

Nationwide Components of Estonia's State Information System

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Estonian government agencies are all responsible for the development and maintenance of their information systems, and they must all keep in mind the general principles of the state's IT interoperability framework. In order to ensure interoperability and a multilateral approach toward public sector information systems, the public sector assumes responsibility for the development and maintenance of several central and nationwide components of these systems. These include the common single point of entry which is a part of collaboration among state information systems, as well as support systems which refer to agreements among state information systems and the relevant middleware.

INTRODUCTION

According to the principle of subsidiarity in the Estonian IT interoperability framework [1,2], each state agency is responsible for the development of its own information systems, but only in the context of the general principles of the state's IT interoperability framework. This framework, however, involves a move toward a multilateral approach under which several supporting components are to be created. This paper can be seen as a follow-up to [1], where a generalised overview of the principles of interoperability was presented.

There are two types of nationwide information systems which are developed and managed centrally:

- Common single points of entry which are a part of the collaboration among state information systems. Users of public sector information systems are interested not in the state information systems as such, but rather in the data that are contained therein. State information systems must work together in presenting a single system for all users;

- Support systems refer to agreements among state information systems and to the relevant middleware. As a general rule, support systems do not have meaning in and of themselves. These systems ensure interoperability and reuse of resources.

The establishment and development of nationwide information systems is co-ordinated by a government agency which is responsible for co-ordination in the relevant field. Responsibility for the functioning of the systems rests with an institution that is designated by the co-ordinating agency, or by a business which has been hired by the agency to do the relevant work.

The institution which is responsible for the co-ordination of state information systems administers the state's domains and portals, while use of these is organised by an agency or by a designated business. The agency which organises the use of portals and domains has the necessary computer resources to provide Web site hosting services for public sector institutions.

INTEROPERABLE PORTALS

Recommendations from the Web Content Accessibility Guidelines Working Group (WCAG WG) have to be observed when developing state portals (see <http://www.w3.org/WAI>). The requirements for Web content have been published at <http://www.riik.ee/kord> (in Estonian only).

In the public sector, institutional and thematic portals function in co-operation with the government portals www.riik.ee and www.eesti.ee. The following principles have been observed in the development of these portals:

- The content is preferably XML-based and reusable by any agency or individual in any information system;
- The XML format is preferred for data exchange, as opposed to the http or https protocol;
- The XML format is easily understandable and contains no "noise" – unnecessary tags or details;
- The XML format must be documented in a manner which developers can understand;
- The presentation layer is a separate application which communicates with the main application via XML texts, while also generating the HTML that is necessary for the user, or providing the interface in some other way (WAP, SMS, desktop solutions, etc.). Direct generation of HTML text which does not support adaptable semantics from the main application should be avoided;

- Portals must be designed so that content producers can use them in a database-based manner, while for ordinary users, they are generated in a static way;

- Portals must not be redesigned unless there is a clear and present need to add functionality;

- The tables of content and summaries of portals are presented not only in their usual visual design, but also as RSS or RDF feeds. Standard interoperability must be ensured among institutional/thematic portals, the citizen information portal <http://www.eesti.ee>, and the E-government portal <http://www.riik.ee>.

Government agencies maintain at least one domain and one Web site which are a part of their information systems. Data are generated into the Web server mostly from the operational information system of the agency, which ensures the dynamic updating and efficacy of the data. Information on static Web sites is generated from operational systems – the Web sites are added to the Web sever and are updated regularly. The principles for data acquisition are defined in the agencies' document management procedures.

THE RIIK.EE DOMAIN

The riik.ee and gov.ee domains are jointly administered by state agencies.

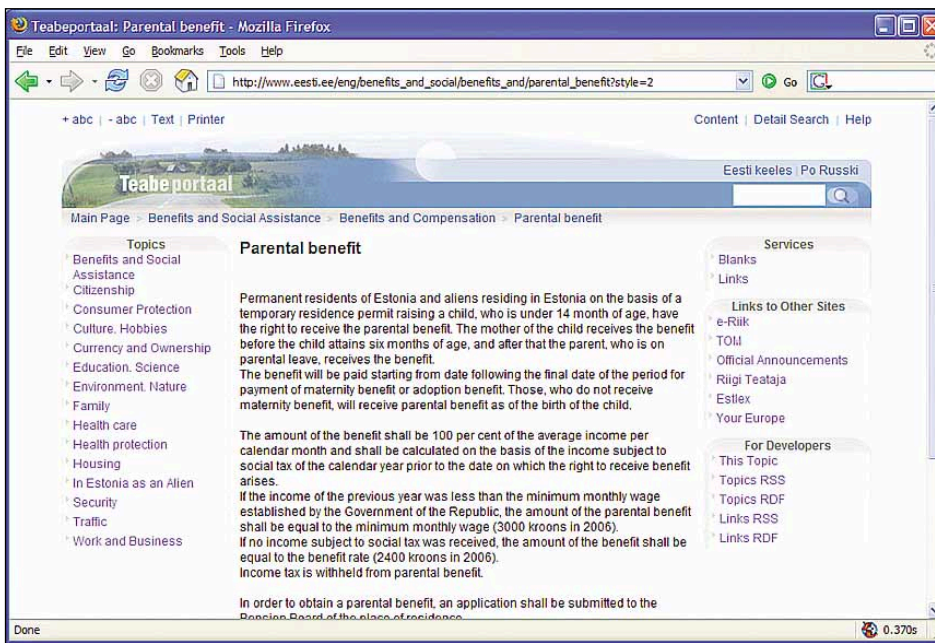


Figure 1. An article on the eesti.ee portal

All institutions have the right to create third-level domains. It is recommended that *riik.ee* domain names be used for Web sites which bring together several institutions in the same area of activity (e.g., *vanglad.riik.ee* is the domain for Estonian prisons), as well as for the creation of Web addresses for registers (e.g., *teeregister.riik.ee* for the Estonian Road Register).

The central element in the *riik.ee* domain is the single-point entry – the E-government portal www.riik.ee, which is based on collaboration among public sector institutions. This portal:

- Ensures access to information that is provided by constitutional institutions, as well as central and government agencies;
- Presents, in a balanced manner, the functions of all state institutions;
- Offers an English and a Russian version to provide a balanced and adequate overview of Estonia's state structures to the rest of the world.

The E-government portal functions with the following portals – the E-democracy portal *tom.riik.ee*, the government portal *valitsus.riik.ee*, and the prime minister's portal, *peaminister.riik.ee*. The portal enables search functions from all public sector Web sites.

THE EESTI.EE DOMAIN

The *eesti.ee*, *estonia.ee* and *eesti.info* domains are administered jointly by the relevant institutions. All institu-

tions can create third-level domains. The *eesti.ee* domain names must be used for thematic portals which are aimed at local residents (e.g., *euro.eesti.ee* and *euro.estonia.ee*). These domain names are also suitable for citizen Web sites that have been created by several institutions jointly – e.g., the *korruptsioon.ee* portal which has been created by the Interior Ministry and the Justice Ministry should have the name *korruptsioon.eesti.ee*.

A central element in the *eesti.ee* domain is the information portal <http://www.eesti.ee>. This portal is universally available and contains information about the rights and obligations of Estonian citizens, as well as the services which are provided to them by public sector institutions. This information is relevant both for permanent residents and for foreign residents who are interested in having a better understanding of the Estonian way of life.

The information portal ensures access to information from state institutions which covers the entire life cycle of individuals, and this information is arranged in thematic fields (Figure 1). Hoping to avoid chaos in the content of the portal and to ensure that information can be found easily, the portal's editors have mapped out the various fields of life, elaborated the structure for presenting information, and organised the initial drafting of texts in-

tended for the portal in a centralised way so that duplication can be avoided. Institutions are required to notify the portal's editors about any changes in their area of operations so that the information on the portal can be constantly updated.

Government agencies monitor information in their area of administration on the *eesti.ee* portal and, if necessary, submit proposals on updating it. Materials from the portal can be freely downloaded by all central and local government agencies so that it can be published on their own Web sites. The information portal is linked with the so-called citizen portal. Central and local government agencies can use the E-service environment to communicate with local residents.

According to the EU's interoperability framework, all member states are expected to develop analogous portals in the next few years.

THE PERSONAL PORTAL [HTTPS://WWW.EESTI.EE](https://www.eesti.ee)

Upon authorisation, citizens can use the citizen portal as a personal and secure environment. The main components of this environment are the following:

- The secure E-mail area. Each local resident has his or her own E-mail address, which is recorded on the relevant citizen ID card and can be used to send signed and encrypted E-mail. The system does not, however, offer E-mailboxes to users. Each resident must declare an E-mail address to which mail is to be forwarded so as to redirect the content of the E-mail address that has been provided through the national ID card;
- The personal documents management system (Figure 2) allows people to fill in forms and then to forward them to the relevant institutions. The institutions process the forms and report the results to the personal document management system from which the form has been submitted. People can trace the development of their issue through various institutions. No user is allowed to monitor any other's case;
- The direct services area allows people to survey the data which the government has collected about them.

They can also receive E-services which do not involve specific institutions. Direct services are produced through the X-Road system;

- There is an area for notification services (breaks in electricity or water deliveries, expiration of a period of validity, etc.);

- The secure document area allows users to sign documents and forward them. These facilities are based on DigiDoc software which was developed by the Centre for Certification and financed by the private sector via the "Look@World" project.

Public sector institutions are obliged to provide E-services which require authentication and are targeted at citizens and the private sector (express services, notification services, etc.) via the citizen portal. Links to the citizen portal must be available on the Web sites of the various institutions.

INTEROPERABLE DOCUMENT MANAGEMENT SYSTEMS

The interoperability of document management systems refers to the ability of these systems to exchange and manage digital documents. Document management systems exchange information without the use of paper and ordinary postal services. The systems cover processes related to the use of network services and the processing of network services which are targeted at local residents and businesses.

A document repository has been created so as to ensure the interoperability of document management systems in central and local government agencies. All document management systems must interface with the central document exchange system. Additionally, all public sector document management systems must be able to communicate with the citizens' IT environment – to receive documents from residents and businesses and to respond to them. The ordinary Post Office is no longer needed, nor are scanners. Metadata documents are exchanged in the XML format.

Responsibility for the interoperability of document management systems has been assigned to the State Chancery and the Estonian National Archives.

INTEROPERABLE GEOGRAPHIC INFORMATION SYSTEMS (GIS)

The interoperability of geographic information systems means that the relevant services are easy to use, and digital maps are accessible to all authorised users and to other information systems.

The interoperability of public sector geo-information systems must be based on the principles of open standards:

- Conditions must be in place for the use of digital maps and spatial data together with data layers which are significant from the local or the administrative viewpoint;

- It must be possible for all agencies, businesses and residents to use digital maps which have been developed by the public sector on the basis of open GIS standards;

- It must be possible to use new geo-information data sources, to provide new E-services through open interfaces, and to add to existing E-services links related to geo-information services, all without any significant additional costs;

- Authorised use of data must be ensured (e.g., objects related to Category I of nature conservation are only accessible to authorised users).

A simple search mechanism must be ensured so that people can find information about the availability of spatial data and maps, their accessibility, their usage, and the conditions for their acquisition and use. A catalogue

service must be developed as to the availability of spatial data and the possible use of different map applications.

According to the trans-European INSPIRE initiative (<http://www.ec-gis.org/inspire>), which seeks to create a spatial information structure in the EU, new data sources must be added to the interoperable system of service providers. The principles of open GIS standards must be observed in the development of regional geo-information systems.

Responsibility for the interoperability of geo-information systems in Estonia rests with the Ministry of the Environment, which:

- Develops a map interface to the X-Road;

- Uses basic maps developed by the Land Board by making use of IT tools which are based on open standard;

- Co-operates with other relevant agencies to develop tools for the implementation of new spatial data layers.

THE ADMINISTRATION SYSTEM

The State Information System (RIHA) works to ensure the interoperability of public sector information systems and the reuse of technical, organisational and semantic resources. For service users, RIHA is a tool which makes it possible to:

- Obtain information about existing services and those which are still under development, as well as about service descriptions and the principles of service provision;

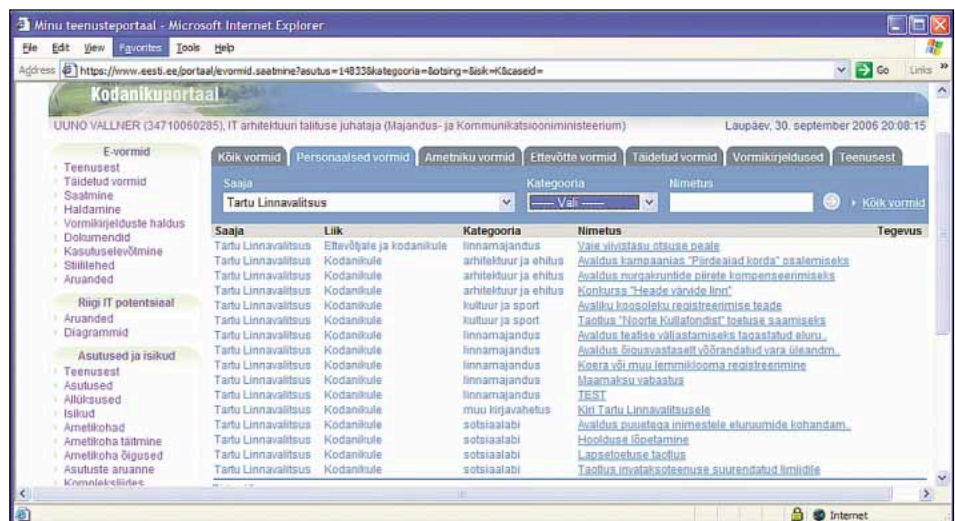


Figure 2. The personal document management part of the <https://www.eesti.ee> portal

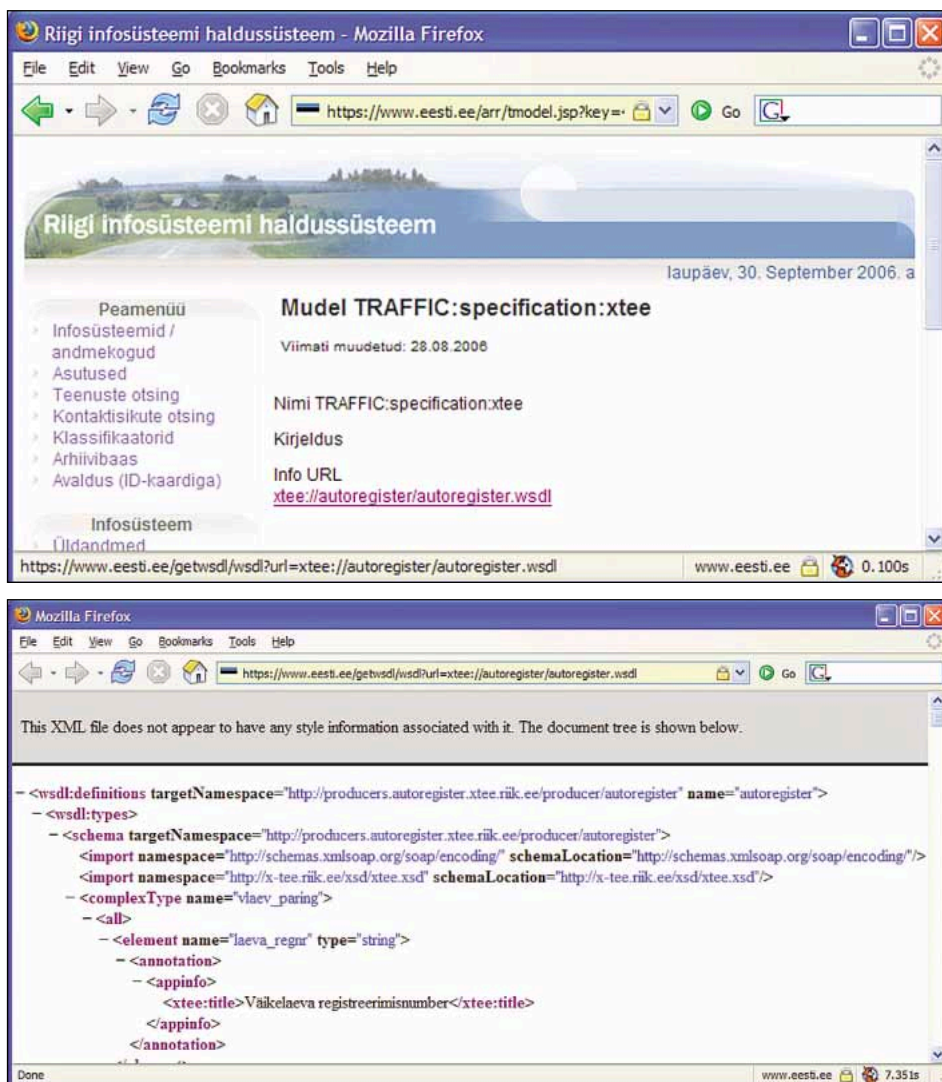


Figure 3. A view of RIHA (information about the Traffic Register) and a fragment from a WSDL description of a query about small tonnages

- Reuse services stored by RIHA in the WSDL (Web Service Description Language) format;
- Apply for the right to use a service;
- Propose the creation of a new service;
- Use data services in accordance with one's rights;
- Administer in-house access rights;
- Ensure legitimate use of data services.

For information systems administrators and service providers, RIHA is a support system in terms of their ability to handle the functions that are imposed on them by law. They can:

- Register information systems in RIHA;
- Connect to X-Road;
- Join an agency's information sys-

tem with X-Road;

- Maintain statistics about the use of an information system;
- Enter data about an information system and then change, correct and archive it;
- Describe services in verbal (text) and computer-oriented (WSDL) form;
- Describe the principles of service provision;
- Register services with RIHA (in the case of X-Road services, this is an automatic process);
- Ensure access to data services for authorised users;
- Register an information system's classifications with RIHA.

Private companies and local residents can obtain information from RIHA about the actual condition of the information system and about services offered by various state agencies.

They can also submit proposals to information systems administrators about the creation of new services.

For the Ministry of Economic Affairs and the Department of State Information Systems in particular, RIHA is a supplementary instrument for co-ordination of state information systems.

For the Estonian Informatics Centre, RIHA is a tool for the development and administration of the X-Road data exchange layer, the state register of databases, and other support systems for the maintenance of databases.

For the Statistical Office, RIHA is a tool for the co-ordination of classifications and the administration of their metadata.

For the Data Protection Inspectorate, RIHA offers a support system for the supervision of personal data.

SUPPORT SYSTEMS FOR DATABASE MAINTENANCE

Support systems for the maintenance of state information systems ensure their horizontal interoperability. There are currently five support systems:

- **The classifications system:** In order to understand processes and to categorise data in information systems in a standardised way, data must be classified and tagged. The use of classifications facilities facilitates the unification of data, enabling information exchange among information systems (data providers and data receivers) and allowing for a comparison and analysis of the published data. The Statistical Office serves as the co-ordinating agency here, supervising the establishment, administration and functioning of classifications systems. The use of established classifications is mandatory for all central and local government information systems.

- **The system of address details:** The system of address details defines a set of common principles which ensure the unique identification of address objects in terms of their location and the different information systems which are used. This makes it possible to compare addresses that have been submitted at different times and on the basis of different principles. The system

of address details consists of information systems which process and handle address details, the requirements for the chief processors of address details, the services and their users, as well as address services. The processors of address details include the Land Board (objects to be entered on maps that are defined in the Land Cadastre Act whose location addresses are assigned pursuant to legislation), the Ministry of Economic Affairs and Communications with respect to construction, the Interior Ministry with respect to place names, the Road Administration with respect to national roads, and the National Heritage Board, which deals with cultural monuments that are not buildings.

- **X-Road – the data exchange layer of information systems:** X-Road allows information systems to use a common data exchange environment, a common set of interfaces, and a common authentication system. Adding an information system to X-Road saves money and considerably increases the efficiency of data exchange among state agencies and in communications between local residents and the state.

- **The geodetic system:** The geodetic system consists of the geodetic reference system, the system of plane rectangular co-ordinates, the height system, and the gravimetric system.

- **The system of security measures for information systems:** The objective of the system of security measures for information systems is to define an unequivocal procedure to specify the security measures, to determine security classes in relation to security requirements, and to select the security measures in accordance with security classes.

THE PKI INFRASTRUCTURE

The Public Key Infrastructure and the use of ID cards are regulated in Estonia by the Identity Documents Act and the Digital Signatures Act. Estonia's citizens began to receive their ID cards in January 2002, and the first digital signing occurred in October of that year. The ID card is mandatory for everyone in Estonia – both citizens and resident aliens.

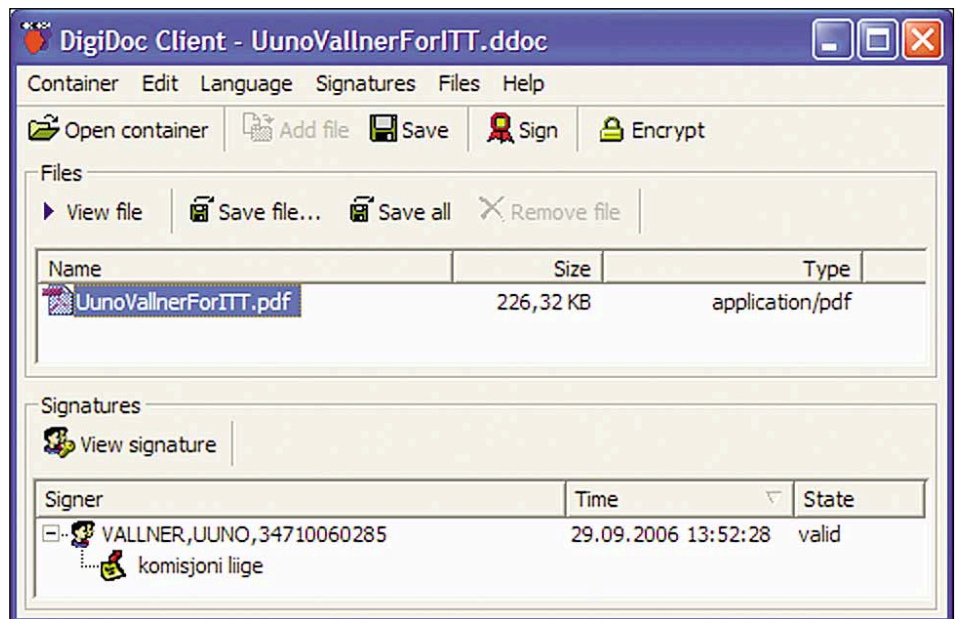


Figure 4. Signing of a document via DigiDoc Client

More than 80% of citizens owned a card in 2006.

The ID cards are issued by the Citizenship and Migration Board. The private sector is responsible for certification services. The Ministry of Economic Affairs and Communications is responsible for the digital signature infrastructure. Use of the PKI infrastructure is free for citizens – they don't pay for certificates or for the presentation and validation of a digital signature.

The EU directive 1999/93/EC, "On a Community Framework for Electronic Signatures", defines requirements as to the digital signature and certification service providers. The directive covers several categories of certification and digital signatures. The Estonian ID card and digital signatures with the use of the card are in line with the strictest of these requirements – advanced electronic signature, secure signature creation devices, a qualified certificate, a certification service provider to issue qualified certificates).

The primary application which is available at no charge for ID cardholders involves two secure signing portals – DigiDoc (<https://digidoc.sk.ee>) and a personal portal (<https://www.eesti.ee>). In addition to these portal technologies, a programme called the DigiDoc Client has been developed. It makes it possible

to check the signing and signatures in a user's computer (Figure 4). Because the signed file format is also a file in a fixed format, it can be used without affecting daily work processes. Most documents are drafted electronically anyway, and now it is possible to sign them digitally. Signed documents can be sent by E-mail and downloaded to a document management system. If only paper documents have been stored in the past, attention today is devoted more to the storing of signed files. Documents are delivered more quickly, and the cost of the delivery and storage of documents has been slashed.

A digitally signed document can be opened without any specific software and without an ID card by using the portal for checking digital documents (<https://digidoccheck.sk.ee>). Detailed information and necessary software are available free of charge on the ID card information portal (<http://www.id.ee>, in Estonian and English). □

REFERENCES

1. Vallner. U. "The Estonian IT Interoperability Framework", *Baltic IT&T Review*, No. 2 (41), 2006.
2. "Estonian IT Interoperability Framework. Abridgement of Version 2.0", Ministry of Economic Affairs and Communications, Tallinn, 2006. See <http://www.riso.ee/en/information-policy/interoperability>.