Blockchain: A ledger for Medical Records?

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Abstract - **Medical systems have been improved a lot over the years and technology never stops to upgrade. More the technology upgrades, more the benefits are there for various industries. However, many problems are still present, in particular those related to a unified management of health records that could help doctors all over the world to have access to the complete medical records of their patient. Blockchain makes it possible for having records that can be trusted, secured, and always accessible making it an effective solution for the problem we just talked about. The main contribution of this paper is providing preliminary results of a literature review on the adoption of blockchain to support the management of EHR in health systems - along with the benefits and challenges.**

Index Terms -Blockchain, Medical Records, Aadhaar Number, Healthcare

I. INTRODUCTION

This paper introduces an idea of having a facility which helps the doctors of India to access medical history of every patient they treat of India. Every person's medical history can be affiliated to their unique aadhaar card number. Healthcare data are the most valuable asset of any healthcare system's intelligence. Most of the time, these data are scattered across different systems and sharing them is influential for establishing an effective and cohesive healthcare system. For example, a patient could visit different doctors in different medical networks for different symptoms, and it would be beneficial for each doctor to see the patient's entire history. Under the current circumstance, a doctor could have a rejected access to the data hosted by other institutions without a mutual sharing agreement for personal health information(PHI).Also, a centralized hosting location of data (e.g., cloud-based solution) can be a single point of a security attack. Anecdotal evidence from recent years shows that healthcare data continues to be a lucrative target for data breaches, thus causing patients to be exposed to economic threats as well as possible social stigma and mental anguish Cross-institutional sharing of PHI is also complicated due to the demand of a high level of interoperability. As a consequence, data are not always accessible to a provider even when permission is granted. In an ideal world, patients should not only own their own medical records but also be able to control and share their own data without compromising security and privacy. With growing recognition of the distributed nature of health services and health records, block chain technology has recently reached the impetus of the healthcare domain to accommodate the electronic health records (EHR). Starting from Summer 2017, healthcare giants have been involved in block chain, whether in joining consortium efforts likeHyperledger2 or developing their own services and products. In parallel, the number of publications in scientific databases has also grown, highlighting the potential of block chain to improve transparency and security at the sharing of health records. The main goal of this work is to develop understanding ofthe scenarios that involve deploying block chain for EHR, the benefits that arise from this incorporation and the challenges in such a context. Since every person interacting with block chain should have unique identity, it would be good to use aadhaar number for unique identity of every person. Every person not having aadhar is a problem, but also there is no other thing greater scaled than aadhaar and hence it is our best option. The remainder of this paper is structured as follows: Section2 tells what is aadhaar. Section3 provides an introduction on blockchain. Section 4 provides overview of one possible method to implement the HER. Section 5provides the concluding remarks.

II. AADHAR NUMBER

Aadhaar is a 12 digit individual identification number issued by the Unique Identification Authority of India on behalf of the Government of India. The number serves as a proof of identity and address, anywhere in India. Aadhaar letter received via India Post and e-Aadhaar downloaded from UIDAI website are equally valid.Any individual, irrespective of age and gender, who is a resident in India and satisfies the verification process laid down by the UIDAI can enrol for Aadhaar.Individuals need to enrol only once but in case of multiple enrolment, the Aadhaar is generated against one of the enrolment ID's while others are rejected as duplicate. Aadhaar Enrolment is free of cost for all the residents of India.Aadhaar number is unique for each individual and will remain valid for life time. Aadhaar number will help the residents to avail various services provided by banking, mobile phone connections and other Govt and Non-Govt services in due course. Some other information about Aadhaar is:

- Online verification of demographic information in a cost-effective way

- Unique and robust enough to eliminate the large number of duplicate and fake identities in government and private databases

- A random number generated, devoid of any classification based on caste, creed, religion and geography

Aadhaar will make every patient have separate record from other patient.

III. BLOCKCHAIN: INTRODUCTION

A blockchain is, in the simplest of terms, a time-stamped series of immutable record of data that is managed by cluster of computers not owned by any single entity. Each of these blocks of data (i.e. block) are secured and bound to each other using cryptographic principles (i.e. chain).So, what is so special about it and why are we saying that it has industry disrupting capabilities? The block chain network has no central authority — it is the very definition of a democratized system. Since it is a shared and immutable ledger, the information in it is open for anyone and everyone to see. Hence, anything that is built on the blockchain is by its very nature transparent and everyone involved is accountable for their actions. Blockchain has no single point of failure, data on it will be always accessible. Data on Blockchain is immutable and it will help patients such that no one can maliciously change their medical history. However, we can customize our new blockchain to have any feature we want. Which will ensure privacy of patient's medical records? We all trust doctors with our lives and so it will be easier for patients to trust doctors with their records. Our new blockchain will allow patients to set their trusted doctors, and only those doctors will be allowed to access or update their medical records. Yes blockchain can be configured or developed like this.

IV. ONE POSSIBLE METHOD

A new blockchain should be created, solely for the purpose of saving the patient history. The Blockchain will be public, anyone can access it, Indian doctors and patients from all over the world. The second thing which should be created is a interface application like a website or a desktop or android application, which will be the medium between blockchain and users. It is strictly needed because doctors and patients may not always know how to interact with blockchain. The interface application will be the thing, they will interact with. The application must have following function:

- Users can create a unique identity (account) using aadhaar number

- Users can log-in to use other features of the application

- Users can set who can view their records.

- Users can set who can update their records.

- Authorised doctors can view medical history of their patients.

- Authorised doctors can update medical records of their patients.

Now everyone should update their trusted doctors who will have permission to access and update their records. Doctors must use this application to put whatever they diagnosed and prescribed a particular patient on block chain via this interface application. This will ensure that next time whenever the same patient goes to any doctor, the doctor will be able to see his/her past records. Using this method, we have immutable, always accessible, secure and decentralized medical records of each patient of India. This method can be extended to comply many more use cases like finding the right donor for blood or organ. This is something which we would like to research separately and include it in the forthcoming research paper.

V. FINAL REMARKS

This paper presented our research on the adoption of blockchain to support immutable, always accessible, secure and decentralized medical records of each patient of India. Preliminary results of our research show that, despite the advances that have been achieved, there are still many problems to be solved. We have discussed one method which can be used to implement this solution. In a forthcoming paper, we intend to extend the results and provide deeper details on the use of block chain and this application in medical sector, like this application can be used for filtering blood donors easily and more such applications.

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