Safety first!
Verifiability in the e-vote 2011-system

Christian Bull

The Norwegian E-voting Conference, Sept. 11, 2011

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Let’s look back a couple of years

http://www.youtube.com/watch?v=1aBaX9GPSaQ

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Lessons learned from others

- Openness in every way is essential.
- Secure e-voting in polling stations is also *really* hard to implement .
- You *really* want software independent verifiability wherever possible.
- Doing it right takes *a lot* of time.

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A basic premise for e-voting

- One basic and all important premise for all electronic voting is that the public trusts the government not to conspire against it.
- That having been said, the system should not require that no conspiracy against it exists whithin the government!

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What are Norways advantages?

- **…and prerequisites for e-voting in general?**
- Very high public trust in Government
- Absolute trust in central election administration
- Relatively low levels of political conflict

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What we believe we've achieved

A New approach to transparency

- A fully open source system
  (you must be very clear in procurement process)
- Voter verifiability in remote e-voting by use of return codes
- Much improved robustness against client side (in)security.
- Excellent auditability and verifiability
  - Can be improved further by an N-version architecture in some components
- Observation in the "back office" combined with voter observation of return code replaces the function of the observer in the polling station

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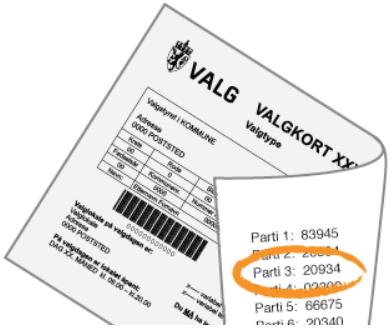
A quick overview of the solution

- Log on
- Submit vote

E-voting system

Receipt code



Polling card

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How does the system know who I am?

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Authentiwhat?

- When you turn up at the polling station, you are required to *identify* yourself.
- In Norway, voters have been required to produce an *ID-card* to vote (since 2007)
- This is analogous to the process of *authentication* to a computer system, for instance using an eID.

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Important properties of a good eID

- It must be obvious to the user that this is an identity document.
- A voter should not be tempted to sell his voting credentials.
  - It *must* have other uses than just e-voting.
  - These other uses *must* be familiar and of value to the voter

eValg login - Windows Internet Explorer provided by Departementenes servicesenter

https://idporten.difi.no/opensso/UI/Login?locale=en&realm=norge.no&gx_charset=UTF-8&service=IDPortenLevel3L

service kostnad bmw

Fil Rediger Vis Favoritter Verktøy Hjelp

Kunngjøringer - ... | The Norwegian ... | eValg login | Welcome, Christi... | Christian's Phot... | Side

< Return to eValg

High contrast AA | Bokmål Nynorsk English Sámegiella

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eValg login

Select an electronic ID to identify yourself:

How to obtain an electronic ID

MinID

SELECT

Use your personal password and code from SMS or PIN code letter.

Buypass

SELECT

Use smart card and card reader from Buypass.

Commfides

SELECT

Use your Commfides USB stick.

Help to log in: Contact form | Tel.: 800 30 300 | Frequently asked questions | About the use of electronic ID

Hosted by the Agency for Public Management and eGovernment (Difi)

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The Particular Challenges of Remote e-voting

- Auditability / transparency to the lay person
- The buying and selling of votes
- Coercion / family voting
- Home computer security
- Anonymity of the vote
- Attacks *scale*

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Transparent e-voting?

- Complete openness and transparecy in all aspects of the project
- Available source code
  - Unfourtunately cryptography is really, really hard.
- Cryptographic proofs of correctness
  - Even the voter gets one
  - The good thing about crypto is that it's all just maths
- Immutable logging of all significant system events

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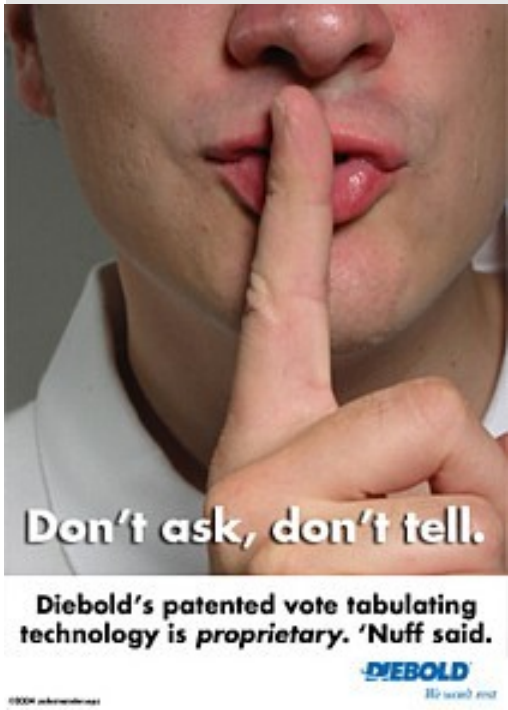
Transparent e-voting?

- Obviously open source won't make the system understandable to "everyone"
- …and extensive use of esoteric cryptography makes things worse…
- ..but at least the lay person can choose which expert to trust.



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Buying and selling of votes

- In practice this doesn't scale
- The seller can re-vote
  - Return code for all ballots cast, not only the final
- Votes submitted from a polling station will supersede any vote cast remotely
- Buyer would have to control seller's eID
  - Would require the voter to give up a lot more than his vote

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- The coerced can re-vote
  - Return code for all ballots cast, not only the final (receipt freeness)
- Votes submitted from a polling station will supersede any vote cast remotely
- The system will never divulge that a previous vote has allready been recorded
- If you accept that bastards are evenly distributed across the political spectrum, this doesn’t really scale either.

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The Particular Challenges of Remote e-voting

- Auditability / transparency to the lay person
- The buying and selling of votes
- Coercion / family voting
- **Home computer security**
- **Anonymity of the vote**

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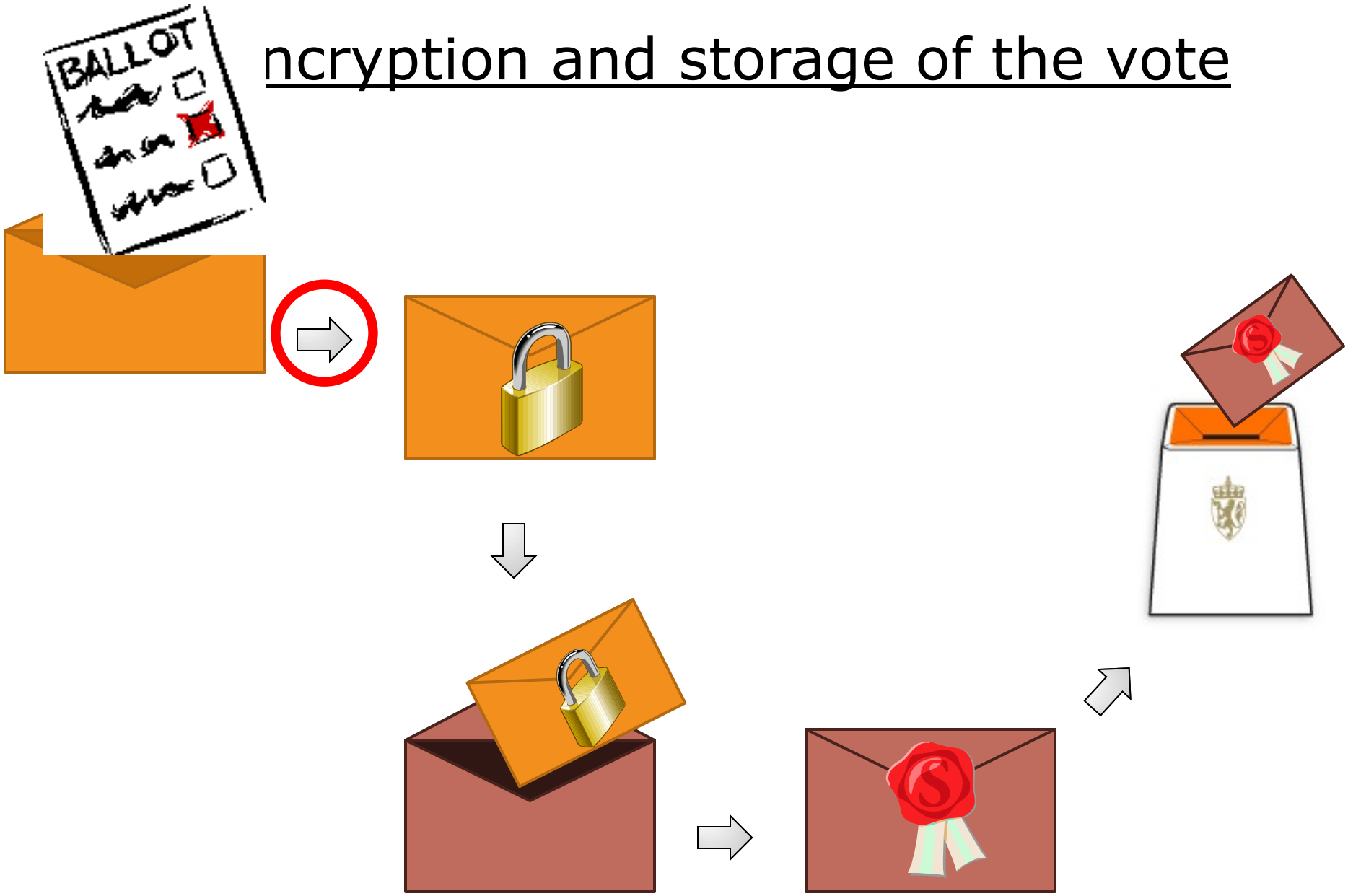
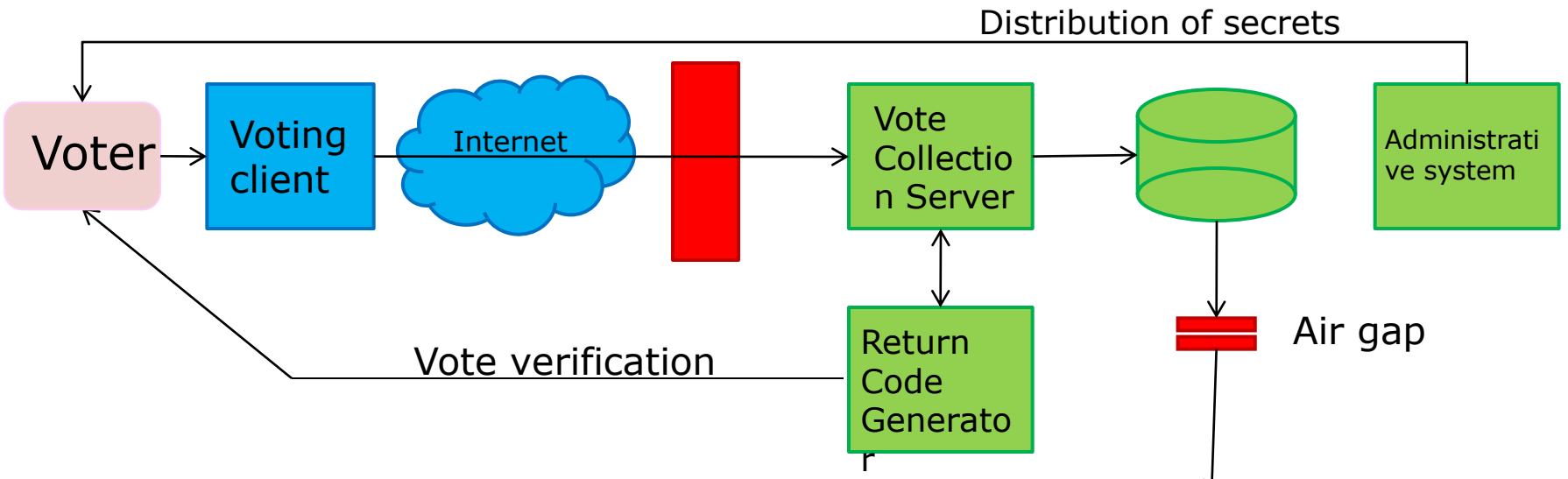
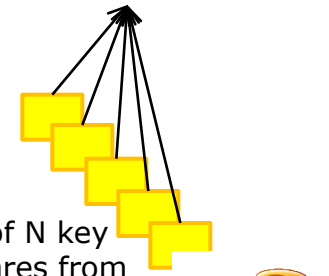


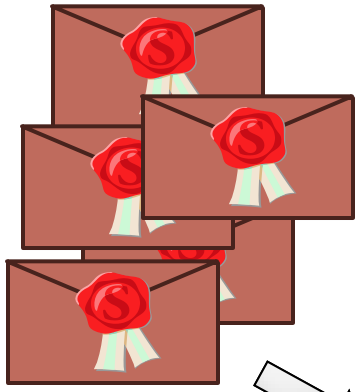
Conceptual model





M of N key shares from parties with competing interests

Counting e-votes

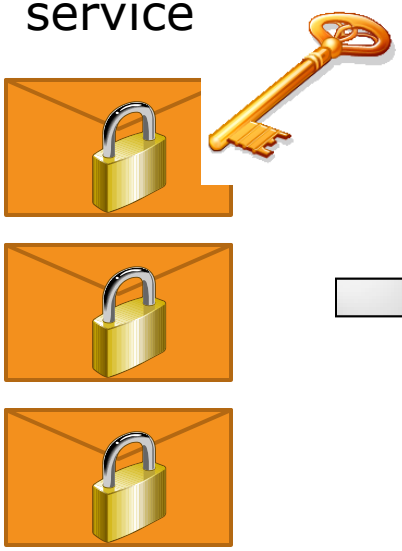


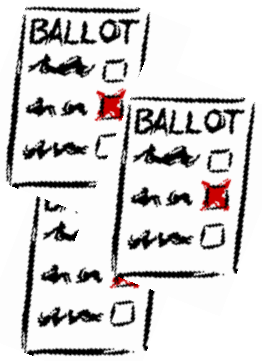
”Cleansing service”

Parti A	2
Parti B	1

Mixing service

Decryption service





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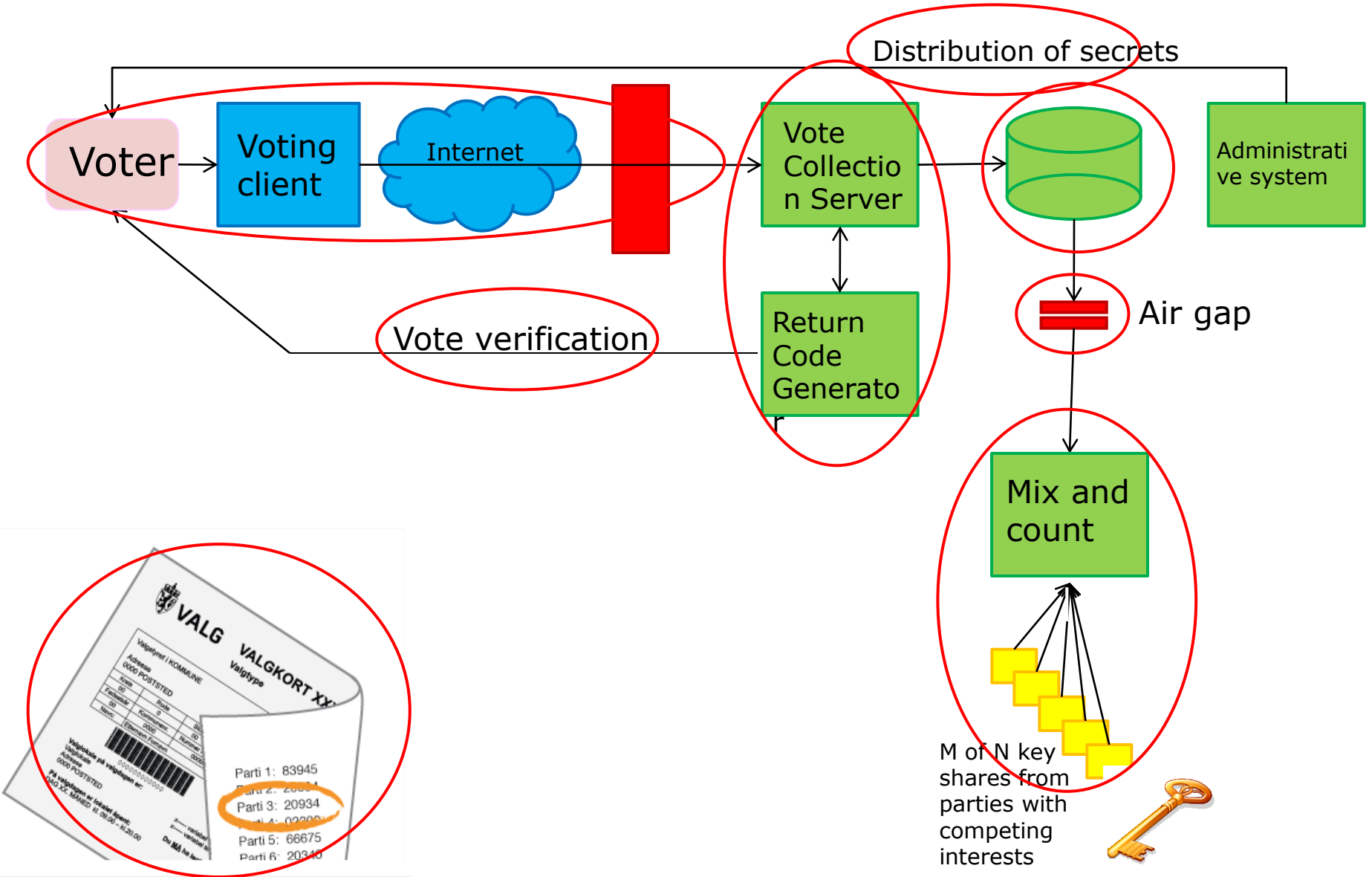

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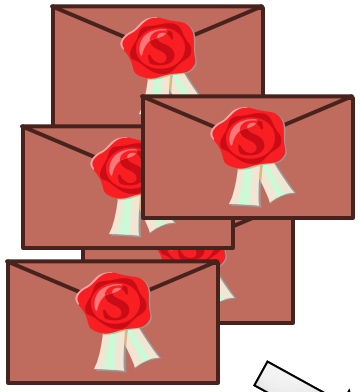

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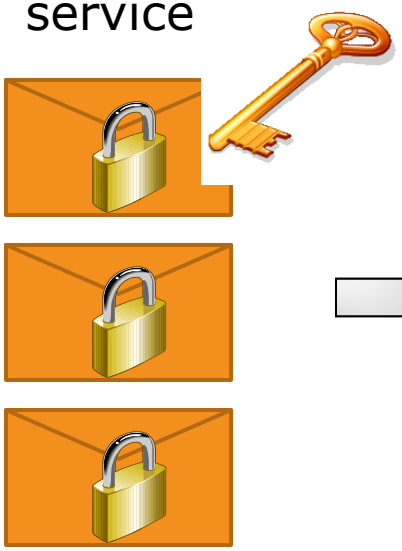

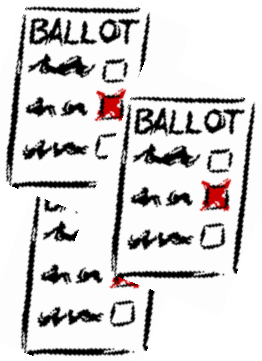

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Lessons learned.

- Wow, this *really* takes a lot of time to implement.
- High security means it's time consuming to test, and there are a lot of special cases to test.
- Work closely with the vendor.
- Verifiability and a good monitoring solution gives a lot of confidence.