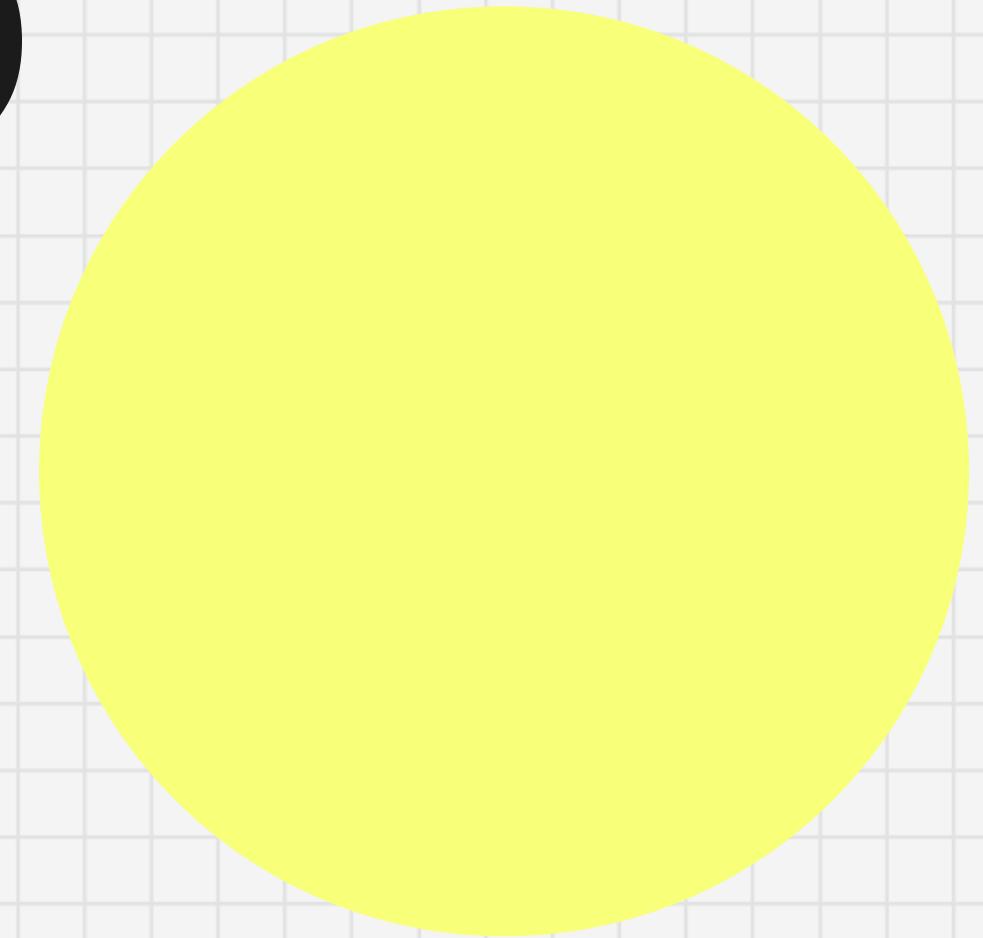
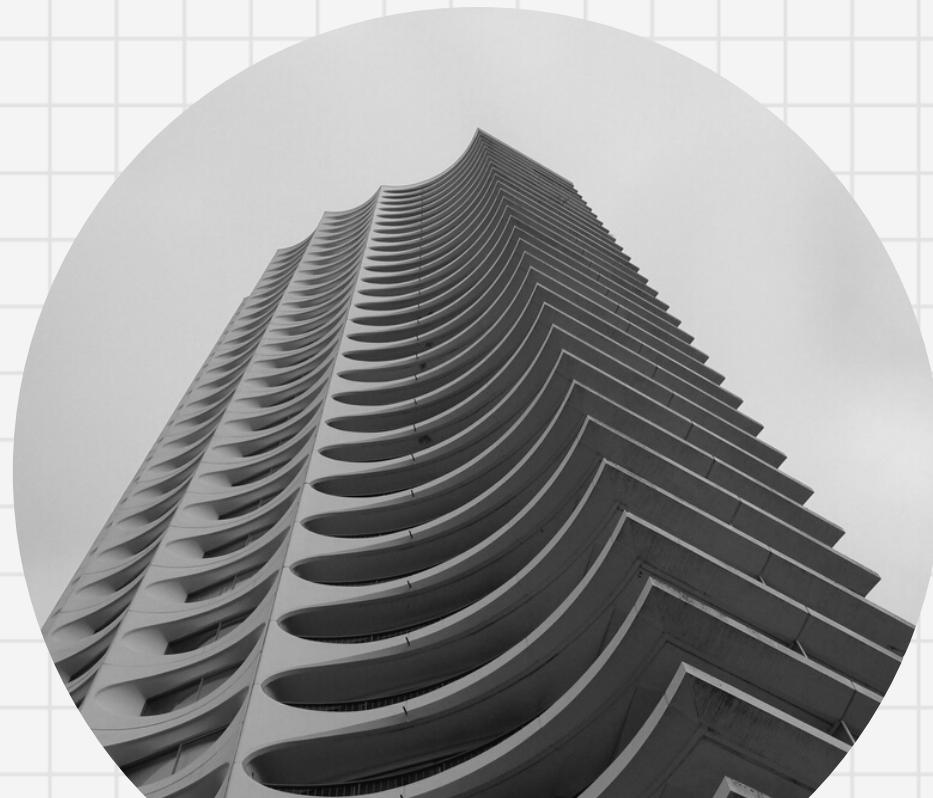




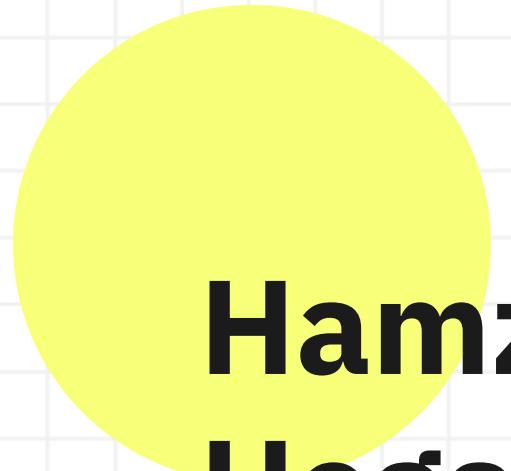
GWU

FORWARD HEALTH

Secure Electronic Health Records



Contributors



**Hamza
Hegab**



**Diego
Alcocer**



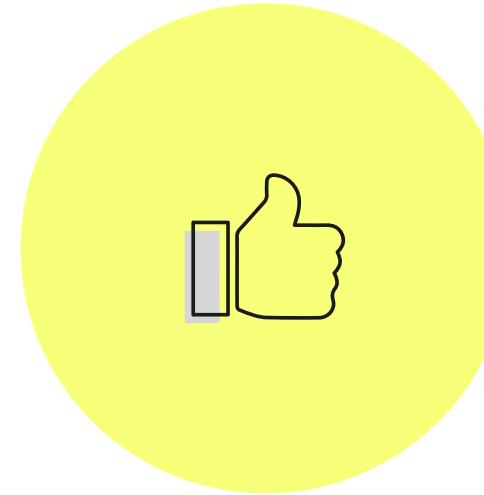
**Santiago
Pesantez**

What this presentation covers

Agenda

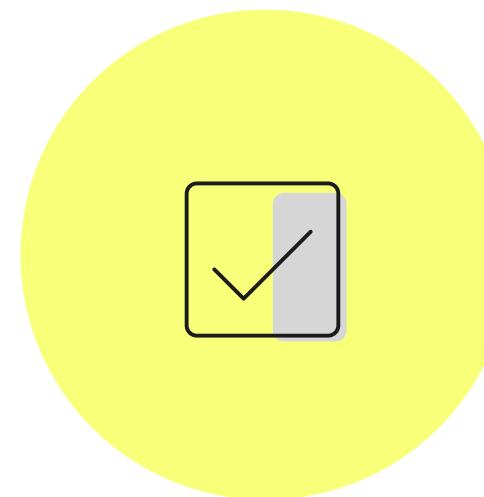
1. The Problem
2. Our Solution
3. Why Blockchain
4. Tech Stack
5. Demo

The Problem



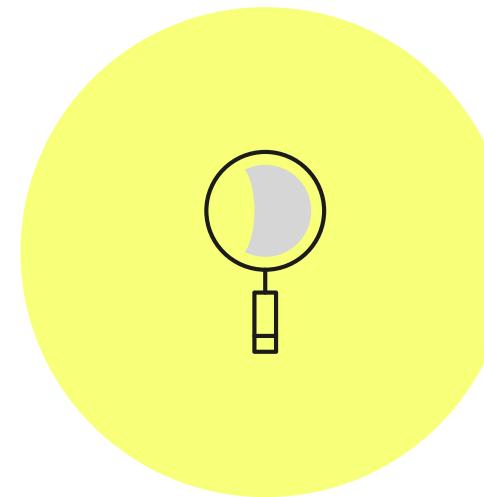
Accurate health records of patients

Health care professionals are required to maintain accurate health records of patients.



Data availability and data integrity

Records should be shared across different healthcare organizations for professionals to have a complete review of medical history and avoid missing important information.



Privacy and data breaches

Security is a major issue in the healthcare industry. There were 692 large healthcare data breaches reported between July 2021 and June 2022.

Our Solution

We use blockchain technology to securely manage health records for a collaborative, smart approach to healthcare.

Forward Health
maintains the
integrity of medical
records.



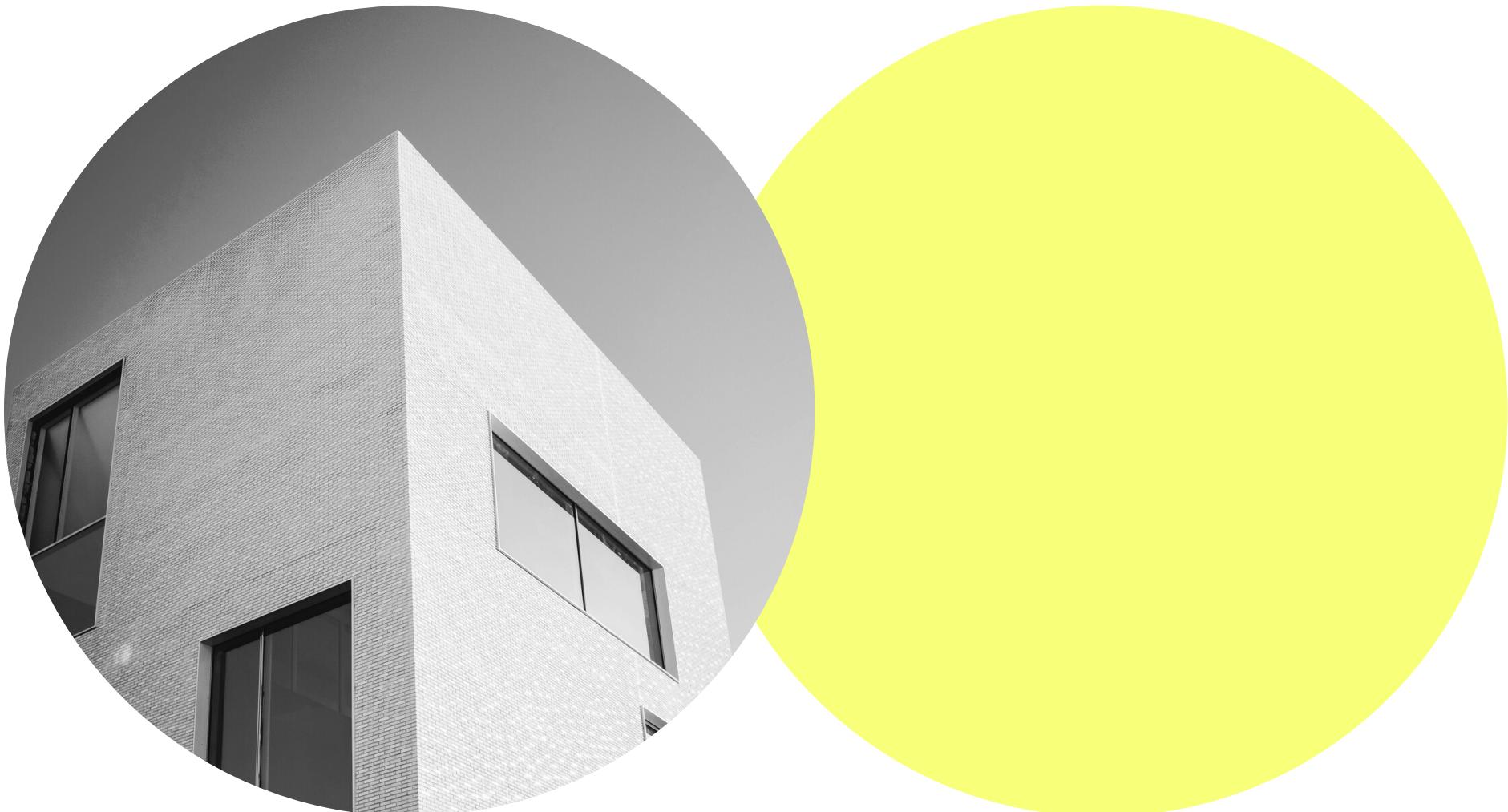
Blockchain

- Cooperatively maintain a record of transactions.
- Blockchain organizes the process of recording and validating transactions.
- Helps to protect the integrity of information stored by the network.

Tamper resistant and
tamper evident



Why Blockchain



Keeping medical data safe

Blockchain's ability to keep an incorruptible, decentralized and transparent log of all patient data makes it a technology ripe for security applications.

Transparency

Additionally, while blockchain is transparent, it is also private, concealing the identity of any individual with complex and secure codes that can protect the sensitivity of medical data.

Decentralize

The decentralized nature of the technology also allows patients, doctors and healthcare providers to share the same information quickly and safely.

Tech Stack

Front End

Streamlit

Allows the production and hosting of web applications

Crypto-wallet

MetaMask

Software crypto-wallet used to interact with the Ethereum blockchain.

IPFS Content

Pinata

Patient data is uploaded and stored in this decentralized file storage system.

Blockchain

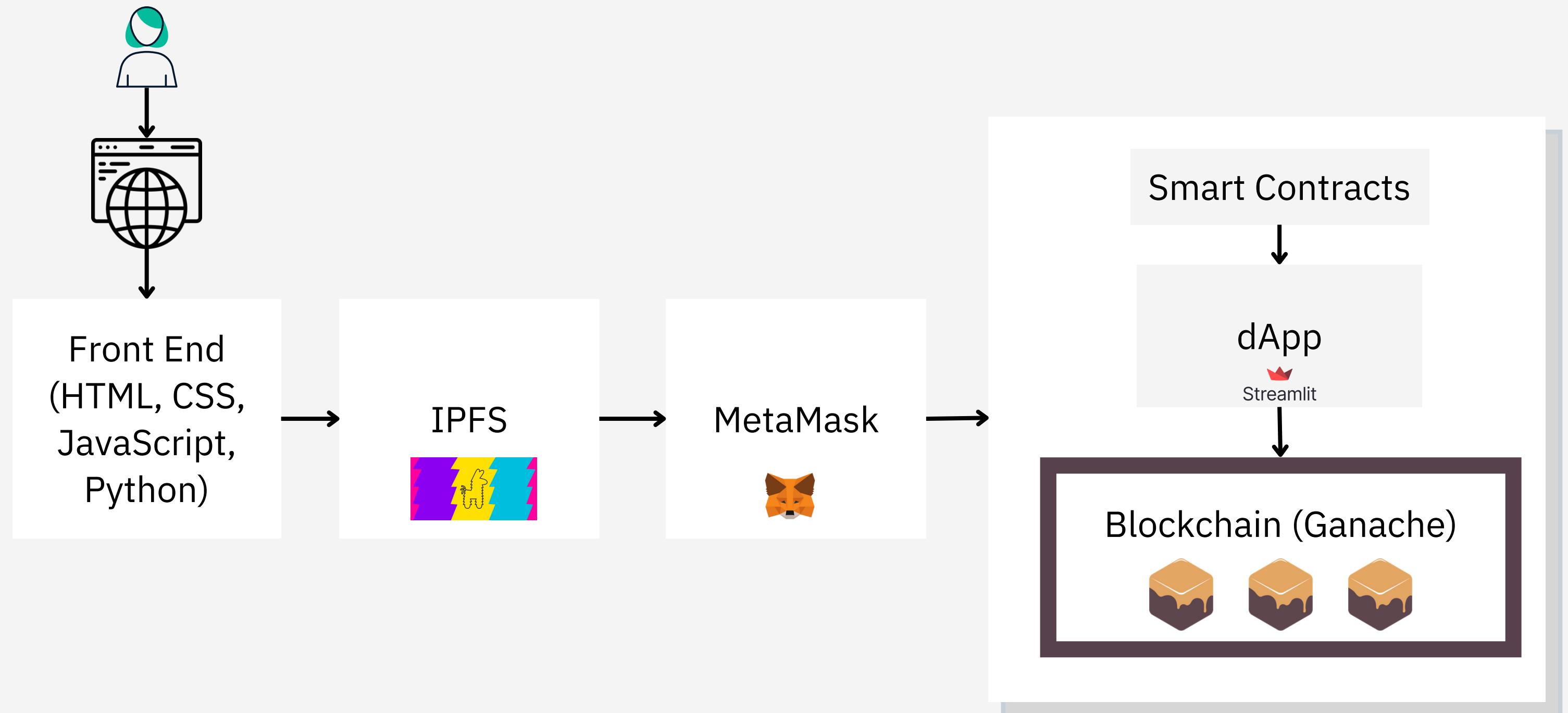
Ganache

Personal Ethereum blockchain: run tests, execute commands, and inspect state

IDE

Solidity + Remix

Solidity is an object-oriented, high-level language for implementing smart contracts



Smart Contract

Built with solidity

Main goals:

- Gas efficiency - minimal storage & updates to the blockchain
- Privacy - no patient data is stored on chain except name & DOB
- WIP - Patients will have the ability to add & remove viewers/editors of their data

```
EmrBlocks.sol ✘
pragma solidity ^0.5.0;

import "https://github.com/OpenZeppelin/openzeppelin-contracts/blob/release-v2.5.0/contracts

contract EmrBlocks is ERC721Full {
    constructor() public ERC721Full("EmrBlocks", "EMRB") {}

    struct Patient {
        string name;
        uint256 dateOfBirth;
    }

    mapping(uint => Patient) public patientRecords;

    //original registration of patient in database
    function registerPatient(
        address owner,
        string memory name,
        uint256 dateOfBirth,
        string memory patientURI
    ) public returns (uint256) {
        uint256 tokenId = totalSupply();

        _mint(owner, tokenId);
        _setTokenURI(tokenId, patientURI);

        patientRecords[tokenId] = Patient(name, dateOfBirth);

        return tokenId;
    }
}
```

DEMC

Register Patient

Patient Information

Blockchain EMR System

Select a function from the dropdown menu below

Menu

Register Patient

Register New Patient

Enter patient name
Guy Fawkes

Enter patient date of birth
2022/09/21

Select gender
male

Insert patient weight in lbs
100

Press Enter to apply - +

Insert patient height in inches
6

- +

Upload patient picture

Drag and drop file here
Limit 200MB per file • JPG, JPEG, PNG

Browse files

Register Patient

Register Patient

Patient Information

Upload patient picture

Drag and drop file here
Limit 200MB per file • JPG, JPEG, PNG

 guy_img.jpg 23.5KB X

[Browse files](#)

[Register Patient](#)

IPFS

PINATA

The image shows a screenshot of the Pinata dashboard. At the top, there's a purple header bar with the Pinata logo on the left and a user profile icon on the right. Below the header, the main interface has a white background. In the center, it says "Hey, Santiago" followed by a waving hand emoji. Below this, there's a section titled "My Files" with a "Upload +" button. To the right of the upload button is a dropdown menu for "Pin Status" set to "Pinned". There's also a "Search Files" button. A table below lists the uploaded file. The table has columns for "Name", "CID", "Submarined", and "Actions". The single listed file is "Guy Fawkes EMRB" with CID "bafkreidb2tbc...". The "Submarined" column shows "False" and the "Actions" column shows a "More" link.

Name	CID	Submarined	Actions
Guy Fawkes EMRB ⓘ 9/21/2022 79 B	bafkreidb2tbc... ↗	False	More

IPFS

PINATA

Edit File Details

Name
Guy Fawkes EMRB

Key	Value	
DOB	2022-09-21	Delete
name	Guy Fawkes	Delete
gender	male	Delete
height	6	Delete
weight	100	Delete

New Key/Value

key value Add

Save

Medical Record

Update the medical record

Blockchain EMR System

Select a function from the dropdown menu below

Menu

Update Patient Info

 **Update Patients Weight**

What is your Patient ID #

Insert new patient weight in lbs

 - +

Update Weight

Update Patients Height

What is your Patient ID#

Insert new patient height in lbs

 - +

Update Height

Medical Record

Update the medical record

Update Patients Weight

What is your Patient ID # (EMRB CID)

Insert new patient weight in lbs

 - +

Update Weight

Medical Record

Update the medical record

Edit File Details X

Name

Key	Value	
DOB	2022-09-21	Delete
name	Guy Fawkes	Delete
gender	male	Delete
height	6	Delete
weight	666	Delete

New Key/Value

Add

Save

View

The image shows a screenshot of a Blockchain EMR System interface. On the left, a dark modal window titled "Blockchain EMR System" contains the text "Select a function from the dropdown menu below" and a "Menu" button. A dropdown menu is open, showing the option "View Patient Info" highlighted with a red border. In the main area, the title "View Patient Info" is displayed above a "Select your Patient ID" dropdown menu. The dropdown menu shows the number "1". The background of the main area is black.

Thank you!

Feel free to reach out to us
if you have any questions.



GitHub

<https://github.com/santiago-pesantez/emr-blockchain.git>