Decentralized Voting System

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Introduction

This project aims to create a decentralized voting system using blockchain technology. Instead of using the Ethereum blockchain, the Hardhat local blockchain network was chosen for testing and development purposes. This allows us to develop and test smart contracts without spending real Ether.

Creating a Blockchain

In this project, a test blockchain network was created using Hardhat.

Steps:

1. Installing Hardhat and initializing the project:

```
npx hardhat run scripts/deploy.js --network localhost
```

2. Starting the local blockchain:

```
npm install --save-dev hardhat
npx hardhat
```

3. Deploying the contract:

```
npx hardhat node
```

Smart Contract

The smart contract was developed using Solidity and includes the following functions:

- Registering candidates
- Voting
- Listing vote counts
- Preventing the same person from voting multiple times

Code Snippet:

```
mapping(uint256 => string) public candidates;
mapping(uint256 => uint256) public votes;
mapping(address => bool) private _hasVoted;

constructor(string[] memory candidateNames) {
    for (uint256 i = 0; i < candidateNames.length; i++) {
        candidates[i] = candidateNames[i];
    }
}

function vote(uint256 candidateId) public {
    require(!_hasVoted[msg.sender], "You have already vote
    votes[candidateId]++;
    _hasVoted[msg.sender] = true;
}
```

Test Result

The contract was successfully deployed and tested.

- Contrast deploying:

```
Deploying contracts with the account: 0xf39Fd6e51aad88F6F4ce6aB8827279cffFb92266
Voting contract deployed to: 0x5FC8d32690cc91D4c39d9d3abcBD16989F875707
```

- Terminal Outputs:

```
(base) mandanazy@mandanazy-MacBook-Pro Decentralized_180709711_final % node interacti
on.js

Adaylar:
Aday 0: Ali
Aday 1: Ayşe
Aday 2: Mehmet
Oy kullanılıyor...
0. adayın güncellenmiş oy sayısı: 1
```

- An error was encountered when trying to vote again:

```
(base) mandanazy@mandanazy-MacBook-Pro Decentralized_180709711_final % node interacti
on.js

Adaylar:
Aday 0: Ali
Aday 1: Ayşe
Aday 2: Mehmet
Oy kullanılıyor...
Error: execution reverted: "You have already voted" (action="estimateGas", data="0x08
```

Future Enhancements

In the next phase of the project, the following can be added:

- Deployment to a real Ethereum test network
- Development of a user-friendly frontend (React + ethers.js)
- Adding a voting period to limit the voting process to a specific time frame

Conclusion:

This project demonstrates that a blockchain-based voting system can operate decentrally and be resistant to manipulation. By using Hardhat, we successfully completed our tests without connecting to Ethereum and deployed the contract successfully.