Traceability Decentralization in Supply Chain Management Using Blockchain Technologies

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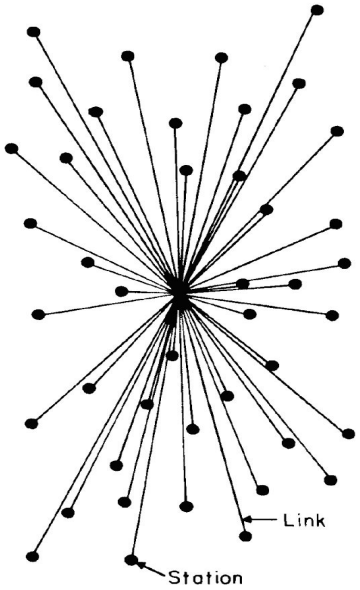
Presentation Outline

- Traceability in Supply Chain Management
- Decentralization and Blockchain Technologies
- Centralized vs Decentralized
- Decentralizing Traceability
- Model Description
- Discussion and Conclusions

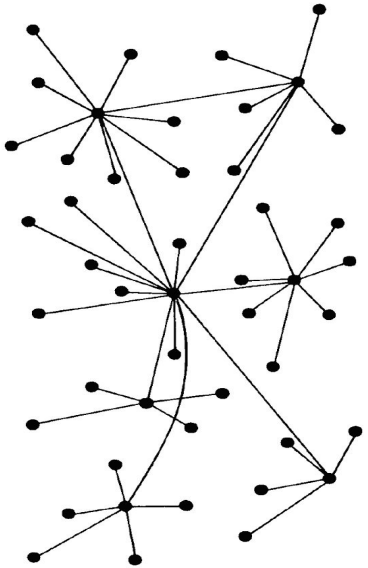
Traceability in Supply Chain Management

- SCM is responsible for the management of the flow of millions of products and services every day
- Traceability is one of the most important aspects of it
  - The ability to trace the history, application or location of an entity, by means of recorded identifications
- Centralized application solution based on databases and centralized techniques
- Single point of failure
- It can also be seen as a strategic tool to improve the quality of raw materials
- Improves inventory management

Centralized vs Decentralized



CENTRALIZED
(A)



DECENTRALIZED
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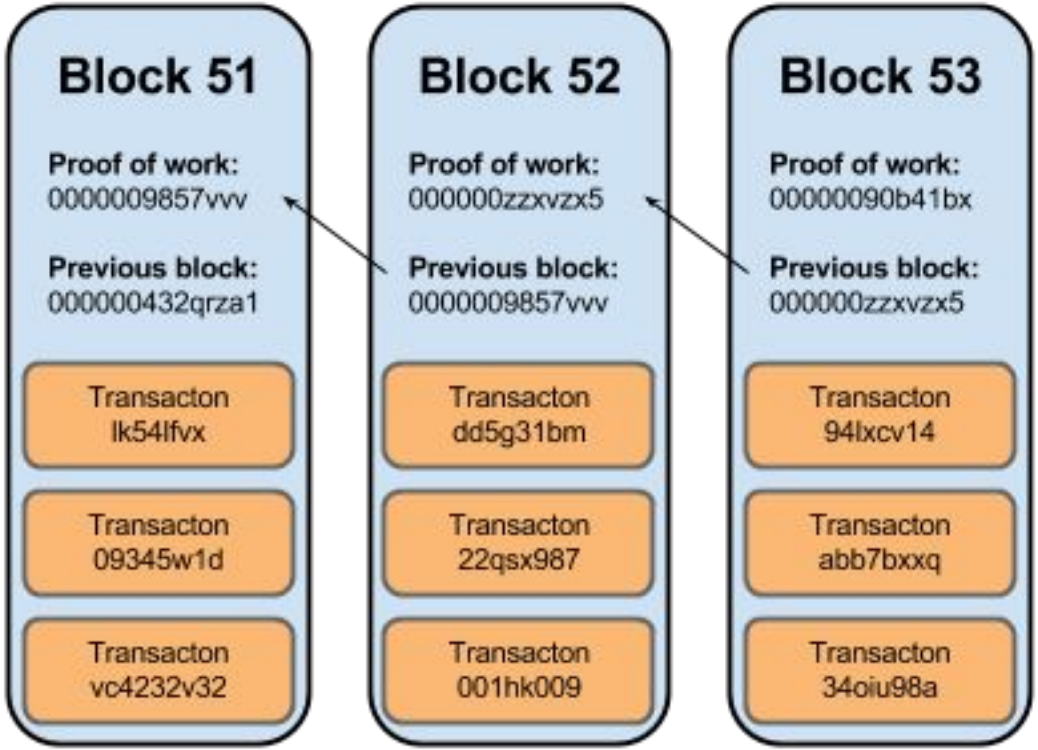
Decentralization and Blockchain Technologies

- Introduced in 2008 with Bitcoin
- A series of blocks linked to each previous block
- Completely decentralized
- No central authorities - no single point of failure
- Ledger which keeps track of transactions happening in a network
- Exploited in many ways, and many different applications
- Data can be transmitted in different blockchain implementations alongside currency units
    - Bitcoin solution - OP_RETURN opcode
- Blockchain characteristics
    - Transparency
    - Immutability
    - Integrity
    - Openness

Decentralization and Blockchain Technologies



Decentralizing Traceability

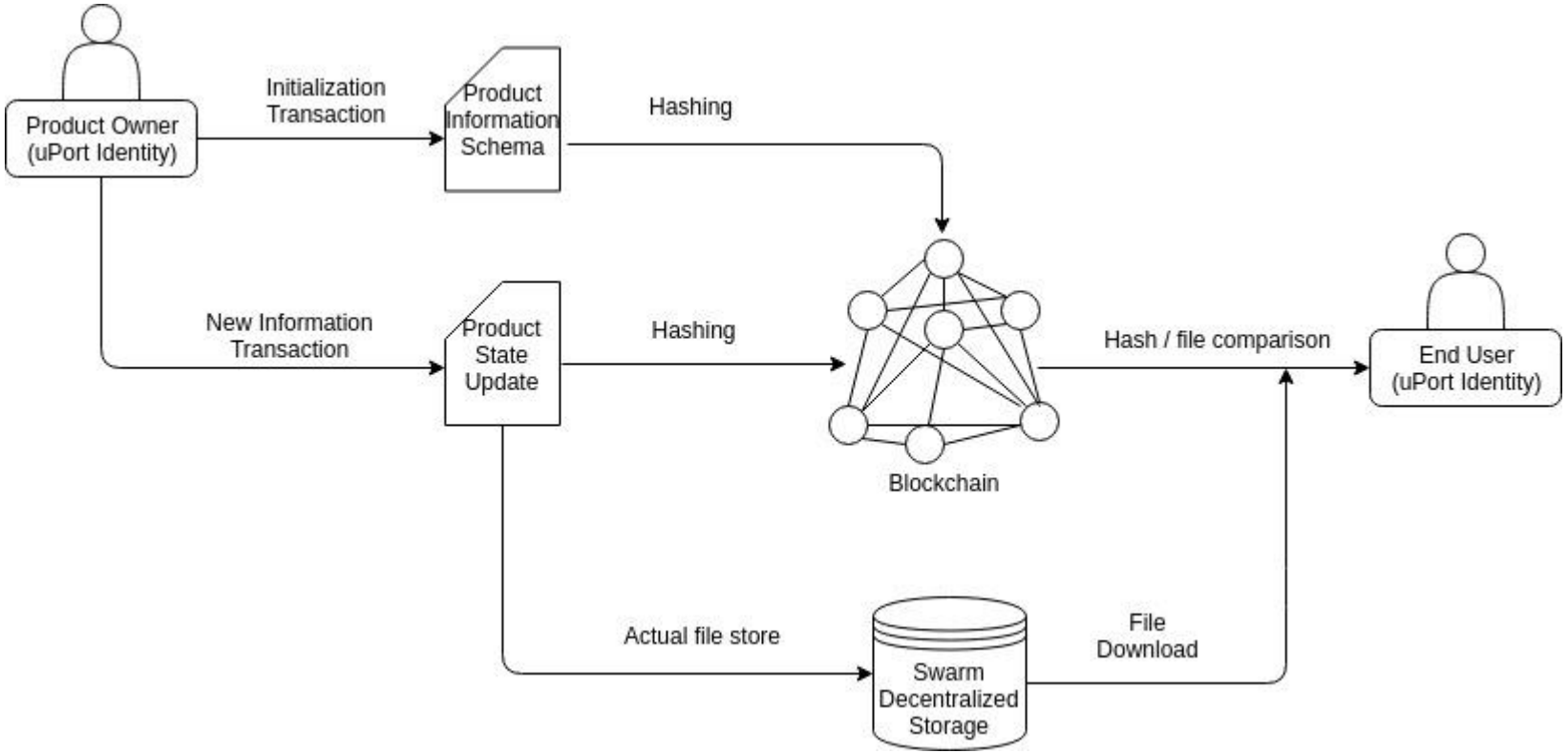
- Use of data storage capabilities of blockchains to store useful traceability data
- Eliminate the single point of failure
- Decentralize data
- Increase uptime, and availability
- Tamperproof data
- Decentralize Identification (uPort) and Storage (Swarm)
- Solution based on well established cryptography methods

Model Description

The platform's desirable characteristics are:

1. Identity management using uPort
2. Initialization transaction generation
    - Information of a certain product type
    - Include in text file
    - Store of the hash of the file in the blockchain
3. Information that are stored or updated in the blockchain get signed by the uPort identity
4. Revocation of false state happens with process update
5. Information update with new info file creation using the format (XML tags) of the initialization transaction
6. Actual files get stored in Swarm decentralized storage
    - Swarm nodes created by the company of the product
7. Client users will use a client-side application
    - Download of the Swarm stored file, and comparison with the corresponding hash stored in the blockchain

Model Description



Discussion and Conclusions

- Only theoretical implementation and PoC
- Possible model improvements:
  - Alternative blockchain implementations
    - Faster, cheaper and bigger data storage capabilities to be considered
  - ID merging
  - Smart contract alternative implementation
  - Private blockchain alternative implementations
- Blockchain technology exploitation can offer significant improvements
- Several different implementations can be developed for different client needs
- Several other SCM parts can exploit blockchains in order to achieve decentralization

Questions?

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