Decentralized verification infrastructure for documents anchored to blockchain

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UNIT

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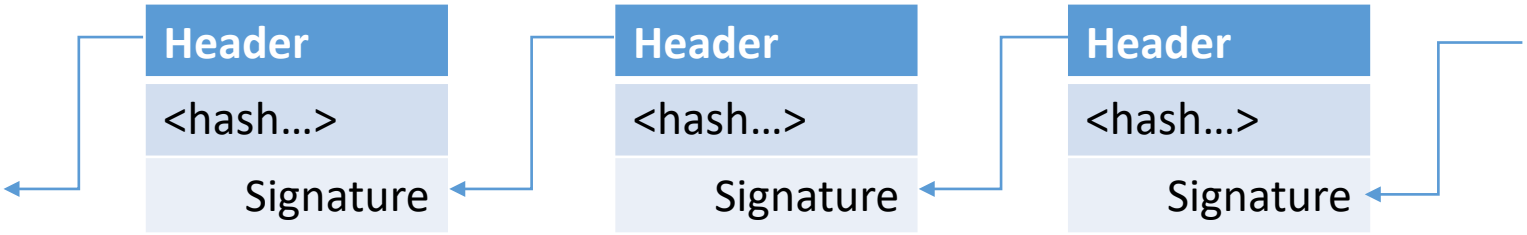
What is a blockchain

- blockchain is the result of a consensus protocol based on proof of work
- represented as a distributed database
- the point of a blockchain is not to store data but to ensure mutually distrusting parties are all in agreement.
  - public vs. private discussion: it is clear that a private blockchain is a misnomer



Characteristics of a blockchain

- Immutable
  - write only *(data cannot be altered or removed!)*
  - open access
- Distributed
  - no central authority
- Only transaction records
  - cryptographic hashes
  - public keys

Digital credentials

- Traditionally issued on paper
  - relatively easy to falsify
  - cannot be revoked
  - need to be verified -> entire industry based around verification
  - can be lost/destroyed (only one original)

- Early 21st century digitalization craze
  - credentials issued digitally
  - require authentication infrastructure
  - large online repositories of data are attractive targets

Zero knowledge proofs

- Zero knowledge proof
  - method by which one party A, can prove to another party B, that they know information X
  - achieved through cryptographic hashing

- To put in real perspective
  - without knowing a credential's contents, the hash stored on the blockchain can be used to prove that it hasn't been altered
  - person is issued a credential
  - proof is stored in a central repository
  - issuer's copy is kept in an offline storage

Where is the blockchain

- One or more proofs are anchored to a transaction on a blockchain

- Benefits
  - records continue to exist even if the issuer seizes to exist
  - ensures non-repudiation
  - cross national repository
  - immutability of records

Data decoupling

- Blockchain does not guarantee the authenticity of the issuer, only the immutability of the record
  - garbage in, garbage out
- Accreditation of the issuers
  - out of scope
- Format/standard agnostic
  - ensures faster adoption
  - mitigates technological obsolescence

Verification infrastructure

- The “cost” of verification needs to be minimal
- Cost can be defined as:
  - complexity of software implementation
  - ease of inclusion into an existing CMS
  - many new systems end up as abandoned code repositories due to high complexity of implementation
- Need for fewer resources for verification
  - helpdesk, account management, hosting…
  - cheap hardware

Verification infrastructure

- Can work offline
  - example: Bitcoin transactions transmitted periodically by satellites
- Stakeholders that can have nodes
  - HEIs
  - Governmental agencies
  - Employers / recruitment agencies

Does it make sense?

- Yes
  - decentralization is always a good thing
  - records are preserved if institutions seize to exist
  - an integral part of the principles of self sovereignty
  - puts the individual before the institution

- No
  - cultural, sociological and legal difficulties
  - cost of development to change a system that has worked for centuries
  - institutions don’t like to share
  - resistance to change
  - if it works, don’t fix it
    - but does it?

The end

Questions?