

Overview of Blockchain Technology in Government/Public Sectors

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Abstract - The development of Blockchain technology in e-government still needs discussion in different aspects; this technology offers a new method for delivering and managing public services, and there remains a need to establish standards, deploy solid management systems and ensure adequate security to make sure the services and platform are reliable, authoritative and supportive of long-term preservation. It has the potential to change Indian society in many aspects. Its development still has both opportunities and risks, however. There is still a need for Blockchain companies and market administrators to actively collaborate with each other, implement Blockchain operations, and introduce innovative solutions. Therefore, the experience of the government could be the first step in the development of Blockchain-based public services. However, this will not be an easy goal to achieve.

Key Words: Blockchain, Bitcoin, Crptocurrency, Consensus, Smart Contracts, Blockchain Decentralized Ledger.

1. INTRODUCTION

A blockchain is a chain of blocks that contains data. This approach was originally define in 1991 by a team of researchers and was originally designed to timestamp digital document so that it's not possible to backdate them almost like a registrar. Then it was accepted by Satoshi Nakamoto in 2009 to design Crypto currency bitcoin. Blockchain is technology that functions bitcoin which was its original purpose. Blockchain technology is important nowadays because it is able to do so much more, it is shorthand for a whole suite of distributed ledger technologies that can be compute or calculate to record and track anything of value from financial transaction medium records and even land agreement. At present, the application of blockchain technology has been continued to the IOT, intelligent manufacture, supply chain administration, digital asset agreement, and other fields in different areas. Blockchain offers government a quick and fast, protected from attacks, active, clear factor of being able to expand government assistance and broadcast with their people.

Eastern European governments have generally led the way on blockchain acceptance, which has been examining the technology since 2008 in Estonia, from 2012; it has used blockchain in many forms like registries in judicial systems, the healthcare system, security and legislature.

Now in India we are talking about blockchain that how it could help us to create more and more use and it could be beneficial of blockchain in public sectors. In India the state Andhra Pradesh has developed into the first state to start the blockchain technology in two administrations and the deal to expand it across the other administration and department. The Chief Minister of Andhra Pradesh in Blockchain Business Conference (BBC) where he said that the state had also build the biggest archives of used cases for international start ups to test their results, since the government in this state is leading to e governance, were it was using blockchain technology to stop cyber security problem. The state stated with the projects for land records and transit management. Andhra Pradesh state IT Minister also said that the technology was needed to avoid cheating/tampering of land agreements, which had already been placed online and digitalized. Similarly, in Transport Division the technology is used to assign numbers for the vehicles. He also added that Andhra Pradesh is doing services for 60% of Aadhaar based activities and broadly uses technology for distribution of services and the state is in need to adopt blockchain to protect the IT assets.

1.1 How Blockchain Works

Blockchain systems are now comprised of two major components.

(1) The first component is peer to peer network. This is the mechanism by which the many computers manage the database and communicate new changes to that database which are called transactions.

(2) Second major component of blockchain systems are the database itself and this database stores the complete history of transaction and the order in which those transaction occurs.

A P2P network is a peer network made of nodes which are computers and this computer simply connects to each other more or less at random and this allows us to have a decentralized network. In P2P network when a new message appears it will be sent to any of them to start with and then each node sends the message to all of its neighbors in the network and each neighbor does the same so very quickly you will have messages that propagate through the entire network and this is how messages get shared on P2P network.

Blockchain is the database itself now a blockchain database is constructed by history of transactions which are modifications to the database so what's at the beginning of history is called genesis of block which is basically an empty state which everyone can agree on because it is so simple. Now at the beginning we have genesis free and everyone agrees on it then people begin submitting transactions to allow modifications to that state so somebody creates a transaction and broadcasted through the network again due to the P2P technology.

We begin to create block of transaction now when a new block is added to the network it groups transaction together, it establishes a consensus of the order in which the transaction occurred and then a cryptographic signature is added to the end of the block. First of all signature establishes a link to the previous block now in the first block this is a link to genesis state in all subsequent block. It will be link to the block that proceeded. When new node appears in the P2P network and connects to some of the other nodes which have been in the network before fill that new node in the history of the database so they send it to all the blocks that new node can replay the history transaction and come to same conclusion as to the current state of database has all other nodes in the network so that's how blockchain tech works.

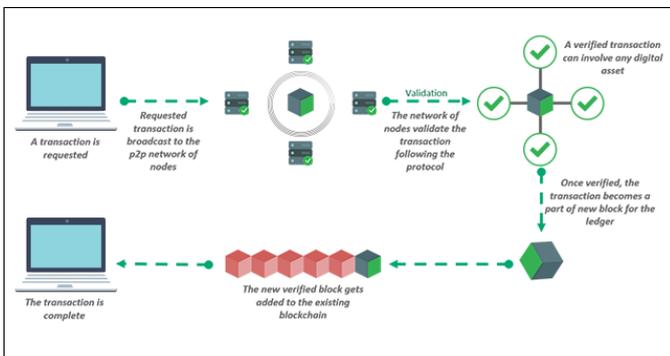


Fig -1: Working of Blockchain

2. THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN PUBLIC SECTOR

This technology we could use in current situation or systems to reduce the error and increase the effectiveness of public service delivery. For e.g. a blockchain could help as intellectual property owned by citizens and businesses people. Like vehicles, houses and any patent on any research or the legal registry/notary for government authorized assets. A blockchain is also helpful for voting in elections, ensuring that each eligible person uses only one vote. A blockchain could serve as back office functionality to streamline and coordinate for purchasing and tendering across all departments, administrations, agencies and other bodies of public sector. That in all situation blockchain could help in reducing the fraud and error

while delivering big profit in terms of effectiveness and productivity.

One of the earliest examples of blockchain is bitcoin where the blockchain powers bitcoin. There are some research also currently working on that how the concept of blockchain can be extended beyond digital currency or cryptocurrency to any asset that has a define value associated with it. The research says that some of the popular cryptocurrency applications like Ethereum, Ripple, Gridcoin, etc., and also lists possible future applications in various domains such as voting, commodity trading, digital identity provisioning, etc. There are now surveys going on that how we can invest in more and more in blockchain. This proved that blockchain is being tried in almost all important administrations such as supply chain management, finance, healthcare, reputation management, etc [7].

2.1 Healthcare

The digitalization of health information/records has brought about significant change in the public health sector, but it has been criticized for being complex on account of centralization. Blockchain technology can create a secure and flexible ecosystem for exchanging electronic health records (EHRs). This technology could also make the Healthcare more clearly by creating origin for organs, blood, critical drugs, etc. and also by keeping all medical licenses/certificate on a blockchain, fraud doctors can be prevented from practicing.

2.2 Education

Educational certificates, student data, faculty data, etc., are key parts play in the education domain. Such records/data need to be contribute with multiple stakeholders and it is compulsory to assure that they reliable. The origin of these records also needs to be concluded correctly. Educational certificates, student data, faculty data can be maintained with the application of blockchain technology. Certificate attestation and verification can be done by blockchain easily. The policy for educational incorporation is enclosed by bringing in base consistency in the tracking of national metrics it could even transform that.

2.3 Public Safety

It could help in delivery of public safety more effective by solving the issue of in between agencies coordination. Where it provides a cooperative source of truth that each and every agency independently interfaces with based on predefined condition. Building a chain of custody for critical proof is often an important for the evidence to be allowed; blockchain technology could help establish the origin of the chain of custody for such proof.

2.4 Agriculture

Blockchain technology can be used to reduce difficulty, cost in food-based value chains and increase clarity by enabling accurate origin and footprint from farmer to consumer. Other possible functions involve the use of blockchain technology to record and manage agriculture insurance as well as agricultural land records.

2.5 Civil Registration

The vital events like as births and deaths or marriage ceremony there certificate these we can register on blockchain. The process of civil registration can be simplified through the blockchain which creates appropriate citizen registration platforms. Use of this in civil registration process can benefit to make citizen records unique no one can interfere or could tampering in the records, flexible, protected and confidential, thus providing wide-ranging benefits for a variety of stakeholders.

2.6 Defense

Information which is strongest foundation of any country is also critical to national security which is like defense infrastructure and computer system. Because of this blockchain comes and plays an important part, it is distributed across different locations to prevent unauthorized access and alteration. Blockchain can be used as advantage to provide consent based access for altering data and distributing access over different system resources such as hardware equipment, data centre's and networks.

Application of Blockchain Technology



Fig -2: Application of Blockchain Technology

2.7 Example (Odometer Tampering)

If any kind of security car manufacturers invent to store the mileage of a car on its onboard computer securely, there will be always something to find a way these mechanisms. The main basic problem is, if a system uses onboard computer to store this information and some cases this system uses encryption and decryption for reading this information, the entire process is available on the same system itself, it can be easily compromised by an attack. So, the mileage or odometer is tampered with new details.

If this information is stored other than the vehicle, the tampering will become much more difficult. The blockchain technology can secure against any kind of tampering with the information.

In today's time we all are connected through internet and this is an advantage for us that we can write or an advantage for car buyers that the mileage is regularly been storing into the decentralized database we can identify that particular vehicles information by giving a Vehicle Identification Number. An entry at the end of the week by specifying the date and time and this could be done via a chip/connector which is installed in the vehicle, it will transfer the information to a decentralized database and we can also check the mileage with an app made for that and compare it to the display in vehicle. So at the time selling the vehicle the buyer can see the information he/she can see the last entry in the chain. While buying the current mileage of the vehicle can then only be somewhat higher or equal to the entry of the database. Attempting to tamper with the database it would require much high end technique and a financial expenditure also.

The scenario which is currently working is that it uses wrong approaches like,

- The government or the buyers want a technical solution from car manufacturers to stop odometer

manipulation/tampering by garages, dealers or service providers.

- Some think that storing the data on a centralized database will solve the problem and protect it from tampering or manipulating.

The odometer which are based on the blockchain technology which uses decentralized database would make it possible to record the kilometers/mileage of all the vehicles worldwide with balanced resources while obeying to legal regulations and protecting it from tampering. The vehicles will store the mileage at the end of the week in blockchain database. By doing this there will be large number of vehicle manufacturers in this project and the distribution of database across the internet is high and so as the protection against tampering will be less.

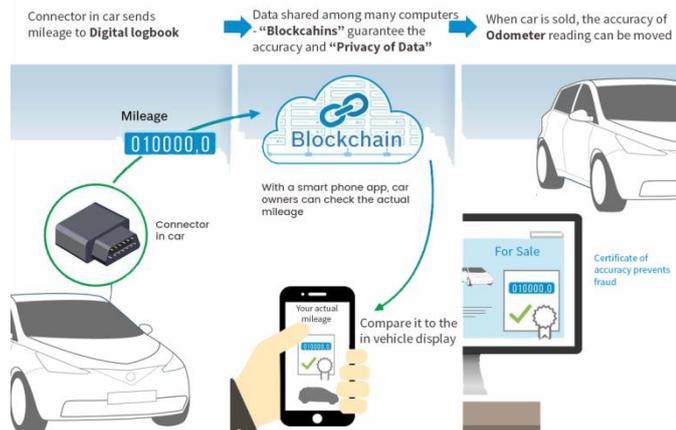


Fig - 3: Blockchain Technology Use in Vehicle Odometer

3. THE ADVANTAGES OF BLOCKCHAIN TECHNOLOGY IN PUBLIC SECTOR

In India e-government is still in developing it is considered an important component for the benefit of Digital India movement. Although a lot of money, technology and human resources will be invested in this area, applying a new technology like blockchain to government services/sectors is kind of complicated by the size of its population and the demands on public services. The government sees blockchain as a potential solution to these challenges, because blockchain itself is secure against online attacks, can be verified by anyone, and is resistant to any attempt to tamper with its history [1]. It is hoped that blockchain can be used to help to set up individual accounts to access government services and improve governance, an area of high need due to the large migrant population.

Blockchain-based platforms can be used to give citizens access to reliable government information, which can in turn strengthen the government's credibility.

3.1 Improving Quality Of Government Services

When using blockchain technology any material objects, property and personal records, and even public records, individual certificates, can be recorded on the same platform, providing each object a permanent digital identity. This system will provide each citizen with individual credit and a verifiable digital identity, stored immutably in the blockchain platform. In this situation, government will rely on individual credit records rather than other conditions to provide public services, which will simplify bureaucratic processes and improve the speed and authority of government approval. It can also help to reduce administrative bias, ensuring everyone is able to access public services equally.

3.2 Improving The Individual Identity

In India, personal records are separately stored in different systems. For example, education records and employment records are preserved in individual institutional archives, while identification information and permanent registered records are stored in the local administration and it varies from other administrations. This fragmentation makes it challenging for individuals to collect all the necessary personal records when they need to apply for public services. Using blockchain technology to establish an individual credit system means that all these personal records can be preserved in the same system so that every individual will have a comprehensive digital identity, including all of their personal records, which contains reliable, authoritative personal information. We can do distribute individual digital identity cards, which will authorize citizens to use the blockchain-based public services platform, and will provide them with access to their records and personal information. Accordingly, the government and other institutions will rely on the records in digital identity cards.

3.3 Strengthening The Government's Trust

Towards People

The functions of government include economic management, market supervision, social management and public service. Open government means that the information related to the public is made accessible to citizens, and individuals can supervise the government's work. An open government that relies on unchangeable information in a blockchain system brings more than just convenience to the public. Transparency brings trust, and when individuals can trace the origin of any particular

information that impacts their life. Thus, by endorsing blockchain technology, the government can strengthen their authority and credibility with the public, and thereby govern more effectively.

3.4 Promoting the Integration of Resources

India is one of the most decentralized country in the world in terms of the resources and responsibilities assigned to local governments. This makes the integration of resources from different governmental bodies extremely challenging. The hope is that blockchain technology can help solve this challenge. Within the blockchain system, every transaction is recorded which makes it easy to trace the parties authorizing transactions and understand scope of the transaction. It also means that data can be more easily and safely transferred between different organizations, thus promoting the integration of information amongst different organizations [6].

The blockchain-based platform has high scalability and it depends heavily upon a consensus mechanism. This means that government can set up different enterprises that meet the conditions of the blockchain-based platform and select nodes that add to the chain through a consensus algorithm. By using a consensus mechanism, government can build trust between different enterprises, establish blockchain-based applications that can provide more diversified public services, and the resources across different enterprises can be integrated into a single platform.

4. DIFFICULTIES TO IMPLEMENT BLOCKCHAIN TECHNOLOGY IN PUBLIC SECTOR

The different strategies regarding economic investment in science and technology might represent not only a government's attitude towards new technology and innovations (and possibly towards a new form of public administration), but also various aspects of the region's context, such as economic abundance and technological resources [5]. The establishment of a blockchain platform involves a number of different systems and organizations, and problems such as time and expense will hinder its construction.

Blockchain technology has only recently begun to be used for applications beyond crypto currency. While it has many exciting potential uses, it does not guarantee reliability of information and would have several limitations as a long-term solution for preserving trustworthy digital records [2]. The question of where and how to store the records associated with the blockchain platform is a problem that must be solved if the blockchain system is applied. The records of public services platforms are valuable evidence of governmental, economic, and

social activities, and thus they should be transferred to the archives and appropriately maintained for long-term preservation. If such records cannot be preserved appropriately, civil rights, legal evidence and social memory could be damaged irretrievably.

At present, the biggest fear actually comes not from system exposure, but the blind trust in the blockchain on the part of blockchain developers, lawmakers, law enforcement and the general public. This trust relies exclusively on the technology, rather than management, to make sure the system is trusted and the records in the system are reliable. It cannot be guaranteed that technology will never make a mistake, however. And if the blockchain platform was widely used in e-government for systems that contain essential information, one mistake may lead to serious consequences [3].

The blockchain platform requires the cooperation of multiple institutions. How to ensure the whole process will be recorded and maintained appropriately, and determining which institution should take responsibility to manage the system and its records is a question that should be answered prior to establishing the system.

5. SOLUTION TO IMPLEMENT BLOCKCHAIN TECHNOLOGY IN PUBLIC SECTOR

The lack of a common blockchain platform and application standard is one of the most important reasons why the initial investment of time and money to develop an e-government blockchain platform is so high. Clarifying the basic concepts, processes, and standards in the application of blockchain technology in e-government can help to improve the awareness of blockchain technology, unify the basic develop platform and application programming interface, promote the interoperability of multiple blockchain systems and perfect the business processes required. This will reduce costs and improve customer satisfaction.

Technology institutions need to consider not only the work involved in developing blockchain platforms, but also the work required for their long-term operation. This means that prior to establishing blockchain platforms, governance institutions, technology organizations, archives and other involved institutions should participate in discussions about both startup and maintenance, with

each applying their professional knowledge of different areas to make the system and management procedure useful and reliable.

The management system remains critical in successful implementation. The government is ultimately responsible for the governance of the blockchain platform for public services. Since this system includes multiple organizations,

it is necessary to clarify the responsibilities of each participating organization, the end-to-end processes. Security and privacy are the main attributes of a decentralized transaction environment [4]. The core goal of records management is to make sure records can be trusted. The security system of a blockchain platform should include physical security, data security, application systems security, secret key security and risk management. Building a secure system can maximize protection of the normal operations and protect the trustworthiness of records within the platform.

6. CONCLUSIONS

Blockchain technology could change our perception about trusting records. We don't have to rely on trusted third parties, like government registry. New technologies have always attracted multinational companies, enterprise and governments. This is largely due to their promise to improve the current way of working and service delivery. Its developing in still many applications and its does have its own opportunities and risks. There will a way connecting market managers and blockchain enterprises with each other. Together they can implement blockchain on various platforms and introduce innovative solution. However, applying blockchain in government sectors it's not an easy goal to achieve. The development of blockchain technology in government sectors is still a debatable topic this technology offers a new method for delivering and managing public services, and there remains a need to establish standards, deploy solid management systems and ensure adequate security to make sure the services and platform are reliable, authoritative and supportive of long-term preservation.

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