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Blockchain Solution for IoT Security

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ABSTRACT:Blockchain and IoT are some of the technologies that are known, yet not that well utilised by we human beings. Blockchain is the technology of connecting data as blocks, which are connected to every other block using a secure cryptographic hash. IoT revolves around the use of devices, internet and a microcontroller. Currently, blockchain has emerged to be the powerhouse, in terms of data and information security. Be it cryptocurrency or its favoured use in the government and data security sector, nowadays blockchain is being used to a large extent. IoT has become the modern trend owing to the amazing opportunities for employment and innovation that it offers. However, in any field that we do go, we find security as a major concern. And in almost every field, it is the domain that gets discovered only when severe pitfalls occur. Since IoT involves many devices that were hitherto considered to be very simple, we need to be cautious while providing information to these devices. Here in this research paper, we aim to discern the various security aspects of blockchain technology and using it to a great advantage in the IoT sector.

KEYWORDS: Blockchain, IoT, Security, Data, Block.

I. INTRODUCTION

Internet of things is the new trend in today's digital world. We are seeing a lot of usage of IoT devices around us. With the evolution of technology, the Internet of Things is growing so rapidly. Almost everyone is a part of Internet of Things directly or indirectly. As every technology that becomes trending requires privacy and security. Privacy and security are two main aspects of any technology in this digital world. As IoT is a network of devices the security should be very high. Because if one device gets expose to threat other devices may be affected. When it comes to security there a new king in the digital world that is Blockchain technology. The new trend that evolves in recent years. Implementation of Blockchain in Internet of Things brings the powerful security.

The organization of paper is as follows; In section II we have discussed some related works regarding the use of blockchain in IoT devices. Section III contains the overview of core technologies i.e., Internet of Things and Blockchain Technology. In section IV we have pointed some challenges or we can say security problems in Internet of Things. Section V explains the how blockchain can solve the security problem of IoT devices. In section VI we have shown the analysis on how rapidly blockchain has implemented in IoT. Section VII contains conclusion.

II. RELATED WORK

Blockchain technology can be used in smart home gateway environment and IoT. In [1] authors have implemented blockchain to maintain the integrity of data in the smart home architecture. [2] has showed that how effective blockchain is in providing security to IoT devices based on his survey. An efficient lightweight integrated blockchain model is proposed to insure the security IoT based smart home [3]. Decentralised system is effective in security of IoT [4]. [5] have discuss about the blockchain base architecture for smart home that provides secure data storage [6]. [7] have discussed about scanless crypto-tokens for user authentication in IoT devices also discussed about how crypto-tokens generation can be improvised. In this [8] research paper authors have implemented blockchain in real time IoT hardware to check whether Blockchain is really helpful in smart home security. Attacks in IoT and their possible solutions are discussed depending on low level, intermediate level and high level IoT layers [9]. [10] showed how effective LSB is against different types of attacks. Mainly focused on privacy in smart home and used machine learning and Blockchain technology to evaluate real time smart home system [11]. [12] shows how Blockchain can be implemented in local IoT network.



III. CORE TECHNOLOGIES

1. Blockchain Overview:

In past few years Blockchain technology is growing very fast in different industries like Banking and financial services, Government, Healthcare and life sciences, Telecommunication, etc.

Basically, Blockchain is a database. BC gives permission to record and distribute the digital information. First real-world implementation of bitcoin was done in 2009 with the launch of bitcoin. It collects information in blocks. Every block has limited storage capacity. When one block reaches its capacity, it connects with the previously filled block. These blocks form a data chain and that chain is known as Blockchain. Every block contains cryptographic hash of previous block. Hash generates in every transaction. Hash depends on the hash of every other previous blocks. If any small change is made in the transaction, then the new hash is generated. This is the advantage of blockchain so that if anyone tries to make any changes in the transaction all the settings will be changed and that person will be caught. This is the secure option. BC is spread in many computers and every computer has copy of blockchain. These computers are called as nodes. Nodes verify that there are any changes made in the transaction by checking the hash. If the greatest number of nodes approve the transaction that transaction will be written in the block. Nodes form the infrastructure of the blockchain. Blockchain updates itself every 10 minutes. If someone try to modify the data, he has to hack minimum of 51% of all blocks at the same time. Peer-To-Peer network is used in Blockchain so that each and every node can join in secure manner. It is almost impossible to modify or hack the information of the system because of the blockchain technology. Blockchain contains decentralised database which is known as Distributed Ledger Technology. In this technology the transactions are recorded in multiple places or systems at the same time. In short Blockchain is the secure way to store digital information.

2. What is IoT

The internet of things or IoT is changing everything around us from the way we react to the way we behave from water heaters that you can control with your smartphone to smart mat that take your exercise to the next level or your smart door lock which opens by the user's authentication. IoT is a very huge network with connected devices. These devices collect, store and share data about every activity of all devices using sensors. Every physical device contains sensors embedded inside them for example, smart phones, smart watches, water heaters, smart locks, etc. These sensors continuously emit data about the working state of the device for the important question that's how can we share this huge amount of knowledge and the way do we put this data to our benefit. There is a standard platform for all the devices to dump the info and customary language for communication with one another. Data is emitted from various sources and send to IoT platform security. The integration of data collected from various sources is done to perform analytics and to extract valuable information. The final result is shared with other devices to achieve better user experience and improved efficiency. Everything that uses IoT technology is mainly having "smart" as the description like smart home, smart train, smart watch etc. With the help of IoT all the devices or appliances can be connected to the internet and monitored remotely. IoT is changing the way we live our lives it helps us to get a better insight into the working of things around us.

IoT may be a system of interrelated devices connected to the web to transfer and receive data from one to the another. Smart house is the simplest example of IoT home appliances just like the AC, smoke detectors, water heaters and security alarms are often interconnected to share data with the user through the mobile application. The user can now get every single detail about the working of the devices around him. Now inanimate objects or things have the ability to change the surroundings to interact and collaborate with one another. For example, within the morning when your alarm pops, the IoT system can open the window blinds activate the coffee pot for you and even activate the water heater. It seems easy but there is a lot that goes on in the background to ensure seamless functioning from effective communication between devices to accurate processing of the data received. Many different components are involved within the context of IoTs devices.

IV. CHALLENGES IN IOT

As we all know IoT is best in business right now and we have various IoT devices around us. IoT has improved the efficiency of resource utilization. As IoT devices can interact and communicate with each other and do huge amount of task the human effort is minimized. They also provide improved security. But the question arises "Are the IoT devices that much secure?", "Is our data safe", "Is our network safe". At some point it has some weaknesses. They are

vulnerable to various types of network attacks. Privacy is also a big concern. Following are some security challenges in IoT:

1. Unauthorized access

We all know that IoT enabled devices use a network so there is a chance that hackers can penetrate the entire network even if there is single device with outdated security system. If an employee logs in to network with a personal device which contains weak authentication, it increases risk. As an IoT network contains a lot of devices the potential of risk of hacking the devices increases.

2. Software attacks

As the name Internet of Things, devices that are always connected to internet. So, if the devices lack security, they are vulnerable to virus and malware attacks and the control over the devices may be lost.



Figure 1. Blockchain and IoT

Source: <https://www.geospatialworld.net/>

V. BLOCKCHAIN SOLUTION

Based on different sources, previous researches and the advantages of BC we have pointed out how blockchain provides security to IoT devices:

1. Data Protection

BC not only creates decentralised ledger but also an unalterable data record. It provides protection and control communication and other activities inside the IoT system.

2. Financial transactions traceability and security

In the distributed ledger the digital data is stored in a block. Data cannot be moved to other block and no one can add an intermediate block in the chain. Confirmation from sender, receiver and miner is required to process and complete the transaction. BC keeps record of everything and if anyone tries to make any changes in the transaction, he/she will be caught.

3. Security of devices and network

As BC keep an eye and track communication of all devices that are connected to the network, any suspicious activity like unauthorized access of data or suspicious logins can be identified and action will be taken.



Table 1: Blockchain solution

Vulnerability	Security
Data Protection	Decentralized ledger and unalterable data records
Financial transactions traceability and security	Distributed ledger blocks. Sender, receiver and miner confirmation to complete the transaction. Private keys protection
Security of devices and network	Track communication between all the devices, unauthorized access detection

VI. ANALYSIS

Nowadays Blockchain is widely used to secure IoT networks and overall, we can say that it has a bright future ahead let's see growth of devices in IoT

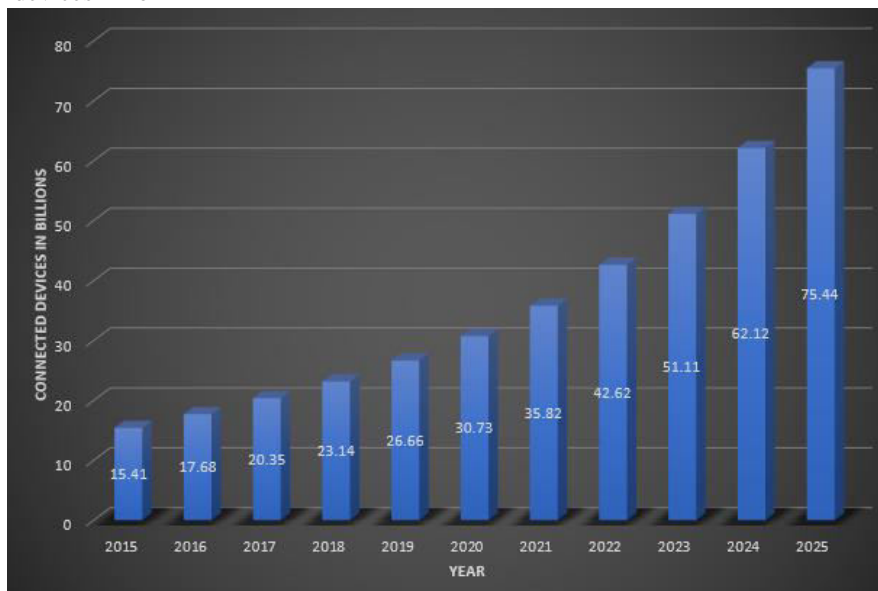


Figure 2.

Figure 2. shows the growth of billion connected devices in IoT in in recent years and also predicted the growth in coming future. This shows that the use Blockchain in IoT applications will also increase in next few years. So here we can say that Growth of IoT technology is directly proportional to growth of Blockchain technology.

VII. CONCLUSION

Thus, we can fairly conclude that the at the convergence point of IoT and Blockchain, we have a fairly powerful and robust technological innovation. While security is the immense benefit that this will provide us, we can still utilize the benefits they provide in other domains as well, including the huge peer-to-peer network ushered by blockchain, that will swell up the connectivity and data provision that will help IoT function as smooth as one could imagine. We definitely do have a bright light in this aspect for blockchain and IoT.

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