

# Developing a Web Application to Ensure the Authenticated Election Process using Block Chain Security

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## Article Info

Volume 82

Page Number: 9474 - 9480

Publication Issue:

January-February 2020

## Abstract

Developing a web based application to ensure that the voting process takes place without any type of type of malpractice and also safety to the employees who are involved in this challenging task. As we know the India's population 1,368,737,513 [14]. in the 2019 and in order to maintain the county and its resources in the appropriate way the Indian constitution has the election system. India is under democratic system which is the rule of the people, for the people and by the people.[12]. Hence there is a election commission which organizes the election process by which people select their representatives in the state level and nation level as well. Earlier people used to vote by ballot paper but now a days Electronic Voting Machines (EVM) are available for voting purpose[12]. This EVM system creates lot of discrepancy by which it leads to variety of the disputes by the opposition and also by the people sometimes due to the machines technical issues and sometimes software related issues of the machines. This is the very big drawback which was raised during 2019 election period. In this article we have developed the web based application using the block chain which is highly safe and secure to hack or to do any type of malpractice by which ensuring that the election process can happen in an authorised method also that leads to the less expensive. World's second highest expenses occurred in India 2019 – election Process [11]. By implementing the model of block chain for voting purpose can save the huge volume of expenses which occurs for the election process.

## Article History

Article Received: 18 May 2019

Revised: 14 July 2019

Accepted: 22 December 2019

Publication: 10 February 2020

**Keywords:**Block chain, ElectionCommission(EC), Electronic Voting Machines(EVM)

## I. INTRODUCTION

The Election process of the country is one of the crucial concepts of the each and every country. When election dates are announced people from the different parties is will start involving different activities to promote their candidate to win in the election. Some will take the positive steps and some will not. All the time it's a challenging task to the EC to run the election without any hassle. As we know that previously the election process used to happen manually. During

that time the malpractice was less in number. Voters who are not residing in the town their votes will be misused by the party members. Later when the technology introduced in the name of machines lot of things had happen some will be defect of the machine and some used to say that the machines are purposely programmed in such a way that any button if the voter is pressing only one party getting voted. All these issues raised and many more criminal actions have been taken on public on parties etc., In order to overcome such

Issues here is the technology which will not allow any of the voter or the party members to involve any of the non-permissible activities during the election process.

## II. LITERATURE SURVEY

Every user makes sure about the data is uncorrupted and unaltered once it is recorded[1] this feature highly helpful to the voter to make sure himself / herself to the authenticity and unclutteredness of the votes which they haven given to the parties which they wish to give. The block chain era which was introduced in the recent years in the market has established its own status based on its safe and reliable feature and also its efficient and convenient characteristics in the booming industry[2]. There are cryptographic hashes that helps to connect the chain of blocks which prevents the user to unlock or hack the data which is locked in the blocks[3].

Still people feel that the technology used in the block chain is very complicated and the concepts implemented are unable to understand by the people so many people[4]. It is observed that two parties can involve in the online transaction securely without involvement of the third party or any hacker due to the decentralized concept which was used in the block chain in the peer network.[5]. Block chain allows two members to interchange the data or any sensitive documents without having interacted with each other and also without the involvement of the third party or the hackers who try to access the data. In order to get this trust in the work block chain extends its features in the infrastructure in the signed form between the trusted parties[6]. The block chain has been divided into head and body then applied the validation to each blocks separately based on the rules fixed by the user in order to get the authenticity[7]. Block chain has created the new possibilities in the information technology field to create its own

application and establish the security and the decentralized characteristics of the blockchain has helped to the internet of things also in its designing and

## III. IMPLEMENTATION

In order to Evaluate the result of the work the followings tools were used.

**Node.js and npm:** Node.js is an open-source, cross-platform JavaScript run-time environment that executes JavaScript code outside of a browser. Node.js lets developers use JavaScript to write command line tools and for server-side scripting—running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying web application development around a single programming language, rather than different languages for server- and client-side script.

NPM is a package manager for Node.js packages. The NPM program is installed on your computer when you install Node.js.

For Installing it simply go to the official website for proper guidance for each Operating System.

**Truffle:** Truffle comes standard with npm integration, and is aware of the node\_modules directory in your project if it exists. This means you can use and distribute contracts, dapps and Ethereum-enabled libraries via npm, making your code available to others and other's code available to you.

For installing truffle in machine, we must install node.js first because npm package is what it needed to be installed.

Code:

```
$ npm install -g truffle
```

**Web3.js:** Web3.js is an Ethereum based API and also it is a collection of libraries which allow you to

interact with a local or remote Ethereum node, using a HTTP or IPC connection.

Before installing it, we may have npm install in our machine. After that we must install Metamask extension in our browser (Chrome or Firefox).

Code to install web3.js:

```
$ npm install web3
```

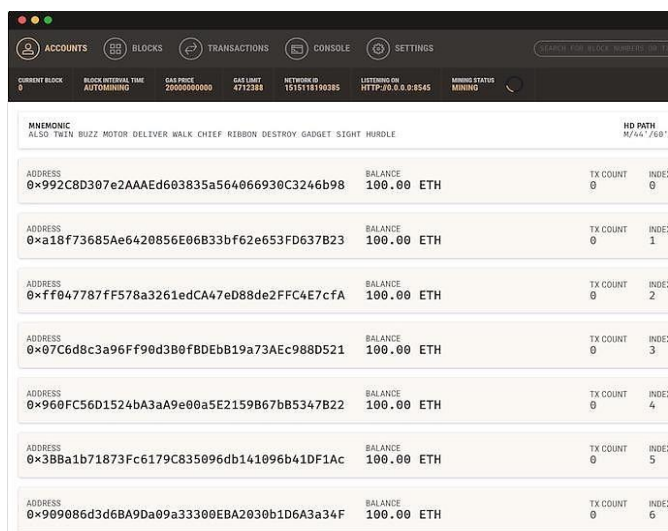
There are many API Reference in web3 like:

web3.eth web3.eth.subscribe web3.eth.Contract  
web3.eth.accounts

We can use these commands for generating accounts and connecting to metamask extension.

**Ganache:** Ganache allows you to create a private Ethereum blockchain for you to run tests, execute commands, and inspect state while controlling how the chain operates. It gives you the ability to perform all actions you would on the main chain without the cost. Many developers use this to test their smart contracts during development. It provides convenient tools such as advanced mining controls and a built-in block explorer.

You will get 10 accounts with 100 ethers as a test network. So that we can perform various solidity programs.



ADDRESS	BALANCE	TX COUNT	INDEX
0x992C8D307e2AAAE683835a564066930C3246b98	100.00 ETH	0	0
0xa18f73685Ae6420856E06B33bf62e653FD637B23	100.00 ETH	0	1
0xff047787f578a3261edCA47eD88de2FFC4E7cfA	100.00 ETH	0	2
0x07C6d8c3a96FF90d3B0fBDEbB19a73AEC988D521	100.00 ETH	0	3
0x960FC56D1524b3aA9e00a5E2159B67bB5347B22	100.00 ETH	0	4
0x3B8a1b71873Fc6179C835096db141096b41DF1Ac	100.00 ETH	0	5
0x909086d3d6BA9Da09a33300EBA2030b1D6A3a34F	100.00 ETH	0	6

we can download ganache from official the site.

**Solidity:** Solidity is an object-oriented programming language for writing smart contracts. It is used for implementing smart contract on various blockchain platforms, most notably, Ethereum. It was developed by Gavin Wood, Christian Reitwiessner, Alex Beregszaszi, Liana Husikyan, Yoichi Hirai and several former Ethereum core contributors to enable writing smartcontracts on blockchain platforms such as

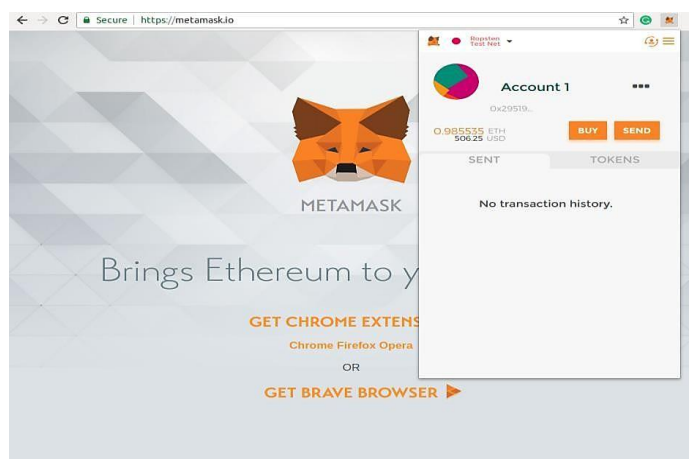
Ethereum.

It can be downloaded from command line interface. Also, we can use online solidity IDE and create smart contract.

here is what is Smart Contract?

A smart contract is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties. These transactions are trackable and irreversible in public blockchain.

**MetaMask:** MetaMask is a bridge that allows you to visit the distributed web of tomorrow in your browser today. It allows you to run Ethereum Apps right in your browser without running a full Ethereum node. Ethereum is easy to use for as many people as possible.



#### IV. METHODOLOGY AND RESULT

After installing all the above tools, we can now start making our Smart Contract and deploy it

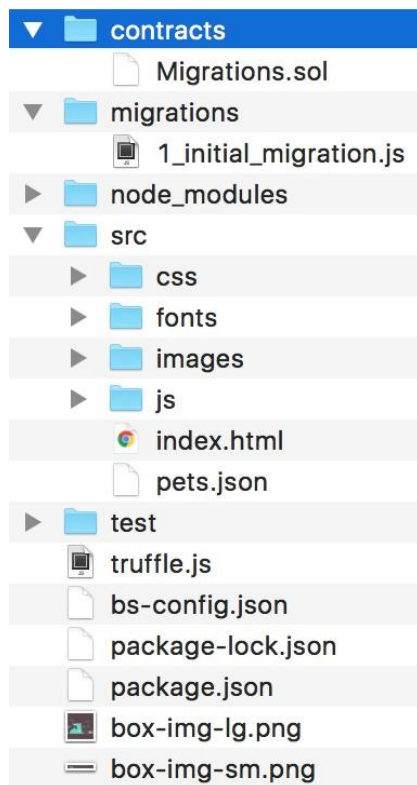
Open terminal and write these commands:

```
$ mkdir election
```

```
$ cd election
```

```
$ truffle unbox pet-shop
```

Now open the folder election you will get these files:



```
var Election = artifacts.require("./Election.sol");
module.exports = function(deployer) {
  deployer.deploy(Election);
};
```

After that truffle migration is done and in the terminal truffle console is started by these codes:

```
$ truffle migrate
```

```
$ truffle console
```

For checking, while our above program is working or not, inside the console we should write

```
Election.deployed().then(function(instance)
```

```
{ app = instance } )
```

Next, we keep track of how many candidates exist in the election with a counter cache state variable like this:

```
contract Election {
  // Model a Candidate struct Candidate {
    uint id;
    string name;
    uint voteCount;
  }
}
```

This is the general code for election.sol pragma solidity 0.;

```
contract Election {
  // Read/write candidate string public candidate;
  // Constructor constructor() public {
    candidate = "Candidate 1";
    // Read/write Candidates
    mapping(uint => Candidate) public candidates;
    // Store Candidates Count uint public
    candidatesCount;
    // ...
  }
```

Now, let's make an election.js file inside the test folder.

General Code:

```
var Election = artifacts.require("./Election.sol");

contract("Election", function(accounts) {
```

```
}
varelectionInstance;
```

This is for testing that smart contract is created and deployed. We can add more candidate as per the voting requirements

2\_deploy\_contracts.js file is created for deploying following general code:-

```
it("initializes with two candidates", function() {
  return
  Election.deployed().then(function(instance) {
    returninstance.candidatesCount();
  }).then(function(count) {
    assert.equal(count, 2);
  });
});

it("it initializes the candidates with the correct values", function() {
  return
  Election.deployed().then(function(instance) {
    electionInstance = instance;
    returnelectionInstance.candidates(1);
  }).then(function(candidate) {
    assert.equal(candidate[0], 1, "contains the correct id");
    assert.equal(candidate[1], "Candidate 1", "contains the correct name");
    assert.equal(candidate[2], 0, "contains the correct votes count");
    returnelectionInstance.candidates(2);
  }).then(function(candidate) {
    assert.equal(candidate[0], 2, "contains the correct id");
```

```
assert.equal(candidate[1], "Candidate 2", "contains the correct name");
```

```
assert.equal(candidate[2], 0, "contains the correct votes count");
```

```
});
```

```
});
```

```
});
```

Now let's run the tests from the command line like this:

```
$ truffle test
```

Then we will make a simple html code for Electronic voting machine interface using html tables, JavaScript files and bootstrap. All these should be written in index.html file. After creating the page you must include this code for client-side voting interface.

```
<form onSubmit="App.castVote(); return false;">
<div class="form-group">
<label for="candidatesSelect">Select
Candidate</label>
<select class="form-control" id="candidatesSelect">
</select>
</div>
<button type="submit" class="btn btn-primary">Vote</button>
<hr />
</form>
```

Your html code should generate this type of webpage below.



## Election Results

#	Name	Votes
1	Candidate 1	2
2	Candidate 2	0

Select Candidate

Candidate 1

Vote

Your Account: 0xc5fd4076b8f3a5357c5e395ab970b5b54098fef

After all this we will change all the above test code to the real ones:

Like:

app.js web3.js election.sol election.js

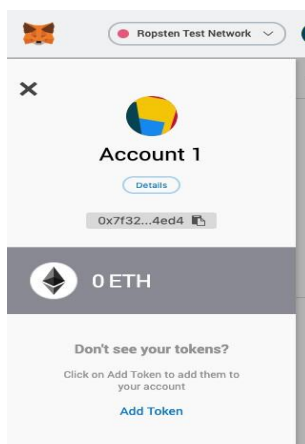
Files is to be changed or new functions is to be added.

Now, just make an id on metamask.io and connect it to the ganache- client with the local server option given in metamask.

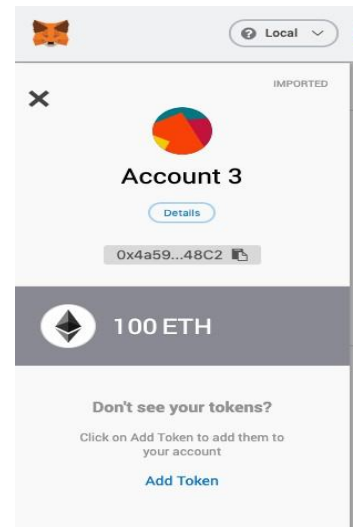
After that Link your account to the ganache and keep ganache running in background.

After linking to metamask. It will show you server name in top right and your account details. When you connect it with ganache. You will get 100 ether and server name according to your choice. Also your account name will be changed.

Before connecting to Ganache



After connecting to Ganache



We have created a full stack decentralized application on the Ethereum blockchain

## V. CONCLUSION

Hackers are trying to their level best to make use of the every loop hole , the technology is also trying its level best to save the data and information. To the nation voting and selecting the right candidate is a very big challenge to do it smoothly without any illegal activities, considering the safety to the employees who are all involved in this work, considering the cost and security of the data etc., in short we can say the economic and social factors are highly considered to establish this work and executed successfully. As a part of the future work this project can be further taken in to the EC to get the approval to implement it in the state at least to ensure the authenticity and accuracy in the election process.

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