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TECHNOLOGY****APPLICATION OF IOT BLOCK CHAIN IN INFORMATION TECHNOLOGY****Anjali Namdev<sup>\*1</sup> & Bijoy Jose<sup>2</sup>**<sup>\*1</sup>Assistant Professor, Department of Computer Science Engineering, SITM, Rewari (Haryana)<sup>2</sup>M. Tech. (Department of Computer Science Engineering), SITM, Rewari (Haryana)

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**ABSTRACT**

Internet of Things is an emerging and growing technology in the field of information technology. It is the actualization of the ideology connecting the things to internet. The 'Things' refers to any physical objects which are uniquely addressable by standard communication protocol, can be identified by a RFID tag and be monitored from remote places or any electronic devices with sensors that can access the information's from the surroundings. This information's can be stored in a central server and can be analyzed and processed by smart applications. It is a technological revolution in this era which brings all the virtual and physical objects integrated into the existing network architectures so that they can connect with each other dynamically, anytime and anywhere, without the direct human interference. However, the IoT applications, has the drawbacks in some areas such as privacy and security of personal information's gathered by IoT devices. This can be overcome by integrating IoT with block chain technology. By applying encryption algorithms blockchain protects, save and transmit these information's over the network. The main objective of this paper is to review the studies conducted in the application domains where the indefinite scope of IoT block chain seamlessly applies. As the application domain is very vast, this review paper focus mainly on the popular application domains such as crypto currency, industrial & manufacturing applications and smart health care.

**Keywords:** IoT- Internet of Things, RFID- Radio Frequency Identification.**I. INTRODUCTION**

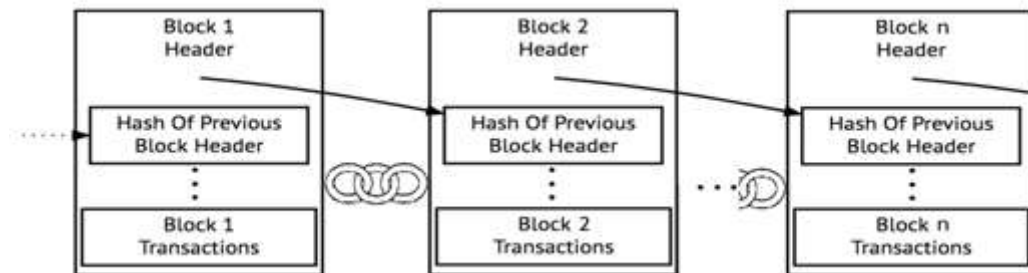
IoT is an evolving topic for studies for many researchers in the recent past because of its vast application domains and future development scope. The information technology goes beyond the traditional concept of internet where one can search the information to a level where the individual elements such as the personal belongings, home appliance, electronic gadgets, living or nonliving objects can be a part of it. The IoT is being a technology by which it brings all the technological findings under one umbrella and the integration is utilized to develop potential applications. Undoubtedly the applications of IoT technologies have direct impacts in our day-to-day life that range from automated home to smart healthcare applications. It is a growing technology and there are many milestones existing in the development phases of IoT such as IoT with fog networks, IoT with cloud computing, IoT with block chaining and many more.

The term 'IoT' combines the two terms 'internet' and 'things', means connecting the things to the internet. The IoT devices can collect and exchange data locally or globally. Then the question is about the privacy and protection of these data, which still remains unanswerable. The IoT architecture flaws the security measures of data protection that is being stored and transmitted over the network. As a result of many studies conducted in this area, the researchers integrated block chain technology with IoT. Block chain act as a ledger in IoT architecture, which maintains an encrypted record of all transactions being conducted in the network and also authenticate the ownership of the participants.

Undoubtedly the IoT block chain revolutionized many application sectors especially in financial sectors by means of crypto currencies, in which a user can do the transactions without a secured middleman. In addition to the current vast features of the IoT, the block chain IoT uses to develop more secure, robust, flexible and accurate applications to exchange value and services.

### What is a block chain?

A block chain is a distributed database that maintains a continuously growing list of ordered records called blocks or public ledger. Each of such blocks consists of timestamps which are linked to the previous blocks using 'hashes'. The block chain acts as a Public Ledger, which maintains a secured encrypted records for all the transactions being performed and shared among the participants by the distributed consensus in such a way that anyone in the participants group can view all the current and past online transactions performed by them. These Ledgers must follow some pre-defined rules achieved through consensus of participants of the group in order to append the information to be stored. Once the information is appended it cannot be removed or modified. This information's are kept in all the participants of the system, as a history of all the transactions that has been performed.



[Diagram of block chain]

### IoT with Block chains

IoT enable us to connect the 'things' to internet through sensors and embedded microchips. The IoT application is mainly based on a centralized model in which all the data being transmitted between the devices can be monitored through a centralized hub, however this scenario is impractical in some scenario as the vast amount of data being transferred from various sources are unsecure. The information's gathered by the IoT devices that spread across all the participants in the network can be a breach in security and privacy and can be misused. By considering the security and privacy of the data, the existing IoT infrastructure is insufficient. In order to overcome these lapses, the current IoT Platforms can be integrated with block chain and P2P storage system. Thus the information's gathered by the IoT devices can be stored in its storage, it can validate and authenticate all the transactions performed in the system and also can enforce accessibility, control policies over the data among the participants of the group, to prevent unauthorized access.

The block chain technology implements the decentralized IoT platforms for the trusted and secure data transmission between the devices over the network. The integration of IoT with block chains is to develop distributed applications (Dapps). The Dapps applications empower and automate the current IoT applications. By these concepts people can monetize their things.

### IoT with block chain applications

#### 1) *Crypto currency*

Block chain is the laid down foundation and act as a distributed database for all the transactions in the crypto currency bit coin. The implementation concept of block chain oriented bit coin was first published in the journal titled 'bit coin: A peer -to -peer cash system' in the year 2008 by a Japanese author Satoshi Nakamoto.

In many countries the government encourages for cashless economy for the strict fight against black money and corruption. The crypto currency is decentralized, digital assets whose storage and transactions are conducted and monitored through the cyber network. The block chain acts as a ledger for virtual money. The bit coin uses the technologies such as hash and digital signature in order to prevent malicious attack and duplicate payments. The author in presents the draw backs of traditional currency system and how the crypto currencies can overcome by its salient features. In addition it also explains the current trends in the financial sectors, challenges, the impacts and acceptance of crypto currencies in the business sectors of various countries and how it transformed global markets by assets has been explained with real world analysis.

**The main technologies that construct bit coins are**

A) Hash	The hash function, figure 3.2 converts the input value into hash value; it is never the same for different numbers. The significance of these hash values in bit coin is that it is responsible for the continuation of block chains and creation of new block chains through Proof of Work.
B) Cryptography and digital signature	Cryptography is used for secure data communication by encryption. Public key cryptography is in use in which two pairs of keys- public key and private key are used for encryption and decryption respectively. The digital signature validates the authenticity and ownership of data being transmitted over the network.
C) P2P Network	In P2P network individual nodes are known as 'peers', which is the base for decentralized network by which the data is transmitted by either relaying from one to another or direct transmission to avoid single point of node failure
D) Proof-of-Work (PoW)	Proof of Work is the mechanism used 'mining' in bit coin which validates the individual blocks in the block chain and secure the transactions in the blocks by some complex computations. Bit coin uses the 'hash cash' PoW system - figure 3.5. Some other PoW are hash cash with script internal hash, momentum birthday collision etc.

**Some features of bit coin is as follows**

- Direct transaction without the third party intervention (such as a bank or credit/debit finance institutions). anyone can send/receive money any time anywhere without bank accounts.
- It is a global form of electronic currency-can be used in place of any currency such as Euros, US dollars or any other traditional currencies. By this global access to the business and international trading has flourished.
- Decentralized design architecture so that any government or central bank cannot determine or control the asset value. Users have the complete authority over their money.
- The security levels in crypto currencies can prevent and detect fraudsters. Users can encrypt and backup their wallets, these backups can be used for future references to avoid any kind of loss. And also maintains a transparency in all the transactions among the participants.
- Enable non-reversible transactions.
- Prevents 'double spending' (it is a flaw in digital currency scheme in which same digital token is spent more than once).

**2) Industrial and manufacturing applications**

Automated factories and manufacturing units are the latest trends in the industries in the recent years. The structural design of IoT architecture in the manufacturing units must be different as these sensors and other embedded systems in these units are exposed to high temperatures from the machine units, high voltage equipments and also some external factors that can cause wear and tear to the machineries.

The capabilities of automated manufacturing unit using IoT block chain must be able to monitor all the internal working conditions of a factory such as detect the overheating in the machines, alarm if any short-circuit or fire occurs, co-ordinate different production unit activities, diagnose the machine faults remotely, guide and instruct the employees in their work, integrate the various units with fire, hospital, disaster management groups as it would be worthwhile in case of emergencies. To make things more practical it could be combined with the cloud-based manufacturing, where in the management can track the customer orders, can analyze the market trends and study the customer demands, it can also find a market place without a mediator, can keep track the product delivery and payments. The author has explained what is cloud-based manufacturing and also presents a working model Block chain platform for industrial Internet of Things in figure 4.

**3) Block chain IoT in healthcare industry**

The evolution of IoT block chain overcomes many of the problems addressed by the current healthcare industry such as maintaining patient record with privacy and security, identifying and to diagnose ill conditions, accessing and distributing of medicines without a mediator, adequate standard in regulating the cost and quality of treatment, mandate for the healthcare insurance and health information exchange etc



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The healthcare industry is very vast and need to integrate many units together such as administrative, finance, insurance, diagnostic, medicines, patients, staff, health centers, on demand health-information systems and many more. The IoT can act as a back bone for all these units. It transforms the healthcare industry by providing quality and cost-effective treatment to patients by avoiding the involvement of a middle-man. Doctors can treat the patient through wearable-devices. The smart program can access and analyze the patient's diagnostic information and helps doctor in planning treatment, diet, and exercise recommendations. Share this information without losing the privacy over the network. The author in presents the current state of healthcare industry and how does block chain fit in it.

### Comparison of IoT applications with block chain IoT

- IoT block chain reduces the cost of process by eliminating the trusted third party (IoT gateway), the transmission, authentication and validations are performed on peer-to-peer basis.
- IoT applications uses the centralized network architecture while the block chain IoT implemented in the decentralized architecture, performs the processing task without a centralized server thus making it an independent unit .
- Block chains are computationally expensive especially in mining and the protocols and security and privacy measures in block chain cause high bandwidth overhead and delays so scalability issues occurs when the number of devices in the network increases.
- Numerous privacy and network threats has been identified in IoT architecture as there is no security measures implemented ,however block chain IoT protects the data by encryption from unauthorized access.

## II. CONCLUSION

The block chain IoT applications has the potential to rejuvenate the living standards .However numerous security vulnerabilities has been reported recently in crypto currencies. Some banks and financial institutions do not permit the transactions using bit coins. So the investment in bit coin is a risky affair. The transactions using bit coins need to be standardized and monitored by the government agencies so as to prevent the fraudsters. The advancement of technologies has not yet reached, the majority, of the population. The acceptance and usage of digital money is still unfamiliar to many. So in the near future the digital technology is expected to meet the basic needs of humanity in terms health, wealth and comfort.

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