

Blockchain Voting

Summary

Blockchain Voting Overview

- Blockchain technology is a digital ledger that draws its power from the nodes on its network to validate, process, and document all transactions across the system. This ledger is never stored in one central place, but rather exists on thousands of nodes all working at the same time. As a result of the encryption and decentralization, the blockchain's database of transactions is incorruptible and each record can easily be verified. Blockchain technology provides a platform for creating a highly secure, decentralized, anonymized, yet auditable chain of record, used presently in cryptocurrency systems. Due to the secure and immutable nature of blockchain, votes may be cast by computer or mobile device instead of having voters show up at a local polling place or cast a mail-in-ballot to be processed manually by election officials. Votes tracked through a blockchain provide for a quicker, tamper-proof way of counting votes, which could lead to greater voter participation, better ballot security, and at lower costs.

How Blockchain Voting Works

- Blockchain voting is similar to the analogue voting that we're used to. The same concepts and processes apply. In order to cast a digital vote, a citizen would need to register and prove their citizenship in a given jurisdiction. We could then record that identity and citizenship on the blockchain associated with that user's private key.
- Next, a citizen needs a ballot to cast a vote. In the blockchain, this would likely take the form of a special voting token that would be deposited in the user's account. This token would also likely have a time limit in which it could be used to vote, after which it would burn itself via a smart contract or become useless.
- Casting a vote on the blockchain would involve sending the voting token (the ballot) to a specific address. Voters would know which address aligns with which candidate or referendum. Sending a token to that address would represent a vote.
- The vote gets registered on the blockchain where it's immutable, verifiable, and transparent. We can easily count up the votes to declare a winner to the election. In addition, we can build nice user interfaces that automate and hide the process of sending a token to a specific address. Instead, voters would see a simple online interface for them to select a candidate or proposal and click submit.

Blockchain Voting Pros

- Transparency
 - The first benefit that blockchain can bring about is transparency. We know that without transparency, people can become discouraged about the legitimacy of their votes and can lead to questions about tampering and falsified results. This is exactly what we saw in the 2020 election. Transparency makes for a trustworthy democracy which then leads to more positive outcomes from the votes. By using blockchain, votes can be tallied and stored on an immutable public ledger. This means that they can be tracked and counted while being visible to everyone (while keeping the votes anonymous). In turn, by allowing voters to see live records of the number of votes coming in, everyone will be able to see the legitimacy of the voting, making for a transparent and trustworthy voting system.
- Security
 - One of the most important factors of voting is security. Currently, voting systems are highly susceptible to hacks. Without substantial security mechanisms in place, malicious actors can enter the system and alter the outcome. This is where blockchain comes in. The technology has the ability to introduce a

seemingly unhackable system. All votes could be verified as soon as voting is finished to ensure they are all counted correctly. Without blockchain, this would have to be done by a central body overseeing the process. This causes many questions to arise about the trust of these central bodies. But with blockchain and its decentralized ledger system, there is no need for a potentially fallible or corruptible central body.

- Anonymity
 - People want privacy when voting and don't always want others to know who or what they voted for. Blockchain allows for anonymity when voting. As with transactions on the blockchain, voters can use their private keys to keep themselves anonymous. They can then vote in the system without the worry of others knowing how they voted. Having the ability to guarantee anonymity might then encourage more people to take part in and use the voting system.
- Processing time
 - Current voting systems often take time to collate and process answers. Often when voting stations are in different areas and offices are not all together, it can be difficult to gather all the information quickly and efficiently. This then leads to time and cost issues. Instead of having to wait for a large number of people to communicate manually, all organizers will be able to see the outcome instantly on the blockchain. Results can be gathered and processed quickly and straight after the voting has finished.
- Voter turnout/Convenience
 - Low Voter turnout has been a major issue in recent US elections. This problem is due to not giving equal access to all because of e.g., handicap, work, long waiting time, distance to voting places or the cost of getting there. If it were possible to vote from phones, it would be easier and more accessible for people to cast their votes no matter where they work or live. In some countries, like Nigeria and Kenya with election-related violence and murders, it would not only be easier to vote, it could actually be more secure to vote from the safety of one's home.
- Corporate Governance & Autonomous Organizations
 - Governments aren't the only institutions that could benefit from blockchain voting. Employees or shareholders could vote for initiatives within a company as well. It's possible to even imagine ownerless businesses where every decision is an open vote from shareholders.

Blockchain Voting Cons

- Security
 - The blockchain technology itself is very secure. However, the private keys and pass codes that guarantee the security of user accounts and wallets can become a point of compromise if they are lost or if they fall into the wrong hands.
- Accessibility
 - While Blockchain voting could increase voter turnout by allowing people to vote from anywhere, the convenience and ease of use of this technology can become a point of contention since it involves the safekeeping of private keys which may prove to be difficult for users that are not technologically savvy. This technology barrier could discourage older & less sophisticated citizens from voting.
- Issues outside of the Blockchain
 - Other problems with digital voting systems are separate from the underlying technologies. In some cases, government-issued IDs used to verify voters' identities are many years old. Even when dealing with current images, facial recognition systems have high error rates, especially for non-white voters. In addition, hackers may try to trick the system.

Blockchain Voting in Practice

- Traditionally, there are two main methods of voting in elections or propositions: Mail-In (absentee) & In-Person ballots. Blockchain voting has the ability to integrate into these systems seamlessly.
- In-Person ballots

- In-person voting on a blockchain system would operate nearly identical to traditional in-person voting
- Traditionally, a voter would go to a polling location and check in with a copy of their ID card, they would then be given a verification slip that could be inserted into the polling machine that would allow them to cast their vote.
- In a blockchain based system, a voter would register to vote and instead of the registration information being stored in a centralized database, it would be stored on a blockchain with a corresponding public and private key. Voters would only have to keep up with their private key to be allowed to vote (Traditional analogue: Driver's license, passport, etc).
- The voter would then go to a polling location and enter their private key in a voting machine and cast their vote.
- Mail-In Ballots (Absentee)
 - Mobile voting on a blockchain could be put in place to replace traditional mail-in ballots.
 - Voters would be required to register in the same way as in-person voting (Verifying ID and receiving a private key)
 - The voter would then open the online voting UI from their computer or mobile device, enter their private key, and cast their vote.
 - A major issue with mail-in voting is that votes are often lost or tampered with while being shipped. Voters also cannot confirm if their vote was received by the intended party.
 - Blockchain voting solves this by allowing voters to audit the blockchain and verify that their vote was received and not tampered with.
 - However, this could create problems for voters who do not have access to a mobile device and cannot make it to the polls

Existing Implementations

- In the November 2018 congressional elections, West Virginia allowed 144 voters living overseas to cast ballots from 31 different countries using a blockchain based voting system called “Voatz”.
- Denver, Colorado, had 119 voters who were overseas use the “Voatz” blockchain voting system to cast their ballots in municipal primary elections in May.
- The most recent – and largest – use of a blockchain-based voting system was used in the city council election in Moscow, Russia, in September 2019.
 - The evidence showed a boost in voter turnout: The city’s overall turnout rate was around 17% of registered voters (Usually <10%). That includes a 90% turnout among the voters who had registered to use the blockchain system.