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Electronic voting system using Blockchain technology

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Abstract

This paper presents an application for a voting system that uses blockchain technology. As is known, blockchain technology has a wide range of applications. What makes it suitable for a voting system is that it can prevent fraud. Another advantage of using blockchain technology for a voting system is that it offers unlimited system availability: the system's operation is not affected by certain factors, such as power outages, updates or network connection.

Keywords: blockchain, electronic voting

1 Introduction

Blockchain is an innovative technology created by the group of people known as Satoshi Nakamoto [1].

Blockchain is basically a digital ledger of transactions, similar to a database, that is distributed to all nodes in the network. Each record in this register is called a block. Every time a new transaction takes place on the blockchain, a record of that transaction is added to the ledger of each node.

The components of a block are [2]:

- a public key;
- a list of transactions;
- the id for the current block;
- the id of previous block.

The main properties of blockchain technology are:

1. Decentralized. Blockchain system is a decentralized system witch means that the information is not stored by a single entity.
2. Transparency. This property assumes that anyone on that network can track the transaction history.
3. Immutability. The immutability property assumes that once a record has been created, it can no longer be changed.

The blockchain technology uses a special type of network named peer-to-peer network [1]. This network is represented by a collection of interconnected nodes. The nodes are individual computers that receive an input, apply an algorithm and generate a result.

In the following image is described how a blockchain system works:

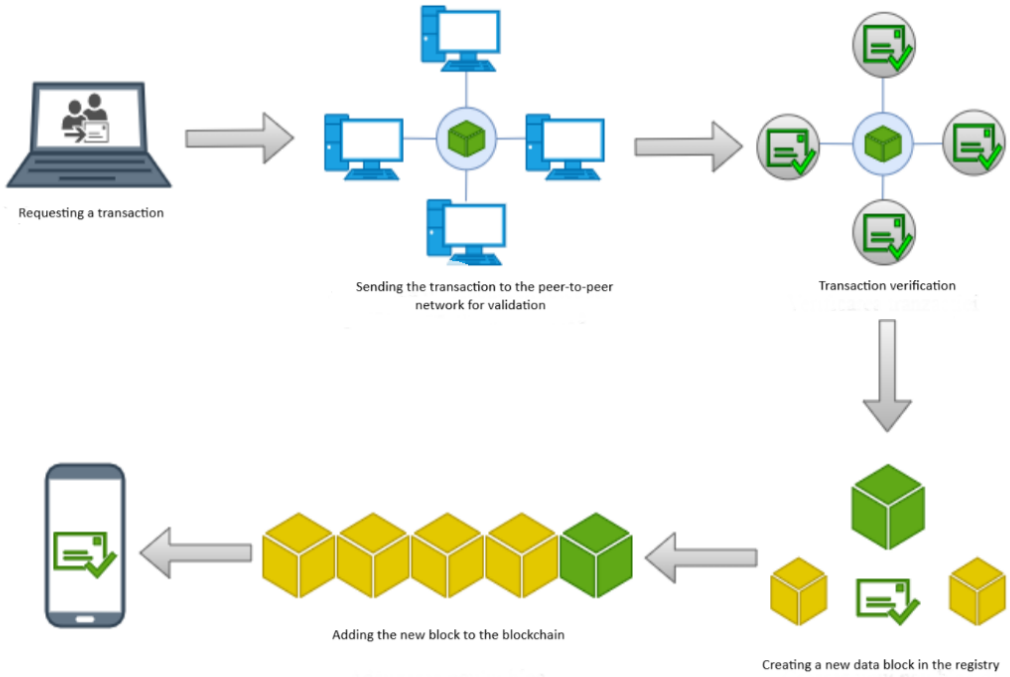

Figure 1. How a blockchain system works[1]

2 Related work

2.1 Requirements

In order to create a voting application, certain requirements must be respected. Bellow are presented the main requirements of a voting system and how the proposed application meets them:

a) Keeping the identity of the voter hidden. The proposed application uses the blockchain technology to store the votes. In the voting process, the personal data of the voter is not saved, but only an address.

b) Preventing multiple voting. Every time a vote is added, the block chain is checked (the users who have previously voted are taken and compared to the current user; if the current user is in the list obtained, the vote is prevented)

c) The possibility to generate the voting result.

2.2 Proposed system design

In order to create an e-voting application that uses blockchain technology, it was necessary to use an existing blockchain system. This system is represented by a program written in the C programming language that simulates the blockchain functionality.

In order to develop a voting application, it was necessary to create a new Windows Forms Application project that could communicate with this blockchain

system. The graphical interface of the project includes a TabControl menu containing four windows (pages): the window for configuration, the window for voting system, the window for viewing the voting results and the window for displaying the specific information of each block on the blockchain.

2.3 Usage scenarios

The proposed application has four usage scenarios:

1. Configuration – the users can configure the blockchain system on the local machine.
2. Voting system - the users can choose a voting option.
3. Voting result - the users can view the result of the vote.
4. Block explorer – the users can generate the block chain that was formed after the vote.

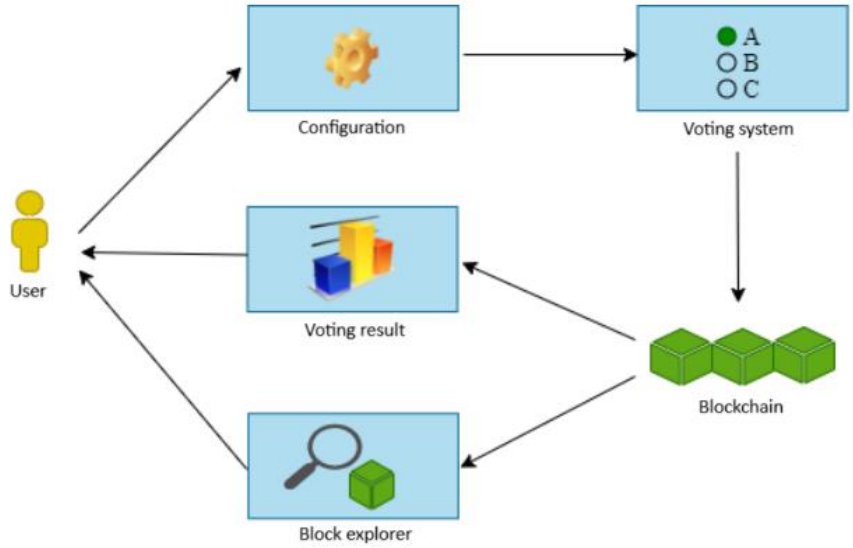

Figure 2. Usage scenarios

2.4 The voting process

Acording to the previous description, the application is developed in the C# programming language and consist of a TabControl component with four windows.

The first window represents the configuration window. As is shown in the Figure 3, this window contains four buttons through which users are allowed to start or stop a node on the local machine, add another node to the network and display the connected nodes. This window also allows to view all the operations that were done on the local machine.

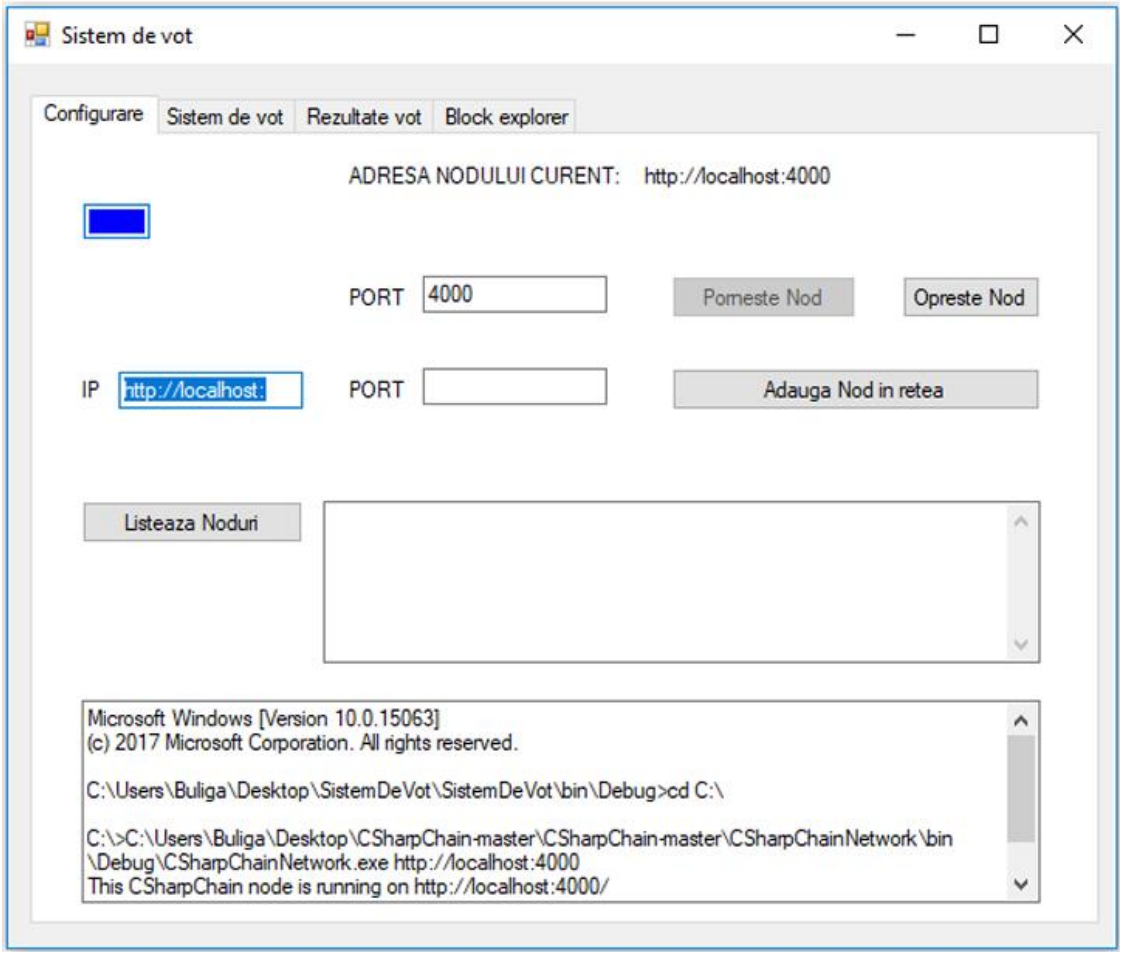

Figure 3. The configuration window

The second window is the Voting system window and allows users to choose a voting option and to register their vote. At this step, the user must first press the Verify user button to unlock the voting options and the vote button. At the press of the Verify user button, all blocks on the blockchain will be covered, all users who have previously voted will be taken and compared to the current user. If the current user is not in the list of users obtained by taking over all the users on the blockchain, the voting options will be activated together with the Vote button.

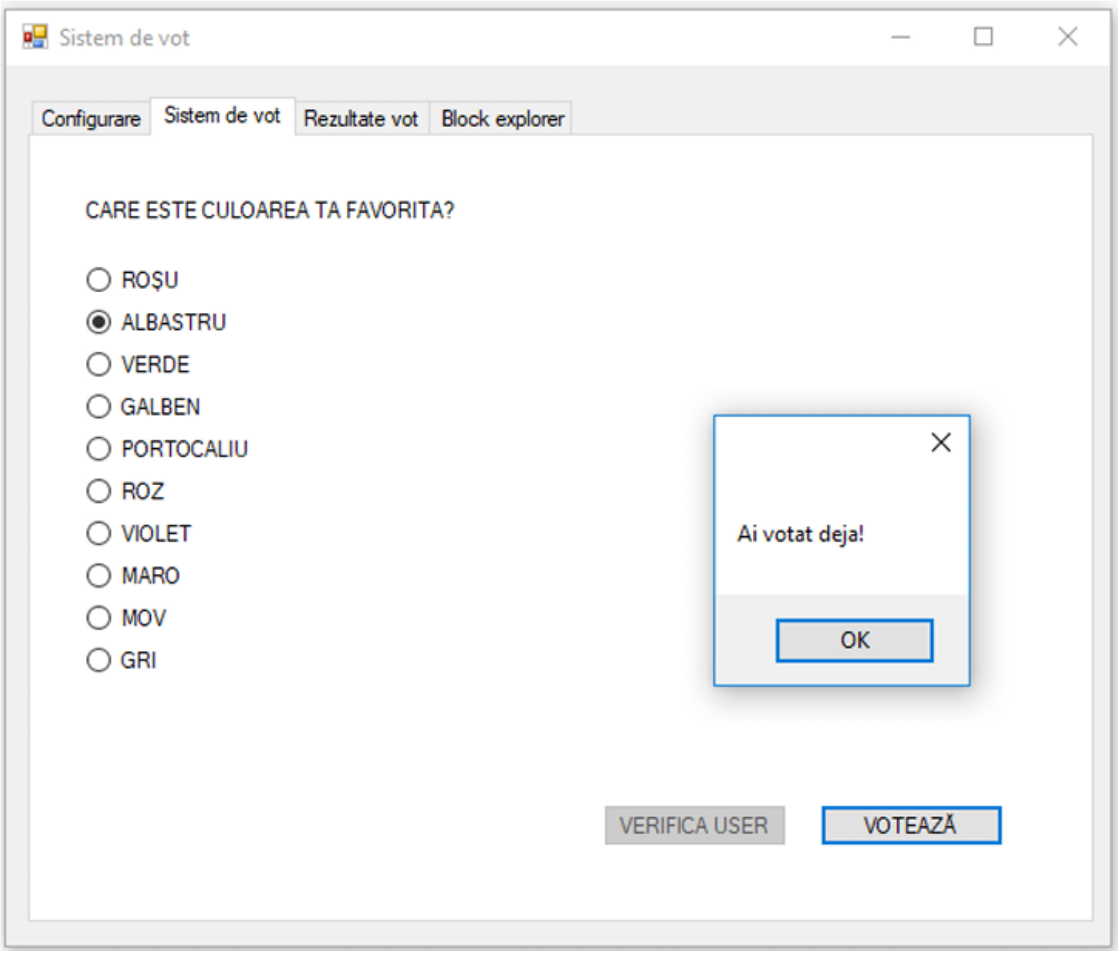

Figure 4. Voting system window

The third window, the Voting results window is designed to display the number of votes for each record.

This window contains for buttons with the following functionality:

a) The Create block button – allows the addition of a new data block at a given time in blockchain, consisting of transaction that are pending;
b) The Update button – it is used to update the blockchain to the longest chain found in the network;
c) The Read vote button – goes to the blockchain and reads the votes;
d) The Display vote button – display the result of the vote.

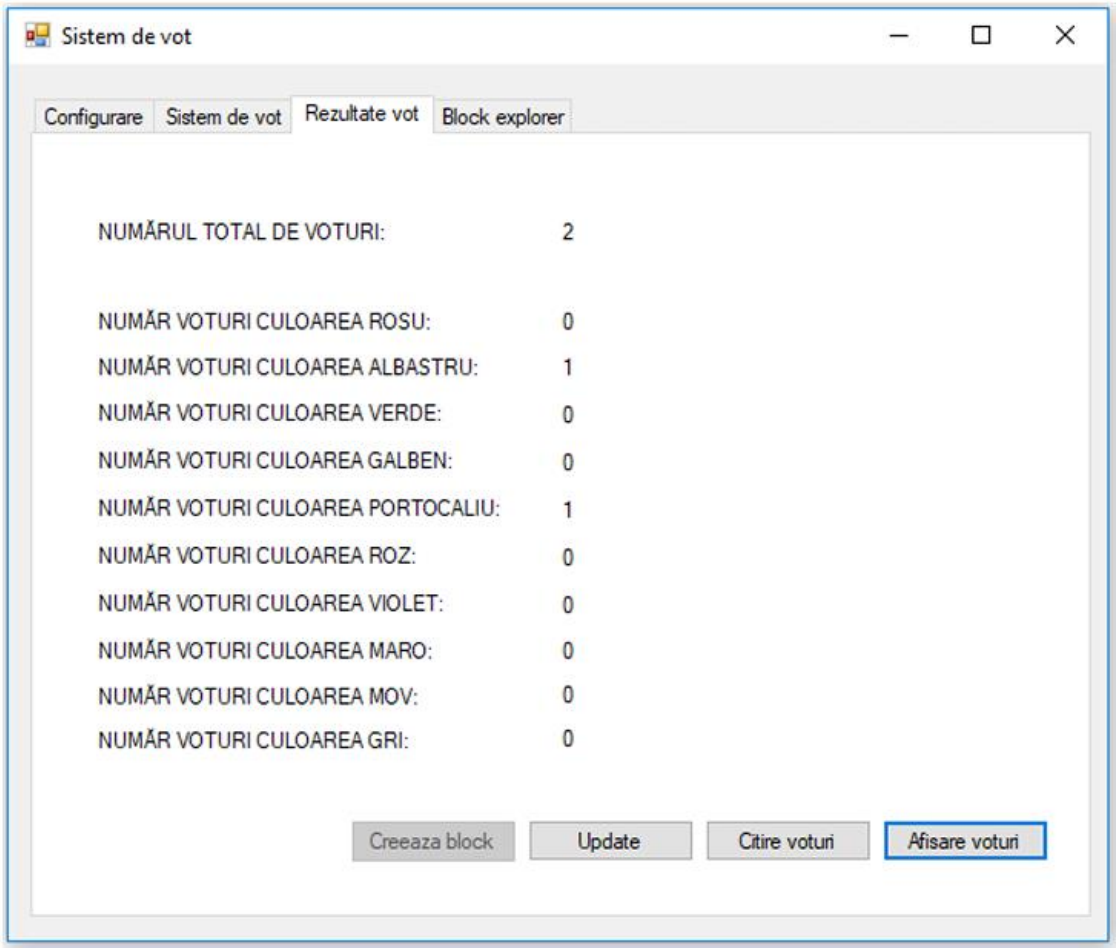

Figure 5. Voting results window

The forth window, the Block explorer window, is designed to display information about data blocks on the network. This window contains two buttons:

a) The Blockchain length button – used to display the total number of blocks from network;

b) The Block explorer button – used to display information about each block of data in the blockchain.

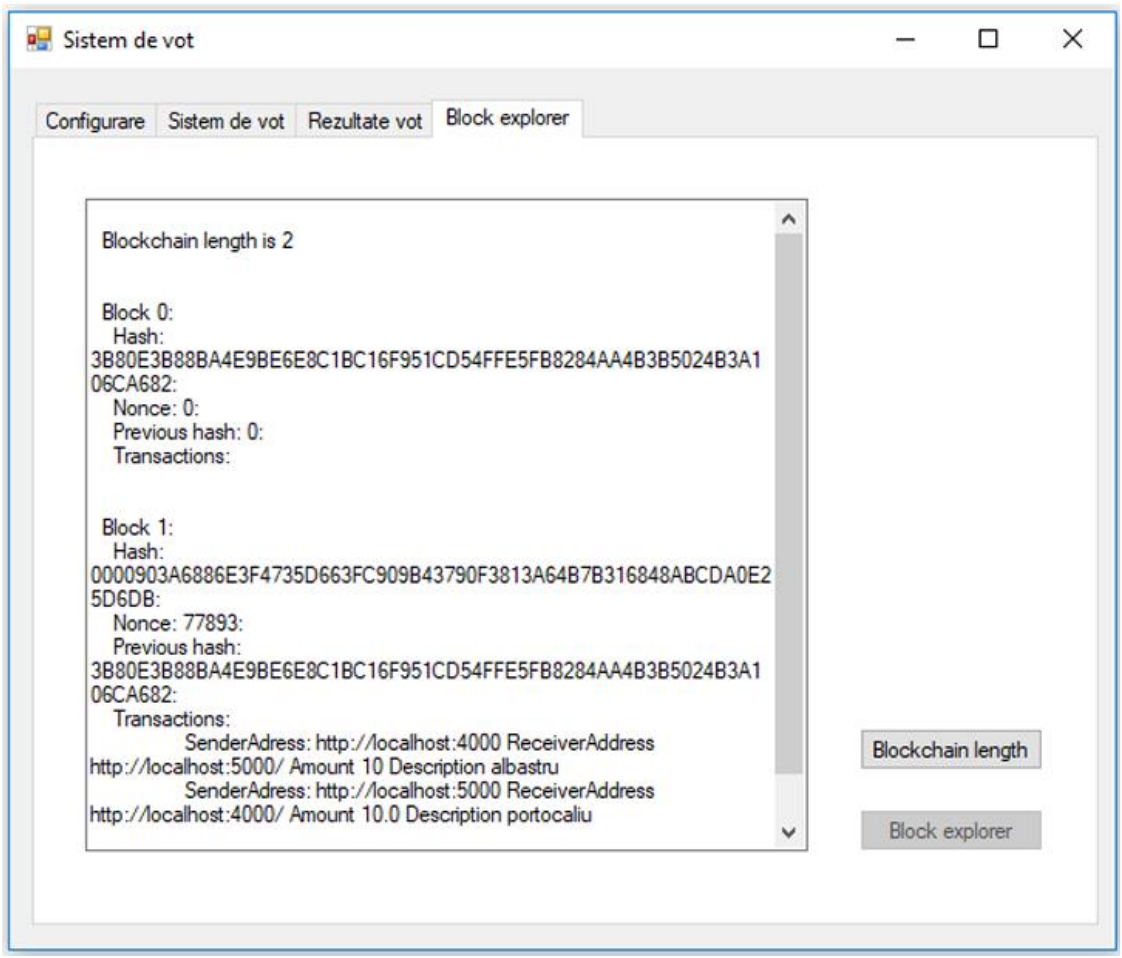

Figure 6. Block explorer window

3 Conclusions

The purpose of this paper was to present an electronic voting system that uses the blockchain technology.

The main advantages of using blockchain technology in a voting system include: keeping users anonymous, preventing fraud and ensuring unlimited system availability.

4 References

[1] Nick Darlington, Blockchain For Beginners: What Is Blockchain Technology? A Step-by-Step Guide, https://blockgeeks.com/guides/what-is-blockchain-technology/

[2] Alexandru Gavrilovici, Este blockchain-ul urmatorul internet?, https://smarternext.com/ro/este-blockchain-ul-urmatorul-internet/