Internet Voting Is Here To Stay

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Though small-scale pilots on Internet-based voting had been carried out in several countries, the number of those having been able to confirm the Internet-based votes valid is still small at the time. In Estonia during municipal elections in October 2005 voting through the Internet was used. For the first time the new kind of voting was applied countrywide.

The Estonian i-voting system has been under development since 2003. The objective has been to provide voters with an additional opportunity, raising thereby voting activity and voting convenience. I-voting does not replace the traditional methods of voting. Legislative framework for of i-voting was created in 2002 and thereafter National Electoral Committee decided to launch a project targeted at the development of i-voting system. The objective of the project was to create conditions for i-voting for the municipal elections of 2005.

By the end of 2001, ID-card enabling secure personal authentication and digital signing as well as the Public Key Infrastructure (PKI) necessary for that had been developed in Estonia. ID-cards had been issued since January 2002, and by October 2005, the respective figure was about 850.000 thus, most of eligible voters (1.06 Mio) hold the ID-card. Such a wide distribution of ID-cards is considered as an enabling key to the i-voting.

In municipal election i-voting took place during advance polls (sixth to fourth day before Election Day) and ID-cards were used for voter authentication. Only authenticated people with the right to vote were able to vote, meaning that a database of citizens with the right to vote was put together prior to elections based on National Population Register.

Principles of i-voting

I-voting follows all principles characteristic of traditional voting. In order to avoid influencing of voters there is a possibility of electronic re-vote – i-voter could cast his/her vote again electronically and only the last vote is counted. Additionally priority is given to the traditional means of voting (with a paper ballot) - if the voter goes to polling station during advance polls and casts a vote, his or her i-vote is deleted.

The main principle of i-voting system lies in „double-envelope scheme" familiar from the physical world. A voter seals his choice into inner blank envelope (encrypts it) and puts this envelope into bigger one writing his name/address on it (digitally signs it). These bigger envelopes are collected to central site. Prior vote counting, outer envelopes with personal data (digital signatures) are removed and anonymous white envelopes (encrypted votes) are sent to counting process which outputs summarized voting results. This scheme, illustrated in Figure 1, allows for anonymity yet providing for accountability.

<fig1>

The i-voting system architecture consists of several building blocks illustrated in the Figure 2. The voter uses a Voter Application which is downloaded from Vote

Forwarding Server to do all necessary selection/encryption/signing/sending activities. The received votes are immediately forwarded to Vote Storing Server which is inaccessible from outer world. Counting of votes happens off-line with Vote Counting Application and Hardware Security Module involved. All central components have extensive logging mechanisms in place – every transaction in the system shall leave a track. The key management requires extra attention here as the security and anonymity of i-votes lie solely on encryption and decryption of votes.

<fig2>

From the user's perspective, the voting procedure looks like following:
1. The voter inserts the ID-card into smart-card reader and opens web page for voting (http://www.valimised.ee/).
2. The voter authenticates him/herself using the PIN1 of ID-card.
3. The server checks whether the voter is eligible (using the data from population register).
4. Candidate list of the appropriate electoral district is displayed.
5. The voter makes his/her voting decision; the system encrypts it.
6. The voter confirms his/her choice with a digital signature (by entering the PIN2-code),
7. The system confirms retrieval of the vote.

Results from October

After the electronic voting and advance polls ended (4th day before Election Day) the list of voters who have voted electronically was comprised and sent to polling stations in order to prevent voters from voting more than once. Polling stations reported double votes back to central site with requests to cancel i-votes.

In October 2005, 9317 voters voted electronically, 30 of them decided to go in a polling station too, thus their i-votes were deleted. The number of valid i-votes were 9287 making 1.85% of all votes and about 7% of votes given during advance poll days. It is interesting to notice that over 60% of i-voters were using their ID-card electronically for the very first time.

History has happened – it was the very first time in the World when pan-country PKI-based Internet voting was used with binding results. Despite of relatively low percentage of i-voters, the occasion shall be considered as a success – all systems and procedures worked, there were nearly zero security problems. Evidently, there is no way back. Next, parliamentary elections in Estonia will be in March 2007.