

Internet of Things Using Healthcare and Medical Sector: Applications of Blockchains, Challenges and Future Perspectives

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ABSTRACT: Internet Of Things (IOT) is one of the modern innovations in Information Technology, which intends to interconnect the physical and digital worlds. It introduces a vision of smartness by disabling communication between objects and humans through the Internet. IOT has different applications in almost all sectors like Smart Health, Smart Transportation, and Smart Cities, etc. In healthcare applications, IOT communication between doctors and patients as the latter can be diagnosed remotely in emergency scenarios through body sensor networks and wearable sensors. However, using IOT in healthcare systems can lead to violation of the privacy of patients, security should be taken into consideration. Blockchain is one of the trending research topics nowadays and can be applied to the majority of IOT scenarios. Few major reasons for using the Blockchain in healthcare systems are its prominent features, i.e., Decentralization, Immutability, Security and Privacy, and Transparency.

KEYWORDS: IOT (Internet Of Things), wearable sensors, Blockchain

I. INTRODUCTION

The healthcare sector is a primary concern for all the developing as well as developed countries because this sector is directly concerned with the social welfare and lives of people. Research and development in the healthcare sector should be a current process, as it will help to improve the quality of living by fighting various health issues and diseases. With the promotion and recent developments in technology, the

improvement in the healthcare sector can be seen easily. The existing capabilities of the healthcare and medical sector can be further improved by the introduction of the latest and innovative computer technologies in the health sector. Various emerging and revolutionary computer technologies are already being used in other sectors with miraculous results. These technologies include the IOT, block chain, machine learning, Data mining, Natural Language Processing (NLP), Image processing, cloud computing, and many more.

IOT means connecting everything with the internet.

Everything here includes vehicles, home appliances, and other items embedded with electronics, and software, sensors, actuators, and connectivity that enable these things to connect, collect, and exchange data.

Such as desktop, laptop, smartphones, and tablets to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. The major technologies used in the internet of things are sensors, cloud, wireless technology, and security. The main applications of IOT are Smart Homes, Smart City, Agriculture, Smart Retail, Driverless Cars, and Healthcare. Security remains a critical aspect of every technology and plays a vital role in the smooth functioning of IOT networks.

In IOT architecture, the proper format of IOT is done at the physical level so that any unauthorized receiver cannot access the system. IOT architecture corresponds to five layers: the Perception layer, Network layer, Middleware Layer, Application layer, and Business layer. Each layer has its objective and issues. The main security goals critical in IOT are Confidentiality, Integrity,

and Availability (CIA). Based on weakness, there are four categories of attacks in IOT: “Physical attack,” “Software attack,” Network attack,” and “Encryption attack.”

II. PROBLEM DOMAIN

This section enlarge on the motivating factors as well as the review strategy used for conducting this study on Blockchain and IOT in the Healthcare sector.

2.1. Review Plan. Time period that were involved in this literature review on the use of Blockchain and IOT technologies in the Healthcare and Medical sector includes building a review strategy, downloading research articles from different online sources, analyzing the quality of articles, interpreting and enumerating observed results of the review, recording the results of the review, and finally presenting various research challenges and future research directions.

2.2. Research Questionnaire. The first step involved in conducting this resume was to frame the different research questionnaires and the motivating factors, and searching for different online research databases for relevant articles.

2.3. Source of Information. For conducting this review, various possible related resources have been consulted for finding the required and related research resources required for this study.

2.4. Search Keywords. Complete search on understanding the possibility of using Blockchain and IOT technologies in the Medical and Healthcare sector includes qualitative.

III. IOT AND RELATED DOMAIN

The fundamental architecture of IOT is the same as the TCP /IP architecture. There are many factors in IOT architecture that need to be focused like Measurability ,Interoperability, Reliability and QOS. The basic architecture of IOT consists of many layers, and the general architecture of IOT is described in figure 2.

3.1 Perception layer: First is the representation (Perception layer) layer, also known as the device layer. In this layer, sensors sense and collecting information about the environment.

3.2 Transport layer: It transfers the sensor’s data between different layers through networks such as wireless, 3G, LAN, and RFID.

3.2 Processing layer: This layer stores, analyses, and processes huge amounts of data. Ability and concepts like databases, cloud computing, and big data are used in this layer.

3.3 Application layer: This layer is responsible for delivering applicationspecific services to the user.

3.4 Business layer: It manages the whole IOT system, including applications, business and profit models, and user privacy. is layer also helps in future actions and business strategies.

Three domains of IOT architecture

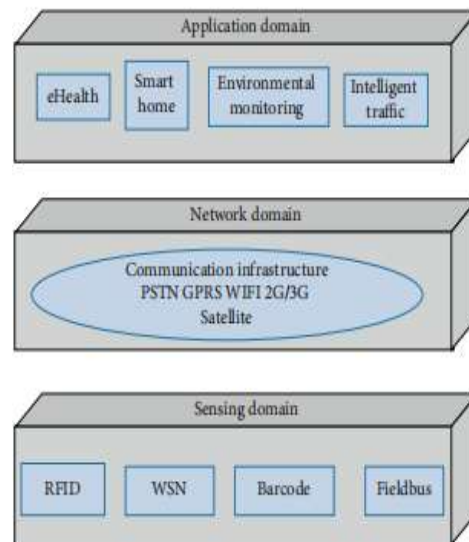


Figure 3: Domains of IOT architecture.

3.5 Communication Technologies in IOT.

Collection of heterogeneous networks and devices is done in IOT. To make Centralization decisions concerning IOT, reliable communication between the gateway and things is essential . The IOT gateway works as a communication between the sensing domain and the network domains like Zigbee, Bluetooth, WiFi are the technologies that are used to connect Smart things to IOT gateway IOT gateways are required in two situations: when the connection occurs between different sensing domains like Zigbee, Bluetooth, and the connection between sensing and network domain, e.g., Zigbee and 3G

IV. INTEGRATION OF BLOCKCHAIN AND IOT TECHNOLOGIES IN HEALTH - CARE

The number of patients crossways the country is increasing day by day and with the increase in the number of patients, it has become difficult to provide full medical care. In the last few years, the superior of medical care has improved with the help of IOT and wearable devices . Remote patient monitoring is the main sensation to address healthcare issues. Wearable devices used for

collecting and transferring data to hospitals, and IOT devices play an important role in remote patient monitoring. The main aims of these devices are to provide important information such as breathing patterns of a person, blood glucose level, and blood pressure to health providers.

Healthcare devices that are used for data collection data can be classified into four parts:

(a) Stationary Medical Devices: These devices are used for specific physical locations,

(b) Medical Embedded Devices: These devices are placed inside the human body,

(c) Medical Wearable Devices: These devices are prescribed by doctors,

(d) Wearable Health Monitoring Devices: These devices are worn on the body.

V. BLOCKCHAIN TECHNOLOGY AND RELATED CONCEPTS

Blockchain is a rising technology used in numerous different networks to ensure security and reliability in those networks. Blockchain technology is also given an option in various transaction management systems, and it is replacing the current existing transaction management system.

The issues with the current banking system are as follows:

(i) High transactional fees

(ii) Double spending

(iii) Banks have become synonymous with crises.

Blockchain consists of a chain of blocks, and each block is a collection of all modern transactions that have taken place and are verified. Blockchain is a guiding technology, only second to the best-selling bitcoin. Working of bitcoins using the Blockchain can help to read Blockchain technology better. Another important concept connected with the Blockchain is the value or proof of work of that block. This is the mathematical solution that is connected to the block to ensure that this is the valid block.

VI. VARIOUS APPLICATIONS OF BLOCKCHAIN AND IOT IN HEALTHCARE

Blockchain helps to maintain and share the patient's medical record with hospitals and health providers. There are many applications of healthcare:

6.1. Patient Monitoring/Electronic Health Record (ERH). According to the International Organization of Standardization, electronic health records store the patient data in a digital format, and the data are exchanged securely and only

accessible by authorized authority. It contains private information about a person's health issues, and its main objective is to maintain and provide efficient service to the patient.

6.2. Managing Medical Records and Other Data. The long-standing method of monitoring medical records needs to be changed. Now, the use of the Computer network in the healthcare system makes it more efficient. Computer network smart objects make it easy to store and process the data in any format like audio, images, or text.

VII. CHALLENGES OF USING BLOCKCHAIN IN HEALTHCARE DERIVED INDUSTRIAL IOT

The main challenges in the use of Blockchain Technology, along with IOT in the Healthcare and Medical Sector, are as follows:

7.1. Interoperability: Healthcare

Interoperability means exchanging information with each other in the Blockchain network. It is the main challenge due to the large and varied providers and due to its large open nature

7.2. Security: As the concept of decentralization is more secure, there are also some disadvantages associated with it. As in decentralized Blockchain, the data are distributed in a public ledger, which can cause privacy leakage

7.3. Lack of Standardization: Blockchain is a trending technology and is adopted in many countries. In domains and networks where the concept of security, trust, and trackability is involved, the Blockchain is used. Proper standardization of protocols, technologies, etc., is very important.

VIII. RESULT AND DISCUSSION

In this article, an attempt was made to identify different possible ways with which the IoT technology along with the Blockchain can be integrated into the Healthcare sector to improve the overall performance and to strengthen the current Healthcare sector. Three major application areas Table 8: Summarizes the list of abbreviations used in this survey.

(a) remote monitoring of patient's health,

(b) drug's traceability, and

(c) medical records management,

where IOT and Blockchain profession have their applicability were explored in detail. Also, various possible challenges and issues in the deployment of these two revolutionary technologies, i.e., IOT and Blockchain, in the Healthcare sector were explored and unregenerated.

IX. CONCLUSION

In Today's world, IOT technology is implemented in every field like agriculture, healthcare, smart cities, etc. In the field of healthcare, IOT is brought into use for applications like observation of the patient's health regularly, drug traceability, etc. However, there exist various security issues in IOT, which can be solved by integrating IoT ensure that patients' sensitive health related records remain safe from any type of tampering and leakage

REFERENCES

- [1]. M. Amadeo, "Named data networking for IOT: an architectural perspective," in Proceedings of the 2014 European Conference on Networks and Communications (EUCNC), IEEE, Bologna, Italy, June 2014
- [2]. R. Beck, "Beyond bitcoin: the rise of blockchain world," *Computer*, vol. 51, no. 2, pp. 54–58, 2018.
- [3]. J. Cheng, J. Li, N. Xiong, M. Chen, H. Guo, and X. Yao, "Lightweight mobile clients privacy protection using trusted execution environments for blockchain," *Computers, Materials & Continua*, vol. 65, no. 3, pp. 2247–2262, 2020.
- [4]. A. D. Dwivedi, "Optimized blockchain model for internet of things based healthcare applications," in Proceedings of the 2019 42nd International Conference on Telecommunications and Signal Processing (TSP), IEEE, Budapest, Hungary, July 2019.
- [5]. Z. Deng, Y. Ren, Y. Liu, X. Yin, Z. Shen, and H.-J. Kim, "Blockchain-based trusted electronic records preservation in cloud storage," *Computers, Materials & Continua*, vol. 58, no. 1, pp. 135–151, 2019.