



REPUBLIC OF ESTONIA
INFORMATION SYSTEM AUTHORITY

Architecting a country

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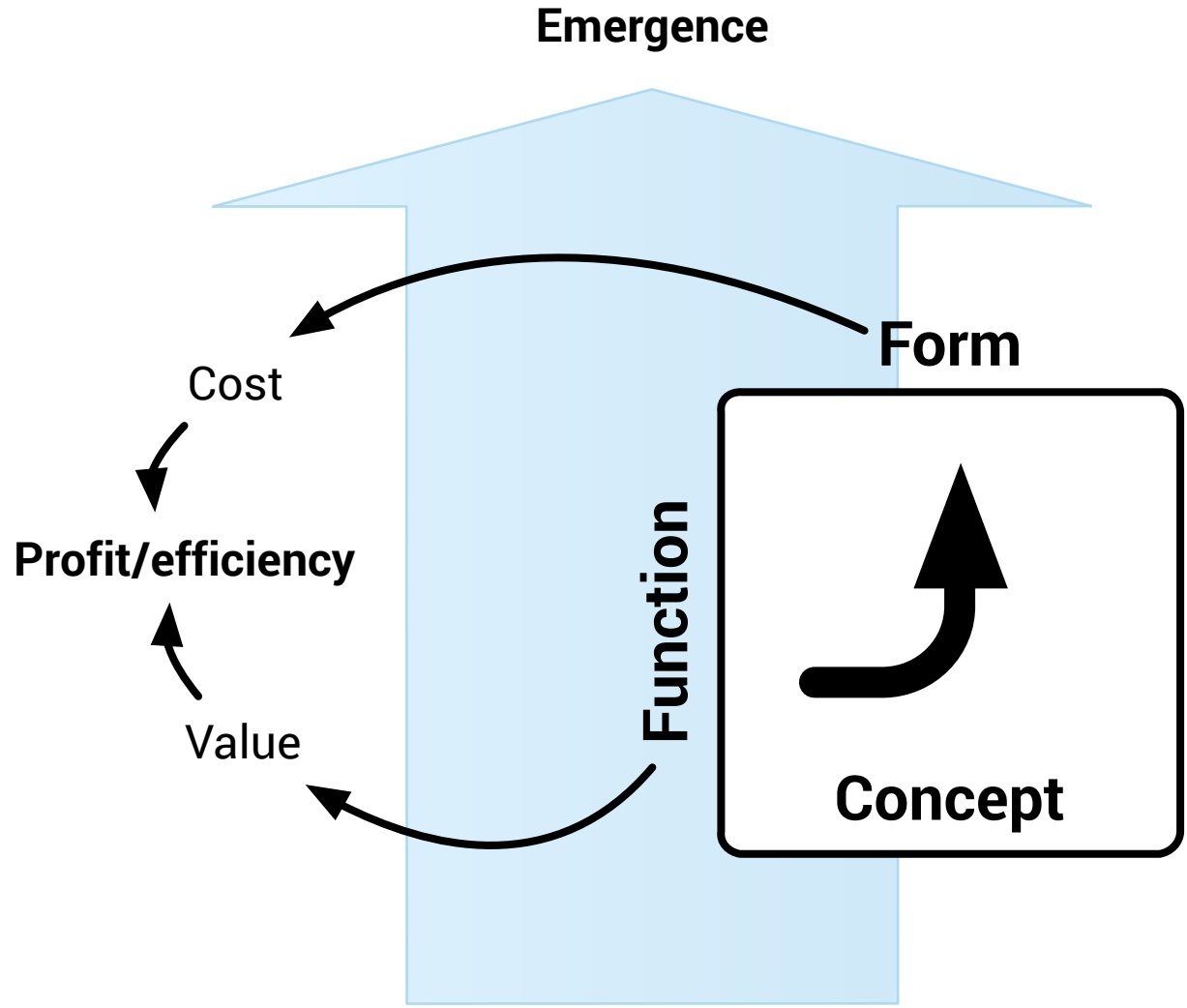
Estonian Information System Authority / Architect

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Agenda

- Fundamental concepts
- Country background
- Problem statement: what are we solving here?
- E-government meta-architecture
- Application of the architecture in Estonia

Fundamental Concepts



Country background: Estonia

A small open economy in Northern Europe

Some perspective

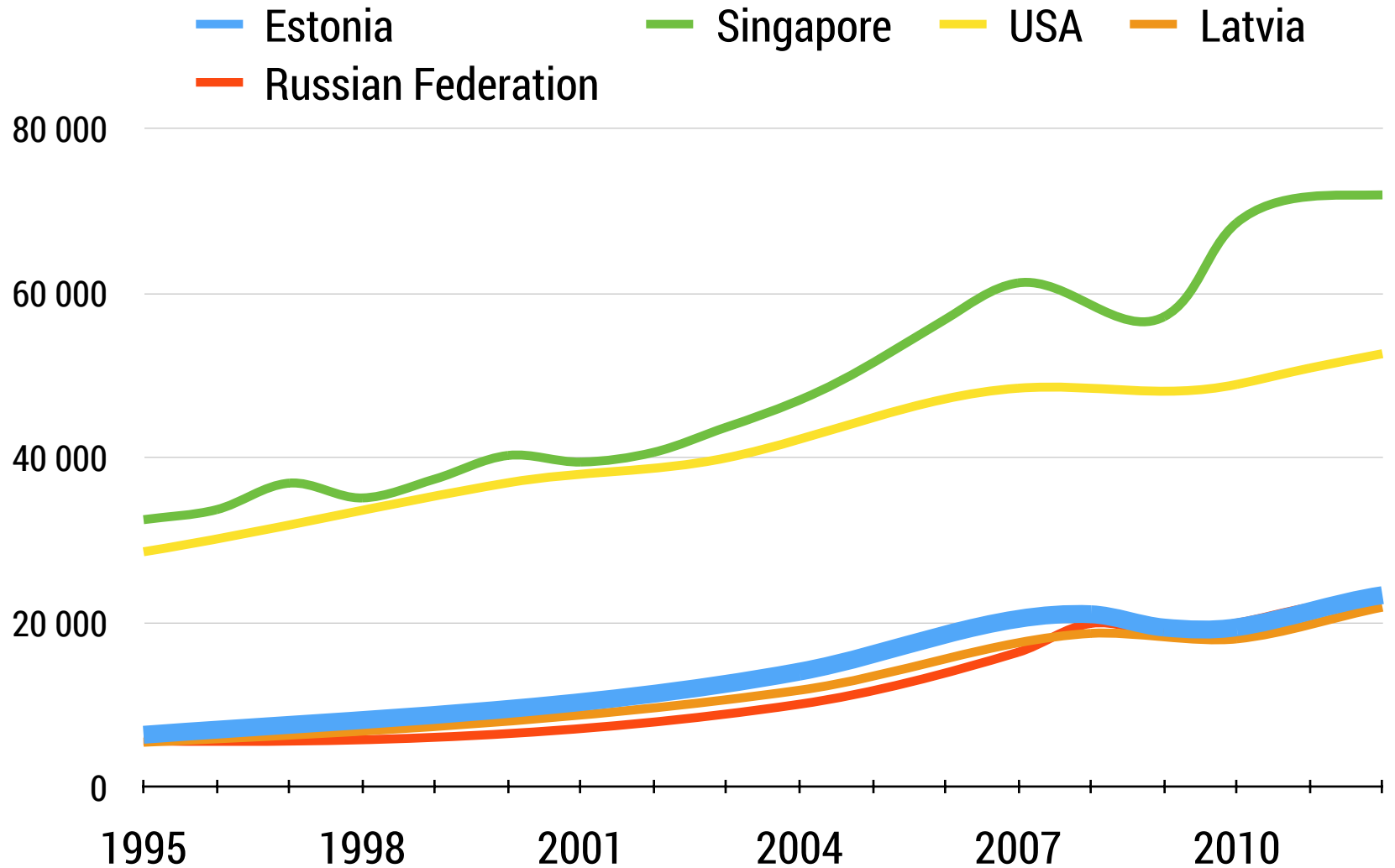
	Popu- lation	Surface area	Population density	PPP gross national income per capita
Estonia	1	45	31	23,280
Latvia	2	64	33	21,820
Russian Federation	144	17,098	9	22,800
Singapore	5	1	7,589	71,900
United States	314	9,832	34	52,610

¹ - In millions, rounded to 1

² - In sq. km thousands

³ - people per sq. km

GNI per capita



How to run a country with a small scattered population, tiny economy and no natural resources?

For the past 20 years, Estonia has chosen focusing on e-government

E-government problem statement

- A need to provide increasingly complex services in an increasingly complex world
 - Systematic development of functional architecture requires a structured understanding of the technical architecture
- Impact of e-government on democracy
 - Predicting emergence assumes a well-developed understanding of the technical architecture
- Cost-reduction without damaging business alignment
 - Thoughtful consolidation of services is a platform problem that assumes a robust technical architecture

Architecture of an architecture framework

What does a framework for describing technical architecture look like in a loosely coupled organization?

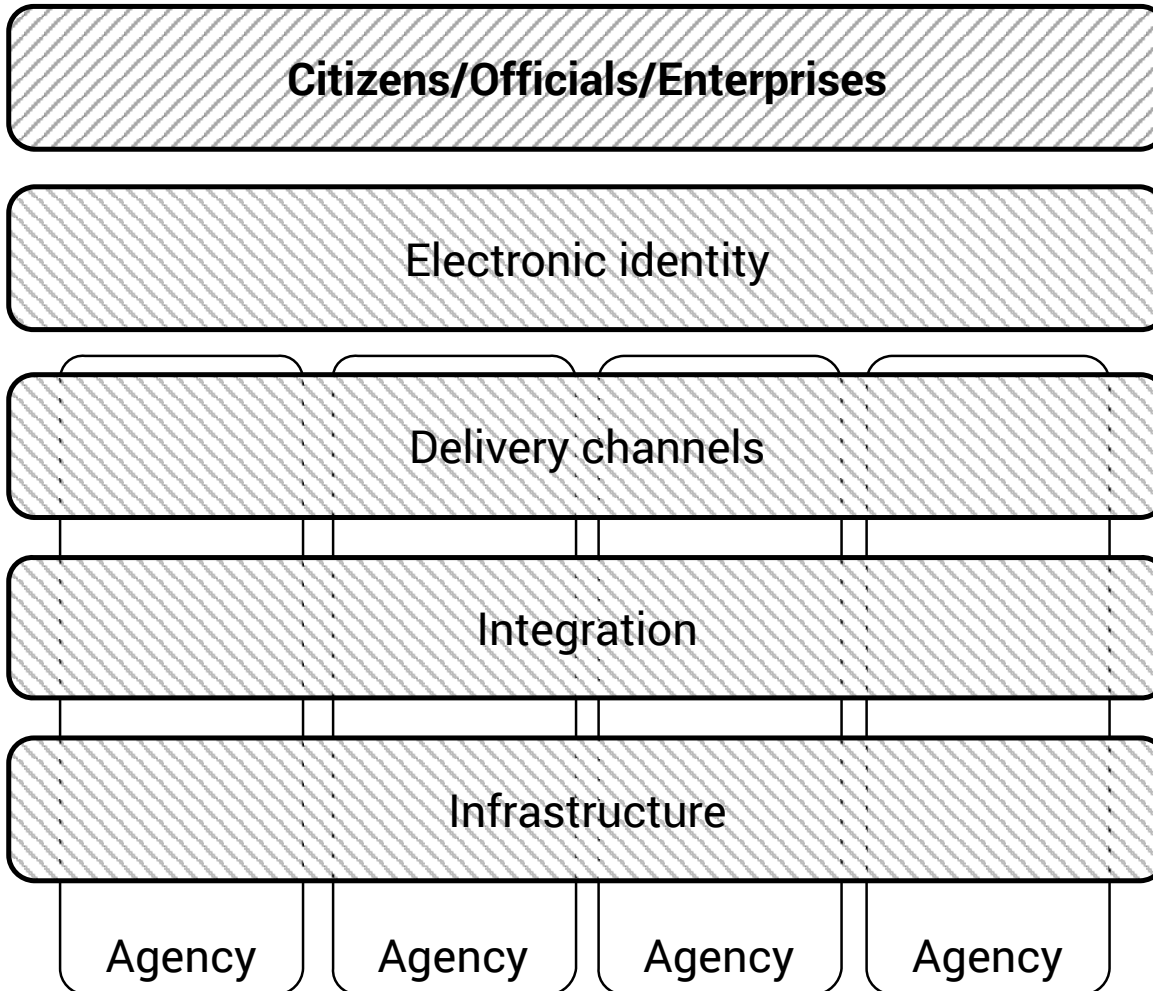
Meta-architecture. Function

- Provide a holistic view covering the entire system in question
- Apply in a wide variety of international settings
- Have a right level of abstraction allowing for addition or removal of detail as need be
- Be usable as a communication tool for non-technical decision-makers

Meta-architecture. Concept

- How to relate the technical architecture to an unknown functional architecture?
 - The framework must be compatible with a wide range of differences between countries and be able to respond to democratic change
- Establish a set of defining functional issues which the technical decisions depend on
- Three main axes to focus the questions
 - Centralization. How centralized is the system in question?
 - Privacy & security. What are the relevant security- and privacy policies?
 - Diversity. What is the level of diversity in the solution space?

Meta-architecture. Form



Denoting the main focus of the framework.

The layers used to split the underlying architecture into manageable, technologically uniform parts.

Agencies as containers for the individual information systems.

The e-governance technical architecture framework

**What is it that we ended up
building and using?**

The electronic identity layer

- E-government services require a way to relate citizens to their portfolio of rights and obligations
- The questions
 - Who is the target customer? I.e. What can be assumed about the user?
 - What is the legal significance of electronic identification? Higher significance requires a more robust technical solution
 - What is the multiplicity relationship between legal and electronic identities? A citizen could have several electronic identities and shared electronic IDs could be conceived

The delivery channels layer

- A distinct set of solutions providing electronic access to the information systems of the agencies
- The questions
 - What is the diversity of channels across the services? I.e. what channels a particular service tends to be provided on?
 - What is the diversity of channels across the country? I.e. what is the total set of channels all the services make use of?

The integration layer

- The integration layer joins the information systems of different agencies allowing for sharing of data and functionality
- The questions
 - To what extent are services centralized between the agencies? Effectively, what is the feasibility of a centralized middleware solution?
 - What are the integration paradigms (e.g. document, data or service) used? This has a strong impact on the functionality of the middleware solution used.
 - How are privacy and data ownership regulated? Integration layer is a central point for any privacy policy implementation

The infrastructure layer

- All of the software described in previous layers needs servers and network infrastructure
- The questions
 - How tightly is the infrastructure consolidated? This question is mainly about physical infrastructure and networks
 - To what extent are platforms offered centrally? I.e. what is the cloud strategy in place?
 - What restrictions exist for the physical location of data? I.e. to what extent can off-shore infrastructure and platforms be used?

Technical architecture of Estonia

**Using the framework to describe the
technical architecture of Estonian e-
government**

Estonia. The electronic identity layer

- **PKI based on a smart-card picture ID**
 - A SIM card can be used as a secondary token
 - For authentication, federated bank-based authentication schemes can be used
- **The card is tied to a unique ID code of a person**
 - There is little information on the card but that code
- **Digital signature is legally equivalent to the physical one**
 - 2-3 digital signatures per capita given per month

Estonia. The delivery channels layer

- Web is the main service delivery channel for most widely used services
 - Mobile is not there yet
 - Branches are used for tailored or complex services
- In 2011, 94% of personal tax returns were filed via a web-based portal
- 120+ different contact points exist, centralization is low
 - Although a central service portal, eesti.ee, exists

Estonia. The integration layer

- A distributed enterprise service bus called x-road is used
 - Offers authentication of parties and secure transport
 - Communication happens peer to peer
- Use of x-road is compulsory for any intra-agency communication
- A central service discovery portal exists
 - Registration of any public information system is compulsory

Estonia. The infrastructure layer

- **The infrastructure is mostly dispersed**
 - Albeit most government networks having been consolidated
 - There is a large number of tiny hosting facilities with varying levels of quality
- **There is a readiness and a plan to move towards central platform offering**
 - Most agencies use virtualization extensively
 - A common set of non-functional requirements towards new systems is in place



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Thank you!

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