

Integrating Consent Management Techniques into Blockchain-Based Medical Data Sharing



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1. Background

Sensitive data needs to be shared across medical facilities

Problems arise concerning privacy, security and integrity

Blockchain can mitigate these problems

Key aspect:
Consent Management

2. Research Question

How can consent management techniques be integrated into blockchain-based medical data sharing through the use of smart contracts?

3. Requirements of a consent management system

1. Legal compliance
2. Privacy
3. Transparency
4. Usability
5. Accountability
6. Scalability

4. Related work

Improvements to the related work can be made on:

- Legal compliance
- Privacy
- Usability

5. Proposed solution

Transactions:

Patient

- update_consent
- view_data_asset

Data processor

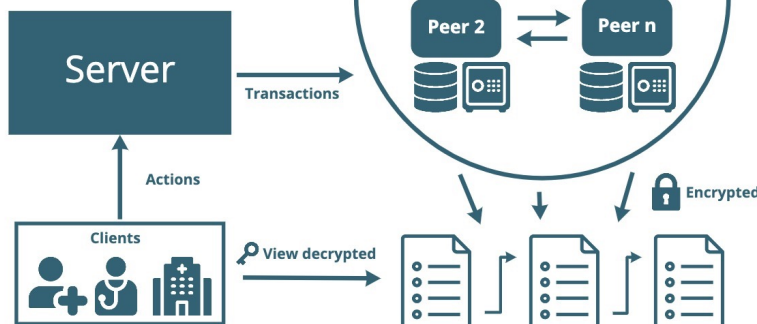
- access_by_patient_id
- access_by_data_type
- add_data_asset

Institution

- assign_role
- revoke_role

Blockchain Framework: (simplified)

Built on Hyperledger Fabric [1]



Consent contains:

Role, institution, purpose, data type, time period

→ Legal compliance

Role based:

Data processors are assigned roles by institutions

→ Usability

Hierarchical structures:

Roles, institutions, purposes and data types structured in a tree-like fashion, ensuring high dynamicity.

→ Usability

Requesting access:

By patient ID (primary).
By data type (secondary).

→ Usability

World state:

World state (data base) is encrypted.

→ Privacy

Trusted execution environment [2]:

Chain code is executed in a trusted execution environment.

→ Privacy

Public ledger:

The public ledger is encrypted, only viewable by involved parties.

→ Privacy

6. Discussion

→ Requirements satisfied?

1, 2, 3, 4, 5: **yes!**
6: **partially**

References

[1] C. Cachin et al., "Architecture of the hyperledger blockchain fabric," in *Workshop on distributed cryp- tocurrencies and consensus ledgers*, vol. 310, no. 4. Chicago, IL, 2016.

[2] M. Sabt, M. Achemlal, and A. Bouabdallah, "Trusted execution environment: what it is, and what it is not," in *2015 IEEE Trustcom/BigDataSE/ISPA*, vol. 1. IEEE, 2015, pp. 57–64.