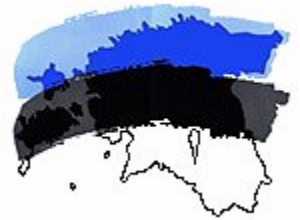


# Internet Voting in Estonia

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Tarvi Martens  
*I-Voting Project Manager*

National Electoral Committee

# Internet Voting?

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- In October 2005 Estonia had first-ever pan-national Internet Voting **with binding results**



- Ever since, i-voting has been used in **four** elections in total



# I-voting uptake

	Turnout	I-voters	I-voters share
Local elections 2005	47.4%	9 317	1,85%
Parliamentary Elections 2007	61.9%	30 275	5,45%
European Parliament Elections 2009	43.9%	58 669	14,7%
Local Elections 2009	60.3%	<b>104 413</b>	15,86%

# E-stonia ?

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- Population: 1.35M
- Everyday Internet usage: 63%
- Internet banking: 88%
- Mobile penetration: >100%
- 1000+ Free Internet Access points
- Member of EU and NATO since 2003
- PKI penetration: >90% (age 15+)





# ID-card Project

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- Started in 1997
- Law on personal identification documents: Feb, 1999
- Digital Signature Act: March, 2000
- Government accepted plan for launching ID-card: May, 2000
- First card issued: Jan 28, 2002
- October 2006: **1 000 000<sup>th</sup>** ID-card was issued



# The Card

- “Compulsory”  
for all residents
- Contains:
  - Personal data file
  - Certificate for authentication  
(along with e-mail address  
[Forename.Surname@eesti.ee](mailto:Forename.Surname@eesti.ee))
  - Certificate for digital signature





# Usage of the ID-card

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- Major ID-document
- Replacement of
  - (transportation) tickets
  - library cards
  - health insurance card
  - driver documents
  - etc...
- Authentication token for all major e-services
- Digital signature tool



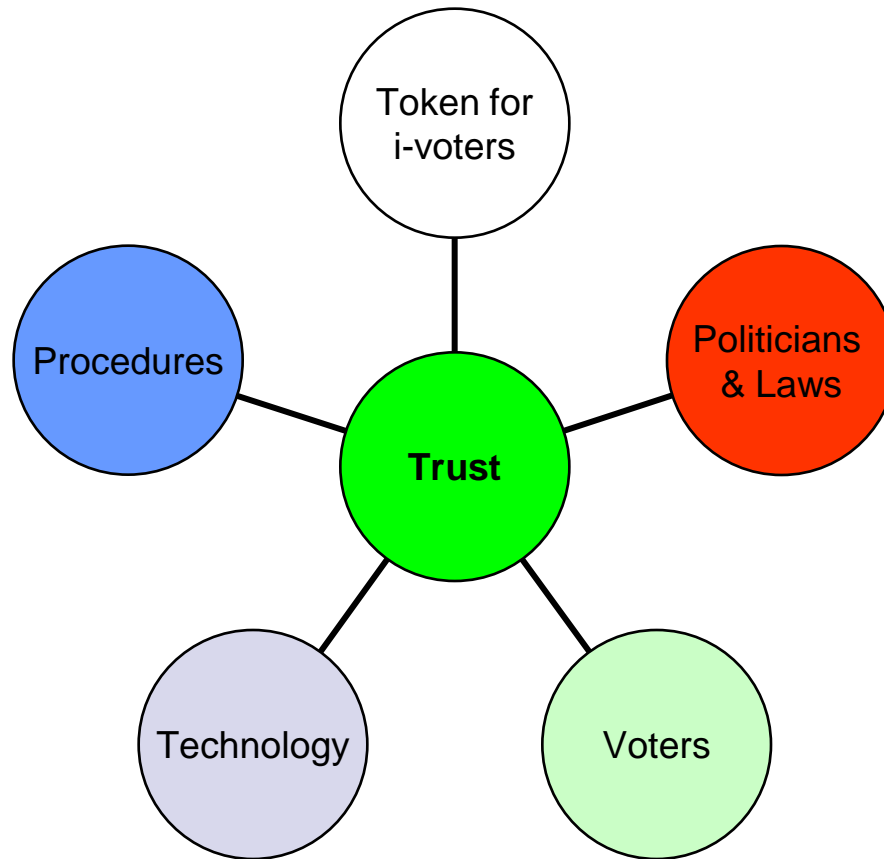
# Internet Voting ?

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- Not a nuclear physics
- Just another application for ID-card  
...with some special requirements & measures...

# What it takes ?

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# I-voting Main Principles

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- All major principles of paper-voting are followed
- I-voting is allowed during 7-day (was: 3-day) period before Voting Day
- The user uses ID-card
  - System authenticates the user
  - Voter confirms his choice with digital signature
- Repeated e-voting is allowed
  - Only last e-ballot is counted
- Manual re-voting is allowed
  - If vote is casted in paper during absentee voting days, i-vote(s) will be revoked

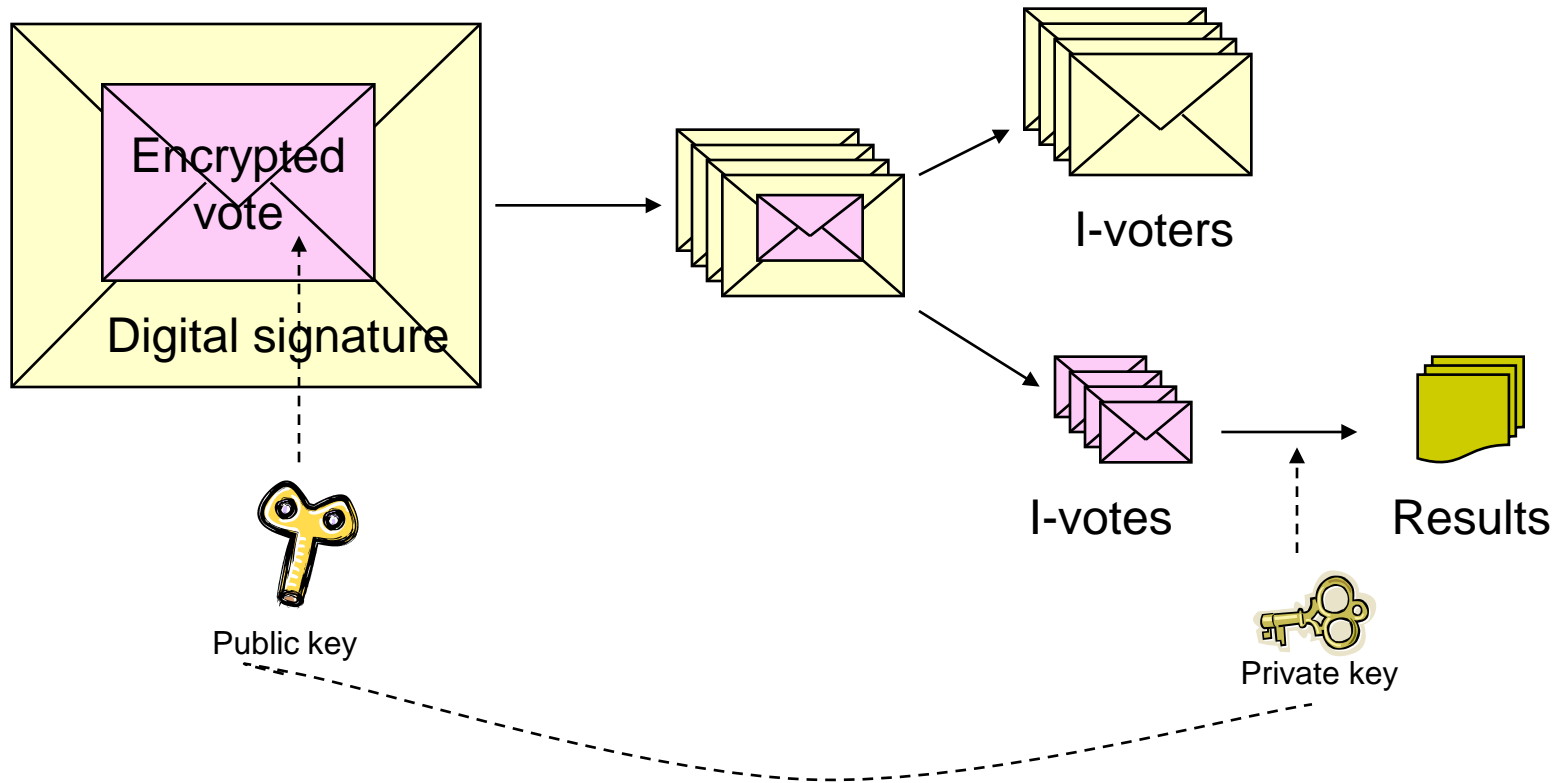
# Voter registration

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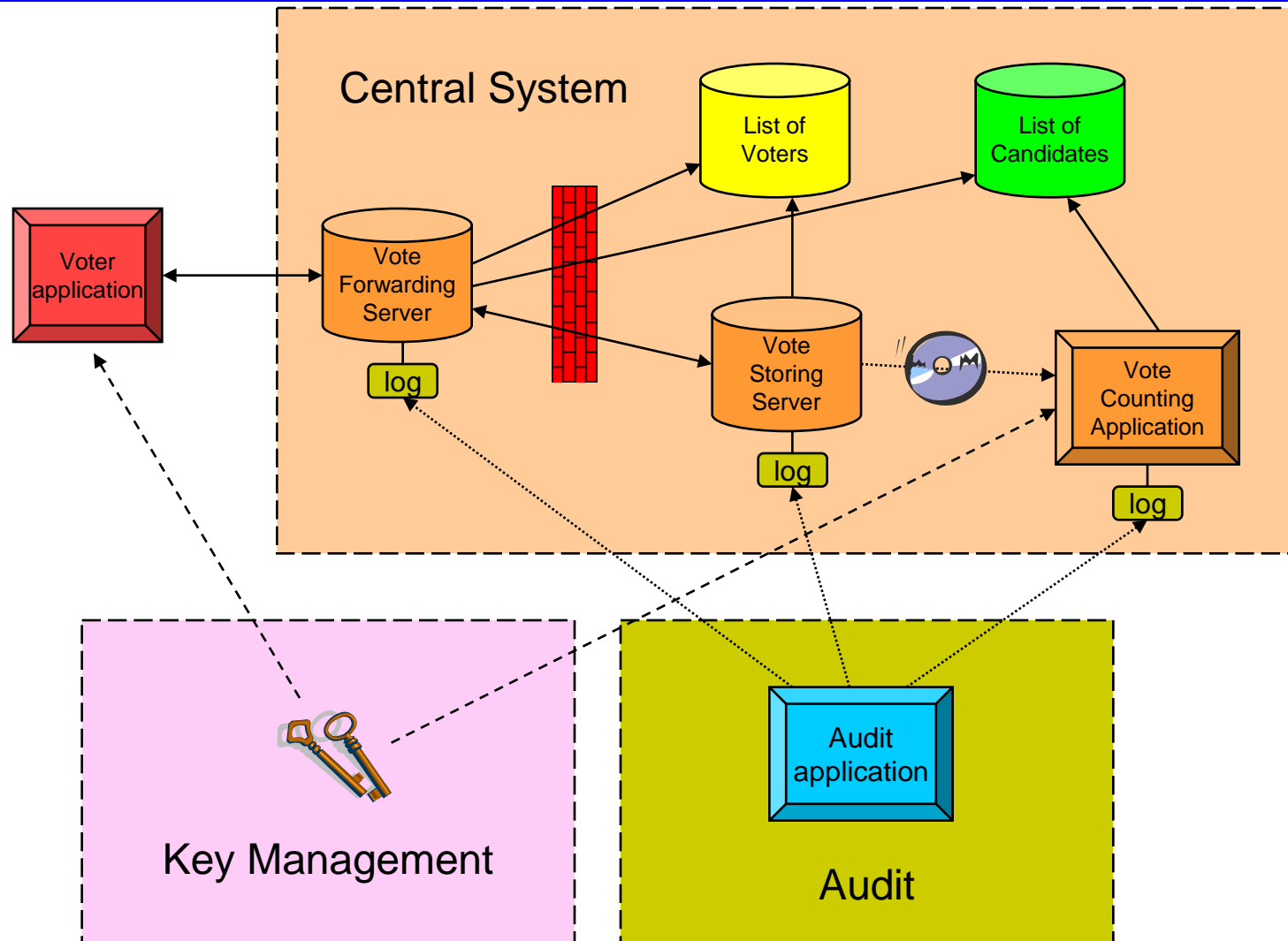


- Missing
- All citizen (residents) should register their place of living in central population register
- Only voters with registered addresses are eligible
- Population register is used

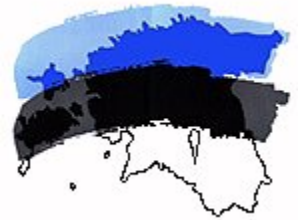
# Envelope scheme



# Architecture



To vote via Internet voter needs:  
an Estonian ID card with valid  
certificates and PIN codes



Computer used for voting  
must have:

a smart card reader (6 EUR)

a driver for ID card (free to download)



# I Website for voting



www.valimised.ee

Client Authentication

Identification

The Web site you want to view requests identification. Select the certificate to use when connecting.

ULST\_MARGUS\_36102242748

More Info... View Certificate...

OK Cancel

# II Identification



- Put your card into card reader
- Insert PIN 1



www.valimised.ee - Microsoft Internet Explorer provided by SA TÜ Kliinikum

IT ID - kaart

Sisesta PIN-kood isikutuvastuseks (PIN 1)

\*\*\*\*

OK Katkesta

Riigikogu valimised toimuvad 4.märtsil 2007. aastal.  
**26. - 28. veebruarini** on siinsel veebilehel võimalik hääletada Interneti teel.  
Hääletamine algab 26.02. **kell 9.00** ja lõpeb 28.02 **kell 20.00**

Pane ID-kaart lugejasse ja

**HÄÄLETA SIIN**

Tehniline abi **e-hääletamisega** seotud teemadel: [abi@valimised.ee](mailto:abi@valimised.ee) või telefonil 610 1880 (kl 9-20). Muud valimistega seotud küsimused: [val@riigikogu.ee](mailto:val@riigikogu.ee)

Seisuga 26. veebruar kell 16:00 oli hääletajaid 5426

Valimised ja e-hääletamine  
Kuidas hääletada internetis

- Juhised Windows'i kasutajatele
- Juhised Linux'i kasutajatele
- Juhised MacOS'i kasutajatele

Korduma kippuvad küsimused

Otsid lisateavet valimiste kohta?

# III You are identified




**E-hääletamine - Microsoft Internet Explorer provided by SA TÜ Kliinikum**

File Edit View Favorites Tools Help Google G Go Bookmarks 138 blocked ABC CH

Back Forward Stop Home Search Favorites Media Print Mail

Address <https://www.valimised.ee/>

 **Vabariigi Valimiskomisjon**

## Tere tulemast!

Olete jõudnud **e-hääletamise** leheküljele.

Teie nimi:	<b>ULST, MARGUS</b>
Teie isikukood:	<b>36102242748</b>

Kui olete valmis alustama, klõpsake allolevat nuppu.

**Edasi**

Vabariigi Valimiskomisjon

# IV Ballot completion



- Choose a candidate

Valija rakendus

1 Tutvustus

2 **Valiku tegemine**

3 Hääletamine

Teie ringkond: **Eesti**  
Kes on metsa kuningas?

**Sõralised**

1 Metssiga

2 Pöder

3 Hirv

**Kiskjalised**

10 Hunt

11 Ilves

12 Karu

13 Rebane

**Närlised**

20 Rott

21 Hiir

22 Oras

Tagasi

Valin

# IV Confirmation

- Confirm your choice with PIN2



The screenshot shows a Microsoft Internet Explorer browser window titled "E-hääletamine - Microsoft Internet Explorer provided by SA TÜ Kliinikum". The address bar shows "main.cgi". A small dialog box titled "ID - kaart" is open, asking for a PIN2 code to confirm the digital signature. The main page content includes:

- Navigation menu: 1 Tutvustus, 2 Valiku tegemine, 3 **Hääletamine**
- Instructions: "Kinnitamaks oma valikut digiallkirjaga vajutage nuppu 'Hääletan'. Valiku muutmiseks vajutage nuppu 'Eelmine lehekülg'." and "Digiallkirja andmisel küsib arvuti teilt teie ID-kaardi PIN-koodi 'PIN2'."
- Question: "Kelle valite Riigikokku?"
- Selected candidate: "Minu valik on: kandidaat nr. 429 **Hannes Astok** Eesti Reformierakond"
- Buttons: "Tagasi" and "Hääletan"

At the top right of the page, the user's name "Teie nimi: ULST, MARGUS" and ID number "Teie isikukood: 36102242748" are displayed.

Vabariigi Valimiskomisjon

# V Vote received




**E-hääletamine - Microsoft Internet Explorer provided by SA TÜ Kliinikum**

File Edit View Favorites Tools He » Google G Go Bookmarks 138 blocked Check AutoLink »

Back Search Favorites Media

Address <https://www.valimised.ee/main.cgi>

 Teie nimi:  
**ULST, MARGUS**

Teie isikukood:  
**36102242748**

- 1 Tutustus
- 2 Valiku tegemine
- 3 Hääletamine

**Teie tehtud valik läks arvesse.**

Palun sulgege veebilehitseja.

Soovi korral saate häält muuta eelhääletamise ajal uuesti elektrooniliselt hääletades või valimisjaoskonnas hääletades. Valimispäeval häält muuta ei saa.

Kui olete hääletanud mitu korda elektrooniliselt, võetakse arvesse viimane hää. Kui olete hääletanud valimisjaoskonnas pabersedeliga, arvestatakse seda ja elektrooniline hää tühistatakse.

Vabariigi Valimiskomisjon

# Principle of Transparency

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- All system components shall be transparent for auditing purposes
- No “black boxes” are allowed
  - No use of 3rd party-controlled authentication mechanisms or services
  - No components without source code



# Technology Selection

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- Involve all major influencers and “specialists”
- Keep it as simple as possible
- Build it on secure & stable platforms (Debian)
- No:
  - Databases (engines)
  - 9GL environments – use C & Python
  - 3rd party libraries too much



# Managing Procedures

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- All fully documented
- Crash course for observers-politicians & auditors
- All security-critical procedures:
  - Logged
  - Audited & observed
  - Videotaped
- All major IS-specialists involved for network-monitoring 24/7 for dDOS or trojans

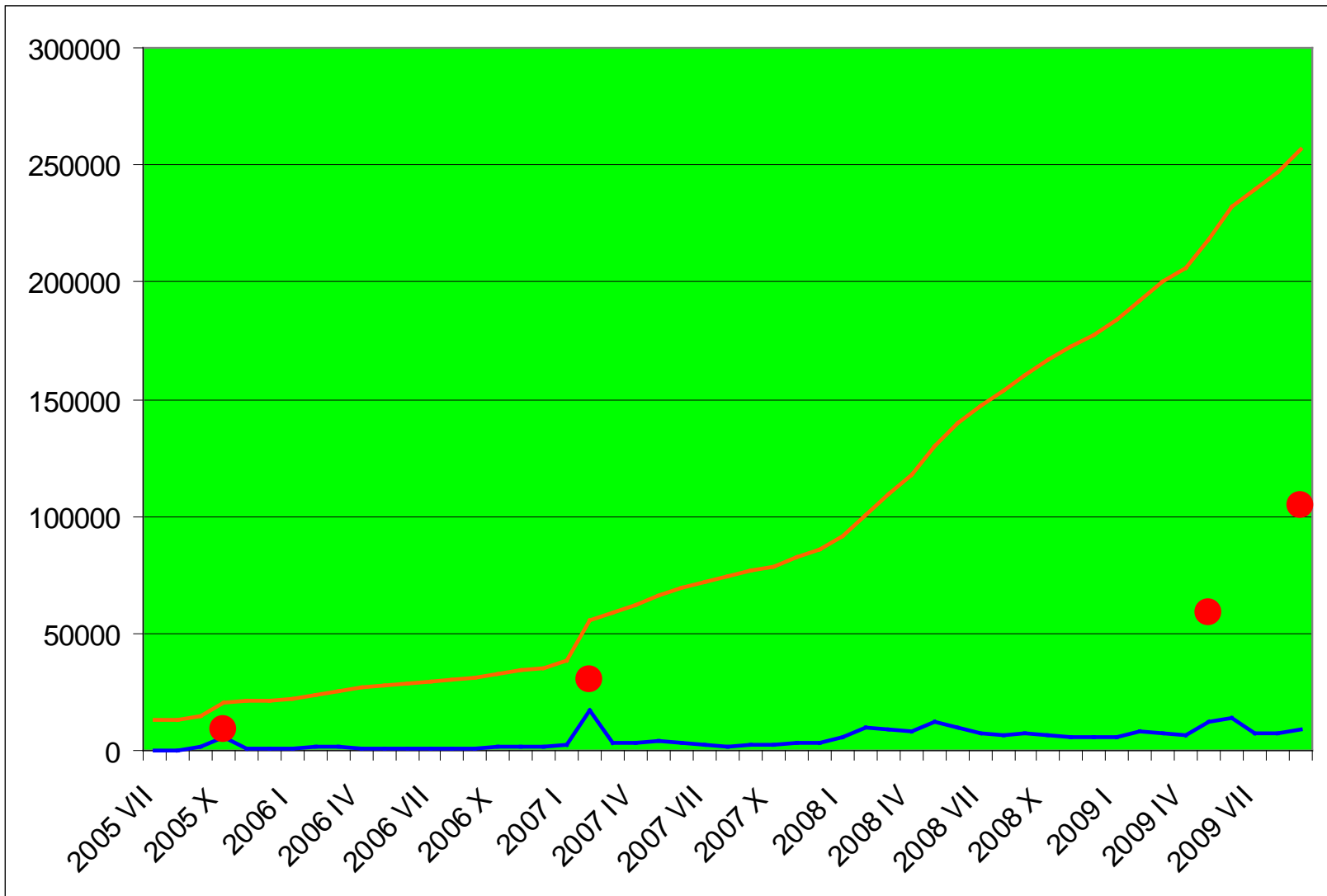


# Physical Security

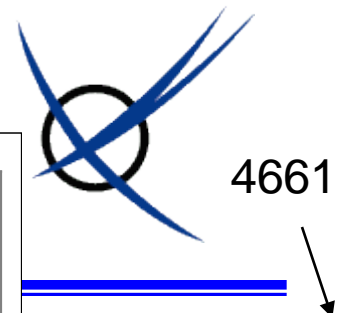
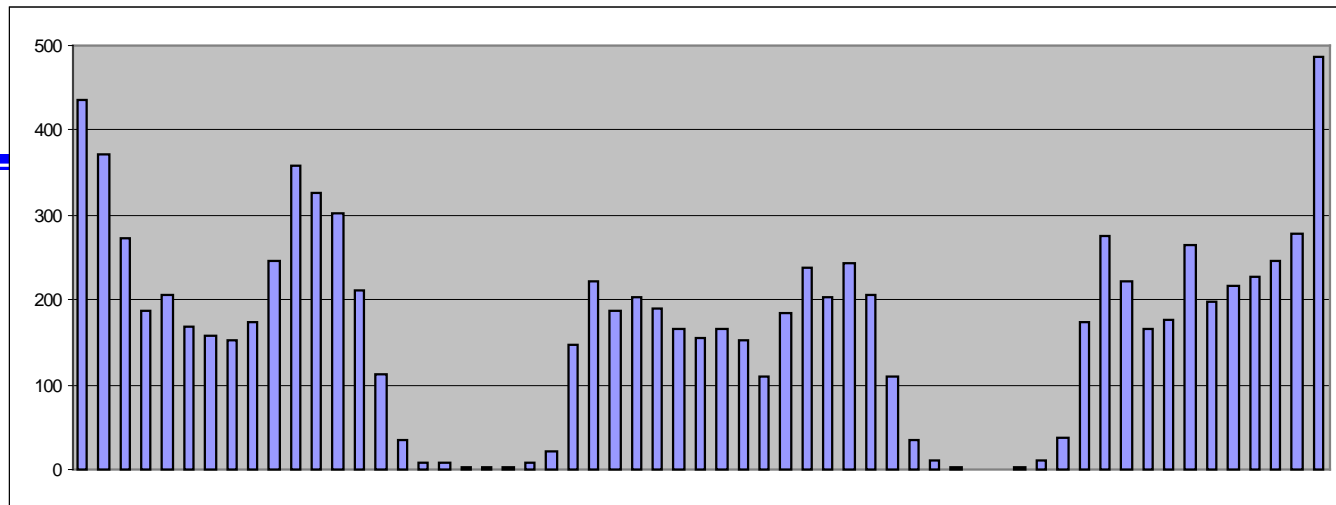
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- Governmental security hosting
- Two independent departments guarding the server room
- Strict requirements for entering the server premises
  - Auditor(s), cam-man, operator, police officer
- Sealing of hardware

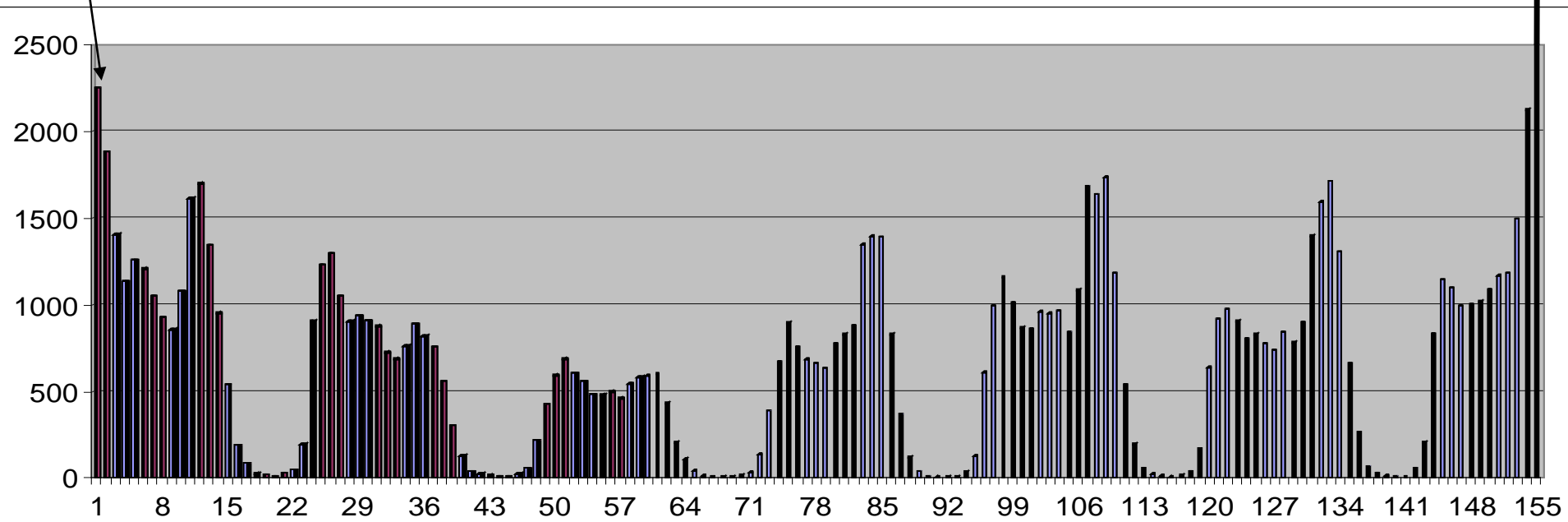
# ID-card usage vs. I-voting



# Local elections 2005



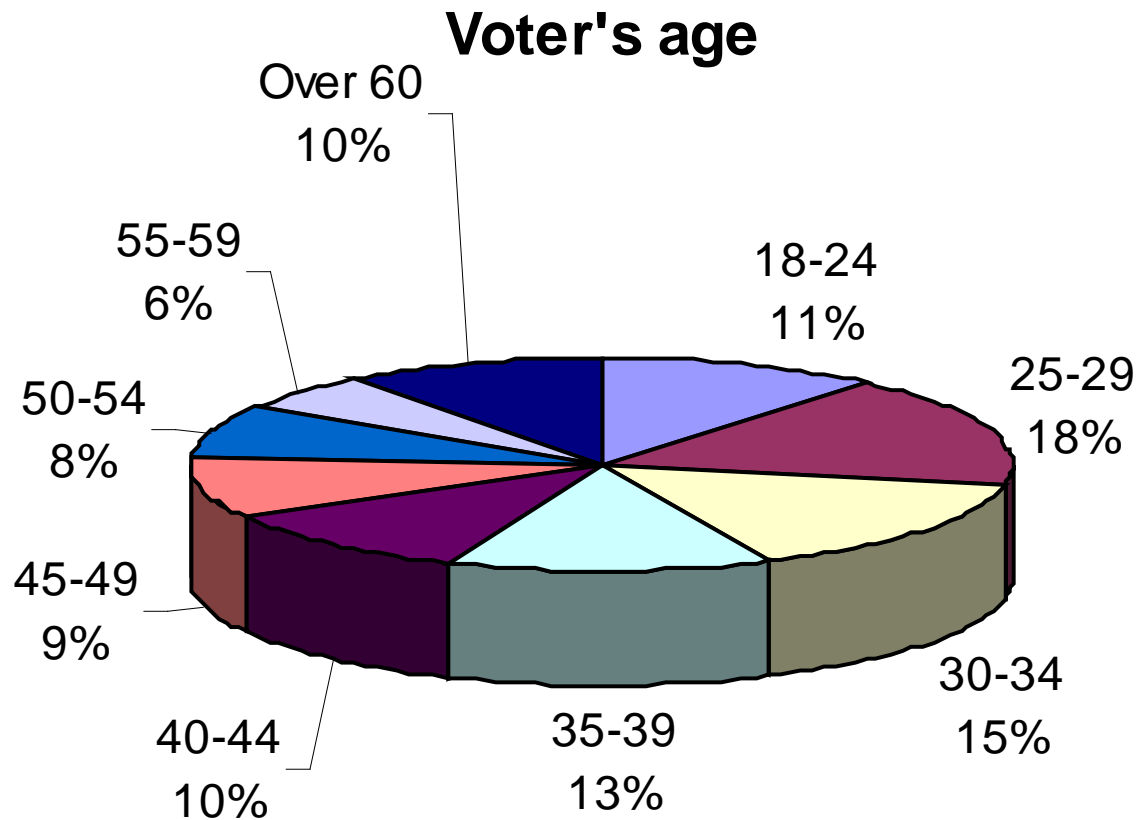
# Local elections 2009



2256

2500

# How old is The i-Voter ?



# Why Estonia succeeded ?

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- Political will (majority)
- Size of the country
- Relatively high tech knowledge level
- Strong leadership
- eID infrastructure
- General attitude towards high-tech
- Lazyness
- Weather



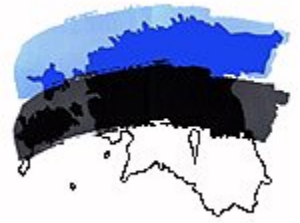
# Lessons learned

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- I-voting is not a killer-application.  
It is just another way for people to vote
- People's attitude and behavior change in decades and generations, not in seconds
- I-voting will be as natural as Internet-banking but even more secure
- Internet voting is there to stay

# More information

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[www.vvk.ee/engindex.html](http://www.vvk.ee/engindex.html)

[www.valimised.ee](http://www.valimised.ee)

[val@riigikogu.ee](mailto:val@riigikogu.ee)

[tarvi@sk.ee](mailto:tarvi@sk.ee)