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Group Number:- 20IT722

Project Guide

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INTRODUCTION

It is a new era for health care and information technology (IT). Due to improvements

in genetic research and the advancement of medicinal Research, health care is witnessing an

innovative approach to disease prevention and treatment that incorporates an individual

patient’s genetic makeup, lifestyle and environment.

Simultaneously, IT advancement has produced large databases of health information, provided tools to track health data and engaged individuals more in their own health care.

Combining these advancements in health care and information technology would foster transformative change in the field of health IT.

However, the vast majority of these systems do not have the capacity to share their health data.

Blockchain technology has the potential to address the interoperability challenges currently

present in health IT systems and to be the technical standard that enables individuals, health

care providers, health care entities and medical researchers to securely share electronic health data.

Underlying Fundamentals of Blockchain Technology

Blockchain is a peer-to-peer (P2P) distributed ledger technology for a new generation of

transactional applications that establishes transparency and trust. Blockchain is the underlying

fabric for Bitcoin and is a design pattern consisting of three main components: a distributed

network, a shared ledger and digital transactions.

a. Distributed Network

Blockchain is a decentralized P2P architecture with nodes consisting of network participants. Each member in the network stores an identical copy of the blockchain and contributes to the collective process of validating and certifying digital transactions for the network.

b. Shared Ledger

Members in the distributed network record digital transactions into a shared ledger. To add transactions, members in the network run algorithms to evaluate and verify the proposed transaction. If a majority of the members in the network agree that the transaction is valid, the new transaction is added to the shared ledger. Changes to the shared ledger are reflected in all copies of the blockchain in minutes or, in some cases, seconds. After a transaction is added it is immutable and cannot be changed or removed. Since all members in the network have a complete copy of the blockchain no single member has the power to tamper or alter data.

Diagram

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**Patient/ Clinical data flow**

c. Digital Transactions

Any type of information or digital asset can be stored in a blockchain, and the network

implementing the blockchain defines the type of information contained in the transaction.

Information is encrypted and digitally signed to guarantee authenticity and accuracy.

Transactions are structured into blocks and each block contains a cryptographic hash to the

A close up of a device

Description automatically generatedprior block in the blockchain. Blocks are added in a linear, chronological order.

**A Collection of interrelated Block : Transactions**

Technical Advantages of a Health Care Blockchain

1. Blockchain is based on opensource software, commodity hardware, and Open API’s. These components facilitate **faster and easier interoperability** between systems and can **efficiently** scale to handle larger volumes of data and more blockchain users.

2. Blockchain would allow patients, the health care community and researchers to **access** one shared data source to obtain timely, accurate and **comprehensive patient health data**.

3. Blockchains distributed architecture is **built-in fault tolerance and disaster recovery**. Data is distributed across many servers in many different locations. There is no single point of failure and it is unlikely a disaster would impact all locations at the same time.

Health Care Advantages of Health Care Blockchain

1. Blockchain technology offers many advantages to medical researchers, health care providers, care givers and individuals. Creation of a single storage location for all health data, tracking personalized data in real-time and the security to set data access permissions at a granular level would serve research as well as **personalized medicine**.
2. Health researchers require broad and comprehensive data sets in order to advance the understanding of disease, accelerate biomedical discovery, **fast track the development of drugs and design customized individual treatment plans** based on patient genetics, lifecycle and environment. The shared data environment provided by Blockchain would deliver a broad diverse data set by including patients from **different ethnic and socio-economic backgrounds** and from various geographical environments. As blockchain collects health data across a patient’s lifetime, it offers data ideal for longitudinal studies.

As like in COVID-19(SARS COV 2) the data of various participants **across** various regions are being monitored and studied on a very large scale, to accommodate this data safely of that many individuals blockchain would have played a vital role.

1. Blockchain data structures would work well for gathering data from **wearable sensors** and **mobile applications** and, thus, would contribute significant information on the risks versus benefits of treatments as well as patient reported outcomes. Furthermore, combining health data from mobile applications and wearable sensors with data from traditional EMR’s and genomics will offer medical researchers increased capabilities to classify individuals into subpopulations that respond well to a specific treatment or who are more susceptible to a particular disease.

For example:- Astrazeneca Vaccine trials have been stopped because one patient was found having some abnormal side effects, if Blockchain technology was used they would have known that the illness was not due to vaccine/ Placebo, This could have saved Time and vaccine development would have been further moved on.

Bibliography

Alcorn, T., Eagle, A., & Sherbondy, E. Legitimizing Bitcoin: Policy Recommendations. MIT.

bitcoin. (n.d.). Retrieved from Bitcoin: https://bitcoin.org/en/

BitFury Group. (2016). Digital Assets on Public Blockchains. BitFury Group Limited.

Blockchain. (n.d.). Retrieved 7 2016, from Wikipedia: https://en.wikipedia.org/wiki/Blockchain\_(database)

Fielder, S., & Light, J. (2015). Distributed consensus ledgers. Accenture, Accenture Payment Services. Accenture.

Form a Vital Link. (n.d.). Retrieved 8 2016, from pcori: http://www.pcori.org/

How does bitcoin work? (n.d.). Retrieved 7 2016, from Bitcoin: https://bitcoin.org/en/how-it-works

Hyperledger Project. (n.d.). Retrieved 7 2016, from GitHub: https://github.com/hyperledger

Kaye Scholer. (2016). An Introduction to Bitcoin and Blockchain Technology. www.kayescholer.com.

Lamport, L., Shostak, R., & Pease, M. (1982, 7). The Byzantine Generals Problem. (S. International, Ed.) ACM Transaction on Programming Languages and Systems .

Makary, M. A., & Daniel, M. (2016). Medical error - the third leading cause of death. BMJ.

Monegro, J. (n.d.). The Blockchain Application Stack. Retrieved 7 2016, from Joel Monegro Blog:

http://joel.mn/post/103546215249/the-blockchain-application-stack

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System.

(2015). Patient-Centered Health on the Blockchain with Chelsea Barabas.

Precision Medicine Initiative Cohort Program. (n.d.). Precision Medicine Initiative Cohort Program. Retrieved 7 2016, from National Institutes of Health: https://www.nih.gov/precision-medicine-initiative-cohort-program

Rodriguez, J. (2015, 1 26). Building an IOT Platform: Centralized vs. Decentralized Models. Retrieved from

https://jrodthoughts.com/tag/enterprise-software/page/2/

Rogers, B. (2015, 11). How the Blockchain and VR Can Change the Music Industry (Part 1). Retrieved 7 2016, from

https://medium.com/cuepoint/bc-a-fair-trade-music-format-virtual-reality-the-blockchain-76fc47699733#.q8lp7sxfl

Rogers, B. (2016, 2 24). How the Blockchain Can Change the Music Industry (Part 2). Retrieved 7 2016, from

https://medium.com/cuepoint/how-the-blockchain-can-change-the-music-industry-part-2-c1fa3bdfa848#.gbiei2jc6

Schwartz, D., Youngs, N., & Britto, A. (2014). The Ripple Protocol Consenus Algorithm. Ripple Labs Inc. Ripple Labs Inc. (2014). Security and Compliance For Scale-Out Hadoop Data Lakes. EMC.

Shead, M. (2009). Retrieved 2016, from Productivity501: http://www.productivity501.com/digital-signatures-encryption/4710/

The Office of the National Coordinator for Health Information Technology. (2015). Connecting Health and Care for the Nation, A Shared Nationwide Interoperability Roadmap.

Zyskind, G., & Nathan, O. (2015). Enigma: Decentralized Computation Platform with Guaranteed Privacy. MIT. MIT Media Lab.

Zyskind, G., Nathan, O., & Pentland, A. Decentralizing Privacy: Using Blockchain to Protect Personal Data. MIT. MIT Media Lab.