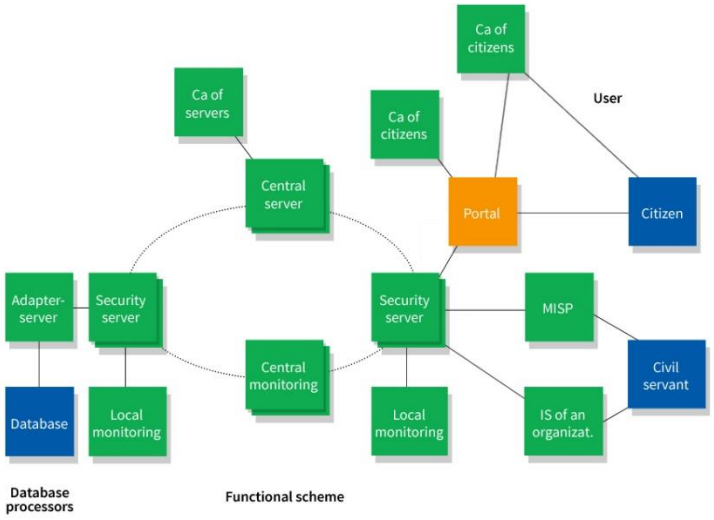
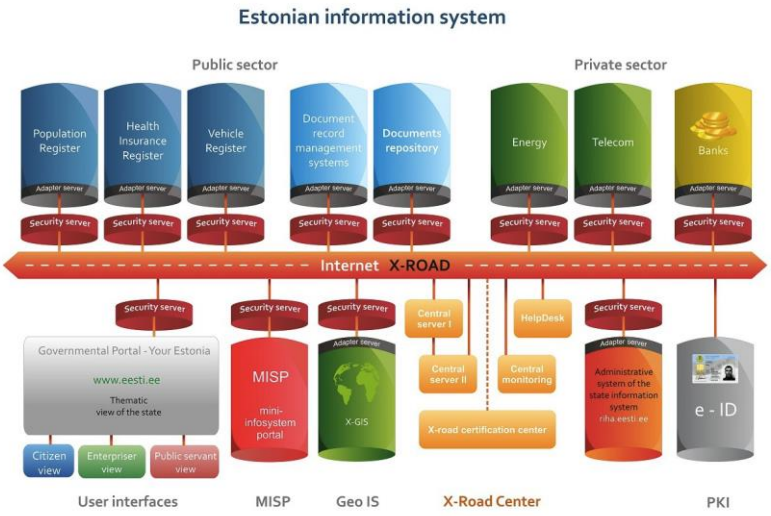
[EE03] X-Road

X-Road			
Summary			
ID	EE03		
Initiative	Estonia		
Short description	X-road is a platform independent data exchange layer that enables secure Internet based data exchange. The system ensures sufficient security for the treatment of queries made to databases and responses received. The X-road infrastructure consists of software, hardware, and organizational methods for standardized usage of national databases. X-Road Europe has a complex security system: authentication, multilevel authorisation, a high-level log processing system and encrypted data traffic with time stamps. These security solutions ensure that all information systems connected to the environment are identified, access to services is regulated and data traffic is saved and provable. Besides being a technical environment, X-Road Europe is also a regulatory and organisational environment. It enables secure and standardised data exchange.		
Owner	RIA / Cybernetica		
Contact	Hannes Kiivet hannes.kiivet@ria.ee	Liina Areng liina.areng@ria.ee	Cybernetica AS info@cyber.ee
Type	Service		
Sub-Type	Infrastructure		
Context	Cross-sector, Cross-Border		
Base Registry type	All		
Operating model	**How does X-ROAD work?** The security of X-Road is guaranteed by its architecture together with regulatory, organisational and technical measures – data transactions between service providers and users occur directly between secure servers using encryption. In the X-Road environment, encrypted data are directly transferred through secure servers from one information system to another. Data does not pass through the X-Road centre and cannot be viewed there. The centre only has statistical information about data transfer. The X-Road central server issues certificates to secure servers and provides a list of trusted certificates to systems connected to the X-Road. Additionally, the central server accepts log hashes from secure servers so that if needed, a		

	chain of service usage can be constructed later. In this case, the service provider's log, the service user's log and the central server's hash are compared. This method allows for checking the integrity of secure servers' logs, as it is impossible to change a log without it being detectable later. Service users' groups are described in the central server, so that service providers could open services to groups as well. **What do I need to do to connect to X-ROAD?** X-road is simple, easy-to-install. Only a few components are needed to connect data system to X-road: • A virtual physical secure server has to be installed for using X-road and exchanging data. The secure server's software also includes a local monitoring system. • If a member of X-road wants to interface X-road with an existing information system, they have to develop a software adapter server on a development platform of their choice. • The service provider creates services in their adapter server that it will start offering to others over X-road. Opening the services for other members of X-road is done in the service provider's secure server. • The service user creates a solution in their adapter server that connects the service provider's open web services to their own information system. • Mini Information System Portal (MISP) software can be adopted for using the service. This is a simple user interface that has mechanisms for user authentication and authorisation, MISP software is meant for the usage of services available on X-road.
IPR	**X-road is developed in the spirit of Openness** • X-road is developed from freeware components. • A common protocol and the independence of development platforms – Information systems developed on any development platform can be interfaced with the X-road secure servers. • Data exchange on the public Internet – X-road does not require a separate network or a VPN. All data exchange is conducted over the public internet and is encrypted with SSL. RIA is working towards making **X-Road EU** base structure software available under the EUPL **license.** Technical documentation and information is already available as well as test bed environments for developers at https://www.ria.ee/x-road-europe-en/ **//** https://www.ria.ee/x-road-environment-parameters/ **.**
Status	Operational
More details	

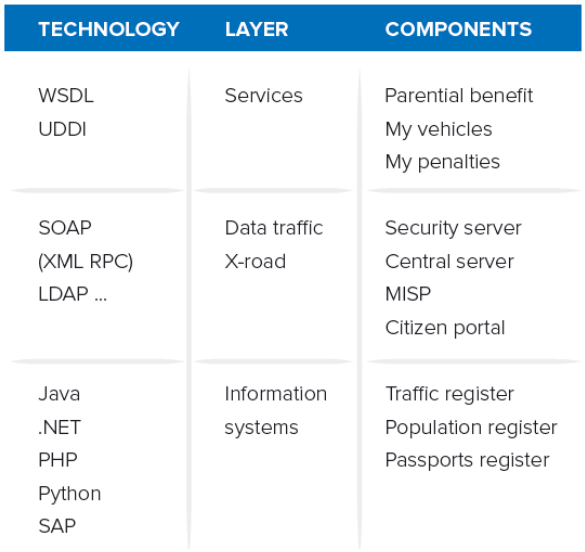
Aggregated business need	ABN – 8 Need for a technology solution enabling the data exchange
Functionalities	**Example of Services on X-ROAD** X-Road enables a wide range of otherwise complex services to be offered quickly and conveniently. Some of the examples: • Presenting a registration of residence electronically; • Checking one's personal data (address registration, exam results, health insurance, etc.) from the national databases; • Declare taxes electronically; • Check the validity of your driving license and vehicles registered to your name; • A new-born child receiving health insurance automatically. X-Road is particularly suitable for queries involving multiple agencies and information sources. In Estonia, the checking of a vehicle's data, for example, has become quicker for the Police and Border Guard Board: • Before X-Road: 3 police officers + 20 minutes = 1 car background checked • With X-Road: 1 police officer + 2 seconds = 1 car background checked 



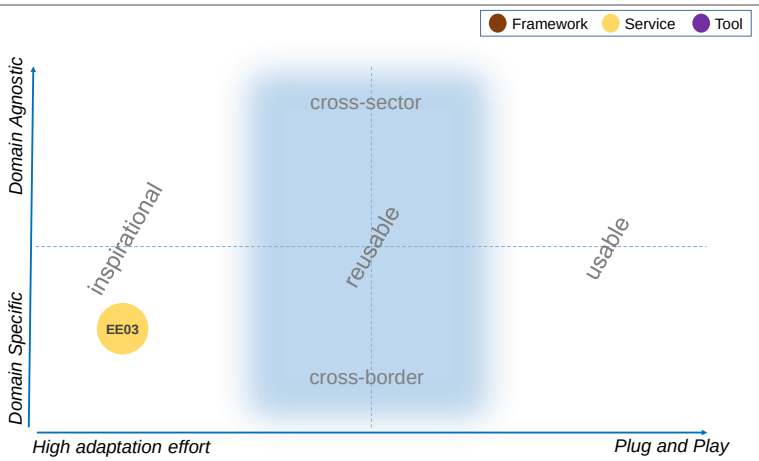
Requirements and Integration modes

SECURITY X-road uses a versatile security that employs authentication, multilevel authorisation, a high-level log processing system, encrypted and time-stamped data traffic.
• Authentication and authorisation of parties – secure servers authenticate parties on the basis of certificates that are located in the central server.
The certificates are created by the certification centre, which guarantees that the certificate owner is who it claims to be. Once the parties have been authenticated on the basis of information available from the central server, authorisation is carried out in the secure server. Data owners maintain control over who can access their data: each organisation can determine the services that are open to another party. The administrative interface of the security server allows a complete freedom in specifying different access for different parties. When a query is made to the secure server, the availability of the service described in the query for the organisation is checked.
• Data protection – In the X-road environment, encrypted data are transferred directly through secure servers from one information system to another. Data does not pass through the X-road centre and cannot be viewed there.
• Monitoring – Secure servers log the data traffic between themselves and only send a log hash to the central server, so that later it is possible to compare the logs of both secure servers and the central server's hash in order to prove the usage of data.
• Distributed architecture – As a result of X-road distributed architecture, individual data transactions do not rely on a central server, presenting no single point of failure.

Design/Architecture	**General Architecture of X-ROAD** • Distributed architecture (no SPOF) • Properties – data integrity, authenticity and authentication, encryption, reliable, verifiable, scalability and availability • Neutral – using X-road must not change systems FURPS settings level • Two-level authorization model • Loosely coupled services – transparent to data models, database/system management technologies and usage patterns • XML-based **X-Road is secure, reliable and simple** The X-Road system uses the concept of digital signatures and contains its own Public Key Infrastructure (PKI) that guarantees confidentiality, integrity and traceability of the exchanged data. X-Road is designed to satisfy the security requirements of the inter-organizational communication by ensuring the authenticity, integrity and non-repudiation of exchanged data, high availability of services, confidentiality of exchanged data. Implementation of X-Road is extremely straightforward from organization information system side. All you need is support for web-services – in fact X-Road is just transparent and secure layer connecting different services in different systems. There is no central gateway or hub in X-Road. All connected organizations could communicate directly. This kind of architecture makes system more secure and reliable – no single points of failure or attack exist.
Technologies	Programming language: J2EE

	
Specifications	XML
Management	Not Available/Not Found
Governance	Not Available/Not Found
Sustainability	Cybernetica maintains the software and also provides technical implementation services and eGovernment interoperability implementation consulting
Documentation	https://www.ria.ee/x-road/ http://cyber.ee/en/e-government/x-road/ http://cyber.ee/uploads/2013/03/cyber_xroad_NEW2_A4_web.pdf http://x-road.ee/docs/eng/x-road_service_protocol.pdf
ADMS	https://joinup.ec.europa.eu/software/x-road/home
Current Users	Estonia, Azerbaijan, Finland
EIRA	
View	Technical View - Application
Building Block	Application Service
Reusability	

Landscape



Criteria