Abstract

We are working on a Blockchain-based solution to model the issuance of medical prescriptions and the subsequent dispensing of medications. The idea is to use the W3C's Self Sovereign Identity (SSI) paradigm and treat medical prescriptions as Verifiable Credentials.

Our web3 solution, BlockMed, gives citizens sovereignty over their assets within the health system. Information flows peer-to-peer between doctors, patients, pharmacies, and healthcare insurance providers, with the patient's device always holding their prescription history. Each participant in the ecosystem identifies himself with a DID (Decentralized Identifier) and then issues or receives prescriptions according to their role. This could eventually be expanded to the patient's entire medical history.

We are also considering the future inclusion of AI solutions to provide predictive assistance to doctors and patients regarding their healthcare assets. The use of Zero Knowledge Proof verifications is also planned for document validation.

We already have an online Proof Of Concept using the Zksync network, and are looking for potential implementations within the healthcare system.

Context and Current Challenges

The traditional process of issuing and managing medical prescriptions presents several significant challenges:

1. **Forgery and Fraud**:
    - Prescriptions can be forged, altered, or duplicated, leading to the improper dispensing of medications and abuses within the health system.
2. **Security and Privacy**:
    - Handling sensitive medical information in non-secure formats can compromise patient privacy.
3. **Lack of Traceability**:
    - Tracking and auditing prescriptions and medications is complex and laborious, making it difficult to detect irregularities and manage resources efficiently.
4. **Excessive Audit Costs**:
    - High degree of distrust among system actors lead to high audit costs.

Proposed Solution: Electronic Prescriptions on Blockchain

The benefits of our solution include:

1. **Authenticity and Fraud Prevention**:
    - Through the use of the W3C's SSI standard, blockchain ensures that prescriptions cannot be altered or forged once recorded. Each transaction of each prescription records a hash on the blockchain.
2. **Security and Privacy**:
    - Prescription information is handled securely and privately following the SSI standard, and documents are shared peer-to-peer, protecting patient privacy.
3. **Complete Traceability**:
    - All actions related to the issuance of prescriptions and dispensing of medications are recorded on the blockchain, providing an auditable and transparent history.
4. **System Interoperability**:
    - Interoperability among actors: The SSI standard ensures communication channels between system actors, namely patients, doctors, pharmacies, and health insurance providers. It also provides a communication protocol for other implementations based on the same digital identity paradigm.
    - Interoperability among health systems: Similarly, our solution will allow integration and connection with different digital systems, ensuring the integrity of prescriptions.

Commercial Target

Our solution aims to be marketed through the following actors as service clients:

- Governments
- Health insurance providers
- Laboratories
- Drugstores
- Pharmacies

Conclusions

Implementing an electronic medical prescription system based on SSI and blockchain models will qualitatively improve the management of medical prescriptions, offering a more secure and transparent process, eliminating any possibility of fraud or misappropriation of information.

This solution places the patient at the center, giving them full sovereignty over their assets within the health system, with the patient having absolute control over their prescription history.

Additionally, the scenario of unequivocal identification of health system actors and the model of verifiable credentials applied to prescriptions open the door to new solutions that could be projected beyond this development. For example, it could be considered that at the time of prescription, the doctor could have the assistance of an AI that, by reading the patient's complete prescription history, avoids the prescription of overlapping or incompatible drugs.

Project Environments

- URL to open source code: https://gitlab.com/groups/recetasbc
- URL to live demo: https://app.recetasbc.com.ar
- Smart Contract RecetasW3: https://sepolia.explorer.zksync.io/address/0x330E512dDB94d2dd17D53816422Af7245BcC1fD1
- DIDs Transactions in ZkSync network: https://explorer.zksync.io/address/0x232e65C20af532344E4eA79cB0CdB15A9B5F995B

References

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- Trust over IP: https://trustoverip.org/wp-content/uploads/Introduction-to-ToIP-V2.0-2021-11-17.pdf
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