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Advanced implementation of Blockchain technology for healthcare monitoring system using IoT

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ABSTRACT:

Healthcare professionals and remedial providers in fields of global pharmacology, community health, drug, and health information are recognizing the benefits of Ethereum Blockchain technology to streamline and secure health information management, drug and medical device tracking, and more. In healthcare, Blockchain is implemented in many areas like security of health care applications and its functions. This latest technology helps healthcare researchers and academicians to uncover genetic code by facilitating the transfer the secure information of patient medical data records, supervision the drug supply chain, and the safe transfer of patient hospital records. In this paper this innovative technology facilitates the transfer of patient medical records securely and maintain the medicine supply chain and helps healthcare researchers unlock genetic code. This Blockchain is a combination of Cryptographic keys. A peer-to-peer network containing a shared ledger. Here maintain a records keep secure with Blockchain technology and transfer using cloud based IoT technology.

Index terms: IoT technology, Blockchain technology, SQL database, JAVA, Cloud technology

I.Introduction:

ConsenSys is a Blockchain technology company that offers developer tools alongside enterprise solutions. The main goal of the developers in worldwide is to build the next generation of advanced applications and launch latest financial infrastructure is decentralized web technology. The applications are endless across all industries and occupations, including healthcare[1]. There is an implementation of Blockchain technologies with cryptography algorithms for transfer medical records, health information, anonymity maintain the protection and security between healthcare professionals and their institutions.In health care, Blockchain has been praised for guaranteeing the security of sensitive data and ensuring authorized access to electronic health records. Moreover, with this technology in place, it is arguably almost impossible to tamper with data or falsify records.In the world of Blockchain, Hyperledger and Ethereum are the two of the most popular Blockchain platforms. Both are open source. To resolve the organization or industry-level problems need a large number of Blockchain applications.

II.ArchitectureBlockchain technology:

Blockchain architecture can serve the following purposes for organizations and enterprises like *Cost reduction* - lots of money is spent on sustaining centrally held databases [2](e.g. banking sectors, number of governmental organizations and institutions) keeping the information secure from third parties like cyber attackers and for other intentions. Within a Blockchain structure, it is possible to check the history of any transaction at any moment in time. The centralized database is very important to maintain a lot of information at a specific point.
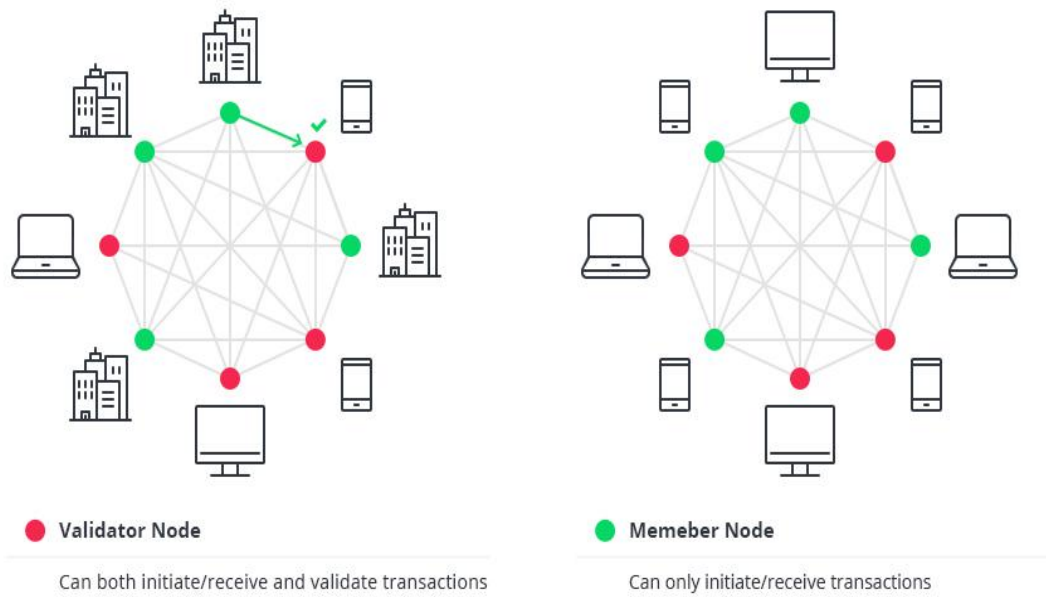
Fig.1 Block diagram of Blockchain Architecture

Nodes in Public vs. Private Blockchains

- *Data validity & security* - once entered, the data is hard to tamper with due to the Blockchain's nature[3]. There are no guarantees of high security and validation when it takes long time for record validation and process it.

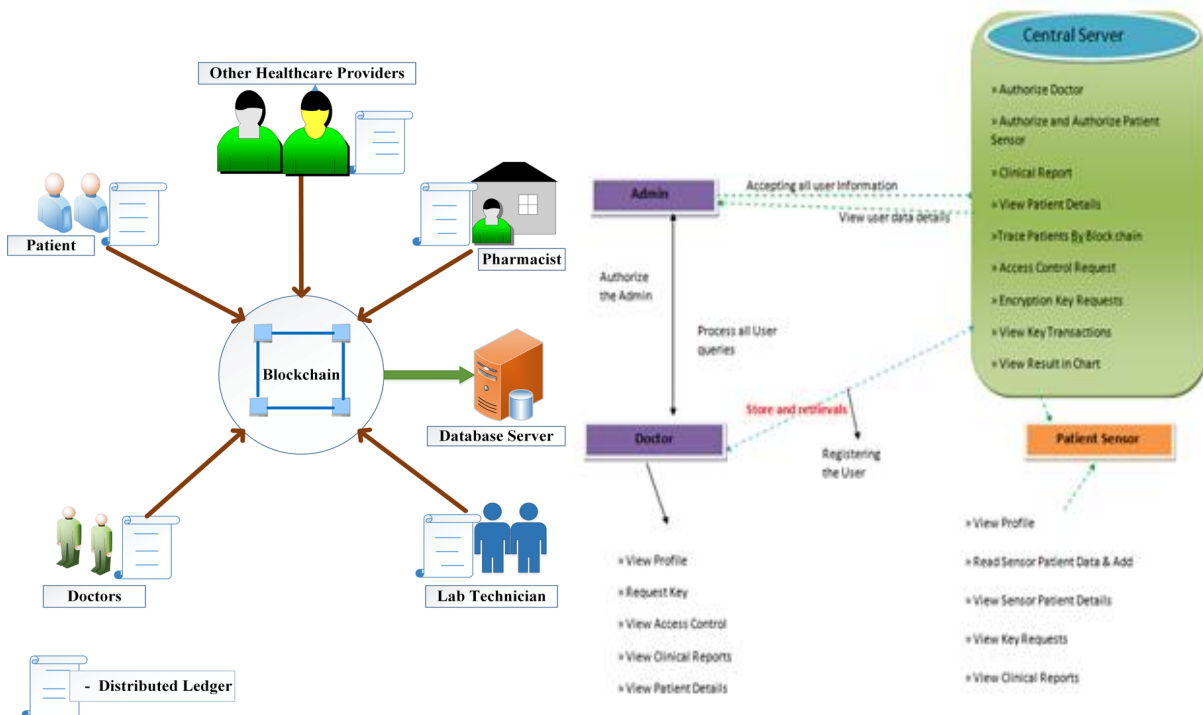## III.Implementation of Blockchain technology for health care monitoring system:

Fig.2. Architecture of Blockchain technology for health care system

Blockchain provide shared ledger using Smart Contracts, integrated, updated, and read by all participants in the medicine supply chain, creating the ability to monitor the journey of the product through serialization from manufacturers, distributors, re-packagers, and wholesalers before reaching[4].

3.1.Process:

When put to work on securing medical data, Blockchain can store information in a way that is accessible to anyone on the network, completely immutable, and tamper-proof[5]. This IoT sensor based Blockchain technology would give owners, doctors and nurses manage over the flow of data from a particular, trusted platform.

3.2.Cloud Technology:

Cloud computing in healthcare describes the practice of implementing remote servers accessed via the internet to store, manage and process healthcare-related data[6]. The advantages of IoT based cloud technology in healthcare departments often work hand-in-hand for both physicians and patients. Implemented security, cost reduction, Reduced costs and facilitating better patient care through interoperability with collaboration, are just a few advantages of cloud systems for healthcare systems. Cloud technology is a case where patient outcomes are largely aligned and the industry outcomes of healthcare providers. Cloud computing in healthcare describes the practice of implementing remote servers accessed via the internet to store, manage and process healthcare-related data[7]. Here very important thing is to maintain the on-site data center with data servers and hosting the complete information on personal systems. This cloud storage offers and allows the healthcare professionals and medical care organizations to control network of remotely accessible servers where they are able to store huge amount of patients information securely and its maintained by developers. In worldwide so many countries like USA is adopted maintain a cloud for EMR records to store and protect the patients information.

IV. Cloud Storage in Healthcare Means Efficient Electronic Medical Record-Keeping:

This is an mandate to maintain a cloud based technology in healthcare departments or hospitals about the patients interactions and EMR data. Its necessary for hospitals to maintain EMR for storing patients information and their interactions. The main goal is IoT based Cloud technology used in medical field to improve security and safety of patients information with quality of medical services and maintain patient privacy and security[8].Today, the majority of hospital and healthcare facilities have abandoned the practice of paper record-keeping when it comes to health records and are turning to cloud storage in healthcare. Every patient records are stored and uploaded using cloud and updated electronically by nurses, owners, physicians and healthcare providers etc.

4.1.Cloud Computing in Healthcare Reduces Data Storage Cost

Actually there is a requirement of on- site storage with hard drives with IT infrastructure to keep information secure and accessible at all times whenever it needs[9]. Providers of cloud-based healthcare departments handles construction, administrative services and maintenance of IoT cloud information services. It enabling healthcare providers to reduce the costs and focus on caring for patients.

4.2.Tokenization:

In present days healthcare systems, most of the hospitals, Pharmaceutical departments, hospitals, do not share any information with patients. Because it is very hard for patients to verify the accurateness of the information. The main aim of Tokenization methodology is implementation in healthcare sectors information can help to develop the healthcare organizations, hospitals[10]. It creates digital representation format information for healthcare sectors and grant usage rights along with services[11]. Also it enables users to retrieve healthcare information without re-encrypting. Using these tokenization methods patients can share medical information with others there by reducing cost of treatment by own data sharing from central services.

V. Discussion and Future scope:

Blockchain with cloud technology could also be used to guarantee for updating of patients information entered in the hospital records, which would thus be non-modifiable. The outcome of action is better documentation of any medical or clinical errors and keeps a track of specific therapy. Now a days network technologies, there is clear need of quality of medicine and health care services. Blockchain with cloud based technology is an increasingly now a days to see advanced level of explosion of its use also in the healthcare mechanisms. BHTY is identifies ten main trends of evolution. Blockchain technology will empower the patients to take more control of theirmedical data and can handle their healthcare information inappropriate ways for managing overall health conditions[12].Each new *user (node)* joining the peer-to-peer network of Blockchain receives a full copy of the system. Once a new block is created, it is sent to each node within the Blockchain system. Each node verifies block and information stated is correct or not. If everything is alright, the block is added to the local Blockchain in each node.All the nodes inside a Blockchain architecture create a *consensus protocol*.

This Blockchain with IoT cloud technology is implemented for faster and secure data sharing in healthcare mechanism and also it fulfill the current needs of healthcare related requirements and also give a lot of facilities to the patients with required medical services. Furthermore, one of the most advanced applications of Blockchain sees the tracking of the entire pharmaceutical supply chain, aimed at guaranteeing the integrity of the products and reducing the phenomenon of counterfeiting of medicines.

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