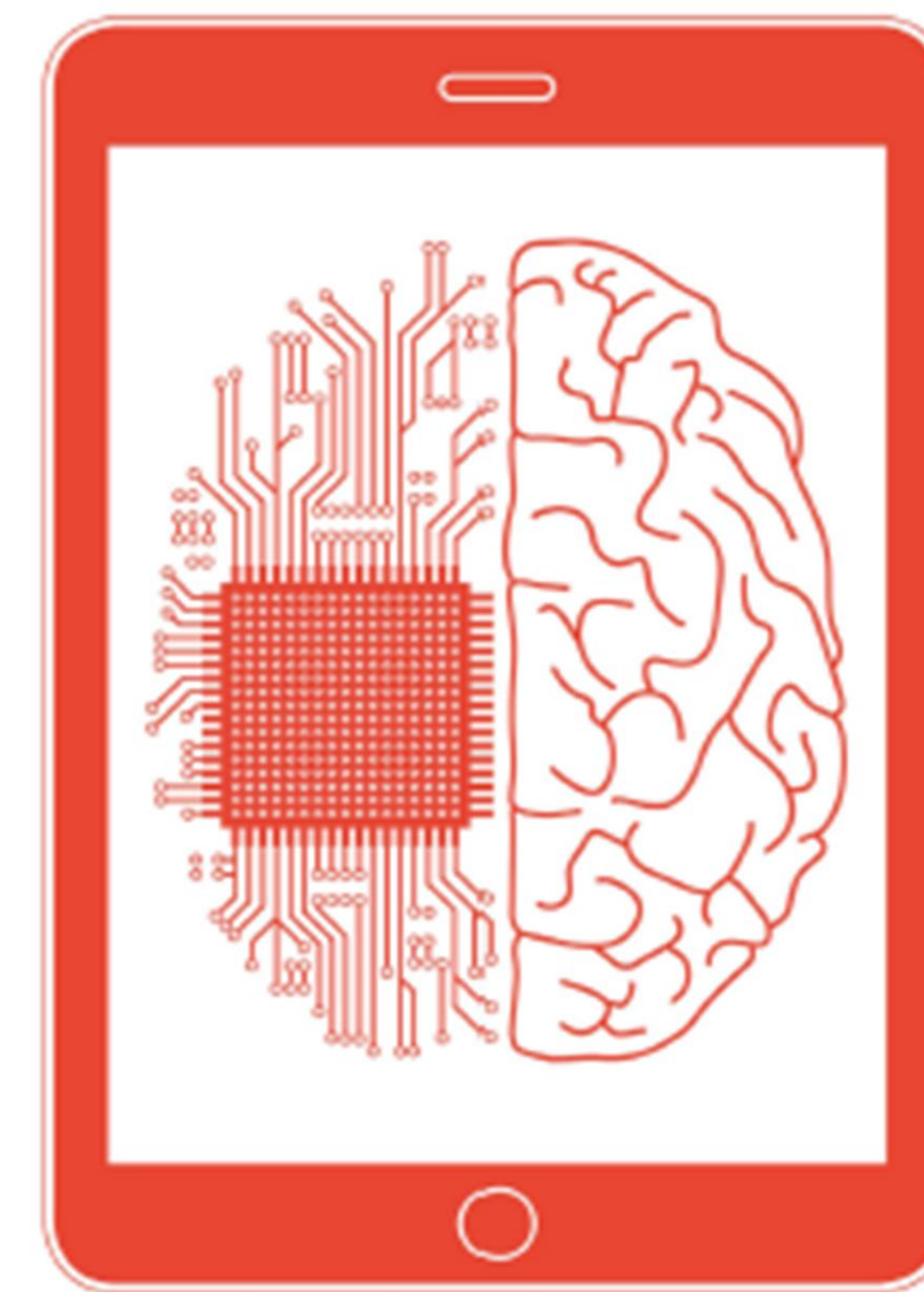


Patient-Centric eHealth Data Exchange Using Distributed Ledger

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Master-Thesis

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Problem and Motivation

Value of data is rapidly increasing in the area of medical informatics. New technologies like artificial intelligence and machine learning are used to discover new drugs or predict patient outcomes. For this, large amounts of data is needed.

On the other hand, patients generate real-world data in their daily lives:

- Heartrate
- Sleep rhythm
- Nutrition / workout data
- Simple doctor visits / blood test results

This study investigated the possibilities of connecting patients and researchers for a voluntary data exchange initiated by the patient.

Methodology

The study was designed as feasibility test of a data-sharing platform between patients and researchers. The goal was to assess the dHealth Blockchain as a possible facilitator and evaluate the prototype based on objectives and requirements.

Objectives were evaluated based on assessments, test runs and capability calculations. Additionally, over 50 requirements from an existing EHR assessment framework have been used to evaluate and assess the prototype.

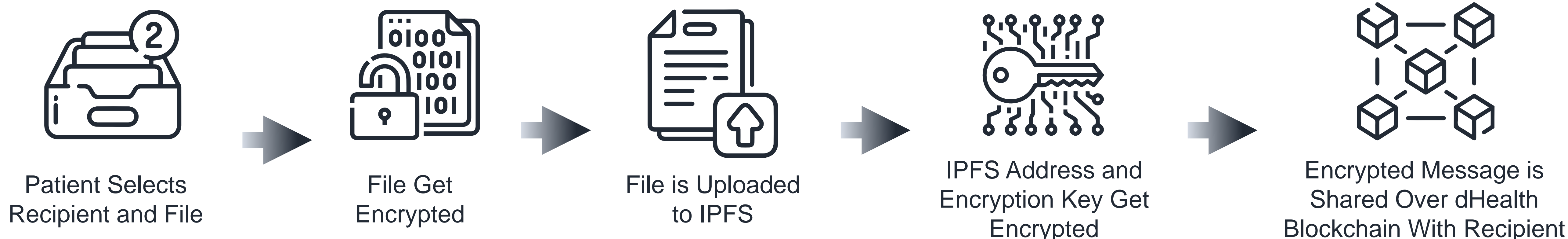
The following technology stack was used:

- TypeScript
- Node.js
- dHealth network as blockchain for the data exchange
- IPFS network as a distributed data storage

Application Process

The prototype consists of two application, a first application for patients to share their data and a second application for researchers to receive data shared with them. The process of the two applications looks as follows:

Patient Application



Research Application



Results

The prototype created within this thesis is working and can send health data from patients to researchers.

Over 90% of objectives and requirements are fulfilled by the application, either by default or with organisational extensions. The requirements only covered partially are due to:

- **Data deletion:** A blockchain is immutable, hence no data can be deleted based on a patient's request.
- **Access logs:** Since IPFS is a distributed storage, there is no access logs consolidated from each single node.

This specific requirements could be mitigated by running a private IPFS service.

Conclusion

Within this thesis, a fully functional prototype was built, proving the feasibility of voluntary data sharing or data donation initiated by patients.

The high level of trust, given by the blockchain network through its immutability, transparency and security, seems a good combination with a storage network, which ensures high availability and integrity.

The performance and cost of operating the prototype suggest a scalability of the application. Based on measurements and estimations, a national coverage seems feasible.