

# MHMD: My Health, My Data

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## ABSTRACT

MHMD<sup>1</sup> is an EU-funded project poised to create the first open biomedical information network centred on the connection between organisations and the individual, aiming at encouraging hospitals to start making anonymised data available for open research, while prompting citizens to become the ultimate owners and controllers of their health data.

## Keywords

Blockchain, Smart Contracts, Anonymisation, Pseudonymisation, Personal Data Accounts, Privacy by design, Differential Privacy, Homomorphic Encryption, Secure Multiparty Computation, Analytics.

## 1. INTRODUCTION – CHALLENGES

Issues of data subjects' privacy and data security represent a crucial challenge in the biomedical sector more than in other industries. The current IT landscape in this field shows a myriad of isolated, locally hosted patient data repositories, managed by clinical centres and other organisations, which are subject to frequent and massive data breaches. Patients are disenfranchised in this process, and are not able to have a clear understanding of who uses their personal information and for what purposes. This makes it the ideal field to build and test new models of privacy and data protection, and the technologies that encode them. MHMD aims at changing the existing scenario by introducing a distributed, peer-to-peer architecture, based on Blockchain and Personal Data Accounts.

## 2. OVERALL CONCEPT

MHMD profiles and classifies sensitive data based on their informational and economic value, and assesses the most suitable and robust de-identification and encryption technologies needed to secure different types of information, while still allowing advanced knowledge discovery through analytics and deep learning applications running on a growing amount of anonymised or pseudonymised data.

MHMD develops new mechanisms of trust and of direct, value-based relationships between people, hospitals, research centres, and businesses, by making use, for the very first time in healthcare, of a blockchain system, i.e. a digital ledger where information relating to the distributed storage of the health data is trimmed in hash-based language code, making it possible to describe exactly what type of data are available, referring to what cohorts of patients, and data transactions are continuously validated to the entire network of stakeholders, avoiding any possibility of fraudulent usage.

A dynamic consent interface will allow users to grant, deny and revoke data access for different uses according to their preferences through personal data accounts, storage clouds enabling individual access from any personal device. In this way, patients will be able to fully leverage the value of their clinical information, turning to different healthcare professionals for second opinion, or searching for profiles of similar patients and contact them upon their permission. Physicians, in turn, will have the possibility to retrieve medical annotations or execute queries to identify patients with analogous features to find cues about a specific clinical case.

## 3. VALIDATION & EVALUATION

Smart contracts, self-executing contractual states in digital form, will regulate data transactions between users, allowing the permission to access, and stakeholders, who will be enabled to make direct requests and offer incentives in exchange of access rights. This system will be checking its applicability as an operational Infostructure, and will represent an innovative challenge within the EU General Data Protection Regulation entering in force in 2018. On this basis, MHMD has the ambition to foster the development of a true information marketplace for healthcare.

MHMD will also analyse users' behavioural patterns alongside ethical and cultural orientations, to identify hidden dynamics in the interactions between humans and complex information services, and will assess the overall security of its multi-modular architecture by testing it through dedicated self-hacking simulations and public hacking challenges, performed on synthetic data sets.

## 4. CONCLUDING REMARKS

MHMD's data and identity protection systems are aimed to be the best privacy and security tools allowing to guarantee the overall reliability of a generic multi modular architecture.

A key goal of MHMD is to improve the design of data-driven platforms and to foster the development of an information marketplace, in which individuals will be able to exercise full control on their personal data and leverage their value.

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