Distributed Ledger Technologies (DLTs):
History, Uses, Misconceptions and Solutions

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Abstract

Distributed ledger technologies (DLTs) such as blockchain and block-lattice have recently seemed to become obsolete and impractical. Due to issues, misconceptions and excessive expectations the technology has largely been neglected. However, current and future implementations can be altered to overcome many of the issues.

Introduction

A distributed ledger technology (DLT) is a digital ledger (DL) based database solution which uses a decentralised method of transacting information between peers (P2P). The decentralised nature of the technologies mean that no central authority can alter or control any part of the system or its transactions. As Nakamoto (2009) mentions, this "non-trust-based system" makes a perfect match for anonymous and incorruptible information and monetary transactions. This of course led him to the creation of Bitcoin, the first cryptocurrency.

Therefore, the most prominent focus of distributed ledger technologies (DLTs) was on blockchain, the technology that Bitcoin was based on. However, there are other non-blockchain based systems such as directed acyclic graph (DAG) and hash graph. These systems use the same principal of decentralised based transaction systems with different methods of distributing, voting and storing the blocks on their chains. (Natarajan, Krause, & Gradstein, 2017) However, their popularity and knowledge of their existence was foreshadowed by the buzz words of bitcoin and blockchain even though these other systems have their own advantages and are arguably better systems overall. This analysis however is shrouded with strong opinions which is why research on this topic needs to be carefully considered.

Bitcoin

As Steve Perry from IBM mentions, Bitcoin began as the first application of blockchain in 2009. At the time, Satoshi Nakamoto, whose real identity is still not known, created Bitcoin as the first cryptocurrency. He envisioned it as an alternative to the e-pay lenders and failed start-ups that were rampant at the time citing that the "centrally controlled nature" of the institutions were the main cause of their demise. (Nakamoto, 2009).

Nakamoto designed the system to work autonomously and was specifically made so that it could not be influenced by lawyers or regulators. (Böhme, Christin, Edelman, & Moore, 2015). The cryptocurrency gained a large amount of traction and publicity until early 2018, when Bitcoin reached its highest price. During this period, Bitcoin, other cryptocurrencies and other uses of distributed ledger technologies (DLTs) began to gain popularity and interest among the public. (Yli-Huumo, Ko, Choi, Park, & Smolander, 2016) This led to a renewed interest in blockchain technology, cryptocurrency and investing in such markets.

Unfortunately, this buzz was almost exclusively about cryptocurrency trading, "getting rich quick" as Gerald Fabrot (2018) the ex-advisor and business-development for Bitcoin.com describes company's actions "as if sprinkling some 'blockchain' magic dust on a project would naturally enable it to change the world". And being decentralised meant that such technologies do not conform to most countries' system of authority and financial system due to the lack of control and taxation. This new interest and lack of knowledge sparked many legal issues and misconceptions as the legal firm Deloitte (2018) explains in their paper instructing institutions of the issues and possible solutions.

Other distributed ledger technologies (DLT)

It is often dismissed that there are other types of cryptographically facilitated information transfers. The second most popular method is using a Direct Acyclic Graph (DAG) structure as explained by Bowin and Johansson. (2018) They mention that the main disadvantages of Blockchain based cryptocurrencies such as Bitcoin and its forks. The main differences being that instead of having a single blockchain, the system uses a block-lattice structure in which each account in the network has its own blockchain. This means that the network does not need to individually pool its resources for each transaction as this uses a large amount of energy, time and prevents the system from being scalable.

Colin LeMahieu (2018) also makes similar claims but as he is the creator of Nano, a direct Bitcoin competitor built on DAG, his opinion is not used here. The cryptocurrency nano has previously been tested and proven by Bowin and Johansson (2018) to be more scalable and faster than Bitcoin as well as using about 9500 times less energy per transaction than Bitcoin while still not having fees. This same trend translates to other uses of Direct Acyclic Graph (DAG) technology such as IOTA, a system of secure communications between IOT devices. (Alexander, 2018) Unfortunately, due to the same hype an extensive publicity that Bitcoin and then other cryptocurrencies had, most project using this technology lost attention.

Misconceptions

As mentioned earlier by Deloitte Legal (2018), there are various misconceptions that have caused many legal disputes and issues. Misinformation and bias has been the main issue and as Fabrot (2018) explains, "governments look at everything as a 'cryptocurrency' and that is a very poor framework to work from" This also stems further into the minds of most people. Hanna Halaburda (2018) discusses that there is a great confusion about the real definition of Blockchain and that: "any blockchain will have these properties: distributed, secure, public, permission less, and will operate without the need for a trusted third party." She also mentions that create problems that do not arise from the need for a distributed ledger of transactions but because they can. Angela Walch

(2016) mentions that "A bunch of states are really in a rush to pass some sort of legislation to demonstrate how crypto-friendly or tech-savvy they are" This matches Gerald Fabrot's (2018) view that companies and governments use the word 'blockchain' as a buzz word to show how forward thinking and innovative they are. Angela Walch (2016) also mentions that "Many of them are putting definitions of blockchain technology in these statutes, and from my perspective, they are very problematic definitions."

Possible solutions

Although there is no solid solution to the issue due to the number of different problems relating to the issue. There are a few small improvements and choices than have been recommended by Yli-Huumo et al. (2016) relating to Blockchain technology but can be expanded to other systems:

- Verifying bitcoin (and similar cryptocurrencies) wastes large amounts of energy ($15million/day) due to the use of Proof-of-Work (PoW). Other systems such as Proof-of-Stake and other non-blockchain implementations can be used to significantly reduce the energy use.
- The same relates to the choice of system in relation to throughput, latency and size, all of which are disadvantages to most Blockchain systems.

Deloitte Legal (2018) also suggests solutions in relation to the legal use and implementation. They suggest the use of hybrid Blockchain which a combination of permissioned and permission less blockchains are used which require some intervention by a responsible party such as regulators.

Another solution is to decide what goes on the chain (no control) and what is taken care of off chain (full control). This allows liability, jurisdiction and other legal aspects into the transaction or contract. This of course only applies to implementations that are public. Private implementation will need to be careful about external acc to their system and attacks such as the 51% vulnerability that is an issue in Blockchain systems.

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