Decentralized Health with Free Software

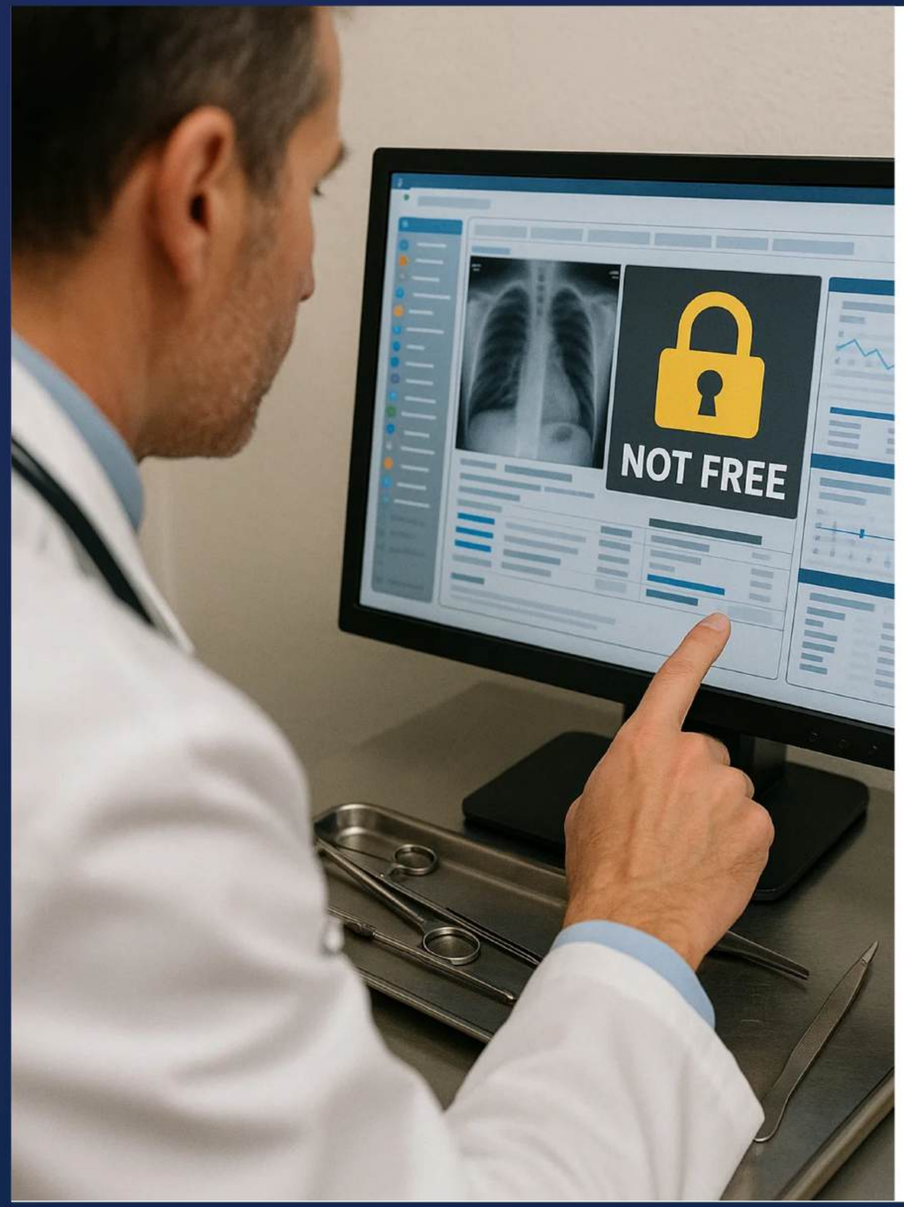
Overview

01 Introduction

02 Free Software in Healthcare

03 Decentralized Healthcare

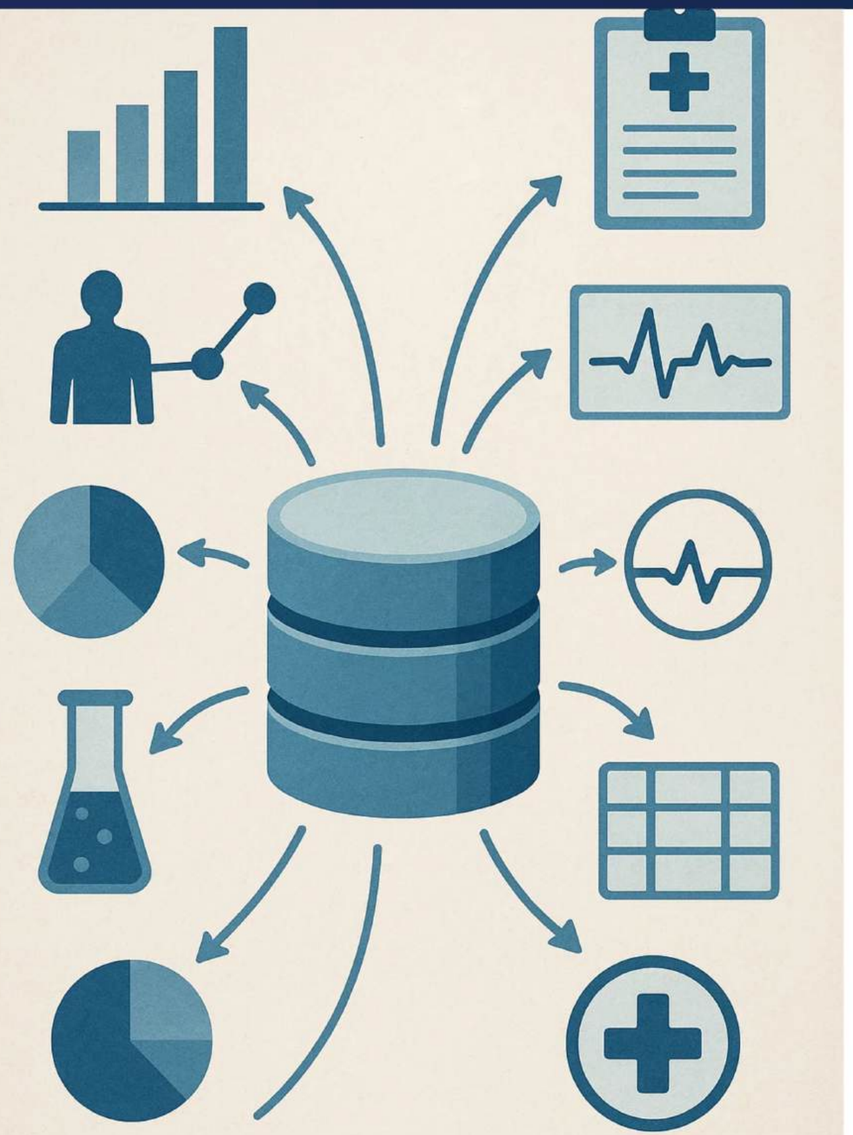
04 Future of Open-Source and Decentralized Healthcare



Intoduction

Non-Free Software

- Tools are closed-source
- No transparency in decisions
- Security risks can’t be reviewed
- Hard to switch. vendor lock-in



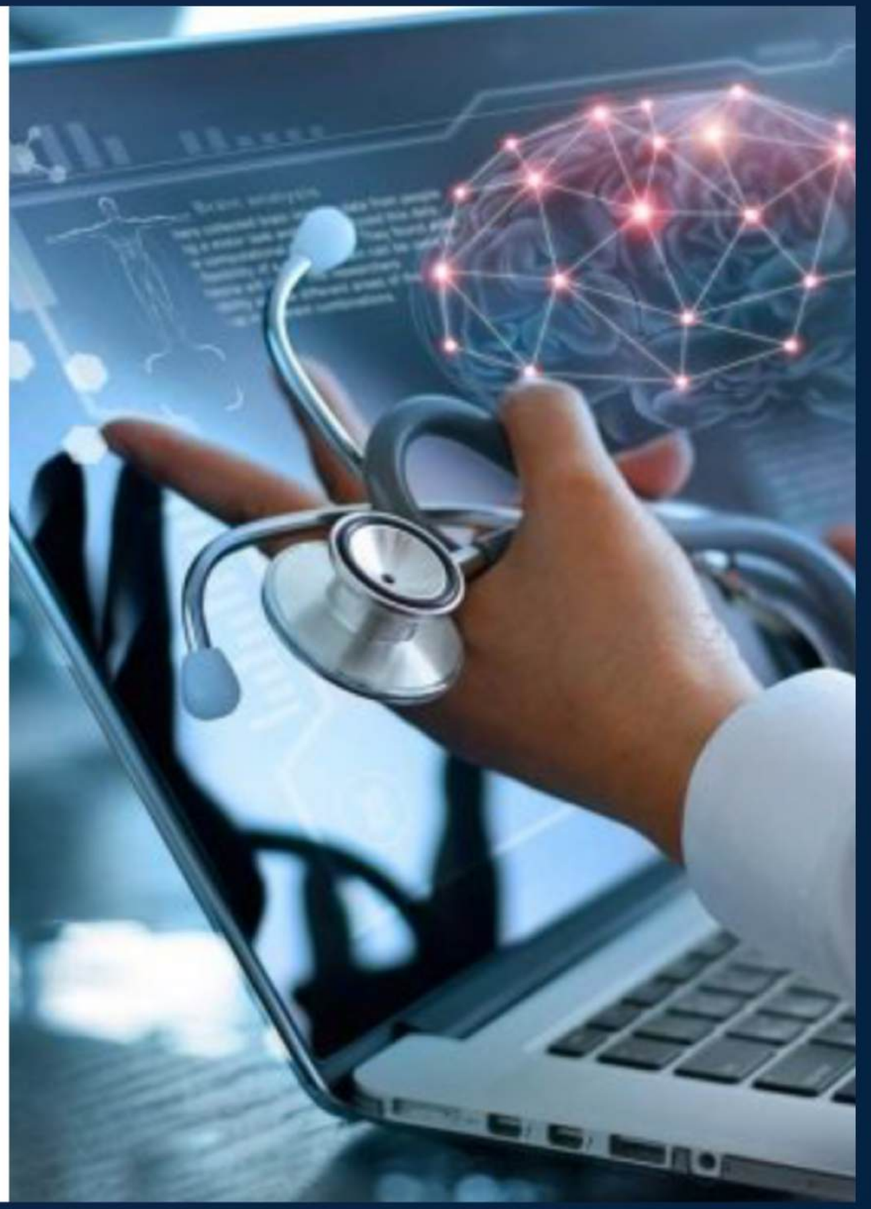
Intoduction

Centralized Data Systems

- Centralized Data Systems
- Data stuck in separate systems
- Hard to share between doctors
- Patients have no control
- Weak security

Free Software in Healthcare

- **Open code:** trust and transparency
- **No vendor lock-in:** freedom to customize and share
- Enables collaboration across borders
- Empowers patients and providers alike

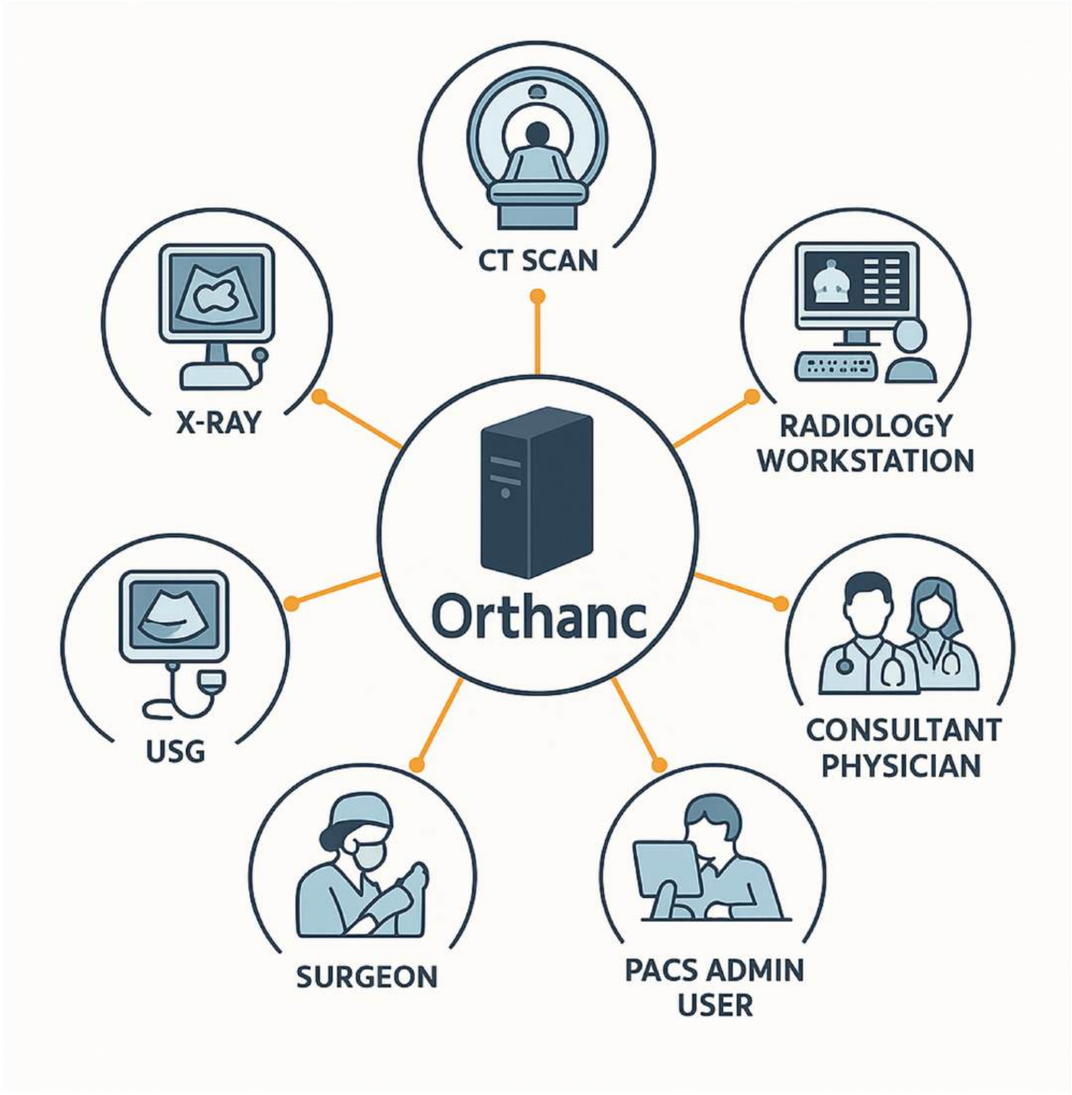


GNU Health

- **Free software for personal and public healthcare**
- **2010**
- **Focus:** Public health, clinical records, social medicine
- **Features:**
  - Complete electronic medical records (EMR)
  - Epidemiological tracking (e.g., outbreaks, demographics)
  - Health information exchange
  - Social determinants of health

Orthanc

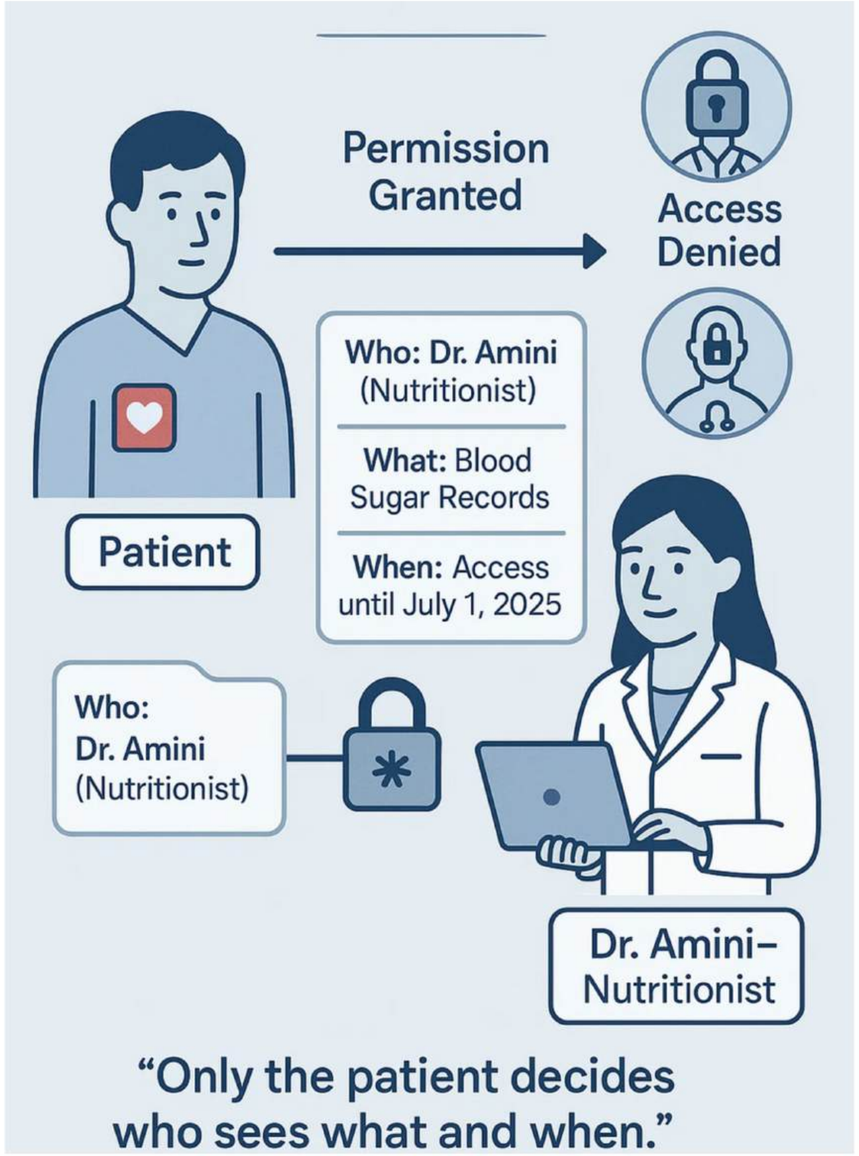
- **Lightweight, open-source DICOM server for medical imaging**
- **2011**
- **Focus: Focus:** Medical imaging (X-rays, CT scans, MRIs)
- **Features:**
  - Full DICOM storage and retrieval
  - Easy integration with existing systems
  - REST API for automation and research
  - Cross-platform and lightweight (runs on Raspberry Pi!)



Decentralized Healthcare

- All health data is stored on a secure, distributed ledger
- Each user owns and controls their medical records
- Data is encrypted and access-controlled by the patient
- No central authority. just verified, transparent sharing

Example


Permission Granted
Access Denied
Who: Dr. Amini (Nutritionist)
What: Blood Sugar Records
When: Access until July 1, 2025
Patient
Who: Dr. Amini (Nutritionist)
Dr. Amini– Nutritionist
"Only the patient decides who sees what and when."

Benefits of Decentralized Health Systems

Data Security & Privacy

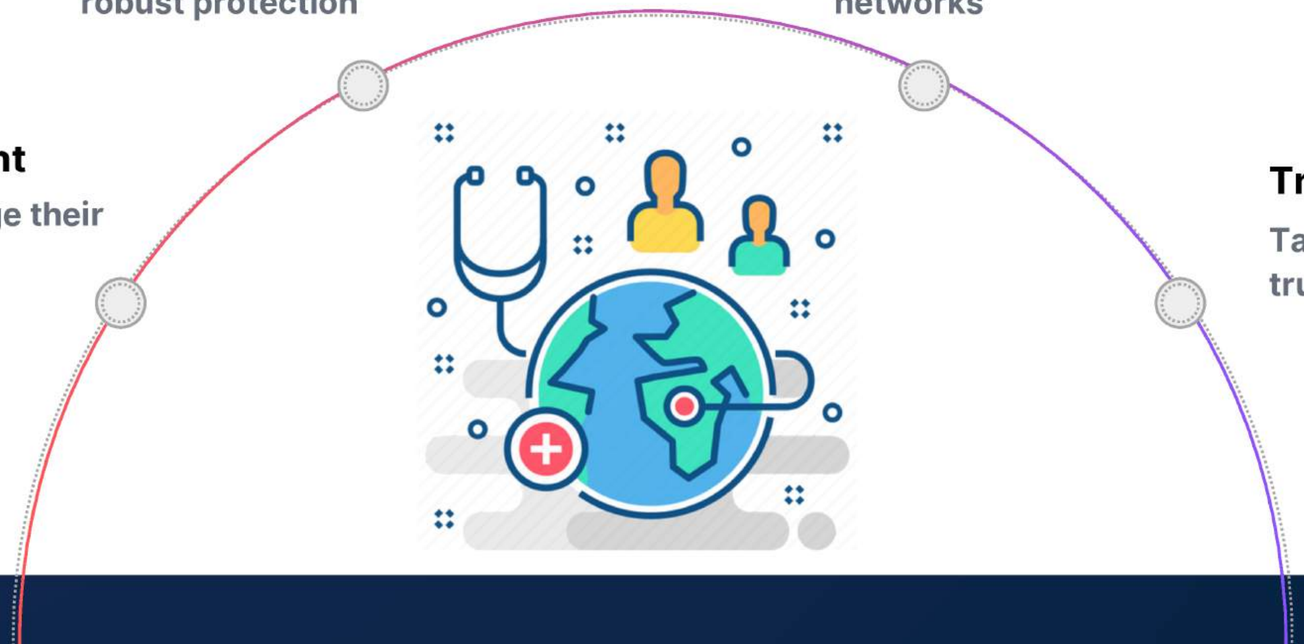
End-to-end encryption and decentralized storage ensure robust protection

Interoperability

Seamless and permissioned sharing across healthcare networks

Patient Empowerment

Patients own and manage their personal health records



Transparency

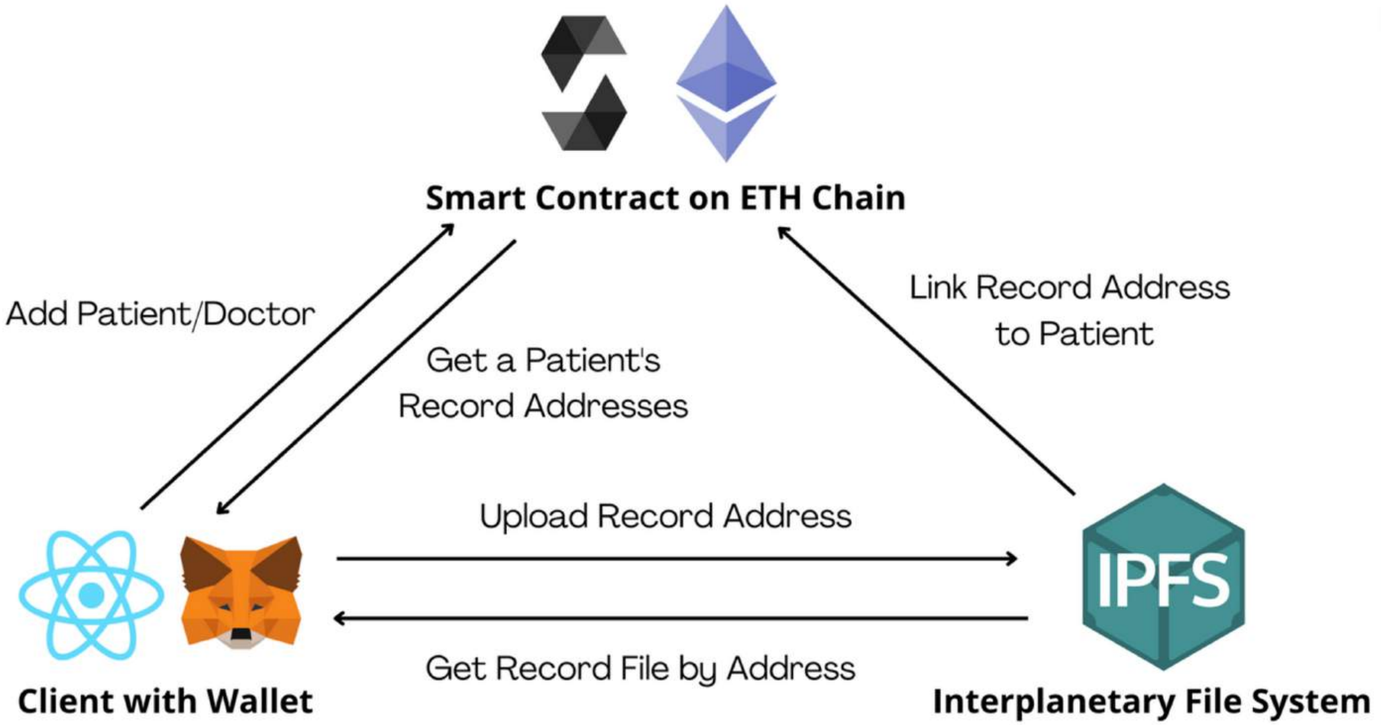
Tamper-proof logs enhance trust and accountability

MedChain

MedChain

- An open-source platform to store and share electronic medical records (EMRs) using blockchain and decentralized storage.
- 2022

- **How It Works:**
  - Provider signs in with crypto wallet
  - Registers patient via wallet address
  - Uploads record to IPFS
  - Links record on Ethereum
  - Patient views data through their wallet
- **Tech Stack:**
  - React (frontend), Solidity (contracts)
  - Ethereum (auth), IPFS (storage)



HIE of One

- Open-source access control for health data, built on decentralized identity and open standards (without blockchain).
- 2017

- **How It Works:**
  - Patient manages identity via self-sovereign ID
  - Access is controlled using OAuth2 and OpenID Connect
  - No central authority stores or controls the data
  - Patient decides who can access what data, for how long

- **Tech Stack:**
  - OAuth2 / OpenID (identity & access control)
  - FHIR (health data standard)
  - JSON Web Tokens (permissions)

Future of Open-Source and Decentralized Healthcare

- Patients control their data
- Privacy-first by design
- Interoperable via open standards (FHIR, DIDs)
- Trustworthy AI from open, auditable data
- Innovation by the community, not corporations

References

- **GNU Health**
  - Website: www.gnuhealth.org
  - Project page: savannah.gnu.org/projects/health
- **Orthanc**
  - Website: https://www.orthanc-server.com
  - GitHub: https://github.com/jodogne/Orthanc
- **HIE of One**
  - Website: https://hieofone.com/
  - GitHub: https://github.com/HIEofOne
- **MedChain**
  - GitHub: https://github.com/JeffreytheCoder/med-chain

Thank You

Freedom in code, and freedom in care

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