

## ENABLING BETTER HEALTHCARE WITH BLOCKCHAIN

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**Abstract** - One of the main problems of Healthcare applications is that each one of them have separate data sources and maintain silos of patient data; data that can neither be exchanged nor used for providing better healthcare. Sharing patients' data on a normal relational database has immense security, confidentiality and accountability issues for this sensitive data. Blockchain, a trusted network, provides a great mechanism to share and exchange patient's medical data without compromising on security, confidentiality and authorization issues. Blockchain is built on encryption, validation and distribution where there is no centralized control. Each block represents data ownership and access permissions of the members in the peer-to-peer network. It creates append-only, immutable time-stamped chain of content. By utilizing Blockchain for healthcare applications the patient has the control on who has access to his medical data. Added to this, smart contracts enable embedding business logic which is self-controlled and autonomous. Our pilot project eliminates manual verification of medical claims and provider's reimbursement is automated via smart contracts built into the application. This reduces claim repudiation and cost of claim processing time drastically.

**Keywords**— Blockchain, EHR, encryption, healthcare, peer-to-peer network

### I. Introduction

Blockchain is a shared, immutable record of peer-to-peer transactions built from linked transaction blocks that are stored in a digital ledger. This is akin to a write-once database on a secure decentralized trusted network. The notable difference is that the data is located in a network of personal computers called nodes without a central entity controlling the data.

Better data sharing between healthcare providers, practitioners, services providers, diagnostic centers and pharmacies, etc., mean a higher probability of accurate diagnoses, more effective treatments, and the overall increased ability to deliver value and cost-effective care. Blockchain technology allows various stakeholders in the healthcare value-chain to share access to their networks without compromising on security and integrity.

Blockchain can bring together the complex health care management by integrating finance, payment and the care provision. The inherent properties of cryptographic public and private key access, proof of work and distributed data, creates a new level of integrity for health care application for collaboration and co-existence.

### II. Healthcare Claims

Claim processing is a complex and tedious task. Most often, claims for medical activities, be it diagnostics or specialist consultation or medications go through a time consuming manual verification and approval cycle before they are reimbursed. It has been found that over 90% of the claims are standard bills that are raised due to routine check-ups and / or ongoing medication to the patients. Such kind of claims should not require manual verification

and should be processed in near-real time. However, given the bureaucratic nature of the insurance industry these standard claims are put in the verification process queue and they make take up to 60 days for approval and for funds release to the effected party. This manual verification process is not only taking up precious time of the claim verification personnel but also robbing them of their inputs on special cases where they are most needed.

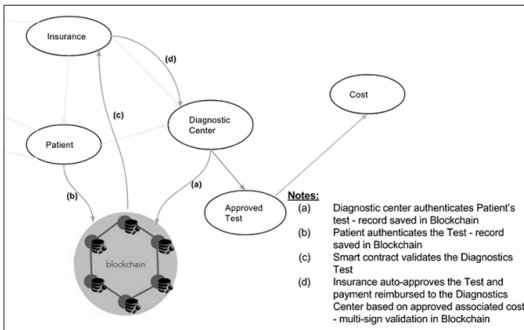
### III. Our Proposed Solution

In our proposed Blockchain based claims processing application, we envision the trusted network based smart contracts to do the bulk of the verification of these standard claims and approve the release of funds in near real-time, thereby freeing the verification personnel of their valuable time to focus on complex and claims which require manual intervention and collaboration with external stakeholders.

The solution overview is depicted in Figure. 1, and shows the typical workflow of the smart contract based claims approval and fulfilment application.

#### A. Background

Diagnostic center which provides various tests are signed up by insurance companies to be part of their services network.



Each of these diagnostic centers will have an approved list of tests which the patients can avail. The rate card and cost for these approved tests are defined in the contract between the insurance company and the diagnostic center. Patients sign-up for suitable insurance plans based on their needs which enable them to go for periodic tests and consultations from the network of providers of that insurance payer.

### B. Workflow

Typically, when a patient needs certain testing to be done he/she will approach one of the diagnostic center that is part of the insurance network. The tests are then conducted at the diagnostic center after providing them the appropriate authentication or identity card. On completion of the tests and receiving the test results the patient shall then authenticate on the system that the said test has been completed successfully. This action initiates the smart contract on Blockchain and verifies the diagnostic center, patient data, approved test and associated costs. If the information is in sync with the approval process, the smart contract then will approve the costs and the payment is released to the diagnostic center for rendering that service to the patient.

### C. Payback

Since the smart contract resides on the trusted write-only Blockchain network, the transaction is immutable and can be audited at any point of time later. The approval is also recorded in the Blockchain network.

In the current scenario, the above described claim processing steps are done manually and it is time consuming one. Typically, the claims are reimbursed to the parties after 45 to 60 day delay, provided all the paper work is in place. Using Blockchain embedded with smart contracts, we are able to reduce this a few minutes for most of the standard claim processes.

### D. Adoption / Extensions

A similar workflow is adopted for specialist consultation and routine hospital visits without complications. The amount of manpower reduction in this approval process for insurances itself is a great motivator for implementing this platform. Apart from the tangible ROI of this system

which the insurance can enjoy, they will also free up the personnel bandwidth for processing complex claims and approving them with required due diligence with the concerned parties.

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