CryptoBallot

Laboratory of Advanced Programming - Engeneering in Computer Science

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Introduction

Project Objective: Develop a decentralized system for secure and transparent voting using blockchain technology.

User-Friendly Interface: Voters can easily cast their votes with an accessible and intuitive design.

Trustworthy and Secure Process: Votes are recorded immutably on the blockchain

Blockchain as a Secure Transaction Tracker

- Blockchain offers a **secure**, **distributed method** for recording transactions.
- In a voting system, each vote is a **transaction** that must be tracked **transparently**.
- With blockchain, every vote is logged on a **decentralized ledger**, ensuring votes are traceable and protected.

Benefits of Blockchain in a Ballot System

- **Decentralization**: Eliminates the risk of single points of control, reducing the chance of manipulation or failure.
- **Immutability**: Once a vote is cast, it cannot be changed, ensuring integrity and preventing fraud.
- **Transparency**: Blockchain’s transparency allows anyone to verify the accuracy of vote counting, boosting trust in the system.

Ethereum: A Permissionless Blockchain for Transparent Voting

- **Public and Transparent Ledger**: Ethereum's decentralized nature means that all transactions (votes) are publicly recorded, ensuring **transparency** and **verifiability**.

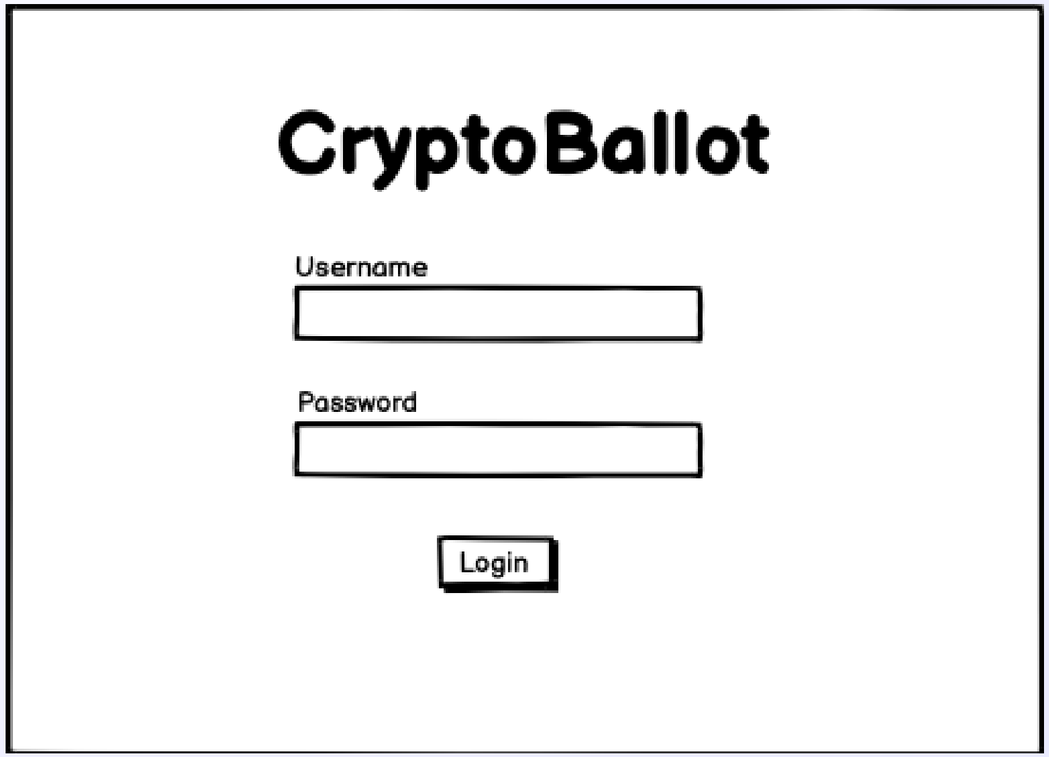
- **Anonymity and Security**: While votes are verifiable, Ethereum's cryptographic features ensure voter anonymity, maintaining privacy without sacrificing trust.

- **Permissionless and Mature Ecosystem**: Ethereum is widely adopted and trusted, chosen for its mature ecosystem, robust security, and well-developed **smart contract** capabilities, which allow for flexible and reliable vote management.

User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US01	LOGIN	As a USER, I want to be able to login, so that I can cast my votes		SM
US02	SIGNUP	As a USER, I want to be able to sign up, so that I can login to the platform		SM

Mockup

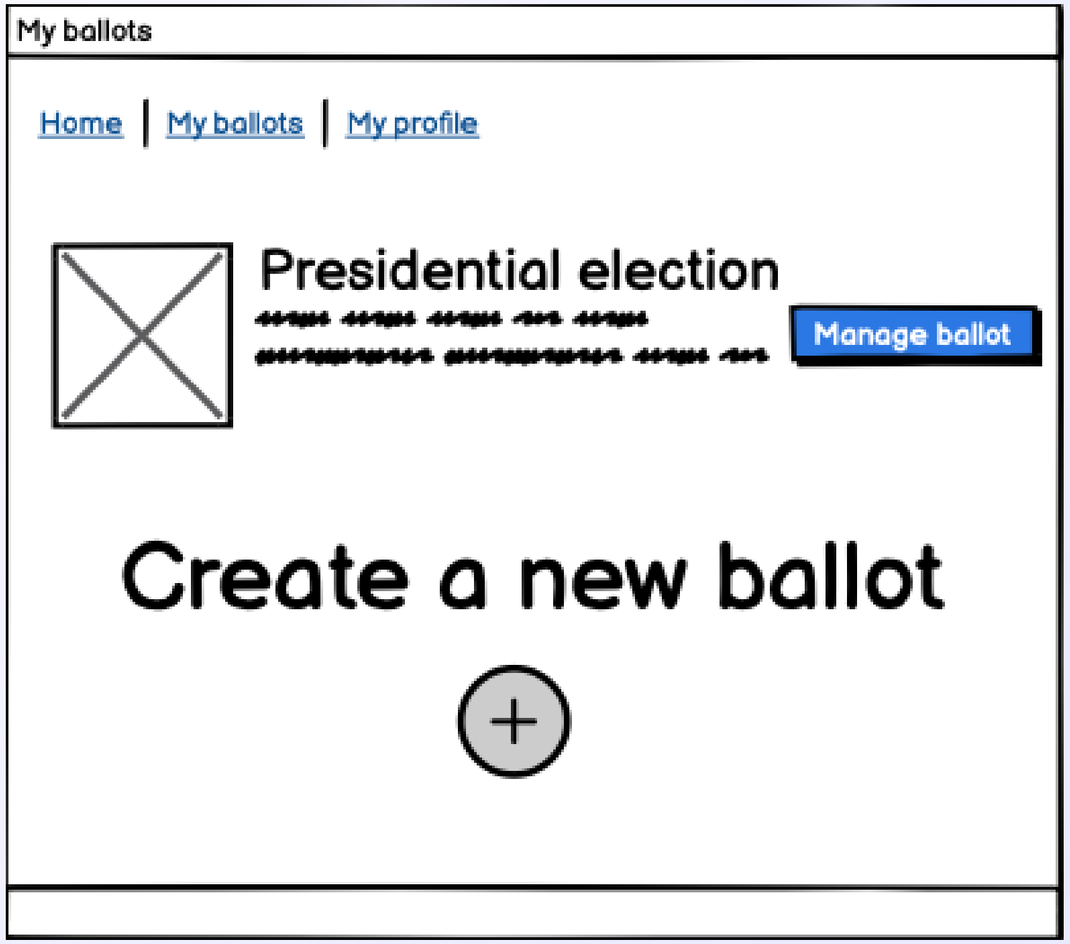

CryptoBallot
Username
Password
Login

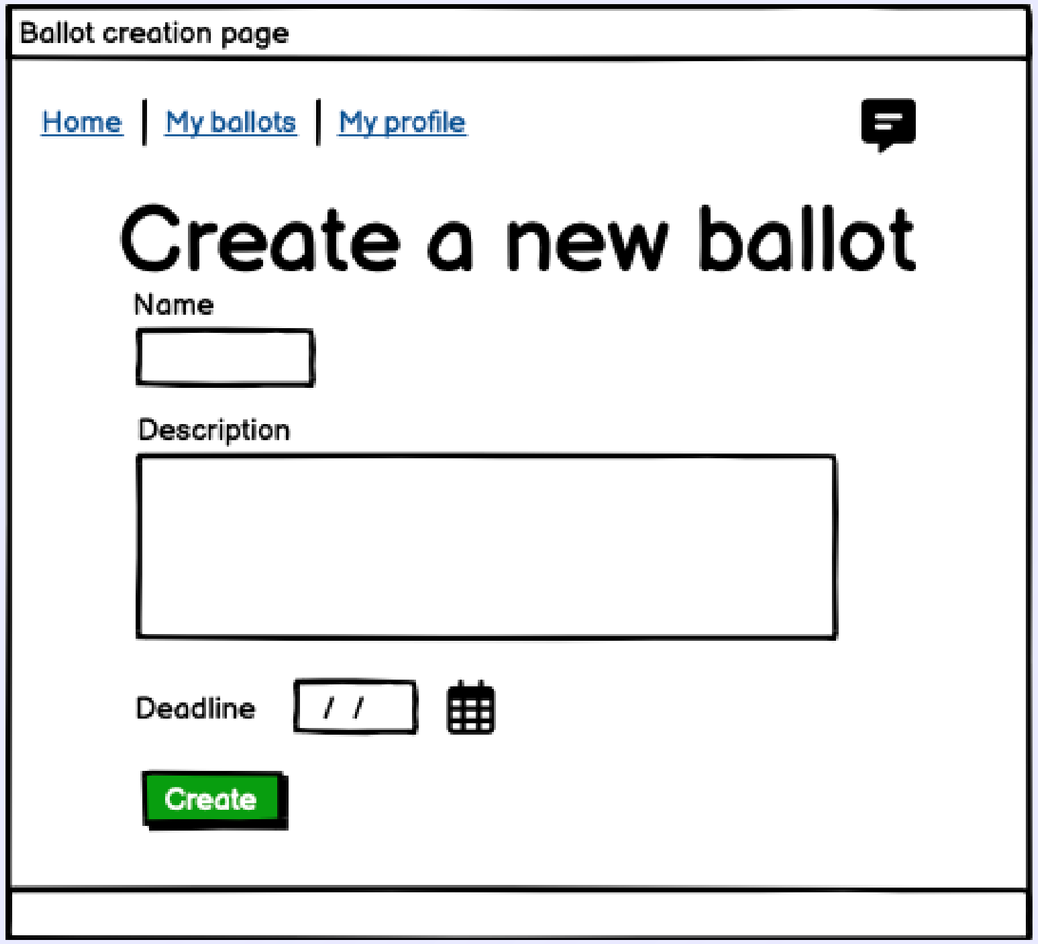

Insert your data
Name
Surname
Email
Password
Register

User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US03	Ballot Creation	As an USER, I want to be able to create a new ballot, so that the users can see it		SM

Mockup

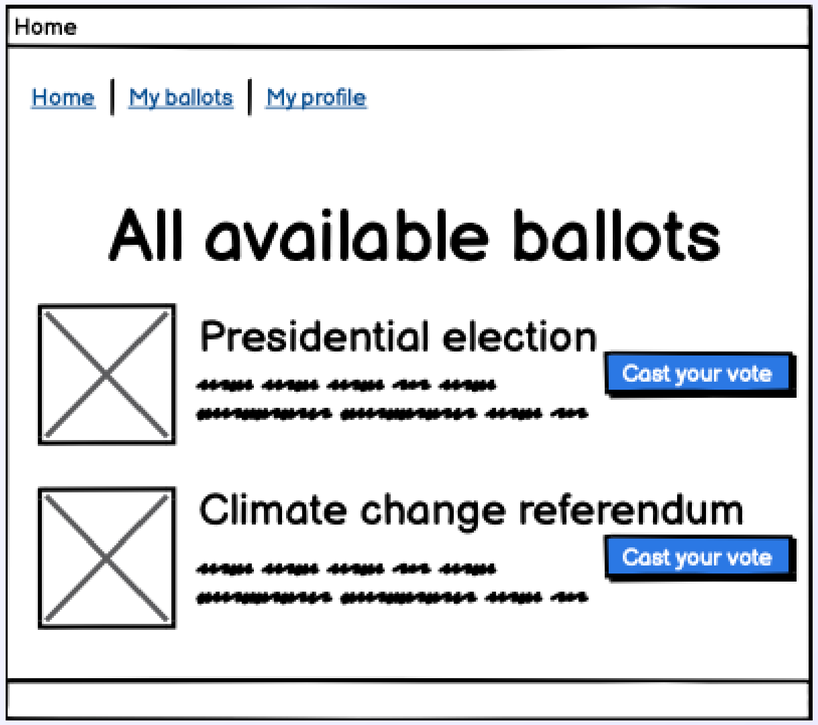

My ballots
Home | My ballots | My profile
Presidential election
Manage ballot
Create a new ballot

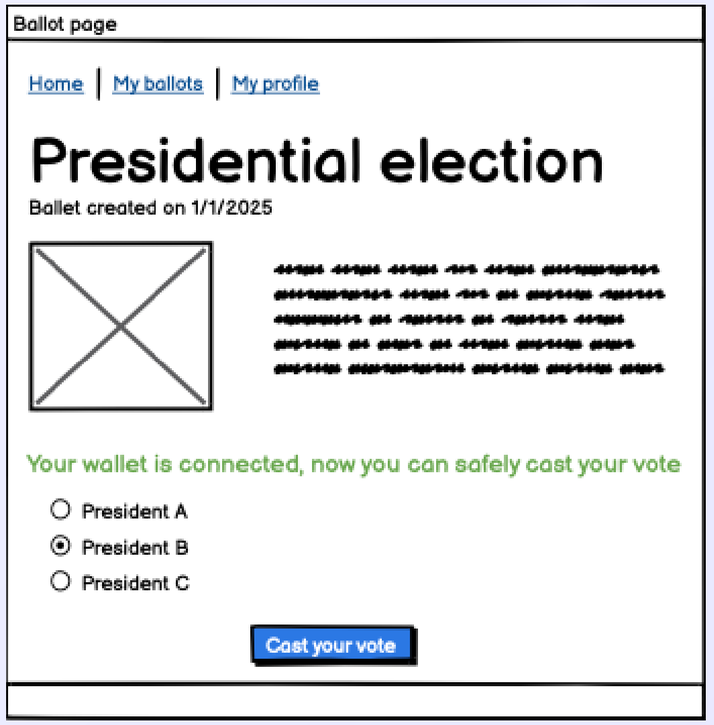

Ballot creation page
Home | My ballots | My profile
Create a new ballot
Name
Description
Deadline
/ /
Create

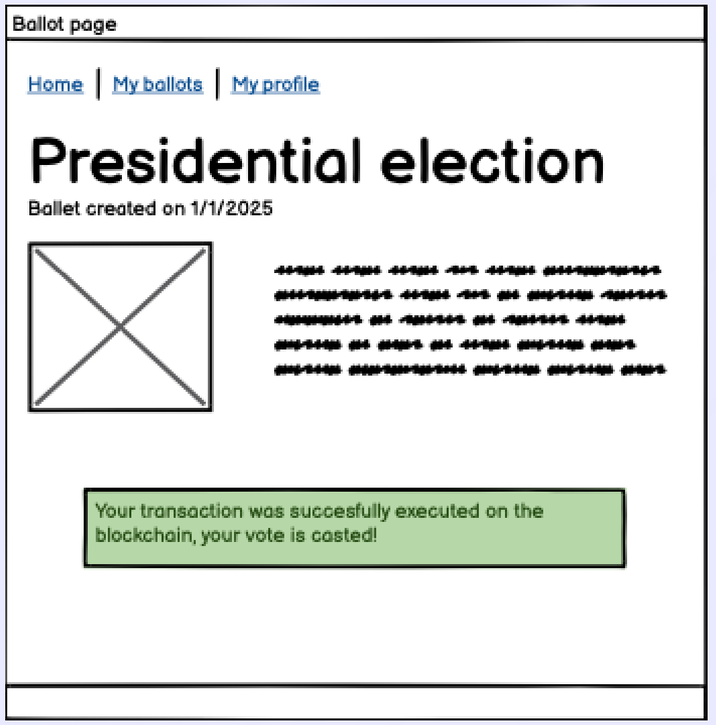
User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US07	Ballot List	As a USER, I want to be able to view all active ballots, so that I can choose one of my interest		MD
US05	Ballot Voting	As a USER, I want to be able to cast a vote, so that I can contribute to the ballot		LG
US10	Vote Confirmation	As a USER, I want to be notified that my vote was casted, so that I can be sure that my vote is counted		MD

Mockup


Home
Home | My ballots | My profile
All available ballots
Presidential election
Cast your vote
Climate change referendum
Cast your vote


Ballot page
Home | My ballots | My profile
Presidential election
Ballet created on 1/1/2025
Your wallet is connected, now you can safely cast your vote
President A
President B
President C
Cast your vote


Ballot page
Home | My ballots | My profile
Presidential election
Ballet created on 1/1/2025
Your transaction was succesfully executed on the blockchain, your vote is casted!

User stories

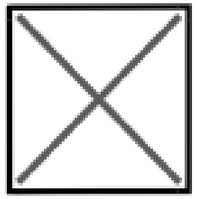
ID	EPIC	USER STORY	NOTES	ESTIMATE
US04	Ballot Results	As a USER, I want to be able to see ballot results, so that I can I can understand the outcome of the voting process		SM

Mockup

My ballots

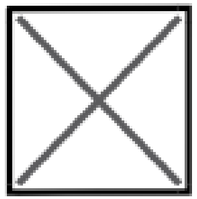
Home | My ballots | My profile

Ballots you participated



Presidential election

Show result



Climate change referendum

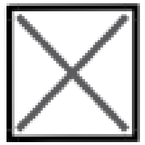
Ballots are still being processed. Results are not yet available.

Ballot page

Home | My ballots | My profile

Presidential election

Ballet created on 1/1/2025



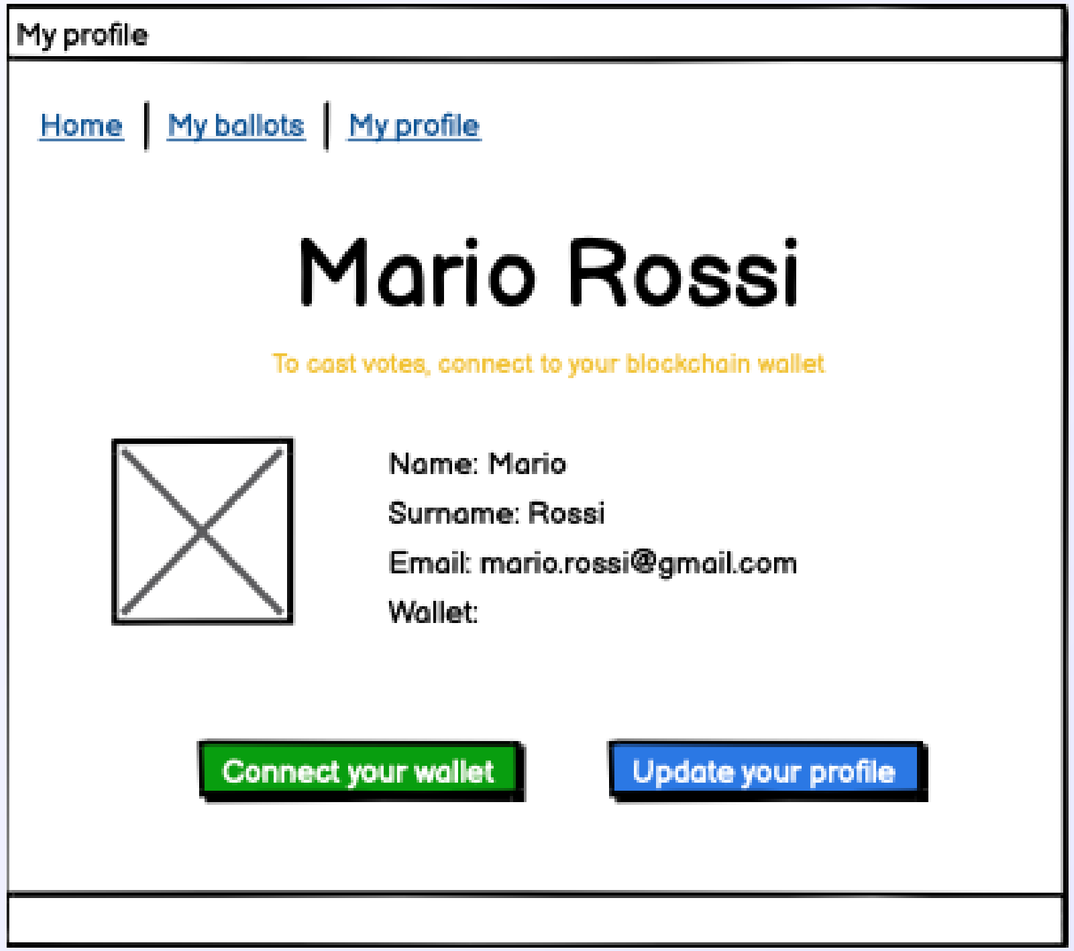
Ballot results

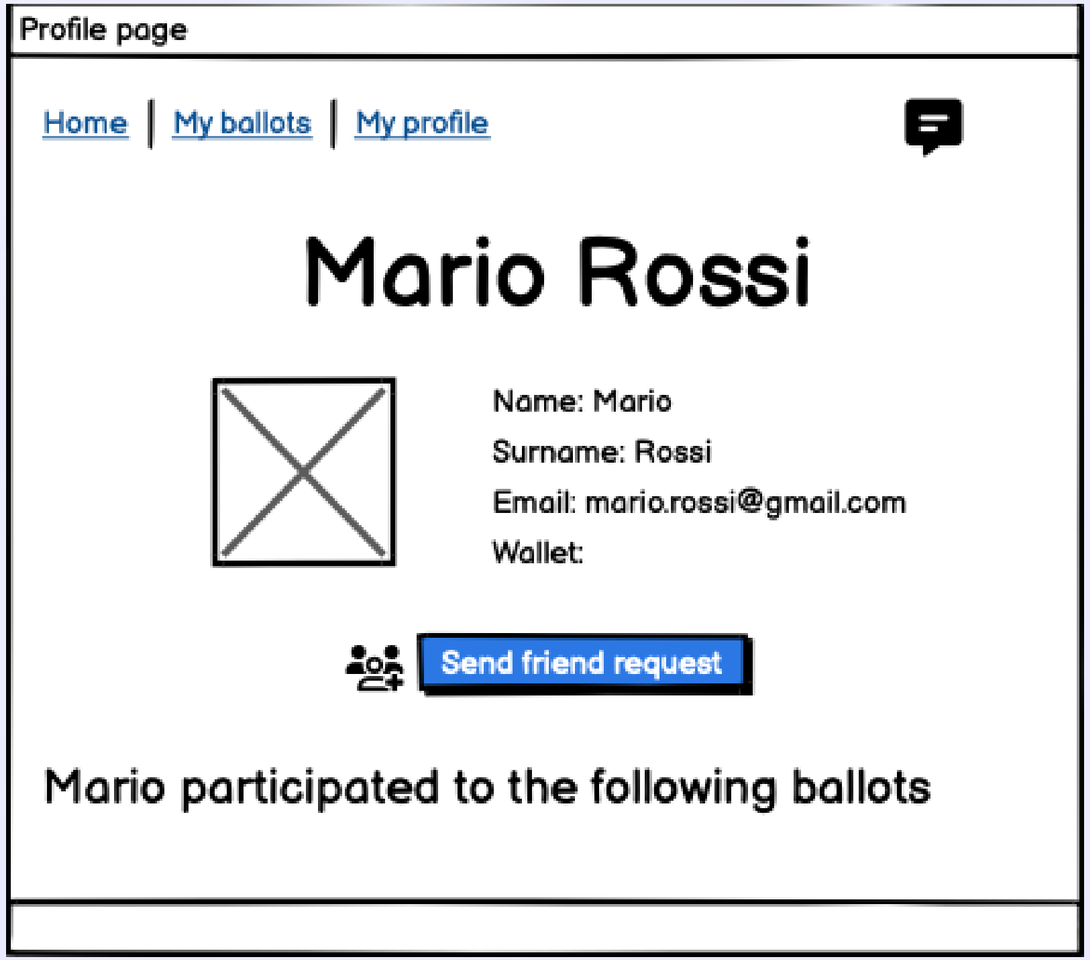
President A: 3.2 millions of voters
President B: 2.7 millions of voters
President C: 1.2 millions of voters

User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US08	Profile Update	As a USER, I want to update my profile, so that I can keep my information up to date		SM
US09	Friend Requests	As a USER, I want to be able to send friend requests, so that I can view my friends' interests		LG

Mockup

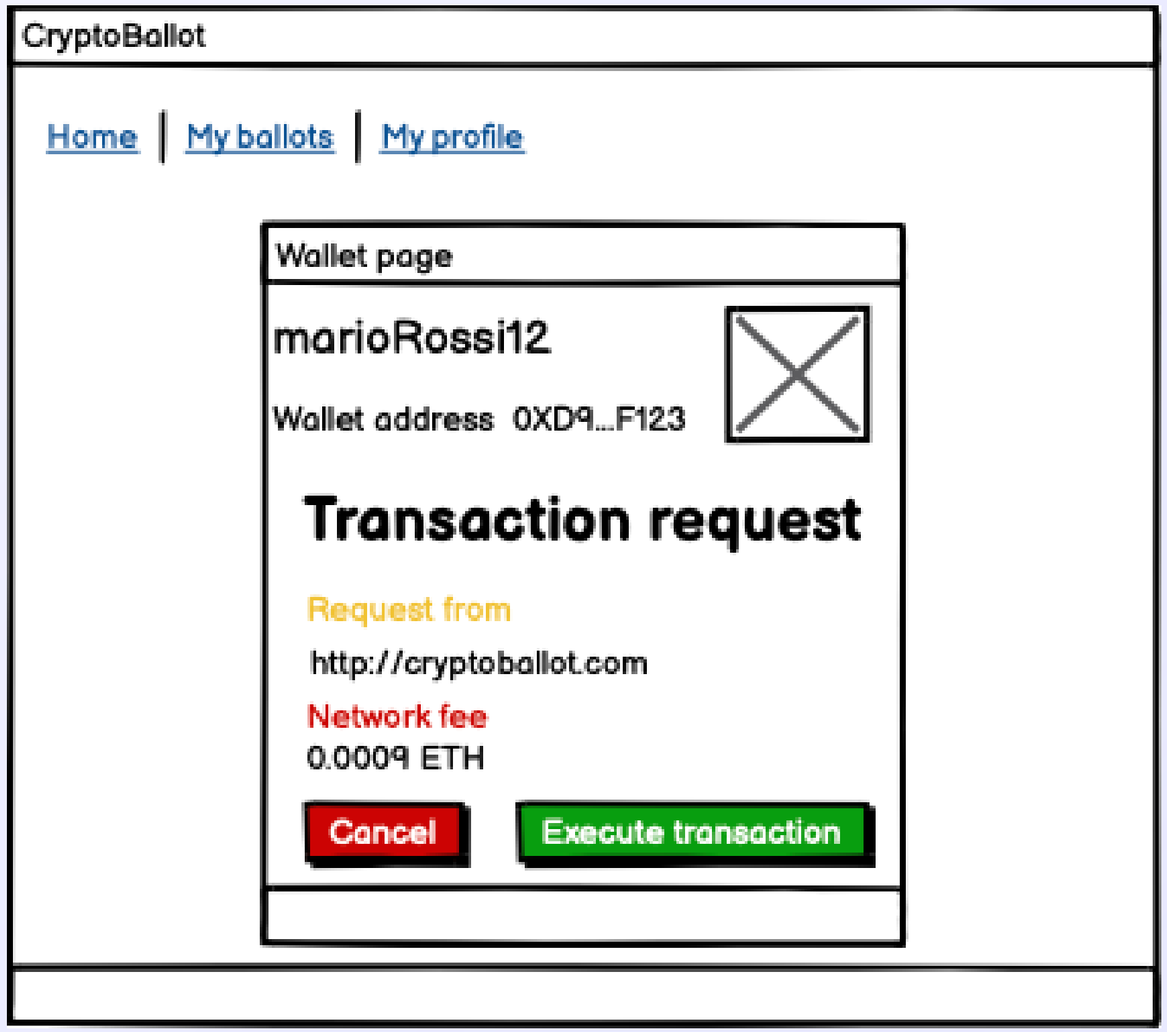

My profile
Home | My ballots | My profile
Mario Rossi
To cast votes, connect to your blockchain wallet
Name: Mario
Surname: Rossi
Email: mario.rossi@gmail.com
Wallet:
Connect your wallet
Update your profile


Profile page
Home | My ballots | My profile
Mario Rossi
Name: Mario
Surname: Rossi
Email: mario.rossi@gmail.com
Wallet:
Send friend request
Mario participated to the following ballots

User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US06	Wallet Connection	As a USER, I want to be able to connect my wallet, so that I can create ballots and cast my votes		LG

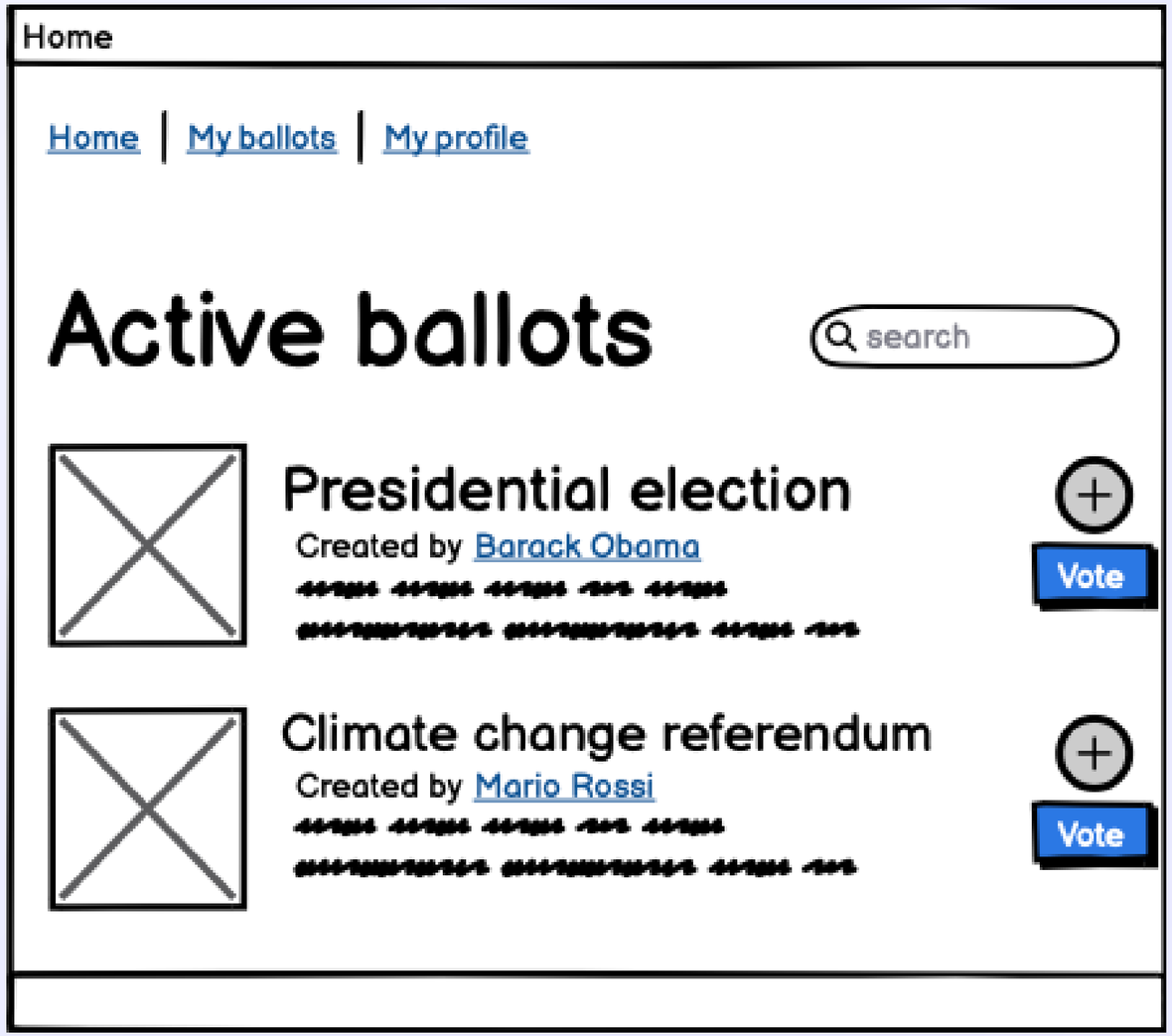
Mockup


CryptoBallot
Home
My ballots
My profile
Wallet page
marioRossi12
Wallet address 0XD9...F123
Transaction request
Request from
http://cryptoballot.com
Network fee
0.0009 ETH
Cancel
Execute transaction

User stories

ID	EPIC	USER STORY	NOTES	ESTIMATE
US11	Ballots Bookmarking	As a USER, I want to be able to bookmark ballots, so that I can save them for later		SM

Mockup


Home
Home
My ballots
My profile
Active ballots
search
Presidential election
Created by Barack Obama
Vote
Climate change referendum
Created by Mario Rossi
Vote

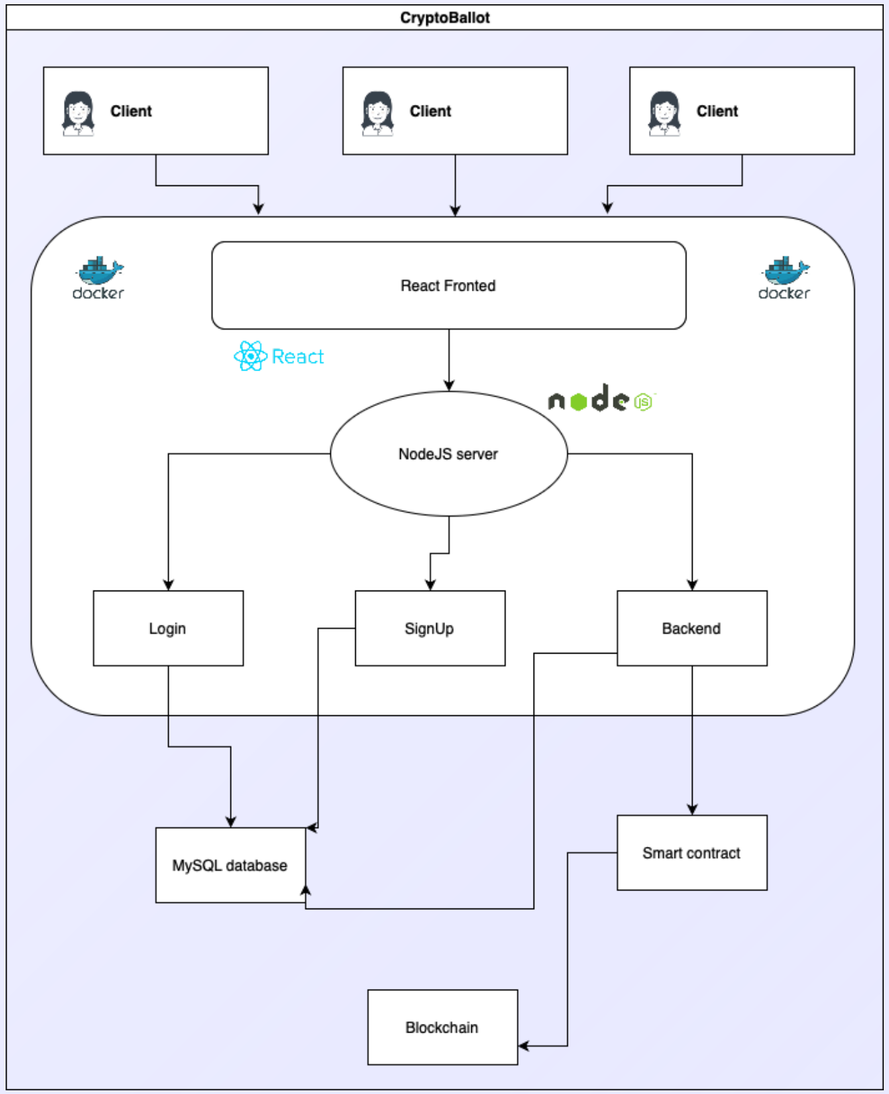
Cost and effort estimation

Total of FP: 90 = 4.770KLOC

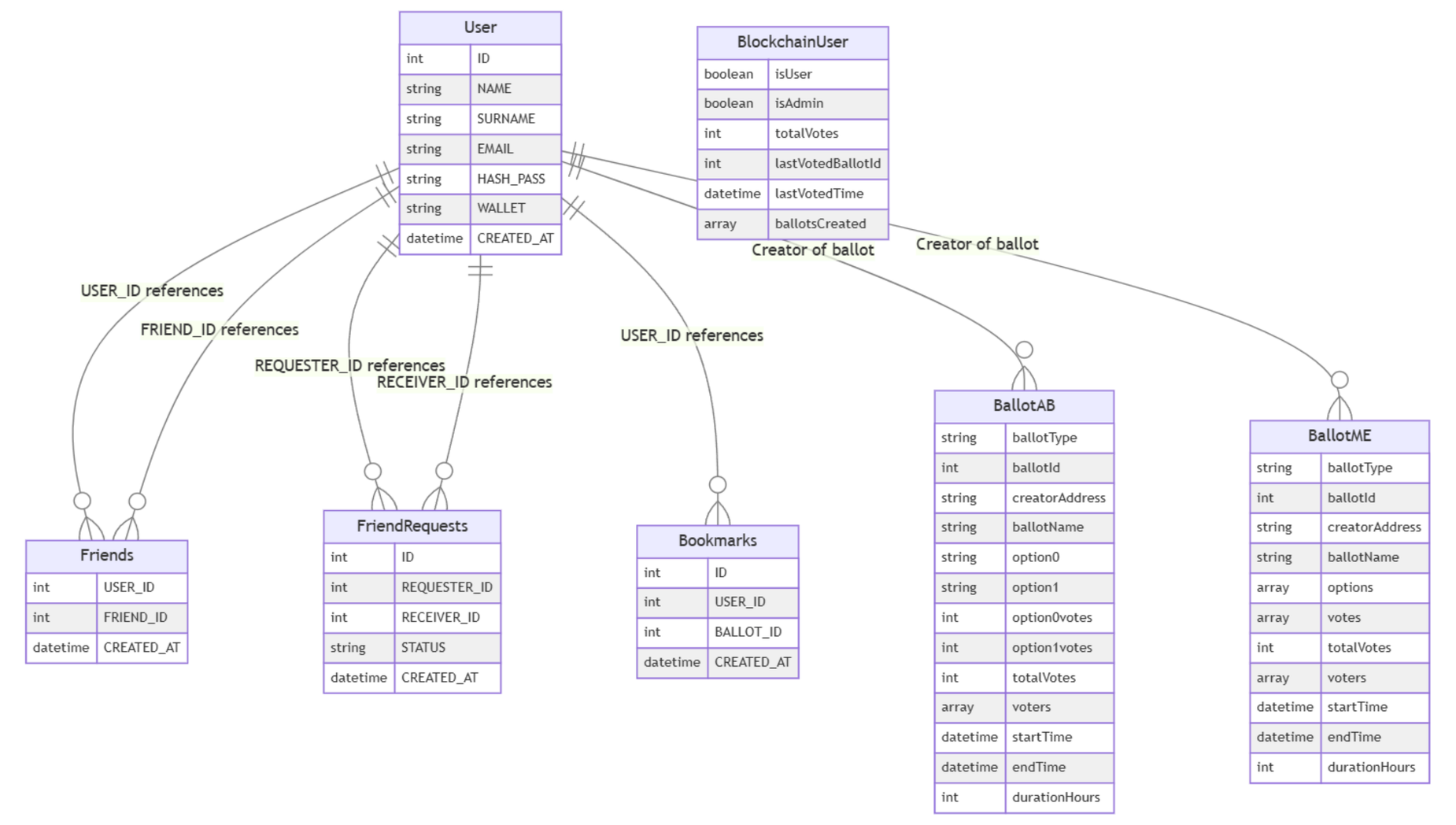
Effort = 1.20446 * 4.770 ^ 1.05 = 6.212 people - month

Estimated time = effort/ n. people = 1.241 month

System architecture



Databases


User
int ID
string NAME
string SURNAME
string EMAIL
string HASH_PASS
string WALLET
datetime CREATED_AT
BlockchainUser
boolean isUser
boolean isAdmin
int totalVotes
int lastVotedBallotId
datetime lastVotedTime
array ballotsCreated
Creator of ballot
Creator of ballot
USER_ID references
FRIEND_ID references
REQUESTER_ID references
RECEIVER_ID references
USER_ID references
Friends
int USER_ID
int FRIEND_ID
datetime CREATED_AT
FriendRequests
int ID
int REQUESTER_ID
int RECEIVER_ID
string STATUS
datetime CREATED_AT
Bookmarks
int ID
int USER_ID
int BALLOT_ID
datetime CREATED_AT
BallotAB
string ballotType
int ballotId
string creatorAddress
string ballotName
string option0
string option1
int option0votes
int option1votes
int totalVotes
array voters
datetime startTime
datetime endTime
int durationHours
BallotME
string ballotType
int ballotId
string creatorAddress
string ballotName
array options
array votes
int totalVotes
array voters
datetime startTime
datetime endTime
int durationHours

Scrum development process

Sprint 1 (Set 27 – Oct 4)

Goals:

- Set up the project structure, initial database configuration, and frontend container.
- Establish initial frontend and backend connections.

Key Commits:

- Sep 27: Initial commit, ideas.
- Sep 29: Project creation, route changes.
- Sep 30: Simple frontend container, merge main branch.
- Oct 1: Database setup, backend and database containers, initial frontend improvements.

Scrum development process

Sprint 2 (Oct 4 – Oct 11)

Goals:

- Implement core functionalities such as login, signup, and user session management.
- Make initial frontend improvements and add error handling.

Key Commits:

- Oct 4: Frontend improvements.
- Oct 7: Signup/Login container, fixes, pagination, merge backend branch.
- Oct 9: Database init file.

Scrum development process

Sprint 3 (Oct 11- Oct 21)

Goals:

- Add friend management functionalities and public profile handling
- Additional improvements on frontend, routing, and modularity.

Key Commits:

- Oct 11-15: Friends management, conditional navbar buttons.
- Oct 16-21: Public profile route, friend request feedback, already friends check.

Scrum development process

Sprint 4 (Oct 28 – Nov 5)

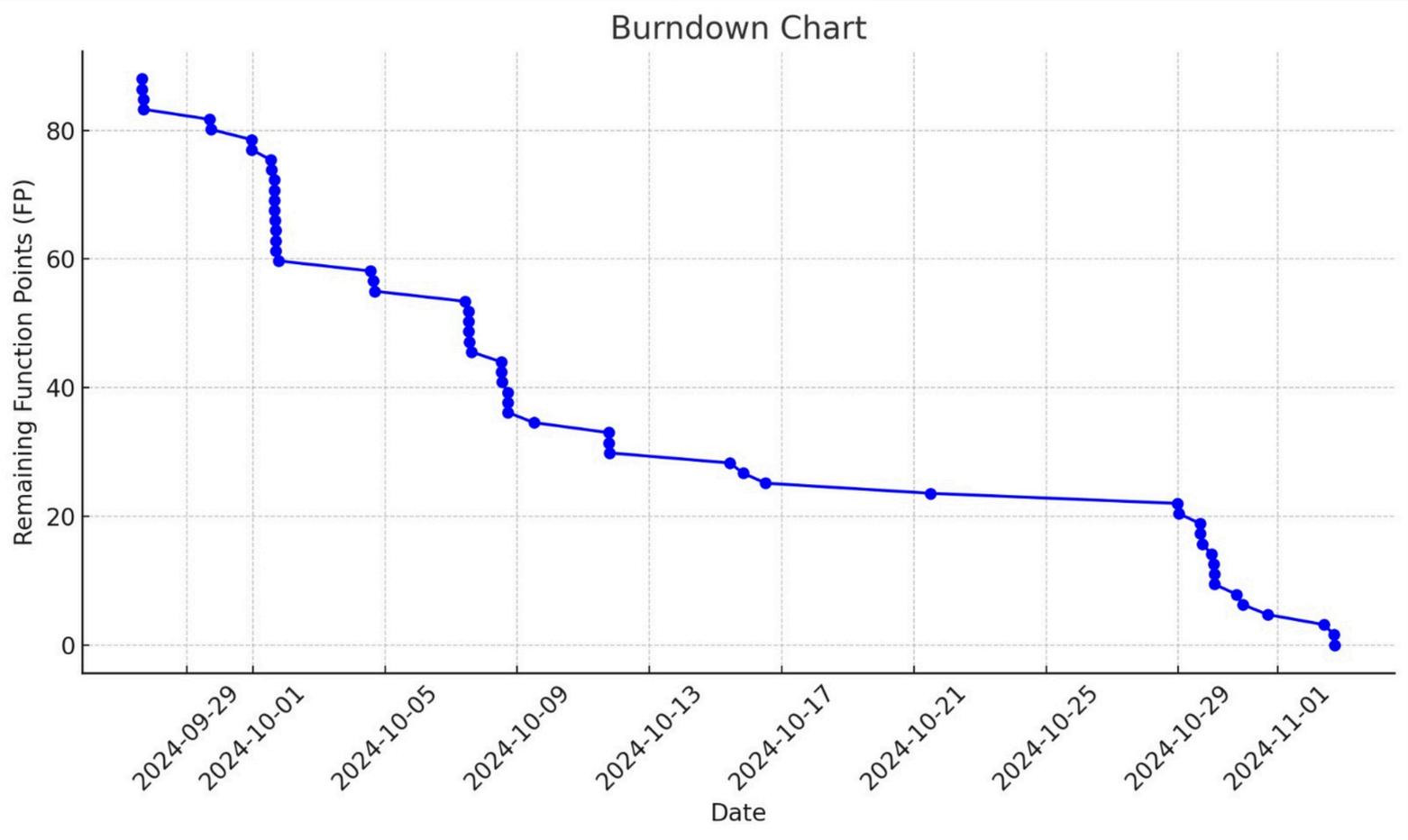
Goals:

- Implement core ballot functionalities, including ballot creation, voting, and backend services for managing ballots.
- Integrate smart contracts to support blockchain voting and add bookmarking and information feedback features.
- Prepare slideshow for the presentation

Key Commits:

- Oct 28-31: Crypto-ballot manager, vote cast function, ballot creation, homepage retrieve all ballots.
- Nov 2-3: Added smart contracts, bookmarking support, contract updates, and documentation.

Burndown chart



Thanks for the attention