Estonian eHealth Experience

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ESTONIA

Area - 45 000 km2
1.33 mlj. Inhabitants
Member of EU since 2004
Euro-zone since 2011

Healthcare expenditures in Estonia
- 6.3% from GDP 2014 - 1.02 bln eur
(OECD countries average – 9% from GDP)

- Per person 1,452 USD in Estonia
- Per person average 3,453 USD in OECD

- Financed: 13% earmarked health
insurance tax on salaries paid by
employers

HEALTHCARE IN ESTONIA

15 441 healthcare professionals

    775 family doctors

1 500 healthcare provider organizations

    60 hospitals

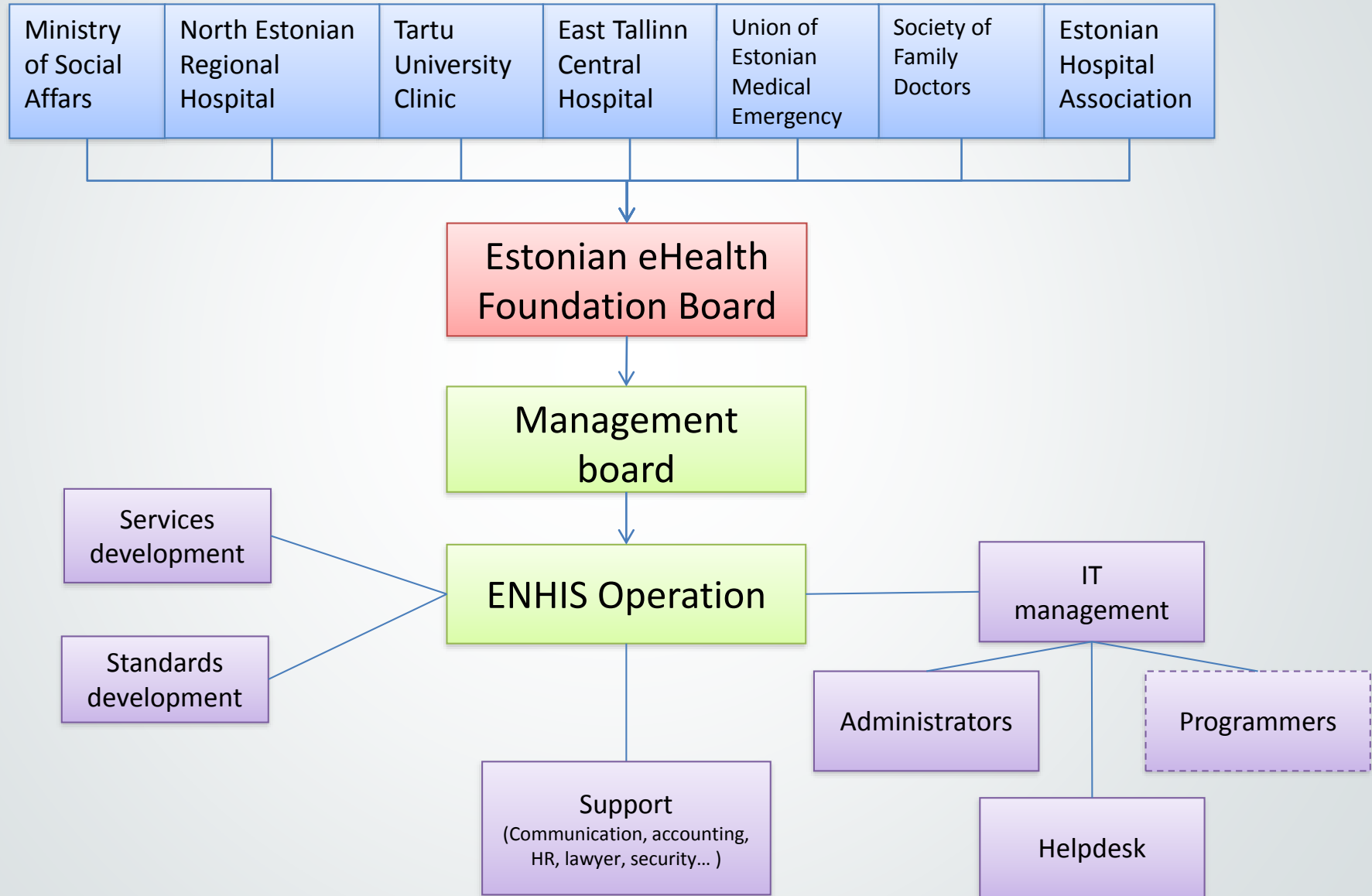Life expectancy at birth 2011

    76,63 years

    Male 71,27 years (healthy 54,2 years)

    Female 81,43 (healthy 57,9 years)

Estonian health System review 2013

Facts about e-services in Estonia

- 100% of schools and government organizations have broadband connection
- 79% of have computer at home (2013)
- mParking in main cities
- 83% of households have broadband connection (2014)
- 99% of bank transfers are performed electronically
- 96% of income tax declarations are made via the E-Tax Board (2014)
- 31% of votes were cast over the internet on (2014)
- 62% of persons have completed the e-census (2012)

Estonian eHealth Foundation organization

Ministry of Social Affairs	North Estonian Regional Hospital	Tartu University Clinic	East Tallinn Central Hospital	Union of Estonian Medical Emergency	Society of Family Doctors	Estonian Hospital Association

Estonian eHealth Foundation Board

Management board

Services development

Standards development

ENHIS Operation

IT management

Administrators

Programmers

Support
(Communication, accounting, HR, lawyer, security...)

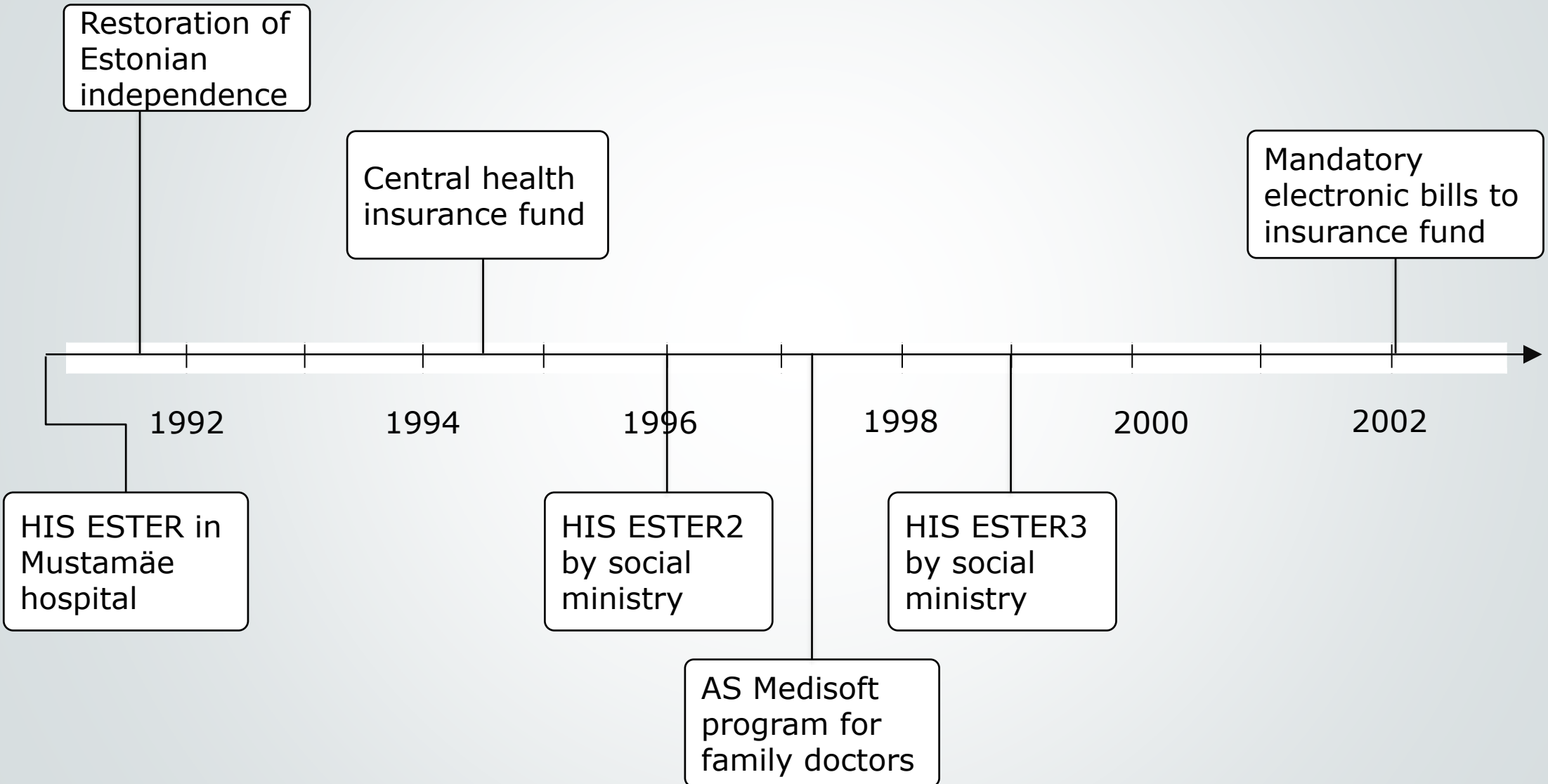Helpdesk

Main tasks of Estonian eHealth Foundation

- Development of Estonian Health Information System (HIS) services
- Coordination of information systems harmonization used by medical professionals
- Management of standardization process, including classifications administration
- Housing HIS and other supportive systems
- International cooperation
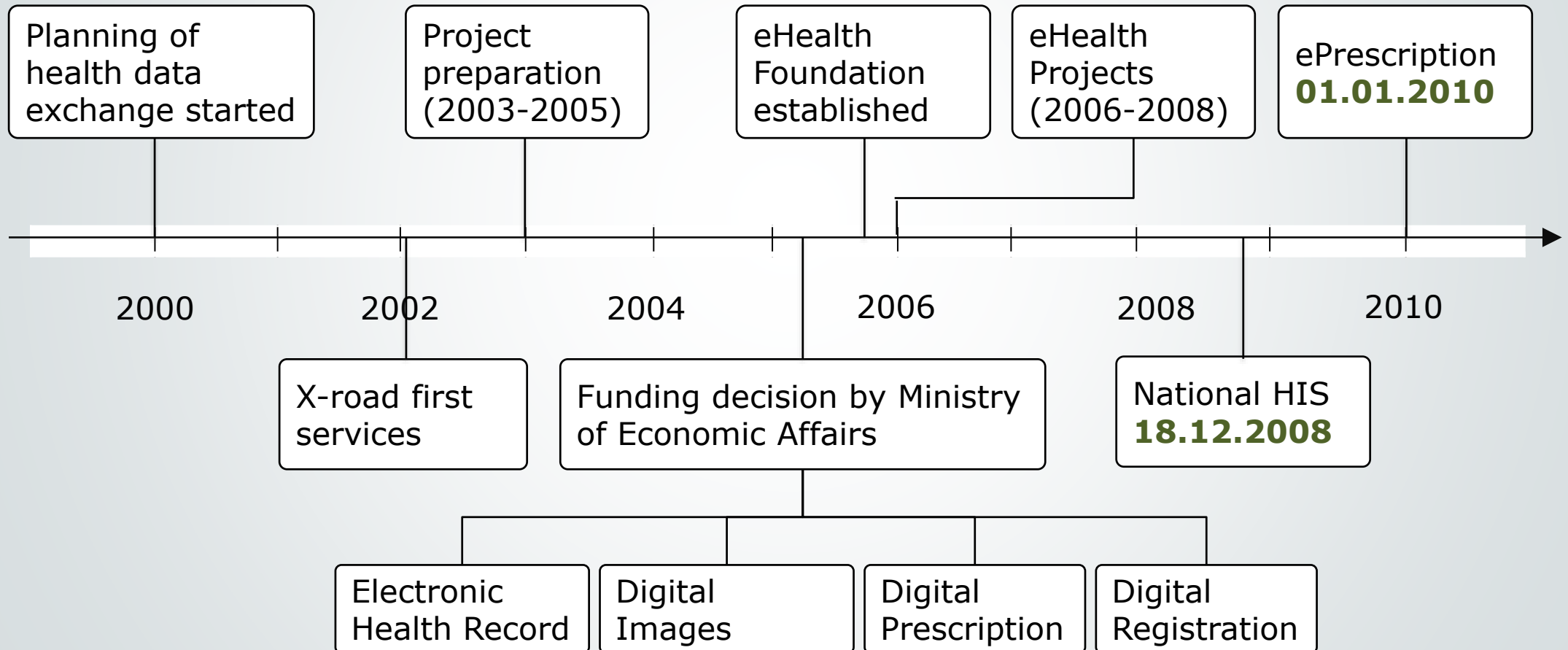- Scientific cooperation with universities

Estonian eHealth, where do you come from?

90-s. Local systems, focus on insurance invoices

Restoration of Estonian independence

Central health insurance fund

Mandatory electronic bills to insurance fund

1992   1994   1996   1998   2000   2002

HIS ESTER in Mustamäe hospital

HIS ESTER2 by social ministry

HIS ESTER3 by social ministry

AS Medisoft program for family doctors

2000 – 2010 health information exchange, focus on health data

| Planning of health data exchange started | Project preparation (2003-2005) | eHealth Foundation established | eHealth Projects (2006-2008) | ePrescription **01.01.2010** |

2000 — **2002** — **2004** — **2006** — **2008** — **2010**

X-road first services

Funding decision by Ministry of Economic Affairs

National HIS **18.12.2008**

| Electronic Health Record | Digital Images | Digital Prescription | Digital Registration |

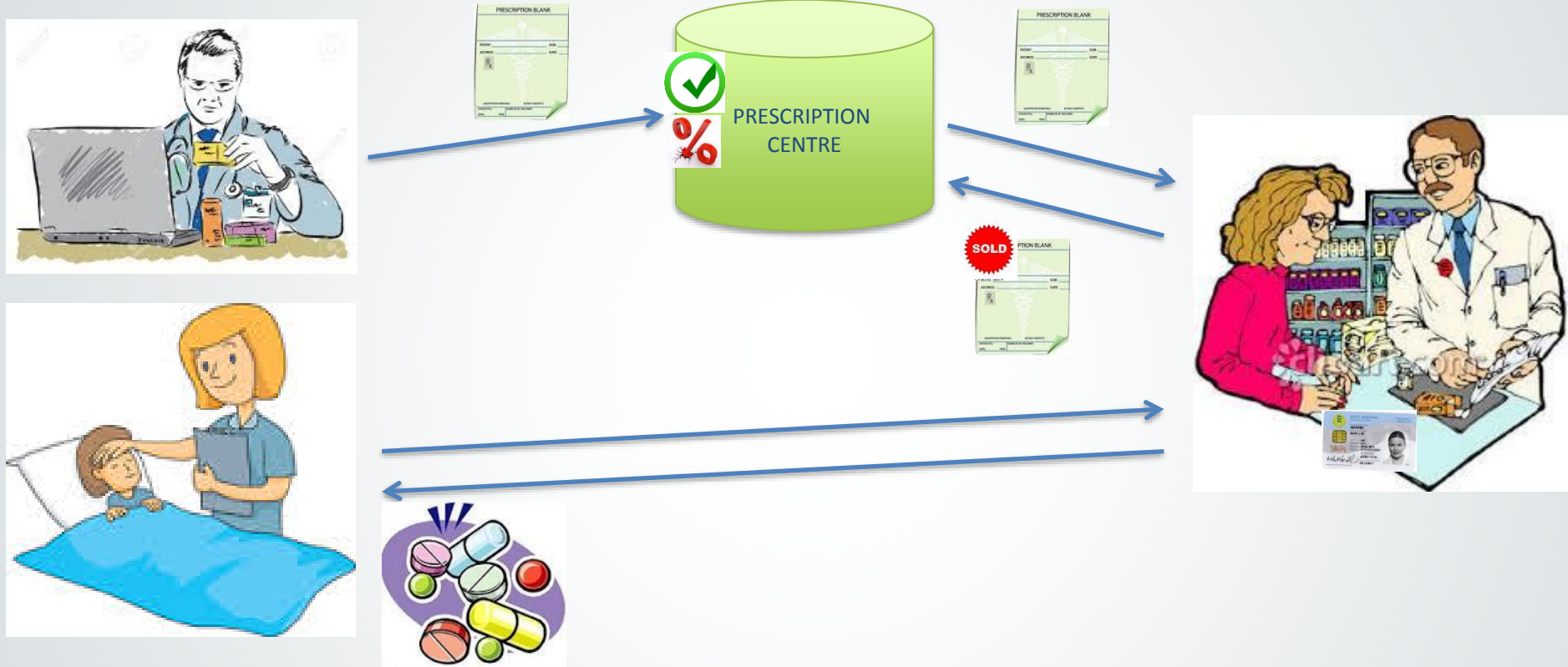Estonian eHealth,

where
are
you?

Laws that regulate eHealth area

1. Health Care Services Organisation Act;

2. Statute of Health Information System (governments Statute no 131 August 14th 2008);

3. The Statute no 53 September 17th 2008 of Ministry of Social Affairs on The Composition of Data, Conditions and Order of Maintaining of the Documents Forwarded to the Health Information System;

4. Data protection law;

5. Public Information Act.

- All healthcare providers must send data to Health Information System
- Access only to licensed medical professionals (other persons have access to personal data in the HIS if such right arises from law)
- ID card for authentication and digital signature
- Patient has the right to close his/her own data collected in the central database (opt out)
- Patient can access their own data (Patient's Portal)
- Patient can declare their intentions and preferences
- Patient can monitor visits to their HIS. (All actions will leave secure trail).
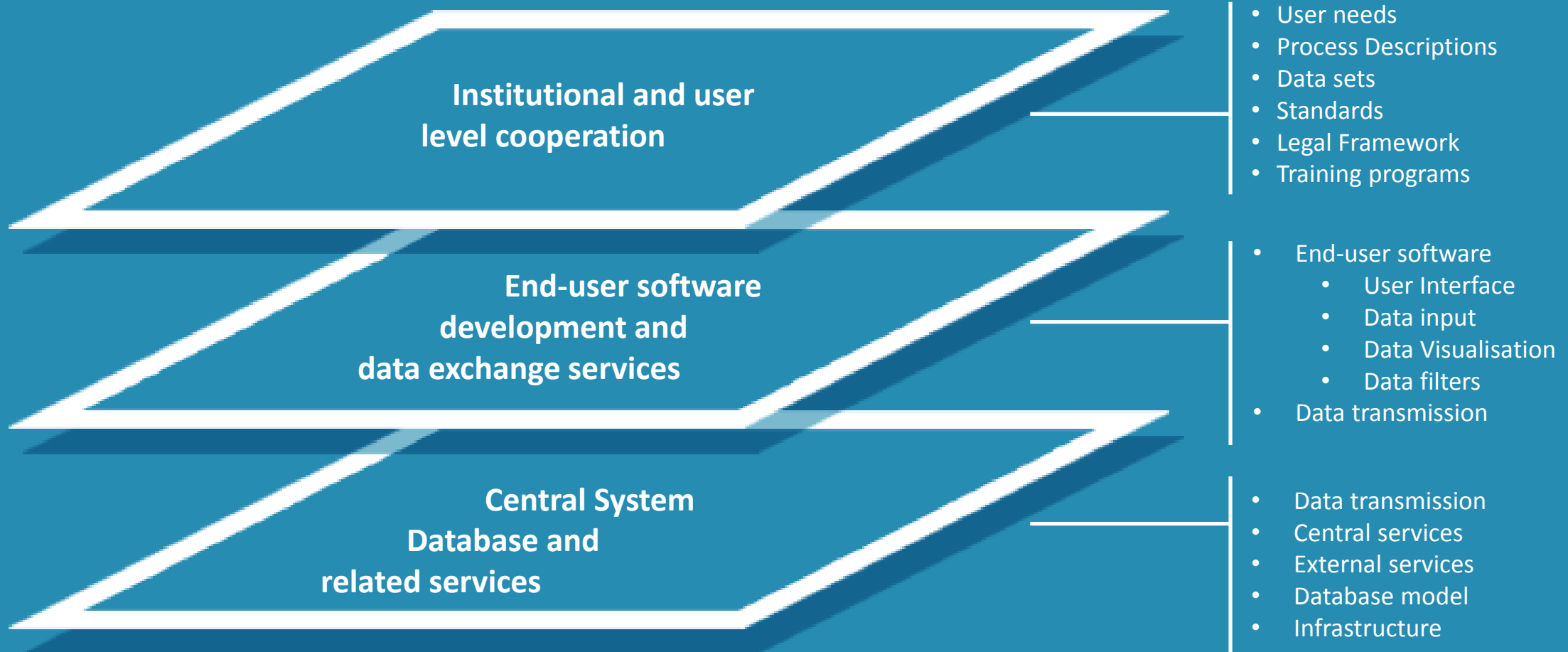
eHealth services in Estonia

ePrescription

https://www.youtube.com/watch?v=m9rTZM2kj78
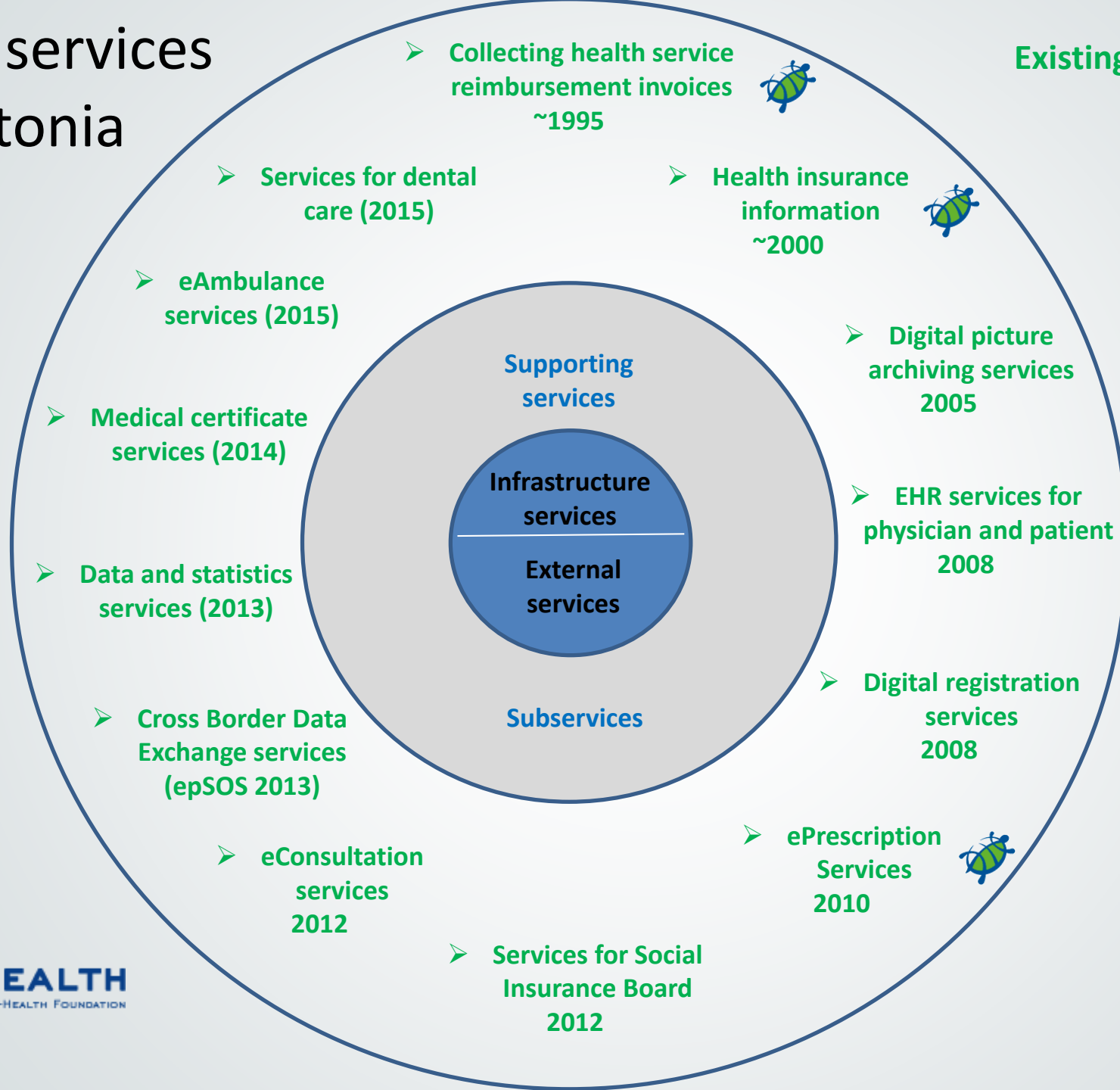
Three-layer development model of Estonian Health Information System

Institutional and user level cooperation

- User needs
- Process Descriptions
- Data sets
- Standards
- Legal Framework
- Training programs

End-user software development and data exchange services

- End-user software
  - User Interface
  - Data input
  - Data Visualisation
  - Data filters
- Data transmission

Central System Database and related services

- Data transmission
- Central services
- External services
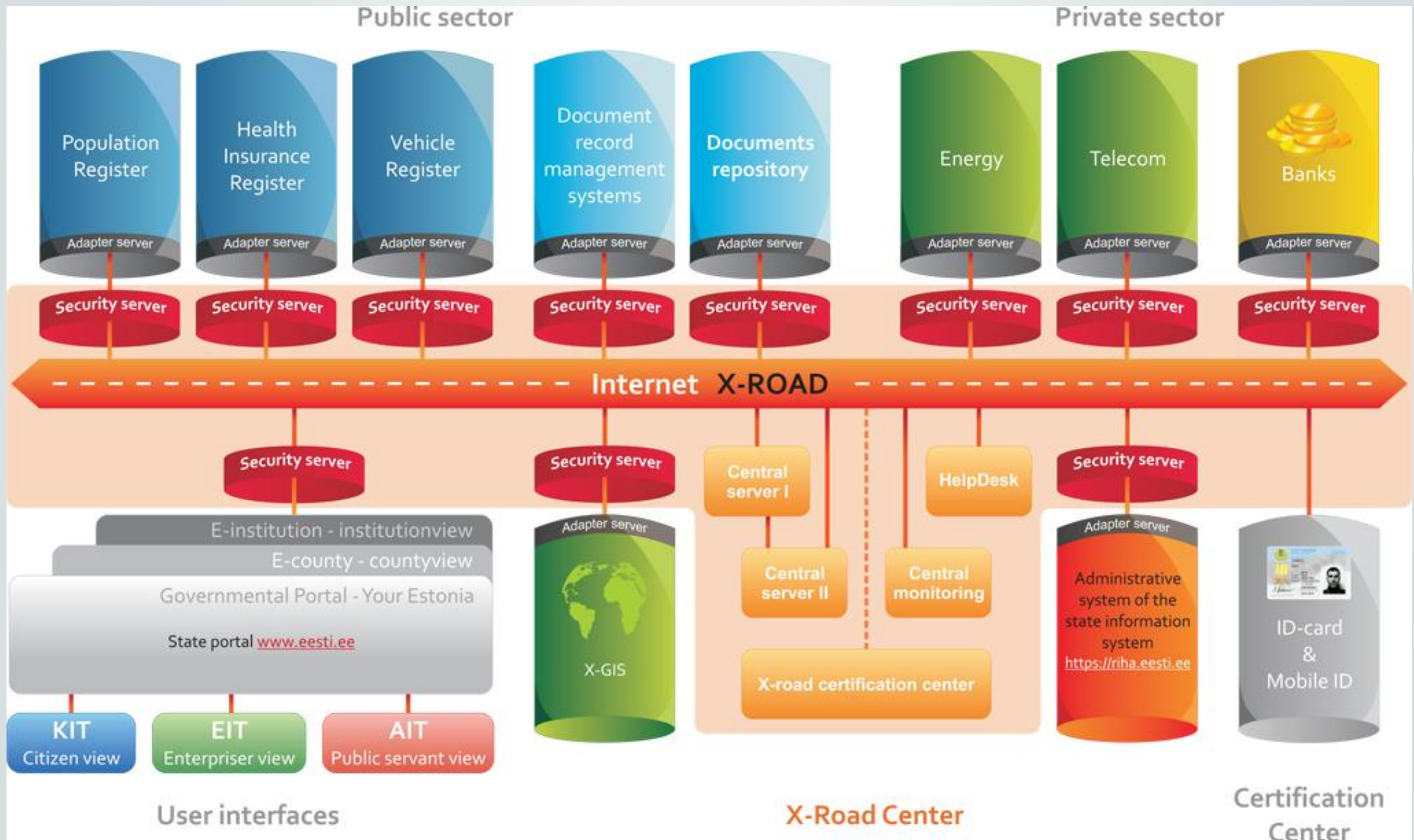- Database model
- Infrastructure

Major architectural decisions of HIS

- Integration through Central system
  - Opt-out policy in form „patient can close data from doctors"
- XML based HL7 v3 (extended) messages
- Documents are kept in XML format (HL7 CDA R2)
- All identifiers have OID-s
- Only final versions of clinical documents are sent into central system
- Reuse of national infrastructure
  - ID card for authentication and digital signature
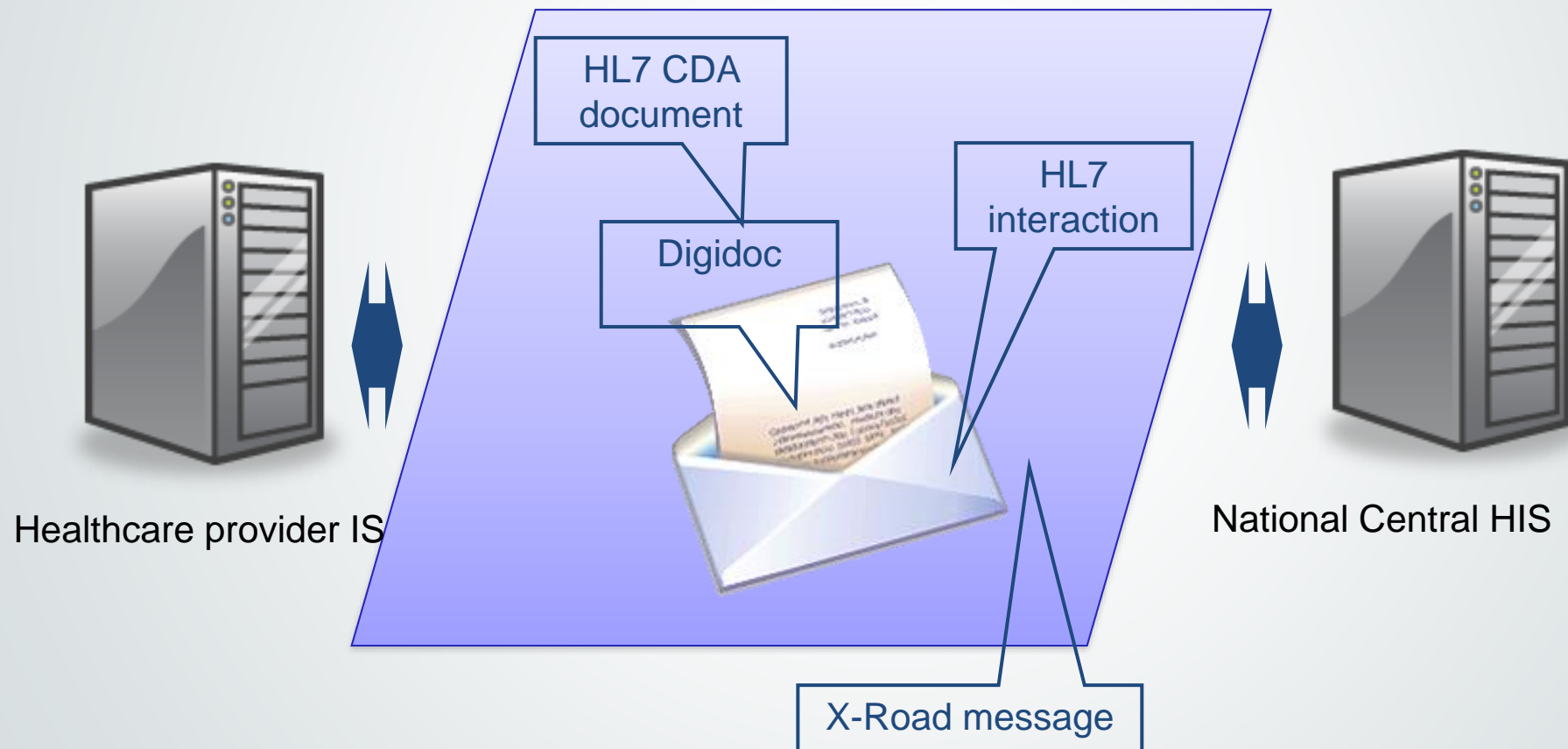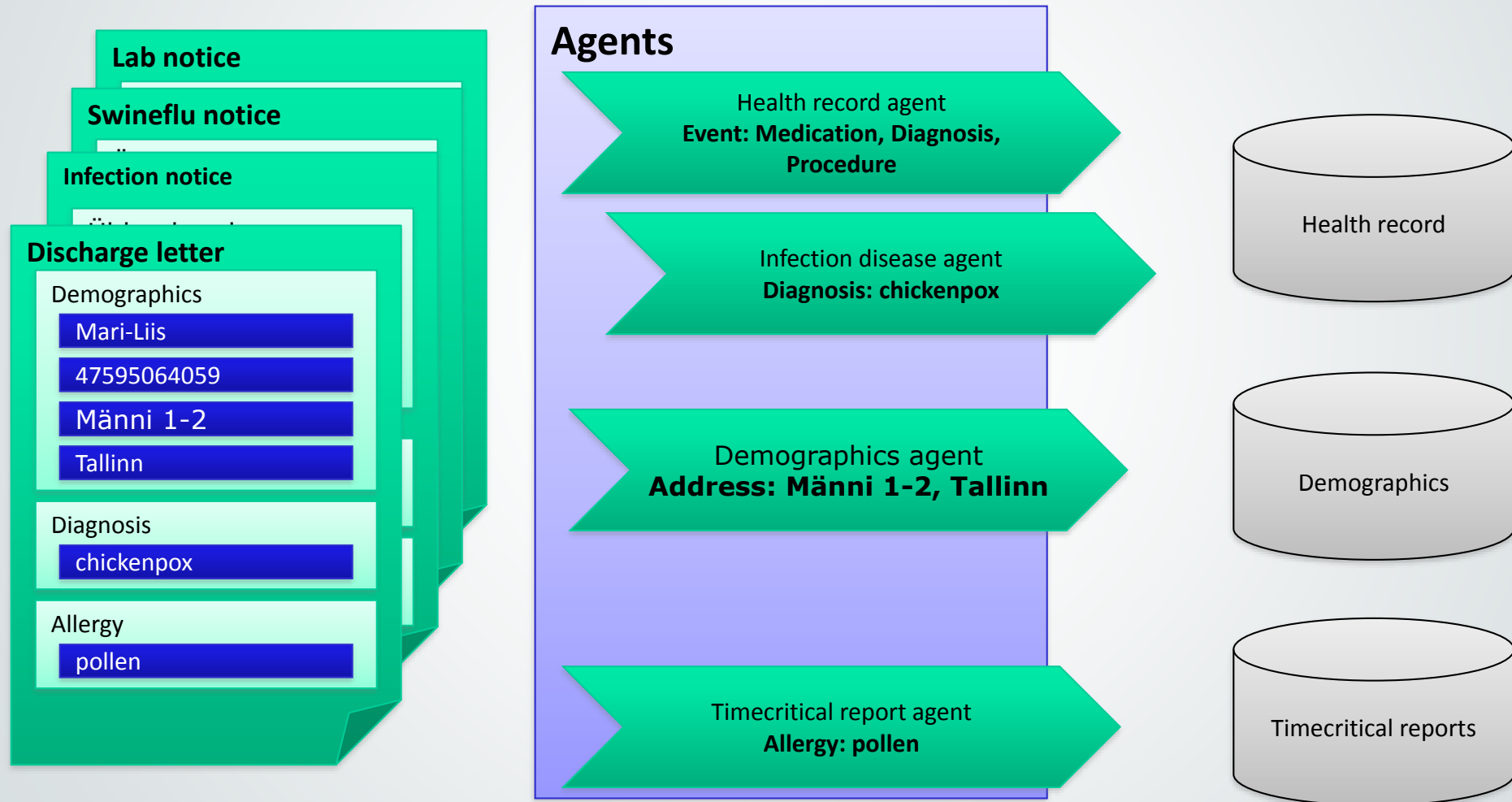 - Xroad for secure communication

Estonian eHealth architecture
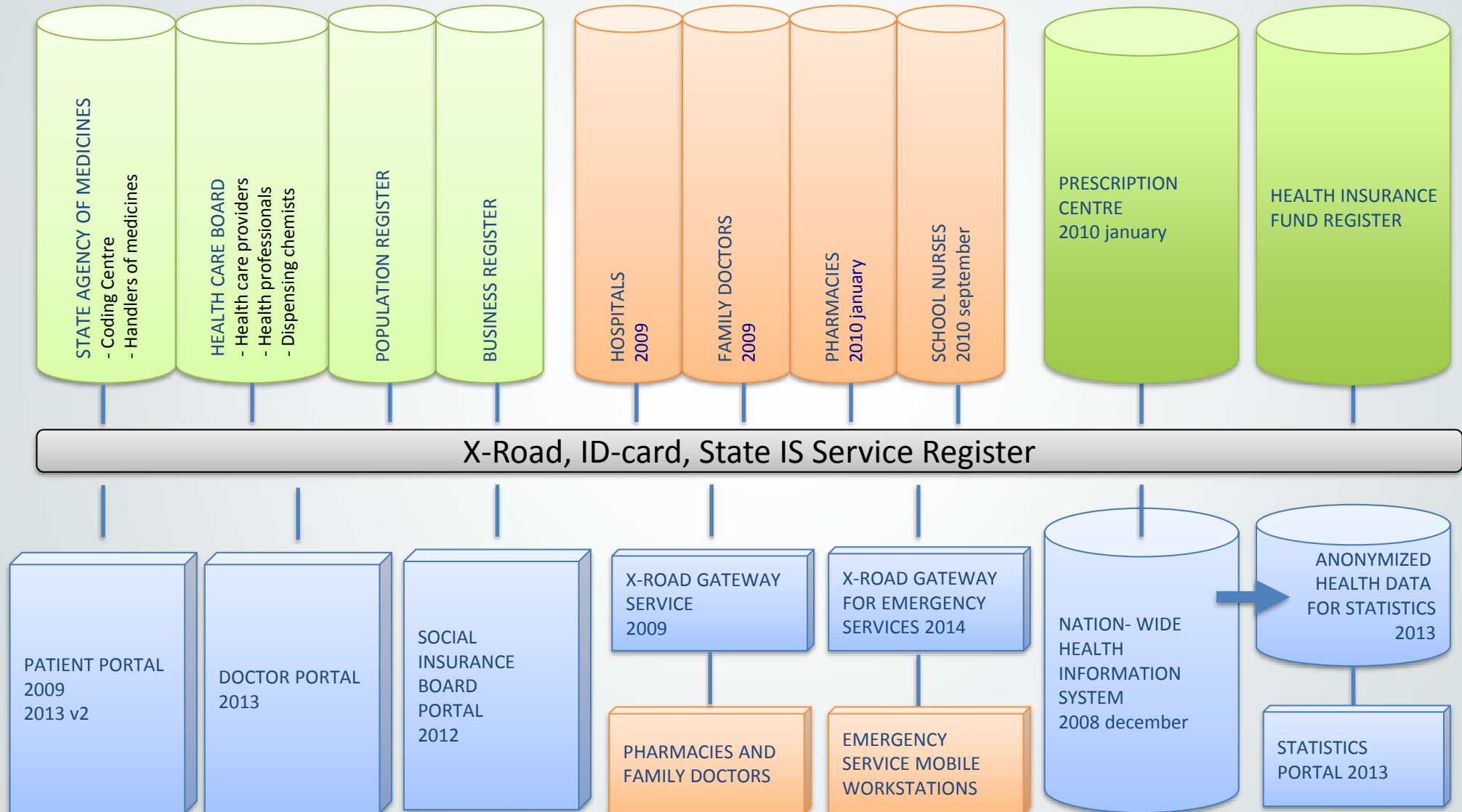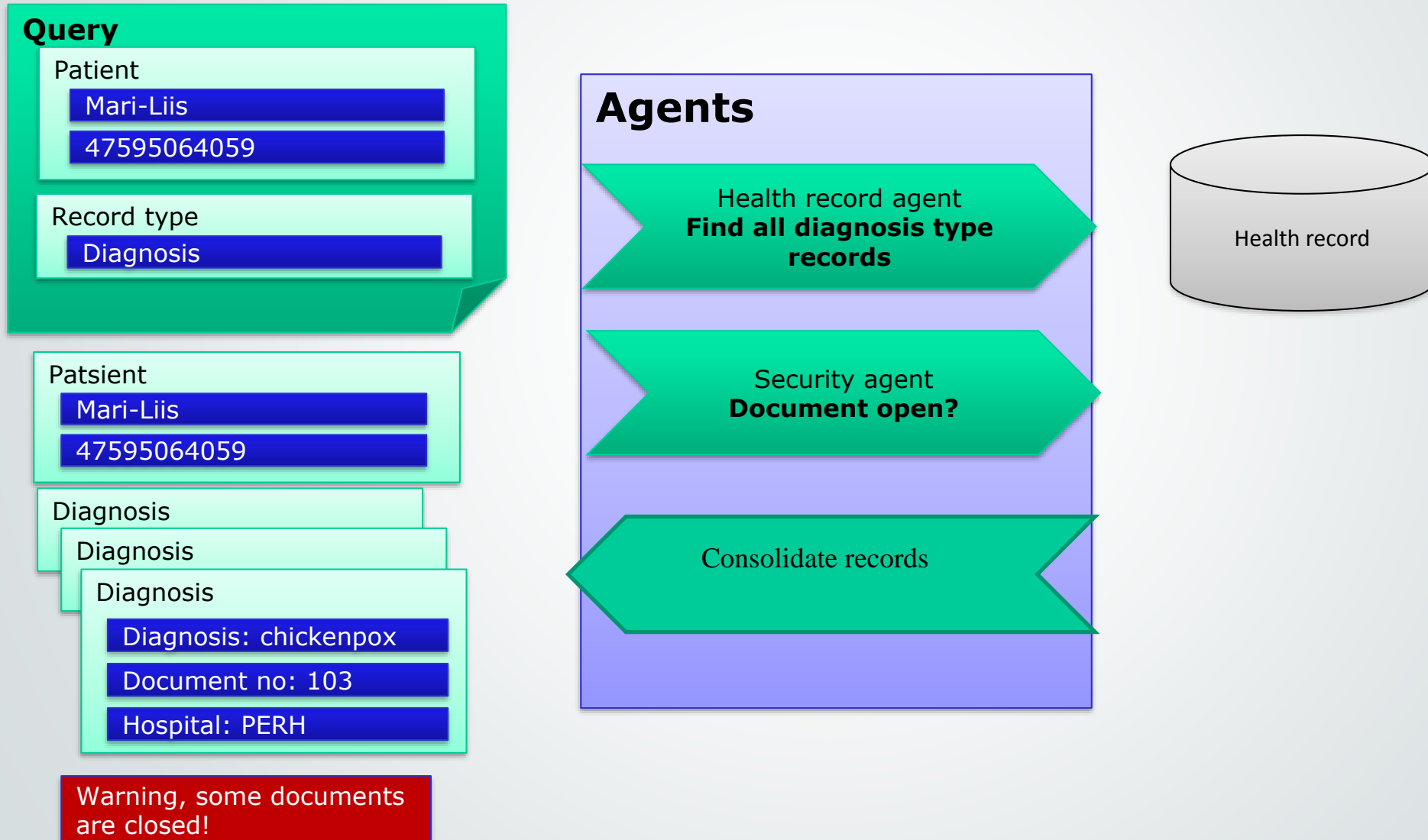
eHealth copies e-state architecture

HIS integration through X-Road

Document processing

Query processing

Query

Patient
- Mari-Liis
- 47595064059

Record type
- Diagnosis

Patsient
- Mari-Liis
- 47595064059

Diagnosis

Diagnosis

Diagnosis
- Diagnosis: chickenpox
- Document no: 103
- Hospital: PERH

Warning, some documents are closed!

Agents

Health record agent
Find all diagnosis type records

Security agent
Document open?

Consolidate records

Health record

The 6 main principles "6 whales" of security of Estonian eHealth system

1. **A secure authentication** of all users with ID-card or Mobile ID
2. **Digital signing or stamping** of all medical documents
3. **A maximum accountability (transparency)**: all actions will leave an unchangeable (and unremovable) secure trail
4. **Coding of personal data**: separating of personal data from medical data
5. **Encrypted database** that allows to remove the confidentiality risk from the technical administrators
6. **Monitoring** of all actions together with the corresponding counter-measures (both organizational and technical)
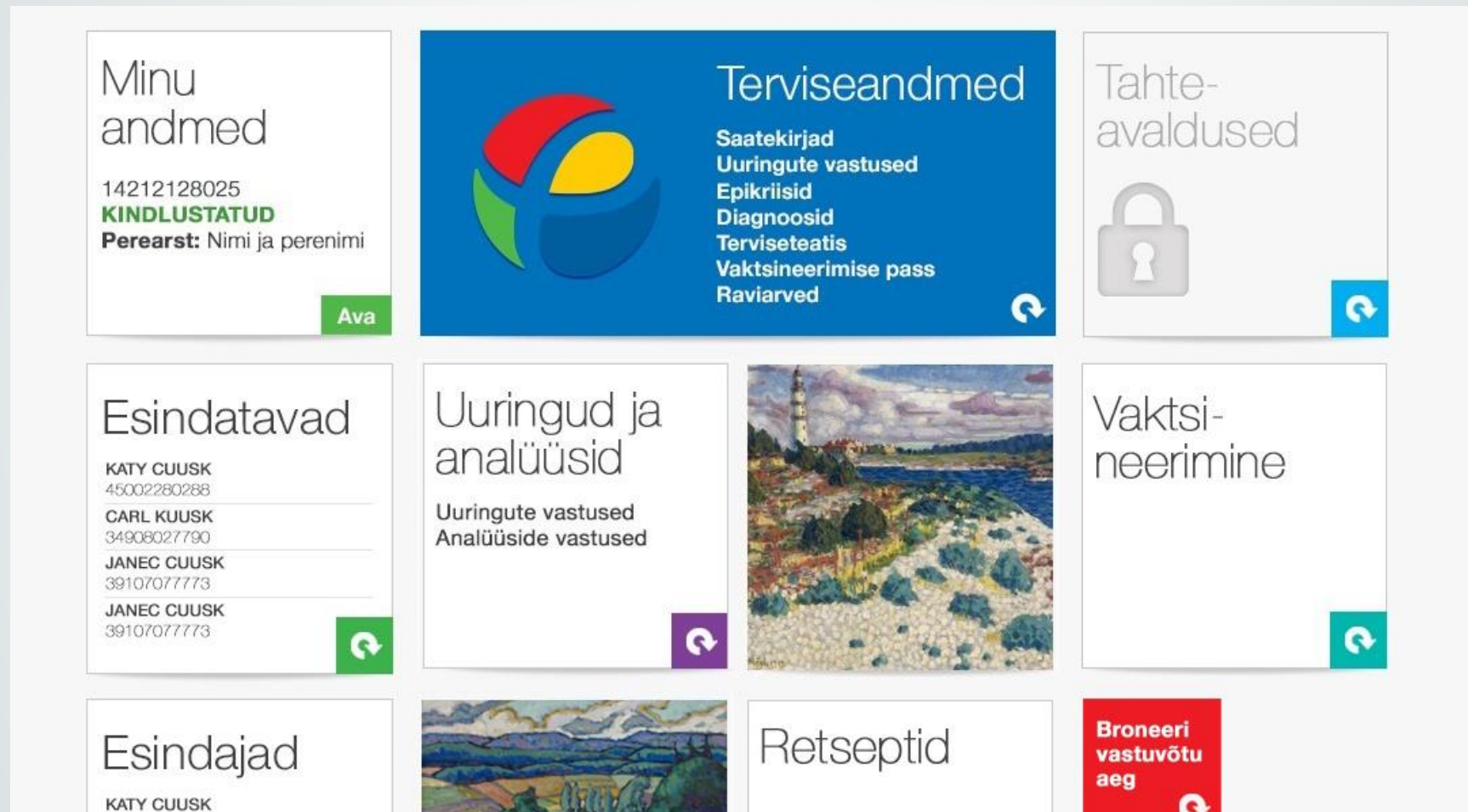
STANDARDS

Standards

- HL7 v3 and DICOM (Picture Archive)

- International classification: ICD-10, LOINC, NCSP, ATC

- Estonian eHealth's OID registry

- Estonian eHealth classificators
  - Published in publishing centre http://pub.e-tervis.ee
  - Classificators are regulated by government act https://www.riigiteataja.ee/akt/12910889

Patient portal new design (live 2013 june)

Minu e-tervis

Portaalis "Minu e-tervis" näed Sa oma terviseandmeid, saad esitada tahteavaldusi, määrata endale esindaja(d) ning teha toiminguid isikute eest, kes on määranud Sind enda esindajaks.

Kõikide tekkivate küsimuste või tehniliste probleemide korral pöördu Eesti E-tervise SA kasutajatoe poole telefonil +372 694 3943 (tööpäeviti kell 9-17) või elektronposti aadressil abi@e-tervis.ee.
Samal elektronposti aadressil ootame Sinu ettepanekuid edasiste arenduste osas, mis aitaks muuta portaali mugavamaks ning kasulikumaks.

Sisene ID-kaardiga

Sisene mobiil-IDga

Tervise infosüsteem

Tervise infosüsteemis paiknevad terviseandmed, mis on tervishoiuteenuste osutajad esitanud Sinu kohta. Siia kogutakse kõige olulisem meditsiiniline informatsioon ning see on portaali vahendusel kättesaadav ainult Sinu arstidele ning Sulle.

Loe edasi

Turvalisus

Andmete turvalisus on ülitähtis. Igast tegevusest jääb järele jälg.

Loe edasi

Eesti E-tervise Sihtasutus

Üleriigilised e-lahendused tervishoius. **Loe edasi**

Olulised teeviidad

Veebilehed, kust leiad tervisega ja tervishoiukorraldusega seotud infot süstematiseeritult.
Loe edasi

Õigusruum

Tervise infosüsteem ja portaal "Minu e-tervis" lähtuvad tegevuses Eesti seadustest ning Euroopa Liidu õigusaktidest.
Loe edasi

SUSTAINS

SUSTAINS on portaali arendust toetav projekt, mida rahastab Euroopa Komisjon.
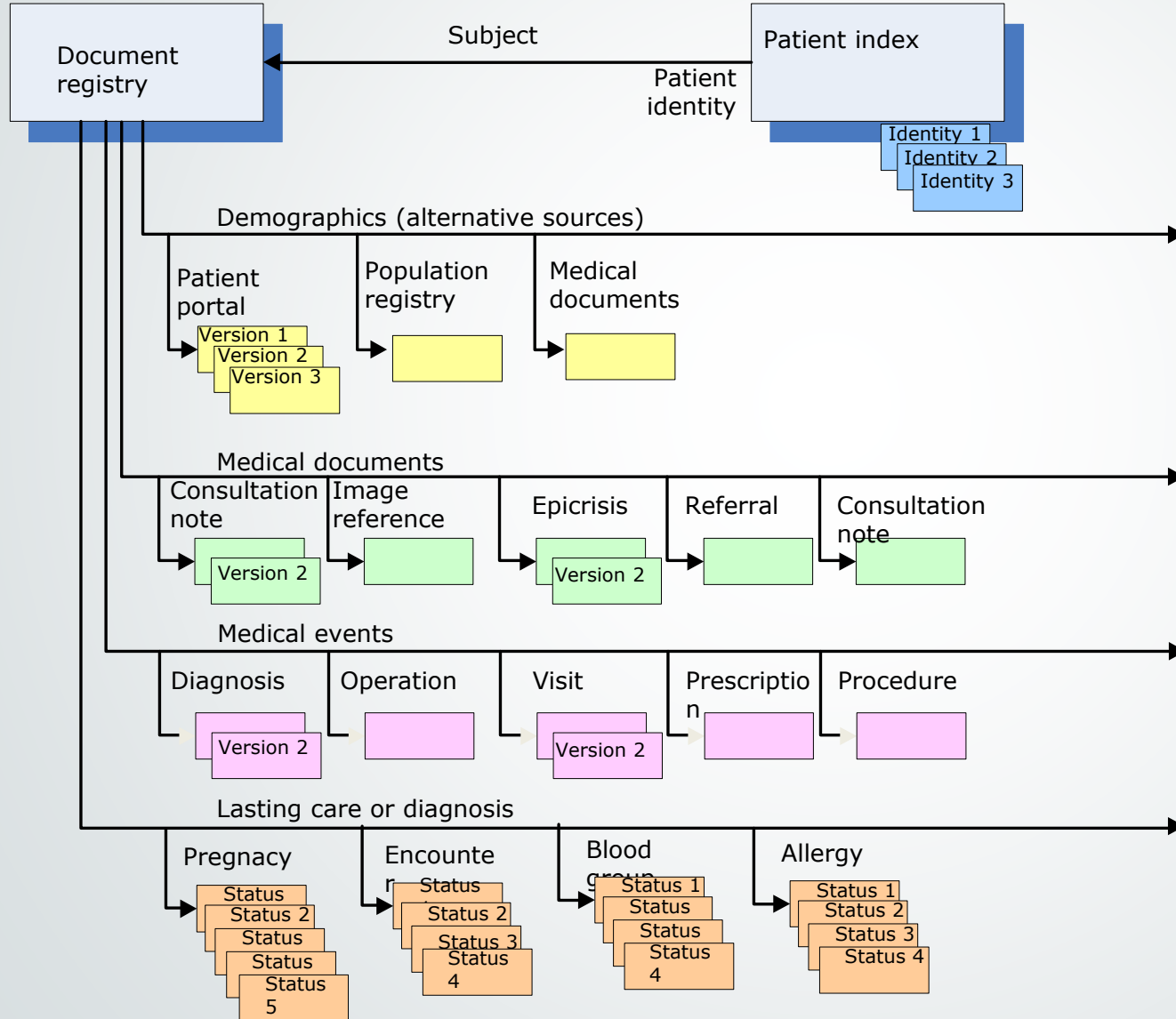**Loe edasi**

sustains

Acceptance

- ePrescription covers 100% of issued prescriptions. 98% are prescribed digitally, remaining 2% are entered in pharmacy.
- Over 95% of Hospital discharge letters are sent to the central DB.
- Ambulatory case summaries sending
  - No certain rules for sending ambulatory case summaries!
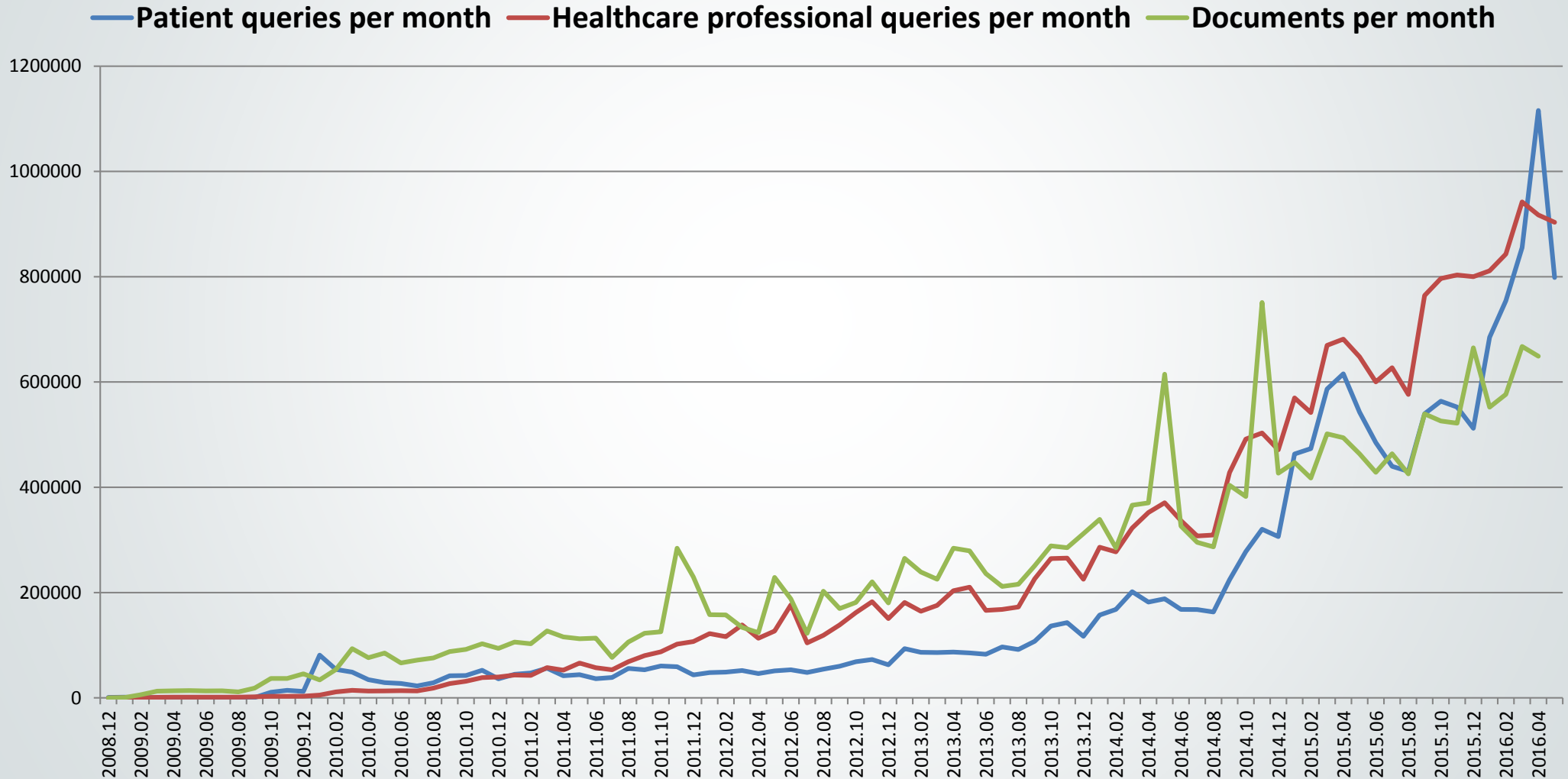- 1 348 468 person have documents

Data in Health Information System

Document registry

Subject

Patient index

Patient identity

Identity 1
Identity 2
Identity 3

Demographics (alternative sources)

Patient portal

Version 1
Version 2
Version 3

Population registry

Medical documents

Medical documents

Consultation note

Version 2

Image reference

Epicrisis

Version 2

Referral

Consultation note

Medical events

Diagnosis

Version 2

Operation

Visit

Version 2

Prescription

Procedure

Lasting care or diagnosis

Pregnacy

Status 1
Status 2
Status 3
Status 4
Status 5

Encounter

Status 1
Status 2
Status 3
Status 4

Blood group

Status 1
Status 2
Status 3
Status 4

Allergy

Status 1
Status 2
Status 3
Status 4

Documents and events in HIS 30.05.2016

Document type	Count
Out-patient consultation notes	12 441 200
Referral answer	5 615 987
In-patient consultation notes	1 487 551
Referral	427 258
Immunization notification	345 611
Children Health check notifications	300 898
Daycare consultation notes	213 418
Emergency care summary	191 852
Home nursing summary	3 968
Total	**21 027 743**

Event type	Count
Procedure	119 454 936
Analysis	57 026 835
Diagnosis	25 576 308
Encounter	24 352 899
Case	16 435 472
Observation	15 604 410
Immunization	1 064 996
Surgery	670 828

HIS usage per month

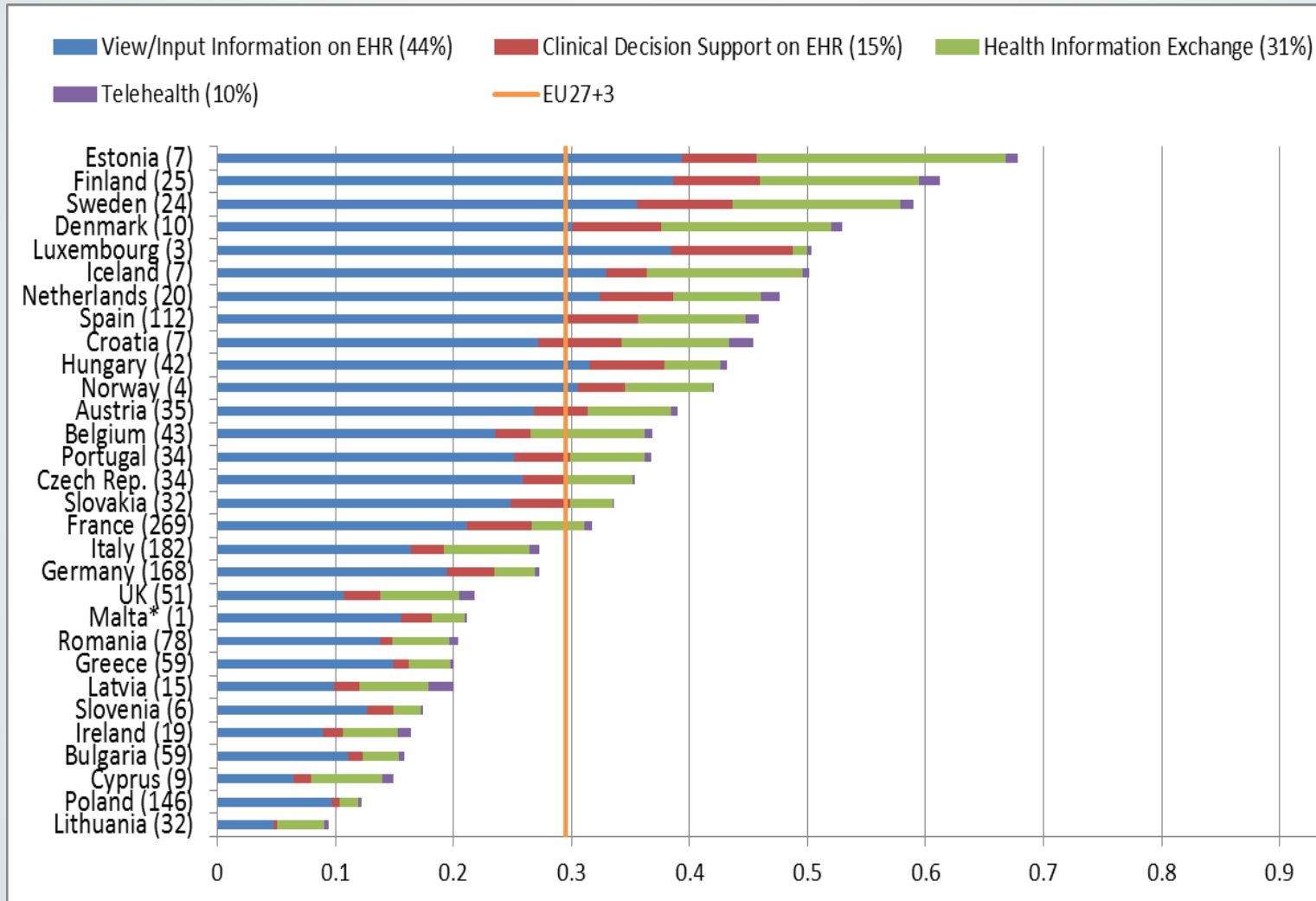Legend: Patient queries per month — Healthcare professional queries per month — Documents per month

ePrescription
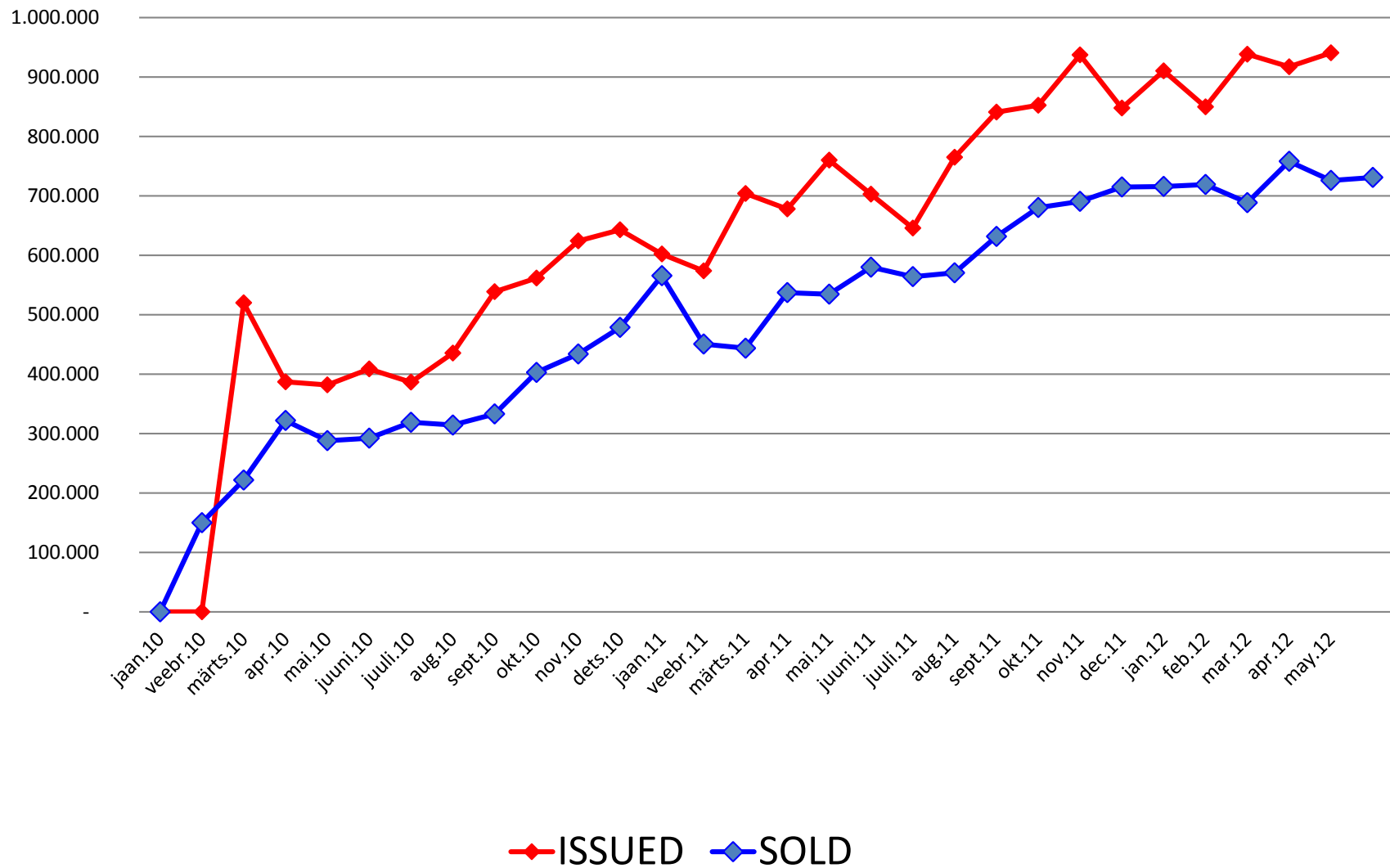
European Hospital Survey:
Benchmarking Deployment of e-Health Services 2012
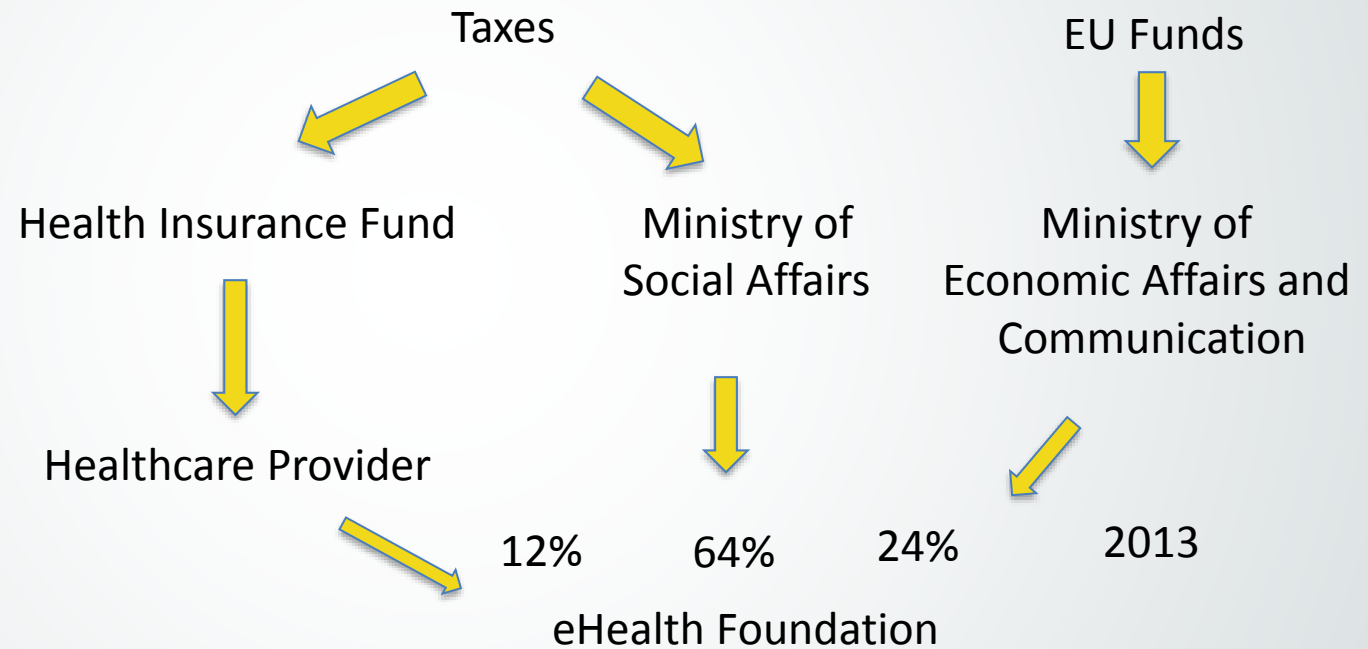**The Availability and Use Composite Indicator**

Legend:
- View/Input Information on EHR (44%)
- Clinical Decision Support on EHR (15%)
- Health Information Exchange (31%)
- Telehealth (10%)
- EU27+3

Countries (from top to bottom):
Estonia (7), Finland (25), Sweden (24), Denmark (10), Luxembourg (3), Iceland (7), Netherlands (20), Spain (112), Croatia (7), Hungary (42), Norway (4), Austria (35), Belgium (43), Portugal (34), Czech Rep. (34), Slovakia (32), France (269), Italy (182), Germany (168), UK (51), Malta* (1), Romania (78), Greece (59), Latvia (15), Slovenia (6), Ireland (19), Bulgaria (59), Cyprus (9), Poland (146), Lithuania (32)

x-axis: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9

Estonian eHealth,

where

do you

get the

money?

eHealth Foundation financing

Year	Expenditure (€)
2005	6 853
2006	259 944
2007	462 193
2008	1 009 156
2009	1 178 362
2010	1 433 602
2011	1 834 204
2012	3 048 636
2013	3 293 680

Taxes

EU Funds

Health Insurance Fund

Ministry of Social Affairs

Ministry of Economic Affairs and Communication

Healthcare Provider

12%   64%   24%   2013

eHealth Foundation

Without EU financing 1/3 from HCP-s and 2/3 from Social Ministry

EU funded projects

Estonian eHealth Foundation

- Electronic Health Record (1.6 mln €)
- Digital Registration (0.2 mln €)
- Digital Images (0.2 mln €)
- Activity surveillance module (0.4 mln €)
- Statistics module (0.4 mln €)
- Authentication and authorization module (0.2 mln €)
- eLaboratory (0.2 mln €)

Health Insurance Fund

- Digital Prescription (0.24 mln €)

Estonian eHealth,

what did you

learn?

Lessons learned

- Resources were planned only for central development.

- Usability is important. Developing process has to include medical competence – users

- Data quality is important
  - Complete and quality data give value

- Balance between security and usability
  - PIN for every document …

Digital stamp for family doctors

Documents Sent by GPs in 2012 and 2013 (1st Quarter)
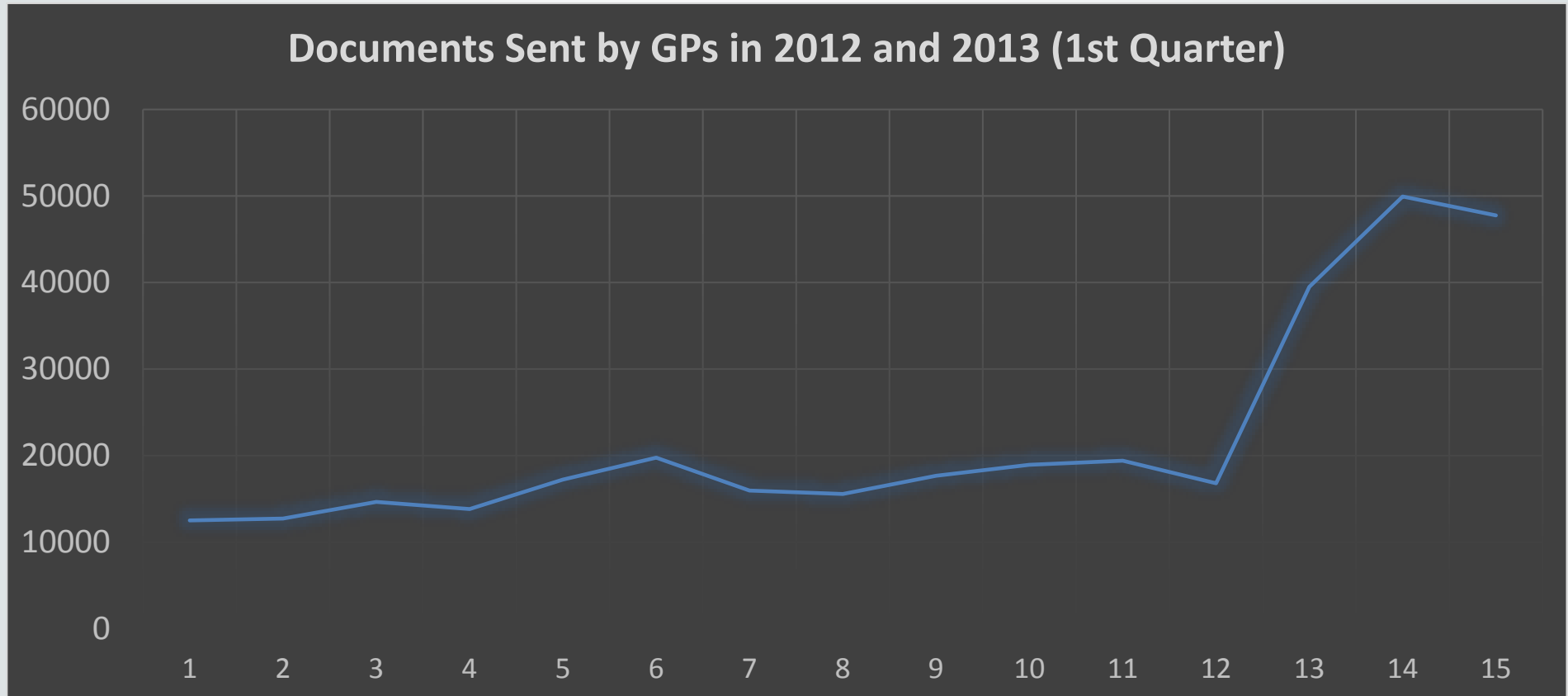
Estonian eHealth,

where are you

going?

Personalized medicine

… proposes the customization of healthcare - with medical decisions, practices, and/or products being tailored to the individual patient. The use of genetic information has played a major role in certain aspects of personalized medicine, …

Combining information from these two systems creates possibilty to develope personal medicine applications.

Over 50 000 donors in database

Over 1 000 000 citizens have documents in database

Estonian E-health strategy 2020

- 5 Focus domains
  - Quality of health data and infrastructure
  - Orientation to person and personalized medicine
  - Integral case handling and organizational cooperation
  - Performance and quality of services evaluation / analytics
  - Telemedicine services
- Workgroups - services, architecture, justice, research and development, international cooperation, management and financing

ePrescription evolution
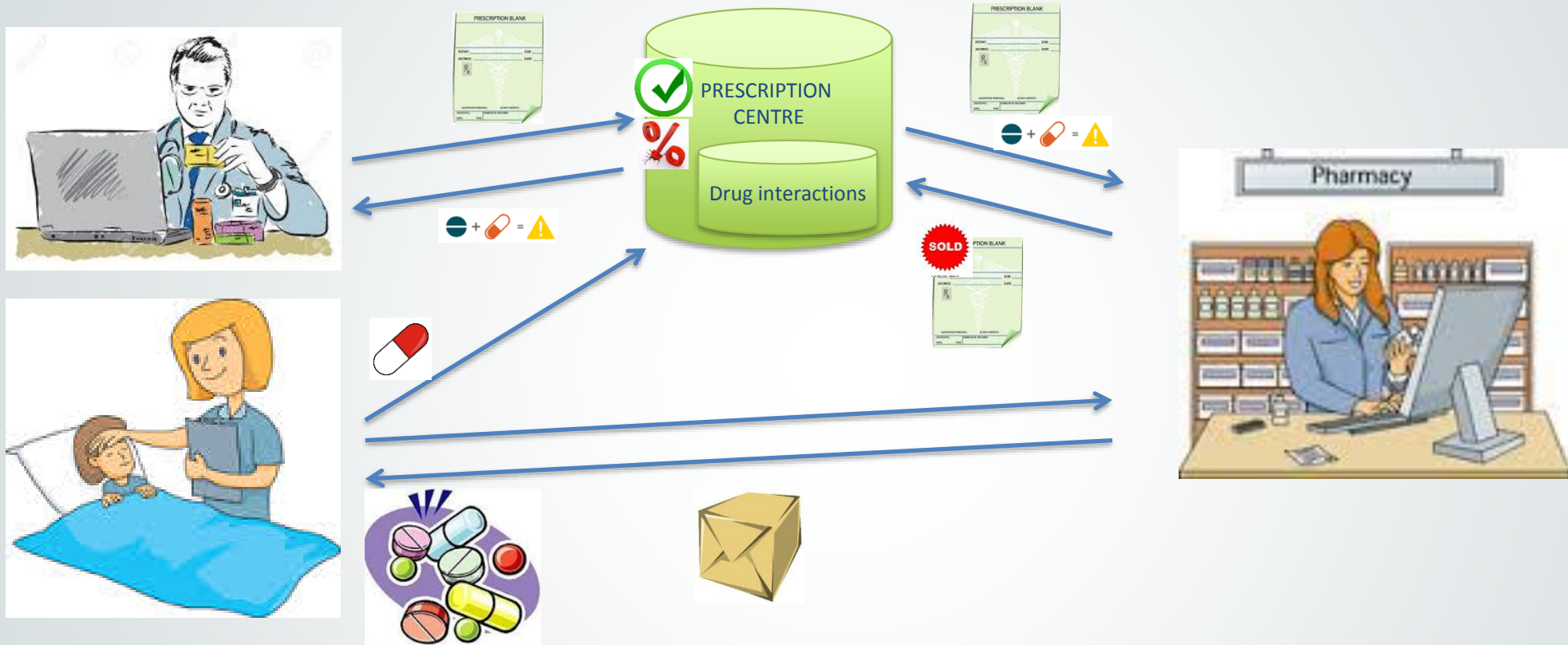
Drug interactions
Electronic ordering
Fast delivery
Usage registration (sensor-enabled pills?)

Questions?

THANK YOU

Artur Novek
Estonian eHealth Foundation