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Blockchain Technology in Voting System

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ABSTRACT

Electronic voting systems satisfying legal requirements has been a challenge to create for a long time. In the world of information technology, distributed ledger technology is a revolutionary technological advancement. Blockchain technologies have an infinite range of applications benefiting from sharing economies. We aim to evaluate the application of blockchain as service to implement distributed electronic voting systems, with this paper we try to provide all the requirements of building electronic voting systems and identifying the legal and technological limitations of using blockchain as a service for realizing such systems.

In this project we propose to evaluate various popular blockchain frameworks which offer blockchain as a service, we then will present an innovative electronic voting system based on blockchain that addresses all limitations we came across in due course of our study.

Through this project we will strive to evaluate the potentials of using distributed ledger technologies on Electronic voting system using blockchains ,it will study and formulate the basis of elections implementing a blockchain-based application which focuses on improving the security and decreasing the cost of hosting a nationwide election.

1.1. Motivation

In all democracies worldwide, securely conducting elections is a national security issue.

The cyber security field for decades has explored the possibility of electronic voting systems [1], in order to minimize the cost of conducting a national election, while fulfilling and increasing the security conditions of an election.

1.2. Objective

Since the beginning of democratic way of elections, the electoral system has been based on pen and paper, to replace the traditional pen and paper ballot system with a new electoral process is a need of time to limit frauds and make the voting process traceable and verifiable [2]. Electronic voting machines are considered as flawed, by the security community, due to physical security threats it poses, anyone with physical access to voting machines can sabotage it, thereby affecting all votes cast on that particular machine.

This is where blockchain technology comes to play. A blockchain is an immutable, distributed and incontrovertible public ledger. This technology works using these four main features:

(i) The ledger exists in many different locations hence there is no single point of failure in the maintenance of the distributed ledger.

(ii) There is dispersed control over who can add new transactions to the ledger.

(iii) Any proposed "new block" entry to the ledger must refer to the previous version of the ledger, creating an non-mutable chain from where the blockchain gets its name, and in this way it prevents tampering with the integrity of previous entries.

(iv) Most of the network nodes must reach a uniform consensus before a proposed new block of entry becomes permanent in the ledger.

All these technological features operate through advanced cryptography, which provide a security level equal or greater than any previous known databases. The blockchain technology is considered to be an ideal tool used for creating new modern democratic voting process [3].

1.3. Problem Definition

In this project we will analyse the use of blockchain as a service used for implementing an (e-voting) electronic voting system.

We, through is project propose to makes the following contributions:

(i) studying existing blockchain frameworks which are suited for constructing blockchain based electronic voting system.

(ii) put forward a new blockchain-based e-voting system using "permissioned blockchain" to enable "liquid democracy".

The proposed project will be organized as follows:

In PART B, we will discuss design considerations to be implemented for election systems.

In PART C, we will propose our blockchain based e-voting system and also evaluate few of popular blockchain frameworks for realizing the system.

In PART D, we will discuss some of the security issues, legal considerations and limitations regarding designing an electronic voting system for national elections.

PART E, All related work will be presented in it.

PART F, Conclusions and directions for future work are to be presented in it

OVERVIEW

In this section we will explain the liquid democracy and its design consideration. We will also provide a brief introduction of blockchain and smart contract technology and its capabilities as a service for implementing an e-voting system for liquid democracy

2.1. Liquid Democracy Design Considerations

The main idea propagated in a liquid democracy [4] is that 'the voter has the power, at any given moment, to review the way his vote was cast in terms of a specific legislative proposal or a bill'. This empowers people with domain-specific knowledge to better influence the outcome of any decision, which by all means should lead to an overall better governance. This concept of liquid democracy could be a possible answer to public requests, but there are few technical and social barriers which hinder its way and the solution to technical concerns associated with the concept of liquid democracy would be pivotal for the evolution of democracy as we know it. Below, we state essential requirements that must be fulfilled by an e-voting system in order for it to effectively be implemented in a national election:

(i) An e-voting system must prevent coerced voting.
(ii) An e-voting system must prevent traceability of a vote to a voter's identity.
(iii) An e-voting system must ensure and assure a voter that the voter's vote was counted, and counted correctly.
(iv) An e-voting system should prevent control to a third party against tampering with any vote.
(v) An e-voting system should be able to prevent single entity control over votes tallying and determination of an election's outcome.
(vi) An e-voting system must only allow eligible individuals to vote in an election process.

2.2. Blockchain as a Service

The blockchain technology was introduced by Satoshi Nakamoto in 2008 when he created the first crypto-currency and Bitcoin, which uses a decentralized public ledger combined with PoW (Proof-of-Work) based stochastic consensus protocol, with the financial incentives to record a totally ordered sequence of blocks, the blockchain, this chain is replicated, cryptographically signed and publicly verifiable at every transaction so as to keep the data that has been written onto the blockchain tamper proof.

The blockchain is structured in an append-only type of data structure, it is modelled such that new blocks of data can be added to it, but cannot be modified or deleted. The blocks are chained in such an orderly manner that each block has a hash that is a function of the previous block in the chain, providing surety of immutability.

The Bitcoin blockchain publishes all its elements of the entire chain, but in general the blockchains could be private, public or consortium based. Cryptocurrencies such as Bitcoin use public blockchains which give access to read and the ability to create a transaction with a user on a network.

In our project to develop an e-voting system, we will use a permissioned blockchain, a type of consortium-based blockchain, which uses the proof-of-authority(POA) consensus algorithm.

CONCLUSION

We will further analyse the security of the proposed e-voting system and the legal issues involved, then we propose to study various research papers which explore similar fields of study. The concept of making use of digital voting system is based on the thought that it will make voting system faster and easier as well as cheap, which will tend to normalize it in the eyes of the voter and not make it a fanfare also removing the power barrier between voter and the elected candidate, putting pressure on an elected official. This system if implemented will result in a more direct form of democracy allowing the citizens to express their opinion on individual bills and proposals of the elected government. In this project we will introduce a unique electronic voting system based on blockchain to make a more secure and cost efficient election system which also guarantees the privacy of voters.

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