

## [A REVIEW ON ENACTMENT OF BLOCKCHAIN IN IOT]

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### ❖ **ABSTRACT:**

-IOT (internet of things) describes the network of physically objects that are nested with sensors, software's and other technologies for the purpose of connecting and exchanging data with other devices and system over internet. In the area of IOT the major issue was security and privacy remain a major challenge, mainly due to the massive scale and distributed nature of IoT networks. For this problem blockchain(a blockchain is a distributed ledger capable of maintaining immutable records of transactions happening in a network) adds the category of security and privacy, The Blockchain is a great source of providing security to new era technological applications. In the upcoming era of industrialization, high growth of IoT based smart applications have high demand of security to manage and maintain the IoT based application's data safety, security integrity, and authentication. A Blockchain technology prevents from the unauthorized third parties and acts as a firewall against a single point of failure and other issues. . This has inspired researchers to investigate block chain's adoption into IoT ecosystem. Blockchain for IOT in the context of eHealth, smart cities, intelligent transport and other applications are analyzed. Blockchain is a distributed and a decentralized ledger technology that combines with IOT to make machine to machine transactions possible. It uses a set of transactions that are recorded in database, verified by multiple sources and entered in a common ledger distributed across every node.

### ❖ **KEYWORDS:**

1. IOT (Internet of Things)
2. BLOCKCHAIN
3. DECENTRALIZED
4. LEDGER
5. TRUST
6. CONSENSUS PROTOCOL
7. END TO END VISIBILITY

### ❖ **INTRODUCTION:**

IOT seamlessly interconnects devices and objects to create a physical network in which sensing, processing, and communication processes are automatically controlled and managed without human intervention. IOT consists of networked objects that sense and gather data from their surroundings, which is then used to perform automated functions to aid human use. The IOT is still steadily growing worldwide, expanding Internet and wireless access, the introduction of wearable devices, the progress of storage technology and cloud computing. With each passing day, smaller and smarter devices are being implemented in multiple IOT domains, including housing, precision agriculture, infrastructure monitoring, personal healthcare, and autonomous vehicles and in many more fields also.

However, data information by IOT devices might contain confidential and personal data , and plenty of security threats have emerged that aim to take advantage of the weaknesses of current IOT infrastructures. Briefly we will observe that the entire IOT network works as a centralized system, for improvement in privacy and security criteria we'd need to adopt **BLOCKCHAIN TECHNOLOGY**.

Centralized specification for the IOT is faced with the subsequent challenges:

- Information keep in centralized servers is analyzed to reveal specific personal information relevant to health, shopping for preferences and behaviors . Users have restricted management over, however their information is employed and by whom.
- Information keep in centralized cloud lacks secure responsibility and traceability. Information keep on centralized servers has the chance of being deleted or tampered with.
- With the exponential growth of the IOT, centralized servers won't be economically enough in handling the high or rich amount of end-to-end communications that facilitate IOT automation functions. Therefore, a

centralized approach can hamper the enlargement of the IOT.

**Currently Blockchain is the new phase or an emerging technology which would be able to support a secure and safe distributed ecosystem for the IOT systems.**

Block chains to modify IOT communications and to eliminate the requirement for centralized sure authorities. The concept of a block chain-based IOT has gather the importance of analysis interest, since decentralizing the IOT through block chains has the subsequent potential benefits:

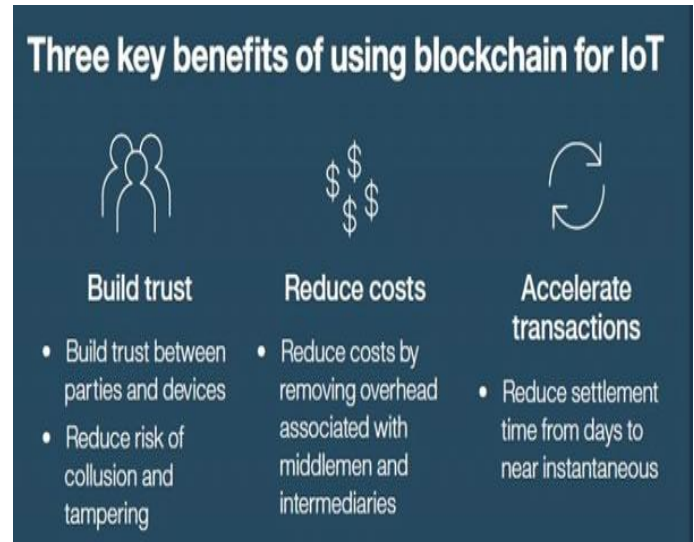
- A decentralized peer-to-peer network architecture enables IOT device autonomy, and end-to-end communications don't have to be compelled to undergo a centralized server for performing automation services.
- Participants in block chain networks can verify the integrity of the information they're sent, moreover as a result of the causing participant.
- Since no single entity controls the contents of a blockchain, IOT information and event logs hold on the block chain square measure immutable, thus there's bonded responsibility, traceability, dependability and trustless.
- The trustless network surroundings of block chains permits secure micro-transactions for IoT services and information.

➤ **Table A shows comparisons between block chain and IOT.**

Blockchain	IoT
Decentralized	Centralized
Resource consuming	Resource restricted
Block mining is time-consuming	Demands low latency
Scale poorly with large network	IoT considered to contains large number of devices
High bandwidth consumption	IoT devices have limited bandwidth and resources
Has better security	Security is one of the big challenges of IoT

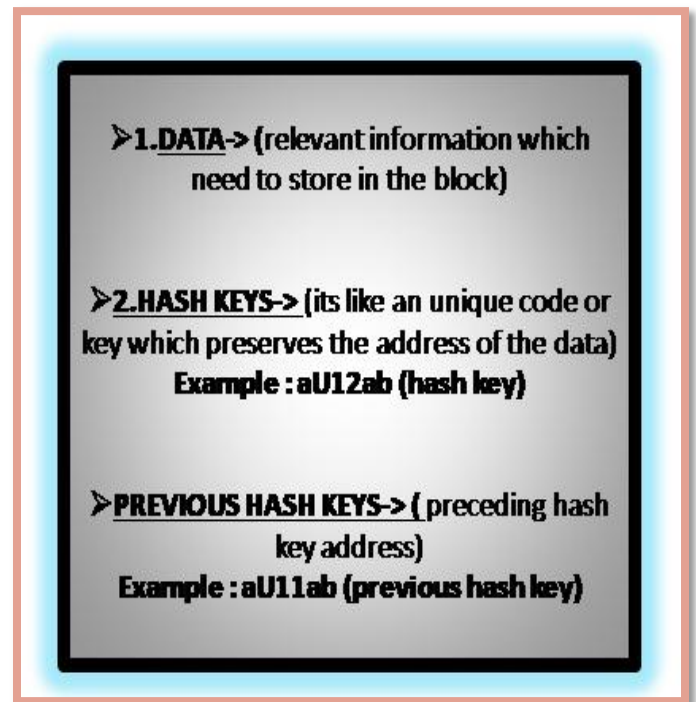
**TABLE: A**

❖ **BENEFITS OF USING BLOCK CHAIN FOR IOT:**



**FIGURE: 1**

❖ **A SINGLE BLOCK OF A BLOCKCHAIN:**



**FIGURE: 2**

❖ **BLOCKCHAIN STRUCTURE (A SINGLE BLOCK)**

A block chain is created from of blocks containing details of transactions that have occurred at intervals the network. The dealing information will be thought to be token transfers occurring in a network, or any manner of knowledge exchange. Every block is largely divided into two elements, namely, the header and also the body. Transactions area unit keep at interval of the body of the block, where as the header of every block contains, among alternative fields, the symbol of the previous block. A single block is shown in above figure 2.

❖ **HOW BLOCKS ARE INTERCONNECTED (WHICH FORM A BLOCKCHAIN):**

The first block within the chain is named "genesis" block, that is shown in the below figure 2. The symbol of every block is obtained by taking its cryptographic hash, that is why having every block coupled to the previous block helps the block chain accomplish immutableness of its contents. If a hackers (data fetchers) were to change the contents of a past block, its symbol would now not be valid, and a rather changes would occur, render the parent block hashes within the later blocks invalid in addition. Therefore, to with success alter the contents of one block, associate degree wrongdoer would got to alter the headers all told sequent blocks and have this alteration crop up within the majority of the nodes within the network, therefore on have the peers reach agreement on this altered block chain. The group actions among a block have a transaction ID, whereby every group action ID is that the cryptographic hash of the corresponding transaction's data hold on within the block. A tampered group action would turn out altered hashes among its branch and would be detected while not a lot of machine effort.

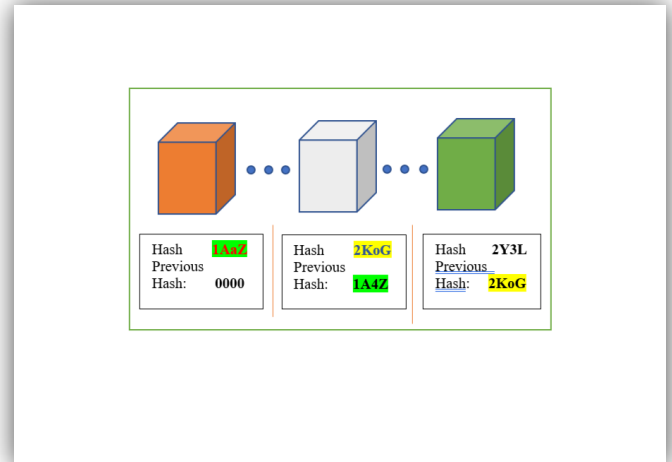


FIGURE: 3

❖ **THE BASIC FUNCTIONS OF BLOCKCHAIN IN IOT:**

The Blockchain is associate degree electronic mechanism that deals with money transactions and uses the "Peer to Peer" technology. It has three basic functions:

1. Permits money transactions between people and institutions around the world with a high degree of reliableness and security as a result they destroy the so-called "double spending".
2. Alter traceability (the ability to trace one thing on the web to its assets) for transactions and data, which suggest that transactions are clear; clear have higher levels of security.
3. Defends users from any attacks or violations by malicious users via the constant system. And there is no need for central authorities to participate in financial transactions, and to ensure lower expenses.

❖ **FEATURES OF BLOCKCHAIN IN IOT NETWORK SYSTEMS:**

The most important features that turn the block chain technology into something with the potential of radically reshaping several IOT industries are:

- 1) **Decentralization:** In centralized network infrastructures, knowledge exchanges (i.e., the transactions) are valid and approved by trusty central

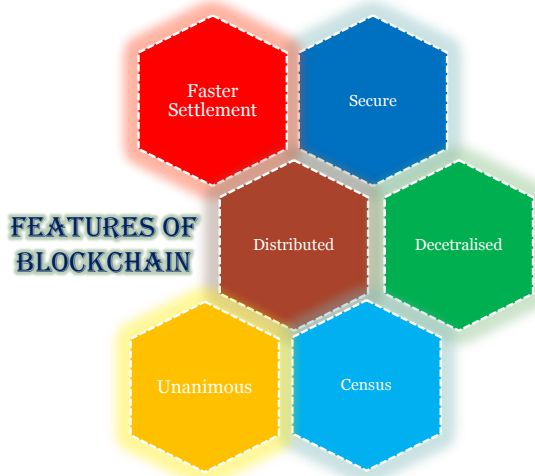
third-party entities. In block chain-based infrastructures, two nodes can engage in transactions with each other without the need to place trust upon a central entity to maintain records or perform authorization.

**2) Immutability:** If any party wishes to make a change in the block chain are agreed upon by peers via decentralized consensus algorithm, the block chain is censorship-resistant and is nearly impossible to tamper. Similarly, all previously held records in the block chain are also immutable and, in order to alter any previous records, an attacker would need to compromise a majority of the nodes involved in the block chain network. Otherwise, any changes in the block chain contents are easily detected. In block chain technology every data holders need to follow the CONSENSUS PROTOCOL.

{**CONSENSUS PROTOCOL:** - "It states that the participants make decisions by agreement rather than by majority vote." A consensus algorithm is a procedure through which all the peers of the block chain network reach a common agreement about the present state of the distributed ledger.}

**3) Fault tolerance:** All block chain peers contain identical replicas of the ledger records. Any faults or data leakages that occur in the block chain network can be identified through decentralized consensus, and data leakages can be easily restored using the replicas stored in block chain peers.

- **BLOCKCHAIN FEATURES IN DIAGRAMMATICAL FORMAT:** (FIGURE: 4)



❖ **USES CASES OF BLOCKCHAIN IOT:**

**SUPPLY CHAIN MANAGEMENT:**

Supply chain management is one in all the foremost sample of sectors with promising blockchainIoT cums projects. The worldwide offers chain network includes varied stakeholders, as well as brokers yet as raw material suppliers. As a result, it is offen chargeable for introducing complications in end-to-end visibility into the supply chain. Curiously, the supply chain may additionally involve varied payments yet as invoices, extending the length of fulfillment by months. Additionally, the participation of multiple stakeholders ends up in delays in delivery.

Enterprises area unit engaged on the uses of IOT and block chain along by creating IOT-enabled vehicles chargeable for chase shipments. The mixture of block chain and IOT may improve the dependableness and traceability of the network. IOT sensors may offer crucial information regarding the cargo standing. A number of the notable IOT sensors embody,

- Temperature sensors
- Motion sensors
- Connected devices
- GPS
- Vehicle information

The blockchainIoT examples in supply chain management then store the detector information on the block chain. When saving informtion on the block chain, stakeholders outline within the sensible contracts may acquire period information access. As a result, stakeholders within the supply chain may prepare adequately for transactions across totally different shipments and borders.

The most outstanding example of mistreatment block chain and IOT functionalities along in supply chain management refers to California Foods. It's a varied provider specializing within the manufacture and distribution of food products. California Foods has collaborated with IBM for the improvement of its supply chain processes through IOT and block chain.

**SMART HOMES:**

1. The application of block chain and IOT in smart homes gives another excellent declare 'How block are often utilized in IOT?' with ease. IOT-enabled devices have provided the best foundation for encouraging the concept of smart homes. With the assistance of IOTblock chain, smart homes could find better ways for managing home



security systems remotely from smart phones. Block chain removes the concerns associated with the conventional centralized approach for exchanging information generated through IOT devices.

2. One of the notable block chainIoT examples in the field of smart homes refers to [Telstra](#). The Australian telecommunication giant offers smart home solutions powered by block chain and biometric security. The smart home solutions offered by Telstra ensure the storage of sensitive user data on the block chain for better security. The sensitive user information might be associate with,

3. Facial recognition

4. Biometrics

5. Voice recognition

6. After recording data on the block chain, the immutability trait ensures that only authorized individuals can obtain access to smart homes.

#### **PHARMACY SECTOR:**

The block chain IOT use cases within the [pharmaceutical sector](#) specialize in addressing essential problems like counterfeit medicines. The pharmaceutical trade takes care of the development, manufacturing, and distribution of medicine, thereby making difficulties in tracking the complete lifecycle of drugs. The traceability and transparency related to block chain might facilitate in monitoring the shipment of medicine from the point of manufacturing to the end-user.

The most prolific example of the use of block chainIoT in the pharmacy sector. Offering comprehensive control over user access.

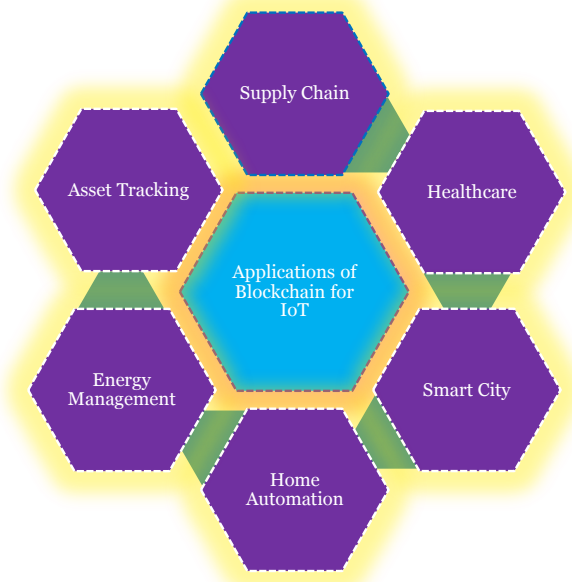
Preventing the increasing growth of counterfeit drug within the international pharmacy offer chain. Enabling simpler and easily navigable payment processes with higher security, is [Mediledger](#). It's a block chain IOT application developed for trailing legal changes in possession of prescription medicines. Observance sensitive attention product needs attention on traceability and transparency. Mediledger ensures that data on the block chain has the correct and correct timestamp. It is immutable and permits access only to:

- Wholesalers
- Manufacturers
- Distributors

- End customers

Mediledger offers an easy interface for exploitation using block chain and IOT functionalities along for several value-based advantages. It will make sure the following benefits.

#### **❖ OTHER USE CASES OF BLOCK CHAIN IN FIELD OF IOT NETWORKS:**



**FIGURE: 5**

#### **❖ LITERATURE SURVEY:**

- **In this paper 1:** Blockchain for Internet of Things (IoT) Research Issues Challenges & Future Directions: A Review. In May 2019, this paper was published by Malak Alamri , NZ Jhanjhi, and Mamoon Humayun. It was published in IJCSNS (International Journal of Computer Science and Network Security). The Researchers had enlightened through this paper that IOT have the ability to connect billions of things at the same time, which seeks to develop information sharing requirements that improve our daily lives. This paper also signifies that the integration of Blockchain with IOT provides significant solutions of security and privacy to IoT based system.
- **In this paper 2:** A survey on the adoption of blockchain in IoT: challenges and solutions.

In February 2021, this paper was published by Md Ashraf Uddin, Andrew Stranieri, Iqbal Gondal, Venki Balasubramanian. It was published in Elsevier. They said in their paper that Blockchain technologies avoid trusted third parties and safeguard against a single point of failure and other issues. In this paper, recent state-of-the-arts advances in blockchain for IoT in the context of eHealth, smart cities, intelligent transport and other applications are analyzed.

- **In this paper 3:** Applications of Block chains in the Internet of Things: A Comprehensive Survey. In 2<sup>nd</sup> quarter 2019, this paper was published by Muhammad Salek Ali, Massimo Vecchio , Miguel Pincheira, Koustabh Dolui, Fabio Antonelli and Mubashir Husain Rehmani. It was published in IEEE (Institute of Electrical and Electronics Engineering) Communications Survey and Tutorials. The Researchers had enlighten through this paper that the blockchain is seen as the missing link toward building a truly decentralized, trustless, and secure environment for the IoT . In this paper they start with fundamental working principles of block chains and how blockchain-based systems achieve the characteristics of decentralization, security, and auditability.

#### ❖ **FUTURE SCOPE :**

Block chain further can be used exclusively in the field of encrypted currencies, where it will greatly increase the compatibility of the Internet of things and block chain. In addition, block chain can be further explored to integrate with IOT for providing better security and privacy in different smart application domains.

#### ❖ **CONCLUSION:**

The current era witnessing a great technological revolution in various domains such as Health, Finance, Education, Economics and in many more aspect. This main reason of this revolution is the Internet of things emerging. The world has begun to resort too many of these techniques that help people to meet their demands within the shortest time and efforts. Block chains achieve immutable and secure records through distributed consensus algorithms. Therefore, block chains provide a “trustless” environment for record keeping, where no trust is required to be placed on any individual centralized ecosystem. The security and privacy is the major concern of organizations especially in case of the internet of things

and the addition of Block chain with the internet of things for providing security and privacy is a better possible solution.

*We found that the integration of both technologies will be able to address the existing security issue of IOT based applications.*

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