Records Management and Long-Term Preservation of Evidence in DLT

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02. June 2021
1. Regulatory Framework
eIDAS defines mandatory regulatory framework for trustworthy digital transactions in EU & EFTA

- Mandatory in EU & EFTA
- Holistic international standardization
- National certification – international recognition
- Preservation of evidence necessary
- Certified QTSP in European wide TSL
- Obligation of acception for public administration

**eIDAS**

**eID & Trust Services**

**Standardization Framework**

- eID
  - eID-systems
    - E-Signature
    - E-Seal
    - E-Timestamp
    - Website-Authentication
    - E-Delivery
  - Preservation

- eID-solutions

- Trusted service providers

- General Policy Requirements
  - ETSI EN 319 401
- Requirements for Conformity Assessment
  - ETSI EN 319 403
- Website Certs
  - ETSI EN 319 411-1
- Qualified Certs
  - ETSI EN 319 411-2
- Public Key Certs
  - ETSI EN 319 411-3
- Attribute Certs
  - ETSI EN 319 411-4
- Time Stamps
  - ETSI EN 319 421
2. Requirements on trustworthy digital transactions
The main requirements on electronic records and transactions have to be made evidence against 3rd parties as long as they are needed – appropriate measures necessary in DLT.

**Fundamental basement: well-defined and established records management**
(see ISO/WD TR 24332, ISO 30300/15489 for details)
Utilisation of state of the art standards ensures long-term preservation & archiving of electronic records
Challenges in DLT: There`s no rehashing or Proof Of Existence for the integrity protection

- Block 2 hash 1, Block 3 hash 2, but no standardized rehashing exists
- Unnoticed manipulation possible due to recalculation of hash values acc. to expiration of security suitability of algorithm
- No valid and standardized Proof of Existence due to lack of eIDAS-compliant timestamps
- Currently no standardized measures for preservation of evidence and on-chain records
Current solution on preservation of evidence acc. To Art. 34 + 40 eIDAS as well as ETSI TS 119 511 + 512: One Hashtree for the preservation of evidence for n-data

Merkle Hash Tree (RFC 4998)

- Hash-values of arbitrary documents or data
- One timestamp for each hash-tree to safe evidences of all included documents

Evidence Record

- Reduced hash-tree (incl. Timestamps & verification data)

Hash tree

Archive timestamp

Merkle Hash Tree

\[
\begin{align*}
H_1 &= H(d_1) \\
H_2 &= H(H_1|H_2) \\
H_3 &= H(H_2|H_3) \\
H_4 &= H(H_3|H_4) \\
H_5 &= H(H_2|H_3) \\
H_6 &= H(H_3|H_4) \\
H_7 &= H(H_5|H_6)
\end{align*}
\]

Time stamp

TSP\( (h_7) = TSP(h_5) = TSP(h_6) \)
Preservation Service acc. to ETSI TS 119 512: applicable for preservation of any data
4. Possible solution
Utilisation of preservation services acc. to eIDAS solve the rehashing and PoE-challenge in DLT and achieve preservation of evidence for on-chain and off-chain data (1/2)
Utilisation of preservation services acc. to eIDAS solve the rehashing and PoE-challenge in DLT and achieve preservation of evidence for on-chain and off-chain data (2/2)
Conclusion and needs for further standardization

• Increasing utilisation of DLT leads to the need to fulfill burden of proof and documentation requirements
• Lack of crypto stability and requirements on authoritative records limit possible fields of application where DLT could achieve foreseeable added value e.g.
  • Distributed digital ecosystems
  • Supply Chain
  • Digital proofs
  • SSI
• Combination of existing trust services and DLT enables feasible solution
• Solutions presumably has to be adopted for each DLT-protocol
• (inter)national Standardization necessary and ongoing for international interoperability & adoption

Standardization

• ISO Tc 46 Sc 11/Tc 307 JWG 1: ISO TR 24332
• ETSI Special Report on eIDAS & DLT
• DIN TS 31648: published in April 2021
Thank you very much for your attention.

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