MACI in 5 minutes

Private voting

ctrlc03

Privacy and Scaling Explorations (PSE)

Agenda

- **What** is MACI
- **Why** do we need it
- **How** it works
- **The future**

Minimal Anti Collusion Infrastructure

Minimal Anti Collusion Infrastructure

- **Increased collusion resistance** - only the coordinator can be certain of the validity of a vote
- **Receipt-freeness** - cannot prove how you voted
- **Privacy** - only user and coordinator can decrypt a vote
- **Non-censorable** - no one can censor votes
- **Non-repudiation** - cannot edit or delete a vote, but can be nullified
- **Correct execution** - cannot produce false output

Why do we need private voting?

Why do we need private voting

- Voting in general is susceptible to bribery/collusion
- In QF/QV the majority of people can make the difference
- If collusion is easy, then results can be gamed
- Public votes could condition other voters
- If a briber cannot be certain of your vote, why would they bribe you?
- Goal is more democracy in voting

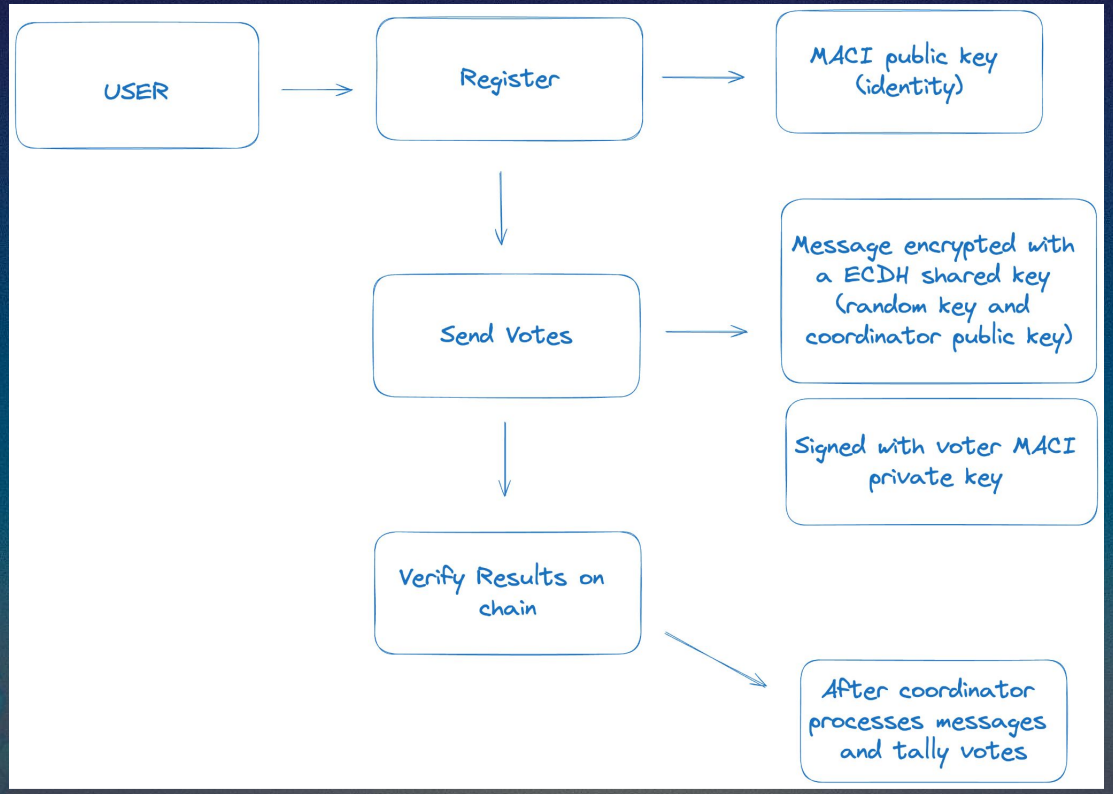
Architecture

Architecture

- **Smart contracts** - EVM compatible only
- **Circom circuits**
  - Process messages - validation of votes
  - Tally votes - summing them up
- **TypeScript**
  - Smart contracts clone for local coordinator processing
  - SDK to integrate with the protocol
  - Primitives (maci keys, encryption, hashing algorithms, Ballots, etc.)

User Flow

User Flow


USER
Register
MACI public key (identity)
Send Votes
Message encrypted with a ECDH shared key (random key and coordinator public key)
Signed with voter MACI private key
Verify Results on chain
After coordinator processes messages and tally votes

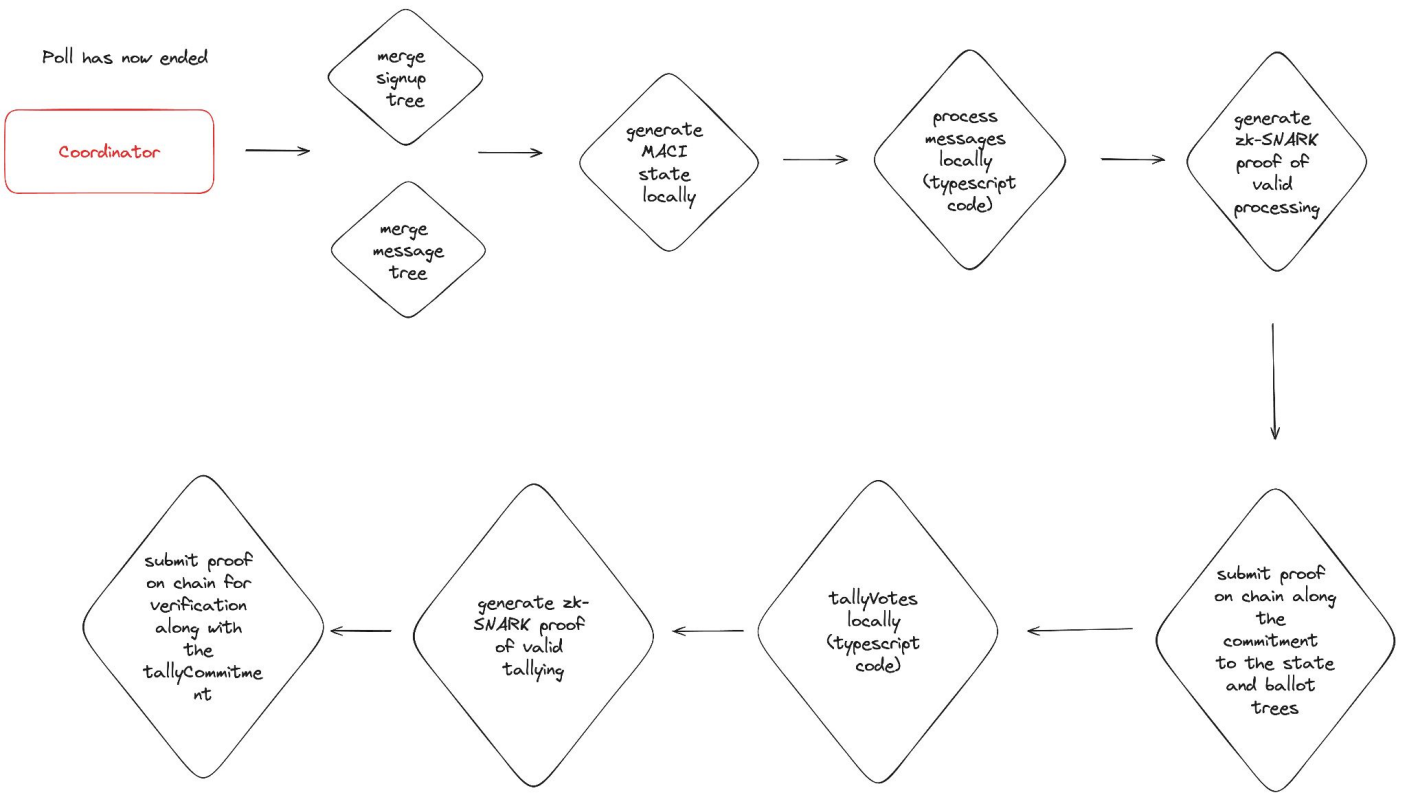
MACI Votes

MACI Votes

- **Shared key**
  - ECDH - ephemeral key and Coordinator public key
- Message is signed with **EDdSA**
- **Nonce** to track message order - can be used to invalidate previous votes
- **Vote weight**
- **User public key** (can pass in a new public key to change identify key)
- **Vote option**
- **The encryption public key** (ephemeral key)

Poll Finalisation

Poll Finalisation



Our Plans

Our Plans

- Improve adoption
- Improve ease of integration
- Decentralisation of the coordinator with MPC
- Research more anti collusion detection techniques
- Research new voting mechanisms that can be integrated into MACI
- Rethink the architecture and how (where) it fits with other protocols (Semaphore, RLN, Excubia)

Devcon Round

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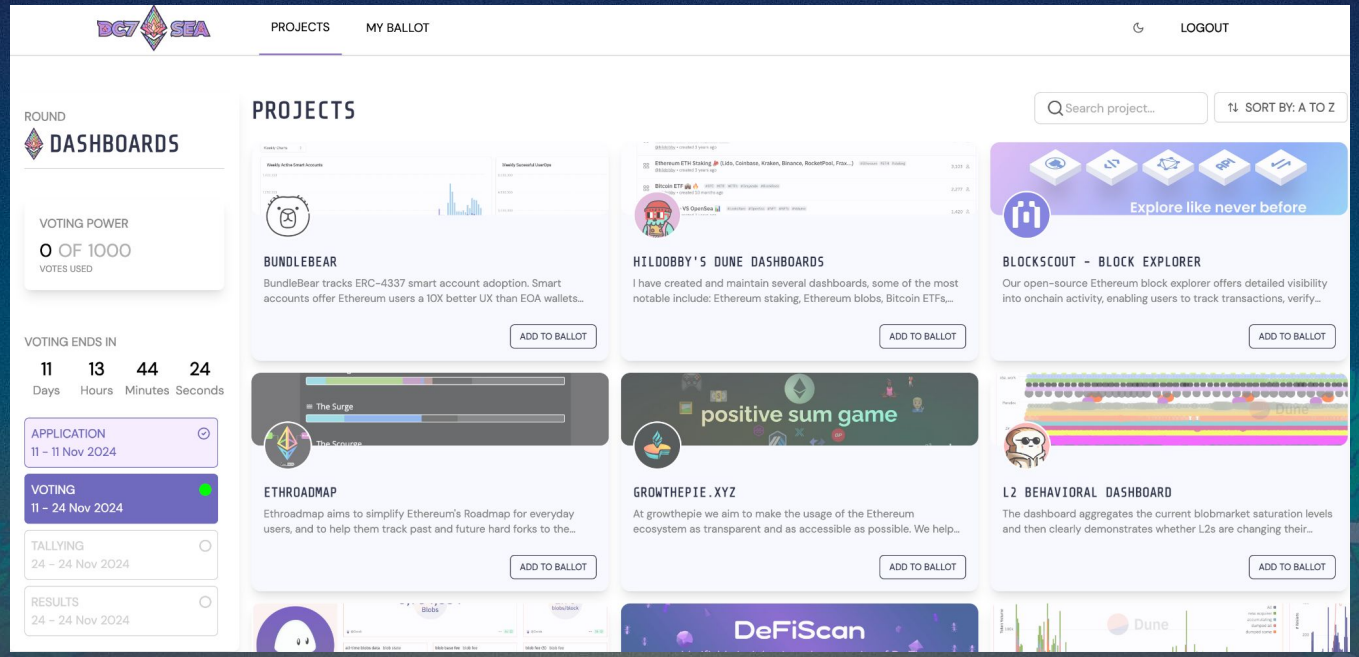
Come and vote @ **vote.devcon.org**



Thank you!

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@ctrlc03 (Twitter/Telegram/GitHub)


Any questions?