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Applications of blockchain technology in libraries: An overview

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Abstract

The Blockchain Technology is mainly used for trading securely in a digital environment by verifying and storing a transaction record in a distributed and time stamp manner. However, there are several other areas also where blockchain technology can be implemented. This technology is redundant and distributed, making it difficult for transactions to be counterfeit, duplicated, or faked. This article provides insight into how blockchain technology works and examines its innovative current and future uses in libraries.

Keywords: Blockchain, scholarly publication, digital rights management, digital-first sale right, smart library services

1. Introduction

The Blockchain is an emerging technology that will change the way we acquire and share information. A combination of technologies including cryptography, peer-to-peer networks, smart contracts, and consensus mechanisms to create a new kind of database. Currently, industry sectors such as finance, medicine and government are making significant investments, investigating the transformational impact of blockchain.

Large people think that blockchain is the technology behind Bitcoin and Ethereum, which makes it secure for trading digitally by verifying and storing transaction records in a distributed and time stamp manner. However, its use is now being explored in many other different areas as well. It also logs the time, date, detail of participants, and other such legal or contractual portions of the transaction.

The term Bitcoin, a cryptocurrency, was first explained in 2008 in his work, "Bitcoin: A Peer-to-Peer Electronic Cash System", by Satoshi Nakamoto. Blockchain technology has potential use not only in the financial domain but also in the non-financial domains as well. Thus, it can be used as a catalyst in the development of the library too. As "Unlike the internet alone, blockchains are distributed, not centralized; open, not hidden; inclusive, not exclusive; immutable, not alterable; and secure. Blockchain gives us unprecedented capabilities to create and trade value in society".

1.1 Working Principle of Blockchain Technology

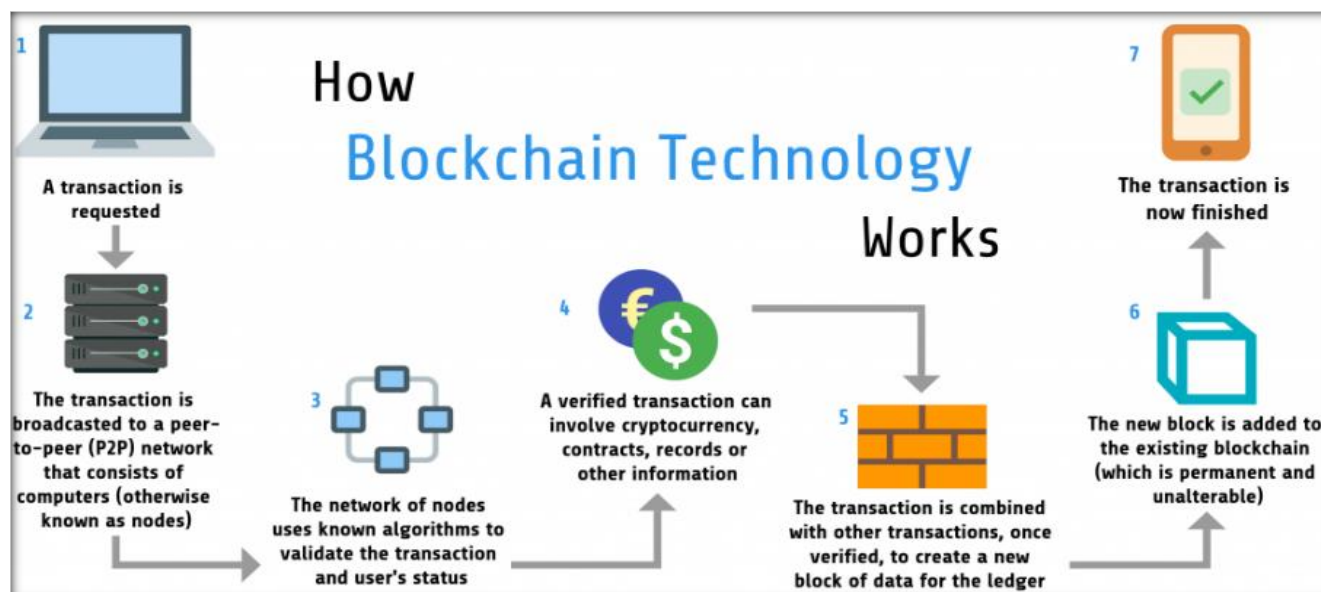
In general, a block consists of three things namely, Data, Hash, and Hash of the previous block. So, every block in a chain consists of the cryptographic hash of its own as well as of the previous one to stay connected in a chain. A hash is a unique alphanumeric number which is being calculated based on Data of its own, a hash of the previous one, and its timestamp.

In order to add a block into the chain, one must create a new wallet by generating a public key and private key. This key is generated through asymmetric encryption. The public key can be shared to have a transaction, but the private key is meant to be kept secret. When any transaction happens on the Blockchain, that transaction is recorded in a block, and that block must be validated before adding it into the chain. The authenticity of a block must be verified through a consensus algorithm (proof of stack) in which the majority of nodes, as well as the nodes having the highest stack in the chain of the distributed network, must validate the block before adding to it in a chain. After the validation of the block, a unique, identifying

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code is generated, called the hash. By doing this, we do not need any third party interference to validate or to do

transactions.



2. Features of Blockchain

2.1 Validation/Consensus: There are many types of consensus algorithms to validate a block into a chain-like: Proof of Work (POW), Proof of Stack (POS), Proof of capacity, Proof of elapsed time, etc.

2.2 Secure: There is no central authority, which means the data is stored in many computers, and to hack it, one needs to hack every node in the network at the same time, which is impossible and costly.

2.3 Immutable: Block once added in a blockchain, it becomes impossible to delete it or modify it. A small change in the block could lead to a new block with a new hash.

2.4 Replicate/ Peer-peer network: Blockchain uses a distributed network and can be termed as a public ledger in which every node/participant has a copy of each transaction.

2.5 Transparency: All transactions are visible to everyone, and all participants know about who performs what action, at what time by themselves.

2.6 Smart contracts: It is peace of code which contain specific terms and conditions, and when these terms and condition met between two nodes, the transaction triggers.

3. Types of Blockchain

3.1 Private Blockchain (Permissioned): In this type, if anyone wants to become a node, they should be permitted by the blockchain authority. Only the authentic member is allowed to access and store data in a blockchain.

3.2 Public Blockchain (Permission less): A public blockchain, as the name depicts, is the blockchain meant for the public. It simply means a kind of blockchain, which is "for the people, by the people, and of the people". Basically, it is open to everyone, where anyone can become a node and is able to read, write, and update in blockchain by creating his/her personal address.

4. Advantages of Blockchain

There are various advantages of Blockchain like:

- Settlement in real time
- Cost saving
- User pseudonymity
- Security & resilience
- Immutability

5. Application of Blockchain in Libraries

It is imperative that librarians play a role in shaping how this technology is applied to content creation, storage and distribution or risk being disrupted. In the near future, we may experience decentralized libraries, where patrons' records would be held on a blockchain instead of the library's centralized database. The Users may control their circulation records and manage their borrowing histories. New economies could also emerge to reward library users for sharing their data with libraries. The rise of blockchain technology has triggered the libraries to utilize

5.1 Publishing E-Books & to protect digital first sale right

To use the e-Book, we have third party interference, and Libraries/users are forced to pay for the full package rather than pay what they use. Also, the author does not get full control over its creation. However, because of Publica, a platform where anyone can publish their book, we can overcome those problems. So, it works like this; the author can create a smart contract, where he/she mentions the terms and conditions for using his/her book. Further, a smart contract creates an ethereum network where anyone can purchase a book through the book token. Publica has developed a new feature called crowdfunding (Book ICO) where the creator can pre-sell their token so that one can be able to raise funds for some initial payments.

5.2 Research Institutions Network on Blockchain

A private blockchain can be used to share research amongst all the Indian Institute of Technology's or other such type of institutions. It can be used to publish grey literature, lab papers, and documents that play a crucial role in carrying

out the research but not in a format to publish as an article or book. If someone invented something, they could share that research over blockchain with every IIT, so that everyone can access that research, rather than doing the parallel research. They can do some add-ons on that research as well. In the whole process, they do not need to care about digital rights, counterfeiting of the data, and also no one can erase the data.

5.3 User to User or Library to User Loan

The other most propitious application of blockchain is lending the book to the user or another library without coming to the library. LibChain is a Distributed Library Management System based on the blockchain technology and ideate modernized procedures to loan books from the libraries. With the help of Libchain, patrons can provide the library books directly to other library users without bringing the book back to the library. The only condition is that, the patron should be a valid member of the library. In the same manner, the system supports inter-library borrowing procedures. LibChain aims to extend popular library services and creating a library ecosystem where the patron gets their desired service efficiently, comfortably and securely.

5.4 Scholarly Publications & Digital Rights Management

Current model for publishing any paper is publisher centered where the publisher has all the rights and the creator has to stay behind the curtain, always; for example, everybody knows about the famous journal, but nobody cares about the creator. Orvium is a platform where all these kinds of issues can be addressed by moving scholarly publishing to a high-tech enhanced blockchain platform. Anyone can register themselves by using Orvium GUI, and the scholar can use their ORCID ID for registration. Therefore, when the creator publishes something on Orvium, he/she receive tokens. These tokens can be used to pay for the peer review process, and the review process can be blind or open. In the tamper-resistant settings, the library can use blockchain technology for storing information, and this technology can also be explored in the world of science communication and publication. Blockchain can also be used to create time-stamped verifiable versions of journal articles. Due to its great potential, blockchain technology is used in Digital Rights Management of libraries as the blockchain creates a unique, verifiable record accessible to anyone. It could be used as a technique to show “provable scarcity” of a resource” after tying to a digital material.

6 Conclusion

Blockchain technology is an emerging technology which provides a reliable way to confirm transactions performed by the party, the date and time of its submission and the content of the transaction without involving the third party for verification. At present, blockchain technology is at nascent stage and researchers are trying hard to exploit its potential applications in various fields. The Blockchain is now one of the trending technologies which has potential application to the library to a smart library. The library is all about gathering, storing, and disseminating authoritative information. With the help of blockchain, this can be done in a distributed, timestamp manner and also can verify the record of creation and ownership. Implementation of new technology in the library or academic environment is much

slower than that of the tech world, but for uplifting library culture in India, exploring the latest and trending technology is the need of the hour, and Blockchain is one of the vast and unexploited areas of research having both challenges and opportunities for library professionals for providing various library services.

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