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Transparency and Technical Measures to Establish Trust in Norwegian Internet Voting

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Outline

Measures for Trust Establishment

Outline of the Norwegian System

The Measures in the Norwegian System

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Some Desirable Properties

- **Correctness**: The published result reflects the electorate's intensions correctly
  - → one-voter-one-vote, only eligible voters
  - → no stuffing, deletion, altering
  - → reliable tallying
  - → no pressure
- **Secrecy of the ballot**
- **Fairness**: No premature results obtainable
- **Receipt-freeness / coercion-resistance**: no advantage for proving how one voted

Some Problems Specific to Internet Voting

- **Scalability of attacks**
- **Trust towards operator, vendor**
- **Sound authentication**
- **Insecure computers, insecure Internet**

Security and Trust

- **We tend to assume strong threats, including operators**
  - → Who try to manipulate the result
  - → Break secrecy
  - → Coerce voters and buy votes
- Researchers *cannot* judge whether a system is sufficiently secure
- But they *can* assess whether a system holds specific features
- **Measures to establish trust** should aid at bridging the communication gap between policy makers / public and experts from research
- Security mechnisms are merely a precondition to trust

Our contribution

Find a set of measures applied in Norwegian System

- separation of duty, verifiability, vote updating
- test elections, third party clients
- foundation: transparency, evaluation

(This list should be extended)

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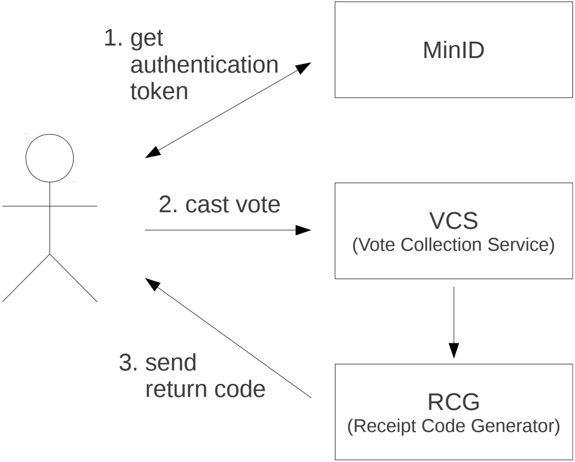
Brief Outline / Voting


1. get authentication token

MinID

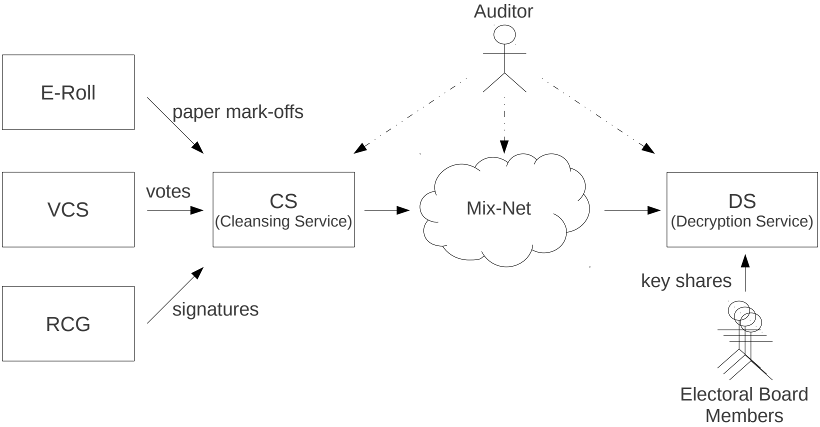
2. cast vote

VCS
(Vote Collection Service)

3. send return code

RCG
(Receipt Code Generator)

Brief Outline / Tallying



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Separation of Duty

Separate secrecy-critical information and integrity-critical power among multiple entities

Implications

- No need to trust one single entity (person / computer, site, vendor)
- Trust only in 1 out of many at being reliable and independent

Need to expose payoff and limitations!

Separation of Duty for Secrecy

Conclusions

- Client learns vote, argumentation of re-voting
- VCS and RCG can break secrecy, buy votes
  - → VCS and RCG operated by different organizations, locations. Same vendor
- DCS and any of VCS, RCG, CS, Auditor as well
  - → DCS and CS same location, same vendor
  - → Auditor different vendor. Trade-off in secrecy and integrity over number of auditors
- 6 EB members and any of VCS, RCG, CS, Auditor as well
- Each node of the mix-net operated by same person, same location, same vendor

Verifiability

Allow voters to verify the correctness of the published result

- cast-as-intended
- recorded-as-cast
- eligibility
- universal

Implications

- No need to trust any entity (computer / person, site, vendor)
- Verifiability vs. lacking proofs (research ongoing)

Need to expose payoff and limitations!

Verifiability

Conclusions

- Cast-as-intended, given
  - → Computer and SMS-receiver do not collude
- Recorded-as-cast, given
  - → MinID trustworthy and
  - → Computer and RCG do not collude and
  - → VCS and RCG do not collude
- Reason: No proofs forwardable to parties external to the system
- Universal and eligibility, given at least 1 honest auditor
- Otherwise, auditor and one out of CS, DCS, 1 mix-node can break integrity

Vote Updating

Allow voters to update by i-vote and / or paper vote

Implications

- Side-step vote selling, confusion
- Trust that cast votes reflect free will
- Sound authentication required

Conclusions

- Implemented
- Protection from vote-buying only regarding outside players

Transparency

Open documents for experts to assess and evaluate:

- Technical requirements, including security concept
- Technical implementation, source code, cryptographic protocol
- Exposition of remaining risks
- Assessment of simplified documentation for average voters

Assessment of simplified documentation to achieve credibility among policy-makers / public

Conclusions

- Project follows a transparency guideline
- Implemented or plan to implement propositions from our side
- Implements many of the measures to some degree
- However constraints are not always made explicit
- Example: Constraint regarding cast-as-intended not pointed out
- Example: Power of MinID contradicts the spirit of separating VCS and RCG
- Dynamic project, information easily outdates

Thank You!

Questions / Remarks

e-voting.bfh.ch and **www.secuso.cased.de**

contacts, papers, reports