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Review on: Analysis of an IoT Based Blockchain Technology

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Abstract: Blockchain is the technology which in the last decade has influenced our lifestyles most. Bitcoin is a word used frequently for Blockchain. For example, scalability and protection issues that stands up because of the immoderate numbers of IoT items within the community. The server/client version calls for all devices to be connected and authenticated via the server, which creates a single point of failure. Therefore, shifting the IoT machine into the decentralized course may be the right selection. One of the popular decentralization structures is blockchain. The Blockchain is a powerful technology that decentralizes computation and management methods that may resolve many of IoT troubles, in particular safety.Many Blockchain still confuse Bitcoin, even if it's not equal. Bitcoin is one of several applications are available in Blockchain technology. First of all we present an outline of blockchain architecture and compare a few popular consensus methods in various blockchains. This study also introduced the entire blockchain ecosystem of all the articles we examined and summed up. Furthermore, analyses and consensus models are conducted on many blockchain platforms. Finally, we analyze key issues which are necessary for the future of blockchain technology in these key fields to be broadly available.

Index Terms: Blockchain, blockchain platforms, Internet of things.

1. Introduction

In today's industry as well as in academia, cryptocurrency has become a motto. Bitcoin is one of the most successful cryptocurrencies with a capital market of 10 trillion dollars[1, 2, 3]. With a specially built data store structure, Bitcoin network transactions may place without a third party and Bitcoin's basic technology is blockchain which was proposed for the first time in 2008 and introduced in 2009[4, 5, 6]. Blockchain can be considered a public directory with a list of blocks recorded for all committed transactions. This chain is constantly expanding as additional blocks are attached.For user safety and ledger consistency, asymmetric encryption and distributed consent techniques were implemented. The blockchain system features crucial decentralization, persistence, anonymity, and auditability features in general. Blockchain may significantly decrease costs and enhance efficiency by using these features.

Blockchain is a non-centralized, reliable and hard to utilize database storage form for fraudulent reasons. Bitcoin, however, is a sort of digital currency that makes transactions through peer-to-peer networks using a public record from Blockchain.Bit coin is only one of Blockchain's financial uses, as there is other said smart contracts and hyperlinks. Blockchain technology can be applied for several purposes.Crypto belongings are normally defined as digital devices that are transferred between users through using cryptography. This take a look at focuses on how the money isn't the same as crypto assets. Bitcoin is largest and primary crypto asset which became created at the start of 2009. After introducing Bitcoin, other crypto property, like ethereum and litecoin had been created in line with equal rules [15].

In different applications, for instance in electronic voting, Blockchain has the potential to be taken by financial companies, banks and government agencies.One survey by IBM, including some 200 financial organizations, showed that 91% of banks and 66% of financial institutions would have embraced blockchain technology in its fullest execution by 2018[7, 8, 9]. Gartner, a leading research and consulting institute, predicted that investment cost $3.1 trillion in Blockchain Technology will be projected by 2030. Due toconsiderable extent that blockchain technology is being adopted by the industry, a large amount of study has been conducted in this field.

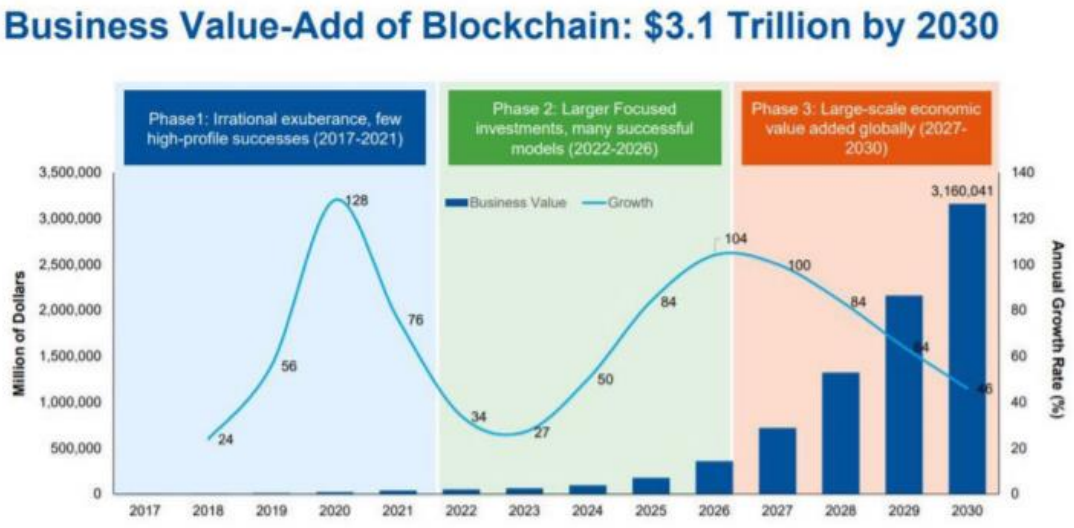

Fig. 1. Blockchain investment growth rate [2].

For its key security, privacy and provenance tracking challenges, Blockchain technology is used by IoT. Some IoT systems employ Blockchain as a trustworthy database. Each transaction is performed through the blockchain network using structures. Similarly, a cloud, IoT and blockchain combinations [10] are available. There are a variety of systems created expressly for the decentralized functioning of the IoT.In the deployment of big-scale observation structures in remote regions, when there isn't an everlasting connection with the Internet, the community calls for disbursed storage techniques for growing the quantity of records storage which decreases the probability of statistics loss. Unlike conventional networked data storage, distributed storage is constrained via the confined assets of the sensor [16].

2. Literature Review

Almost ten years ago Satoshi Nakamoto, an individual/group mystery behind bitcoin, presented the means to use blockchain technology, a distribution system that relates to peer-to-peer, to resolve the challenge of maintaining a two-way problem (Nakamoto, 2008). In a tight-sized structure, Bitcoin orders transactions and arranges them into blocks with the same time stamp. Network nodes are responsible for the chronological links between blocks and each block including a blockchain hash from the previous block (Crosby et al., 2016).The blockchain framework thus ensures that all transactions are recorded in a robust and auditable way.

Since applications and transactions that require the authentication of centralized architects and trusted third parties can now operate decentrally with the same level of certainty, Blockchains has brought severe changes to its conventional business operations. Equality such as transparency, robustness, auditability, and safeguards are provided by blockchain architecture and design (Greenspan, 2015a; Christidis and Devetsikiotis, 2016).An output database arranged as a block list in which the committed blocks cannot be altered might be seen as a block chain. This is good for banks as banks may work together under the same blockchain to push the transactions of their clients.

Blockchain's importance is shown by the number of cryptocurrencies, already above 1900 and growing (CoinMarketCap, 2017). Such a quick speed can eventually pose interoperability difficulties when diverse Bitcoin apps are (Tschorsch and Scheuermann, 2016; Haferkorn and Quintana Diaz, 2015). Moreover, the scenery changes frequently, since blockchain is not used for cryptocurrency in certain businesses, and intelligent contracts play a key role. The SCs that Szabo defined in 1994 as 'computerized transaction protocol executing contractual conditions' (Szabo in 1994) allow us, so as to limit external participation and hazards, to translate contractual provisions into embeddable code. Therefore, A SC constitutes an agreement between parties that automatically fulfil the terms established, but not trusting each other. So SCs are decentralized scripts within a blockchain context that are kept on a blockchain without any trustworthy power (Christidis and Devetsikiotis, 2016). In particular, SC-supporting blockchain systems enable a more complicated process and interaction such that a new paradigm with virtually unlimited applications is created.

The result, Blockchain technology is gaining importance (Zhao et al., 2016) [11]. C-Suite managers said about 1,000 (33 percent) have said they consider blockchains or are participating (IBM, 2017). Researchers and developers already know about new technologies and look at various applications in a variety of fields (Christidis and Devetsikiotis, 2016). Three generations are identified blockchains based on their targeted audience (Zhao et al. 2016): Blockchain 1.0 it comprises applications for transactions of digital of crypto currency; Blockchain 2.0 it encompasses SCs and applications that transcend far off transactions of crypto currency.

3. Blockchain Applications

The Blockchain is not a Bitcoin, but rather, as was previously indicated, a database is a decentralized system. Therefore, Blockchain might be applied to a wide range of applications. Only certain applications in Blockchain are now operating.

A. Monetary Applications

Bitcoin Bits In 2008, Bit coin or digital money had developed by an unnamed human or a group called Satoshi Nakamoto [1]. Bitcoin does business with a public Blockchain ledger over a multicastingnetwork. Bitcoins include for example Bitbond, BitPlay, BTCJam, Codius and DeBuNe.

Ripple

Ripples is a system that employs the Ripple protocol to implement an independent multicasting network, the regionalize bank swapping [8] and to implement the Ripple protocol. Currency trading and sending systems are also known as Kraken, Stellar,BitPesa,Coinbase,CryptoSigma, and Billion.

Non-Monetary Applications

Ethereum

The VitalikButerin [5], a researchers and programmers of crypto-currency, established aupcoming - generation intelligent agreement and decentralised application stage. It employs distributed computer platform from Blockchain, with an extensive language for scripting Turing, allowing smart agreements to be processed on the Blockchain.

Hyperledger

The Blockchain Business Technology Foundation is a Blockchain project that exclusively serves enlisted individuals. Hyperledger are a collaborative open source exertion to enhance Blockchain technology throughout the industry [12]. The Linux Foundation is a global alliance, covering Internet of Things, supply chains, production technology, banking and finance.

4. Research Methodology

The transparent, reproductive and scientific analysis of blockchain-oriented applications was made possible with the technique provided by Denyer andBriner (2012) in addition with some aspects of the PRISMA affirmation (Moher et al. 2009).In methodological approach as a whole comprises:

1. Identify the review necessity, make a review proposal and establish a review methodology.
2. Identification of research, selection of studies, quality assessment, record and excerpts, synthesis of data.
3. Report the review results.

Locating studies

A systemic search for literature was carried out without any time limits during January 2018 and the findings were subsequently revised in April 2018 to address our major research issue. The Scopus had utilized in the main scientific database in all the titles of the papers looked for the phrase "blockchain." Further searches have been carried out using the referred works of relevant publications (snowball effect). Electronic searches were also used to identify relevant "gray literature" including unpublished government-sponsored research or private/public institutional research.We assessed the first 200 Google hits to find the published gray literature. Duration of the search was followed by other terms "blockchain" and "application." Additional gray literature, especially committee reports or policy briefs and research, were produced from both public sectorand privately institutions/organisations in the search reference list in various publications. Fig. 2 presents a flowchart for the strategy. In addition, Scopus used several refining characteristics (multiple refinements of results following the context of specific articles, related documents search, etc.). If there was no summary of a given study, the whole paper was found and significance was evaluated.

Evaluation and Study Selection

The writers assessed independently the suitability in the material collected on a set of established criteria for inclusion and exclusion (see Table 1). Prior to the bibliographic manager, some exclusion criteria were employed (document type restrictions,language andsubject area). At first, the abstracts and opening sections of all the research papers were examined for gray literature. Articles which satisfied one of criteria for exclusion were excluded and classified for exclusion.Comprehensive text review was subsequently carried out, and some more articles describing grounds for exclusion were excluded from the research.Any discrepancies on the relevancy of the articles examined

have been handled until consensus was established. Overall, a number of research were omitted, since the mostly focused on technical elements in blockchain or/and blockchain technology.

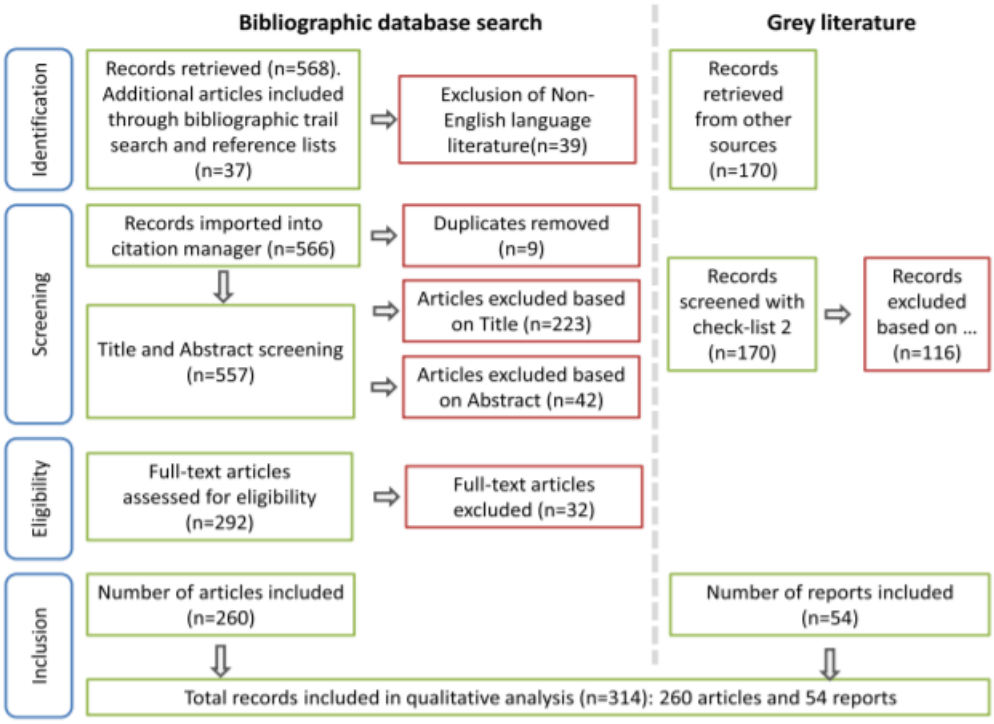

Fig.2. Search strategy flowchart[5]

Table 1. Exclusion criteriaand Inclusion

Selection criteria	Scientific database		Grey literature
Inclusion	Peer-reviewed research articles (including articles in press), conference proceedings papers, book chapters, review papers, short surveys, serials etc. Without time-frame restrictions		English reports Without time-frame restrictions
Exclusion	Prior to importation to bibliographic manager	Non English articles, articles with missing abstracts, notes, editorials	Generic reports related to the blockchain technology without describing specific applications.
	During title screening	Generic articles related to the blockchain technology and/or blockchain architecture	
	During abstract screening	Software-oriented articles related to the blockchain technology	
	During full-text screening	Articles addressing technical aspects of blockchain technology	

Gives an evaluation between blockchain and IoT, there are many advantages of each technologies, which may be mixed, and get a stepped forward final results. The IoT has limitless advantages and adopting a decentralized technique for the IoT could clear up many problems specifically safety. Adopting a standardized peer-to-peer conversation version to process the masses of billions of transactions between devices will notably reduce the costs associated with installing and preserving huge centralized statistics facilities and could distribute computation and storage desires throughout the billions of gadgets that shape IoT networks. This will prevent failure in any single node in a network from bringing the entire network to a halting collapse [13]. The Blockchain technology can promote the current Digital Forensics and Incident Response (DFIR) if it is incorporated into the current forensics system [36]. Logs created by IoT devices and Cloud server can aid in the reconstruction of events, but their credibility and therefore admissibility can only be accomplished if a chain of custody (CoC) is preserved on the Blockchain based digital forensics system. The tamper-proof, distributed nature of the Blockchain has inspired researchers to device Blockchain assisted Cloud forensics framework[14].

Table 2. Comparison between blockchain and IoT

Blockchain	IoT
Decentralized	Centralized
Resource consuming	Resource restricted
Block mining is time-consuming	Demands low latency
Scale poorly with large network	IoT considered to contains large number of device
High bandwidth consumption	IoT devices have limited bandwidth and resources
Has better security	Security is one of the big challenges of IoT

5. Results

This section provides actual assessment findings to evaluate the IoT Blockchain platform's performance. In order to offer a comprehensive way, several experimental tests were performed using various performance measurements [1]. The time required for a transaction request and the length of time taken to obtain a confirmation from the web client were included in the service execution time. We used the postman to examine Restful APIs. This test was carried out by the postman. It offers a beautiful user interface to configure scripts to simulate a high network demand.In the first study the service on time device registration was evaluated and findings have presented in given figure 3. In this paper study, the proposed platform was given with four sets of 50, 150, 250, and 500 devices.

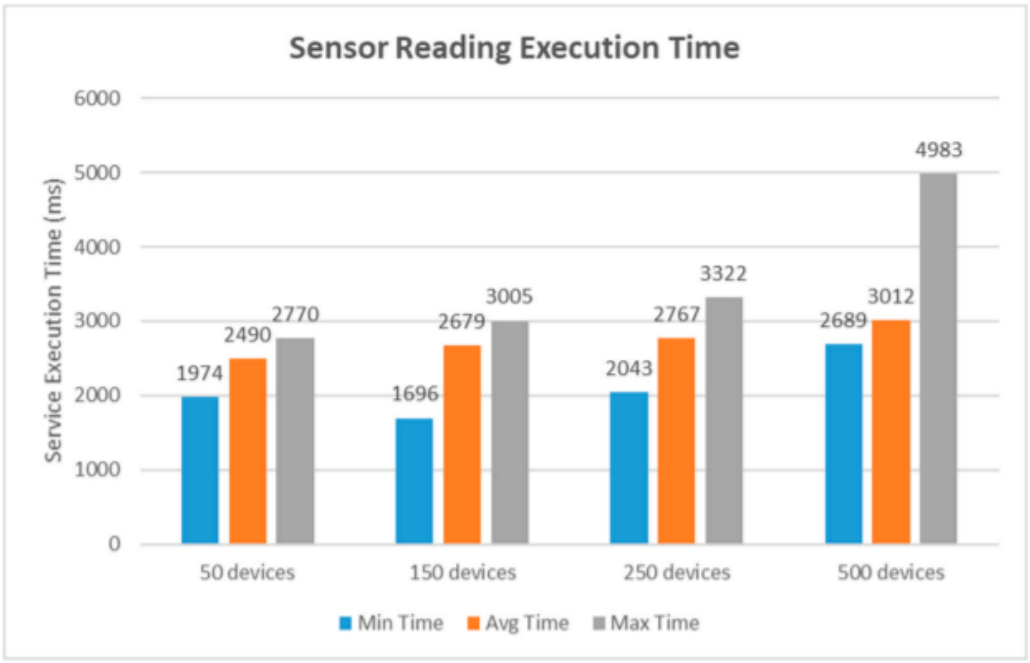

Fig. 3. Sensor reading Performance analysis graph

We assessed service delivery time during our second trial for storing sensor data in this Blockchain network [2-5]. All this devices were equipped with an HTTP client that could read the REST server sensor. When the sensing information has been added to the blockchain, the REST server has collected data and returned the device response from its blockchain network. Figure 3 shows the evaluation results for the performance in the sensor measurement transaction.

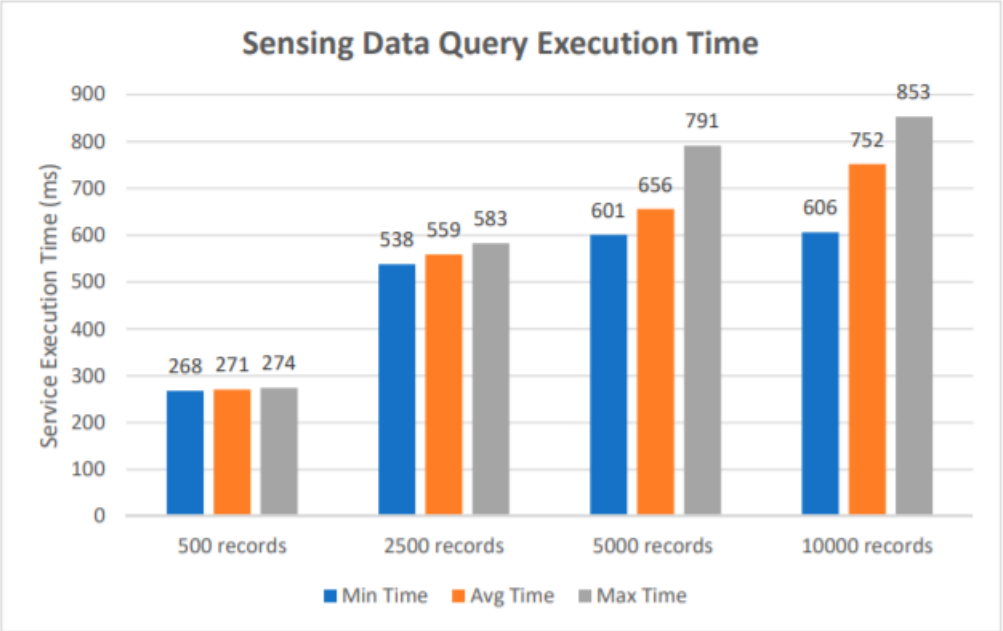

Fig. 4. Sensing Data Queryof Performance Analysis Graph

In the third investigation, when querying sensor records stored in the distributed ledger in the BlockchainTechnology, we analysed system performance. Figure 4 measures the runtime of querying blockchain data records by changing the amount of data between 500 to 10,000 records. At a randomly selected use of the system resources ten times, the delay time, average maximum and minimum taken by the suggested platform for sensing records had reported.The minimum late time was 606 ms, an average of 752ms, the performance with 10,000 is the worst-case records and maximum late-time of 853 ms was registered. The graphic shows that the size of the data records influenced the latency of the trip[6]. The rise, however, was so little that it can even be overlooked, in other words that it may have a negative influence on user experience.

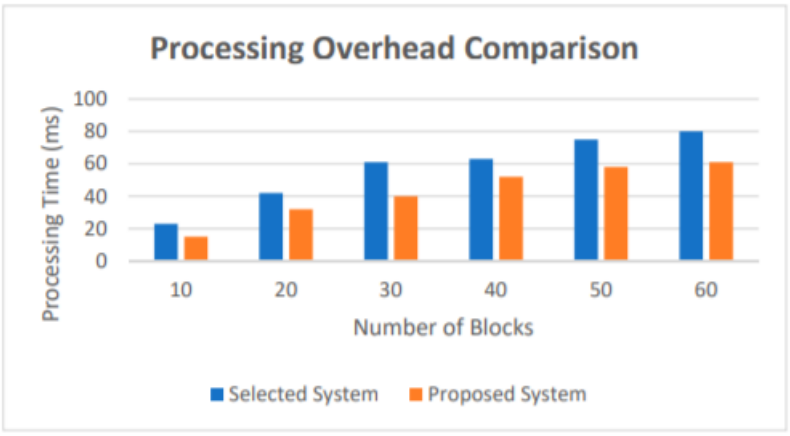

Fig. 5. Processing Overhead Comparison of Performance Analysis Graph

This is clear that most networks are being constructed an unauthorized blockchain technology allowing everyone has to engage and that each member is of unknown name. This means that the contracts or the transaction data they process cannot be confidential. These systems provide their tokens for incentivising expensive mining or fuel intelligent contract execution to reduce lack of confidentiality.Looking at the chances of information tampering, we've also performed an attention to the statistics protection and used blockchain for growing distributed, strong and tempered proof device [17].

6. Conclusions

Blockchain Technology is one of the most consistent technologies when it requires keeping track of financialproperties. It is proved that the usage of blockchain technologyingovernment sector and applications can bring a drastic change in the world.There are structural barriers to IoT scalability on billions of connected systems coming online. Connected gadgets are usually different from manufacturing aspects. Interoperability and identity therefore have to be guaranteed of a safe way. In the centralized design such as the cloud model may also have the possibility,significant, latencyand expensein a single failure position. In order to provide trustworthy IoT devices for data and commerce, Blockchain technology offers a new security protocol, and infrastructure.This document outlines a new way to designing and implementing a decentralized IoT platform for the difficulties of data security, identity and scalability based on an authorized blockchain technology. The Raspberry Pi and different physical devices are used to prove the concept of the suggested technique. In various performance measurements we examine the performance of the system suggested, demonstrating a coherent level that allows effective transaction performance.

Future Work

The above research have shown that Blockchain technology has a fantastic future in different sectors such as supply chain management, digital advertising, forecasting, cyber security, Internet of things, networking, etc. In future, Implementing Blockchain technology in government system can make their operations much more secure and efficient [15].

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