September 11 attacks — as concerns mounted over the world's largest insurer. Shares in American International Group (AIG), which sponsors Manchester United, fell by 45 per cent after it made an unprecedented approach to the US Federal Reserve for $40 billion in emergency funding.

Last night the Fed asked Goldman Sachs and J P Morgan Chase, two of Wall Street's remaining big banks, to head a $75 billion emergency package to keep AIG afloat.

As central banks battled to stabilise the system, the Fed eased its rules for emergency lending further. It announced that it would accept company shares in return for crisis loans for the first time. In Frankfurt, the European Central Bank injected €30 billion in emergency funds into eurozone markets.

A group of ten global banks also attempted to foster calm, announc

KIRSTY WIGGLE

Figure: Caption

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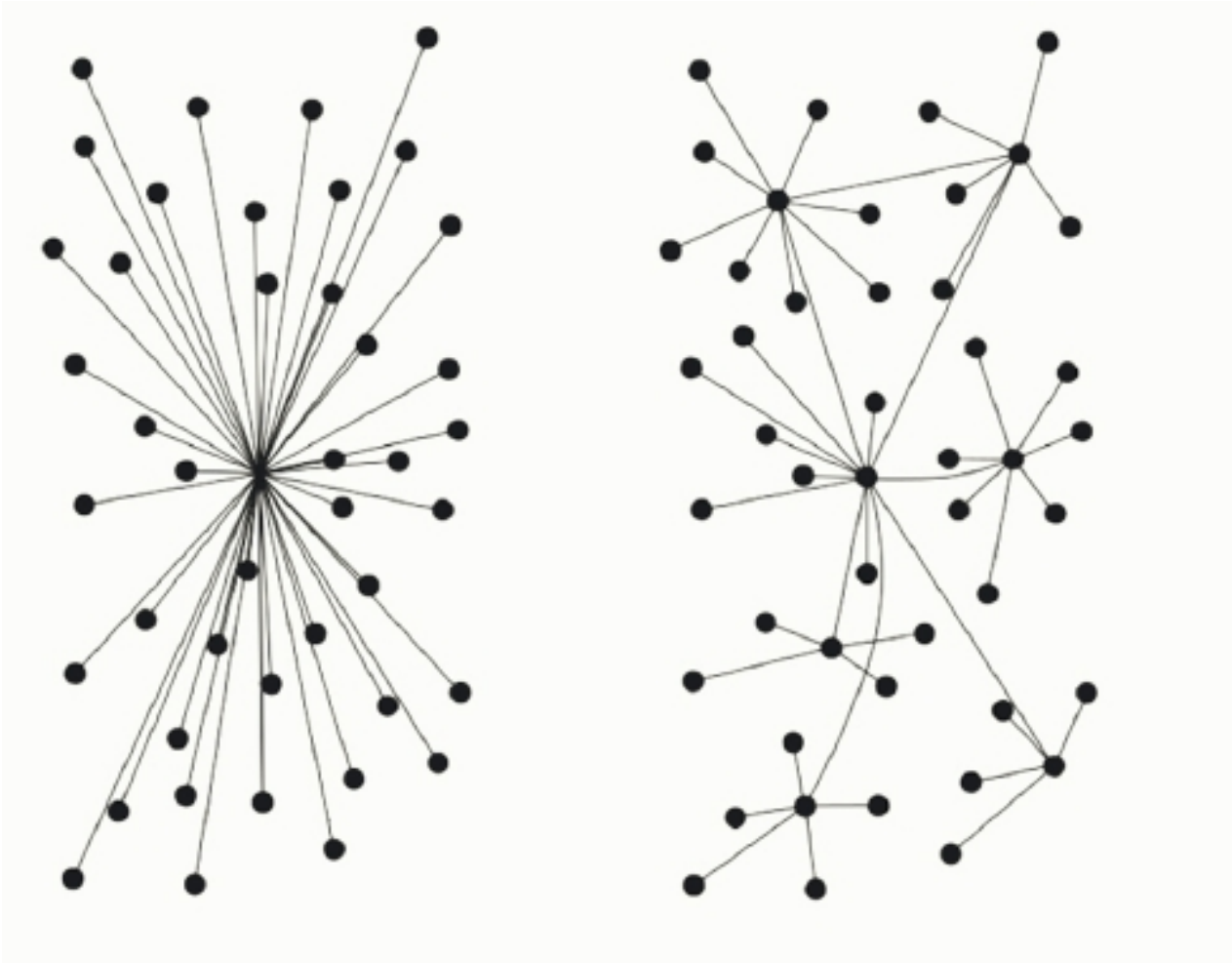

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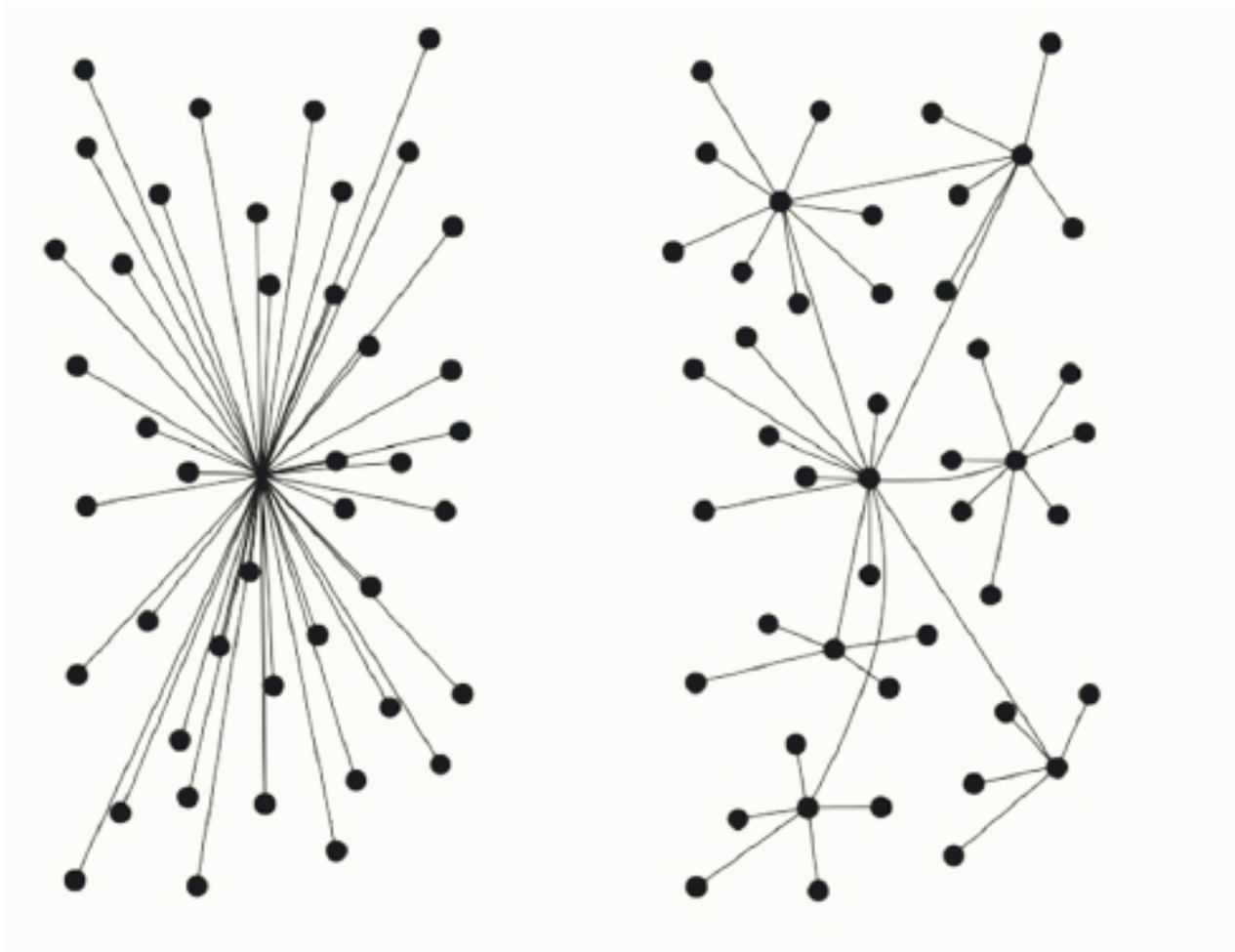

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- What are the resources available?

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- We have seen one such problem before.
- **Factoring**
- problem: how would you find such difficult problems again and again

# Proof of Work

- Limited Resource is your computation power. you cannot fake it :)
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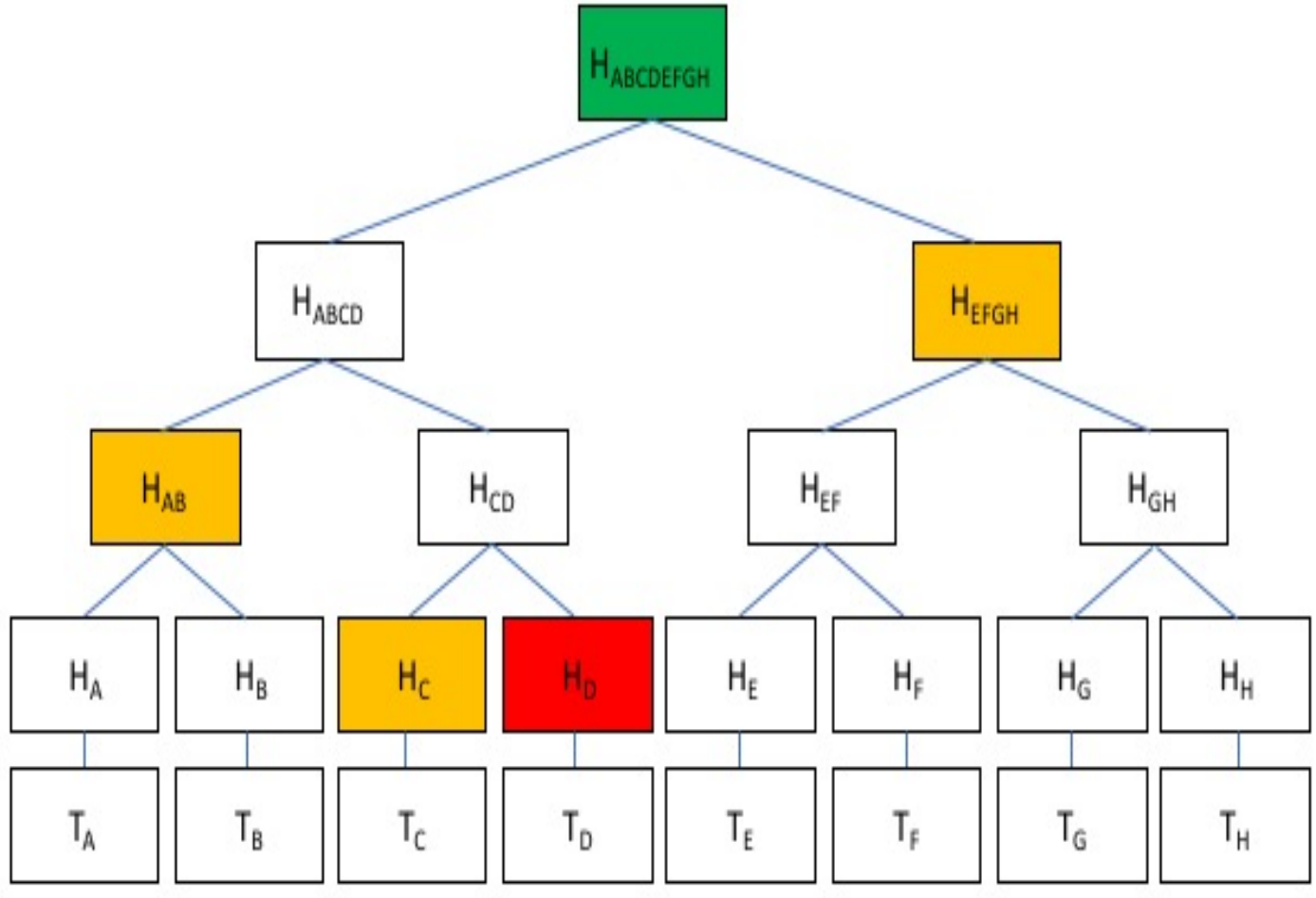
# Merkel tree

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- Gain: you once you get to this transaction, you would never need to see previous transactions to get balance of $A$

# Problem 5: Double spending

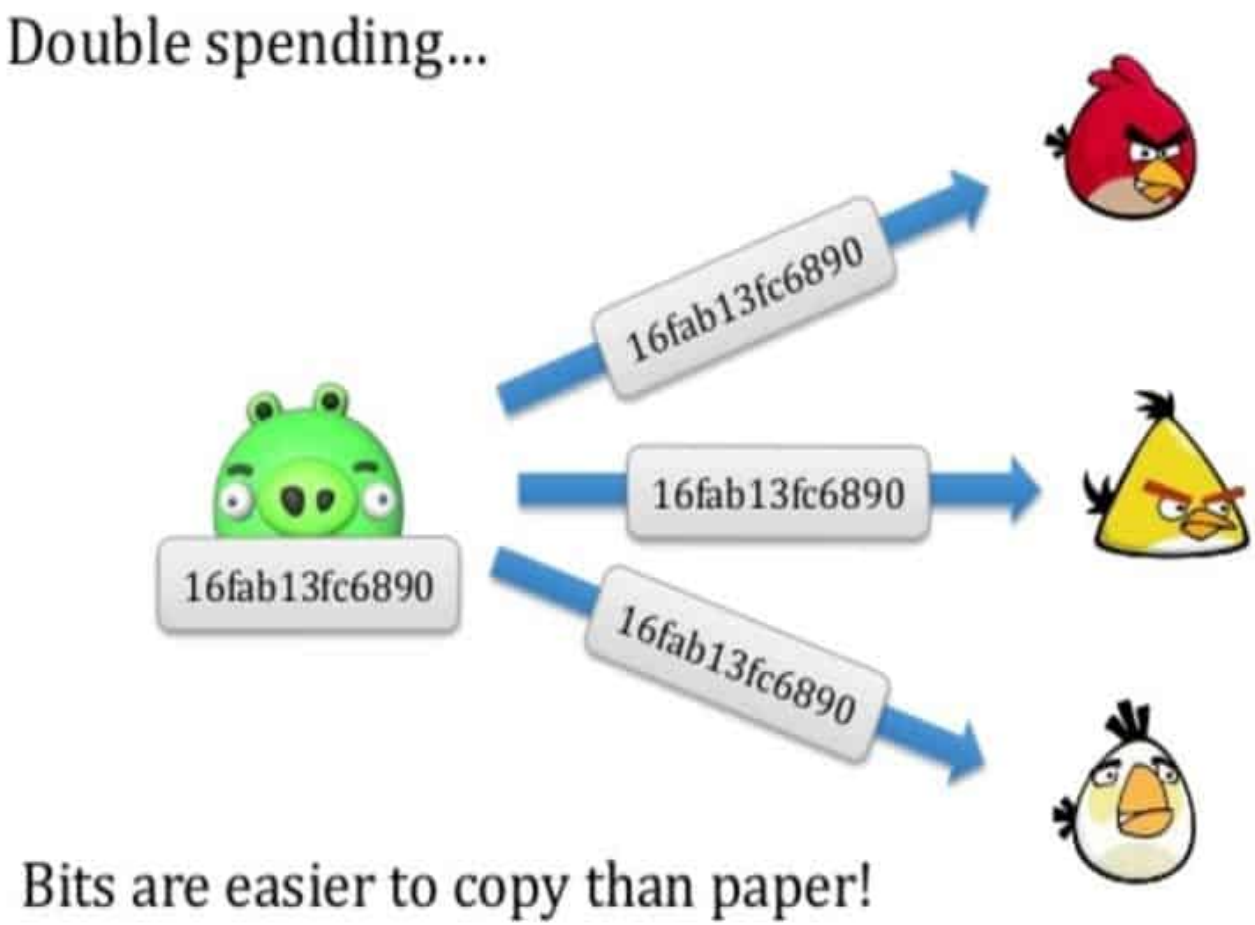


Figure: Double Spending

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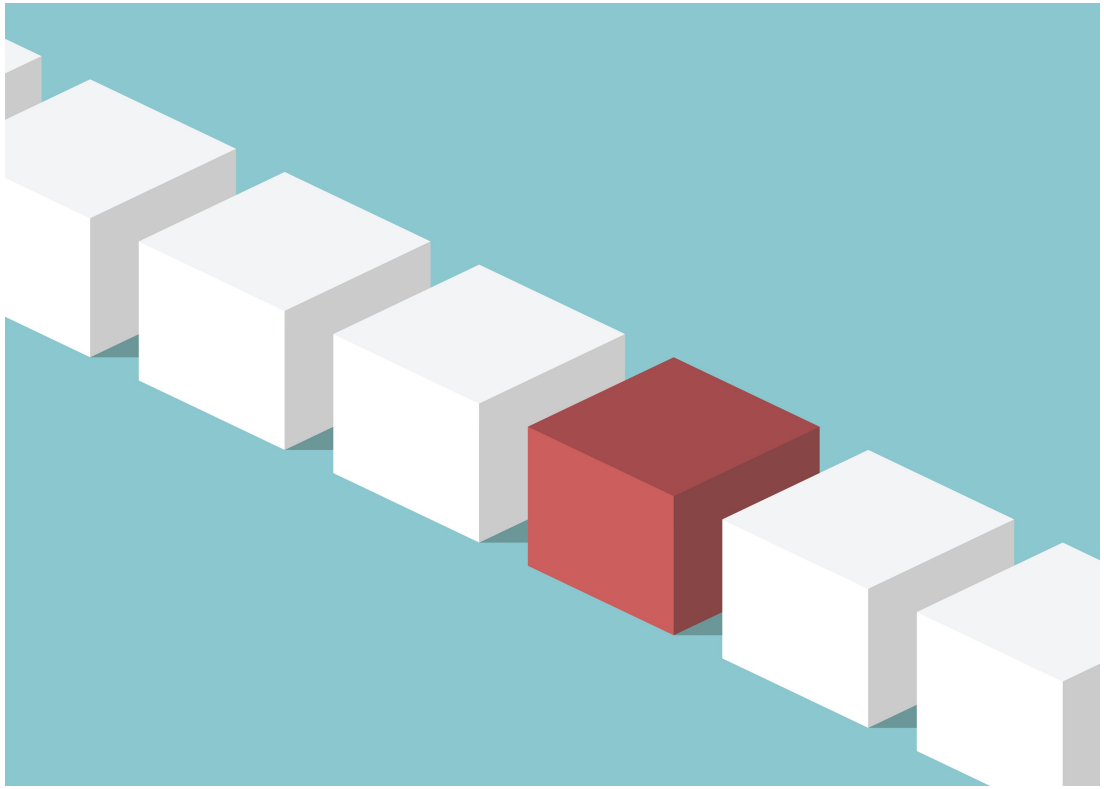

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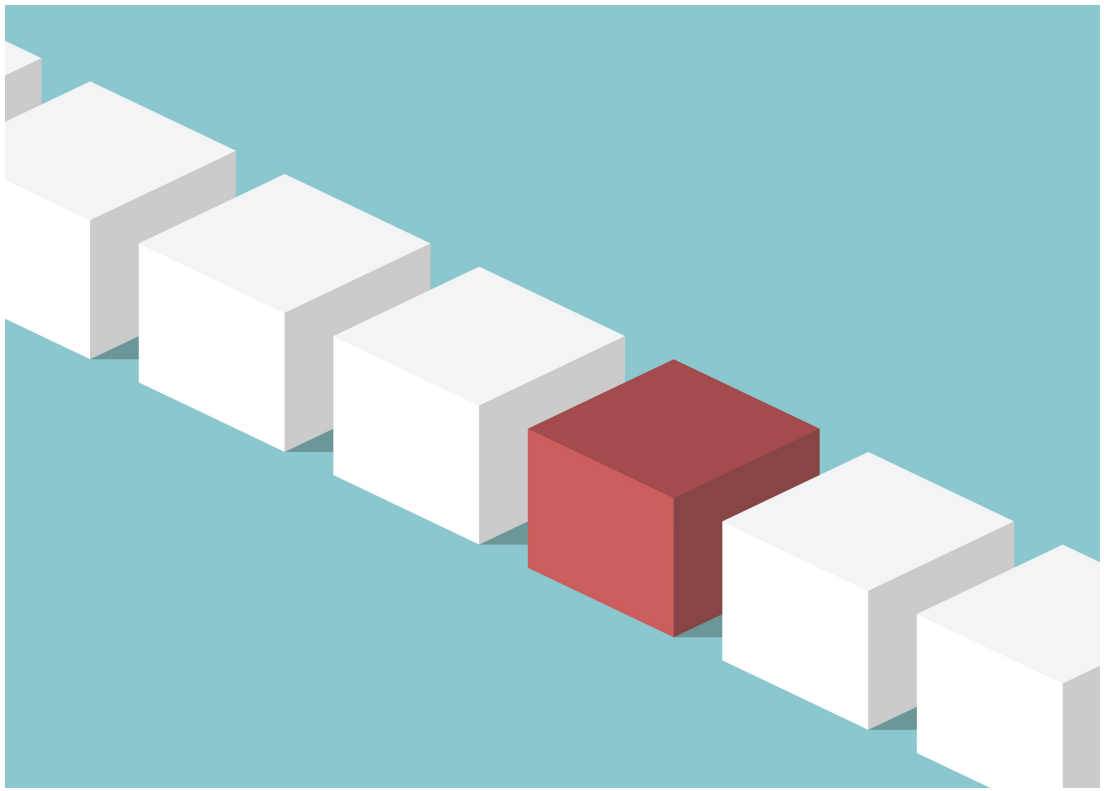

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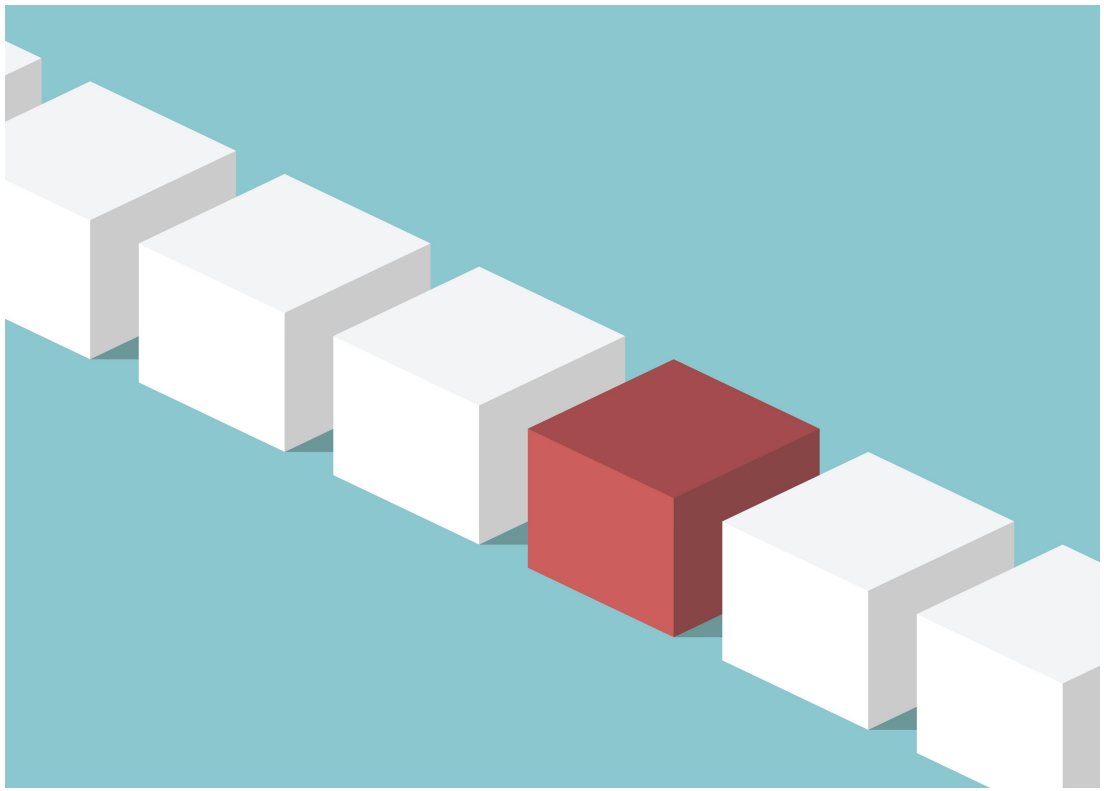

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**Problem: How to organize them?**

**Solution: Include hash of previous block**

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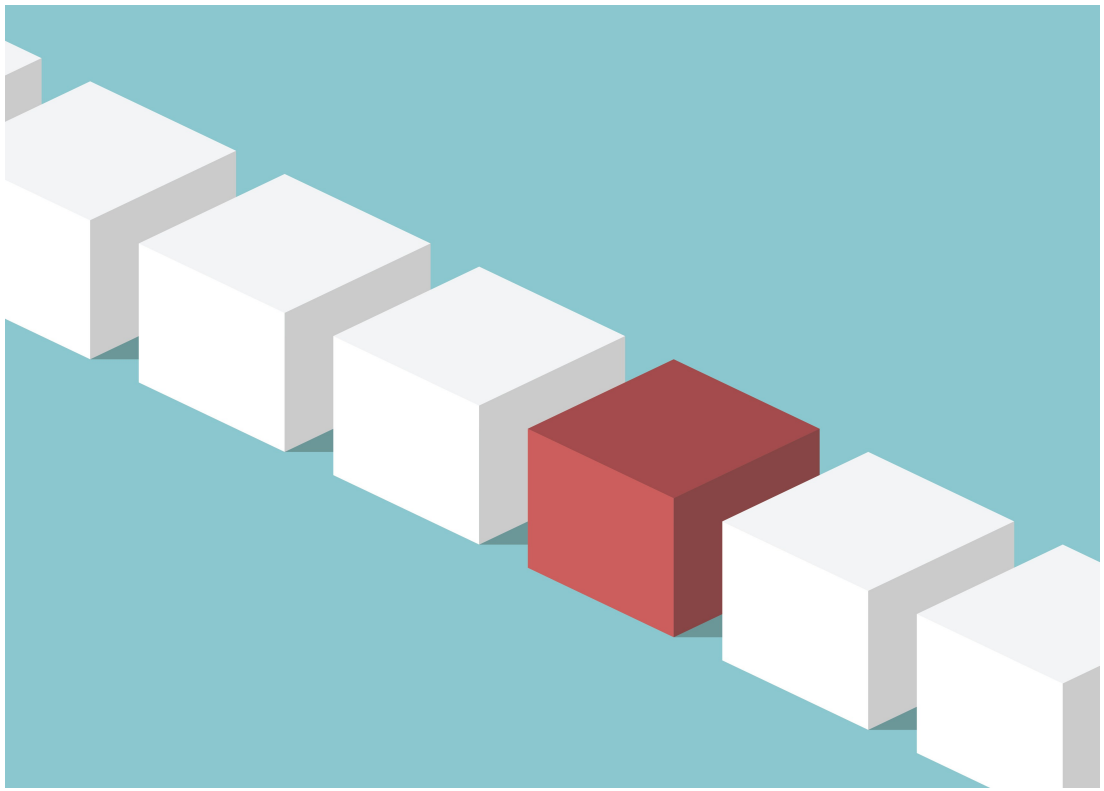

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