ISSN NO : 2347-3150

A survey on Blockchain Architecture, Applications and Challenges

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ABSTRACT

Over the last decade, blockchain technology has emerged to provide solutions to the complexity and privacy challenges of using distributed databases. It reduces cost for customers by eliminating intermediaries and builds trust in peer-to-peer communications. Over this time, the concept of block chain has shifted greatly due to its potential in business growth for enterprises and the rapidly evolving applications in a collaborative smart-city ecosystem, healthcare, and governance. Many platforms, with different architectures and consensus protocols, have been introduced. Consequently, it becomes challenging for an application developer to choose the right platform. In this survey, the evolution of various architectures and types of Blockchains to build collaborative applications is discussed. A classification of those architectures helping developers to choose a suitable platform for applications is also explored. In this survey, use of blockchain technology in wide applications area and its implementation challenges have been done. In this paper challenges in implementing of blockchian and its associated security and privacy issues have been discussed.

Keywords: Public Blockchain, Private Blockchain, Consortium Blockchain, Hybrid Blockchain, Blockchain applications.

1. INTRODUCTION

Blockchain, a peer-to-peer system, enables users to maintain a ledger of transactions that is replicated and synchronized over multiple user servers [1]. The transactions are processed and verified by consensus of most of the network participants, eliminating the need for an intermediary. The transactions are packed in blocks and the blocks are chained together using a cryptographic hash to provide immutability. Since its introduction in 2008 [2], the blockchain platforms and consensus protocols have proliferated, due to the evolution of collaborative applications in smart cities, such as healthcare and governance, as well as the need for green and cost-efficient computing. Therefore, it becomes difficult for an application developer to choose the right platform.

Blockchain technology is the popular in the recent year because of its decentralized, peer to peer transaction and immutable properties. It is a digital ledger available publicly to all users present in the network. The concept is derived from Santoshi Nakamoto's 2008 [3] Bitcoin crypto currency. The different issue like anti-money laundering (AML) [4] legal and illegal mining performance [5] is associated with Bitcoin. This concept is useful to many application areas like healthcare, Internet of Things (IoT), industry, supply chain management etc. In this survey, the main focus has been given to analyze the technical implementation of Blockchain in different application area from the academic point of view as well as some recent development by different organization to apply Blockchain technique in different fields.

In the modern area, digital information flows one end to another end through an untrusted transmission channel. Here the privacy and confidentiality is a major concern. Blockchain technology provides a secure peer to peer communication. In Blockchain technology transaction are publicly available for reading but none can modify the transaction once it is recorded. Extensive literature survey has been done and it has been found that Blockchain is being used in many useful application areas. Authors in [6] specify Blockchain is a probabilistic state machine and is not useful where finality of decisions is needed. Authors in [7] explained some of the potential range of Blockchain utility and addresses how Blockchain technology can be used in different traditional databases problem.

Blockchain technology is one of the most demanding research fields but it lacks technical details to make a really implemented in almost every area. The research articles are classified in application wise. The main focus of this survey is to help developers to select the right platform architecture and

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