DG DIGIT

Unit.B2 (Interoperability & Digital Government Unit)

Open Source Software Country Intelligence Report

Estonia

2025

This research by OpenForum Europe, was carried out for the Interoperable Europe initiative of the Digital Europe Programme under the Specific Contract 300097569 FWC DI 07929-00 BEACON Lot 2 with the consortium DELOITTE CONSULTING & ADVISORY, WAVESTONE. The report provides an overview of open source software (OSS) in Estonia as of February 2025 and is based on publicly available information that was gathered through desk research. This report has been enriched with the kind contribution of Ville Sirviö, CEO, Nordic Insitute for Interoperability Solutions.

Authors

2025 version	2020 version (Wavestone)
May Janin (euteam@openforumeurope.org)	Federico Chiarelli
Axel Thévenet (axel@openforumeurope.org)	Vivien Devenyi
	Debora Di Giacomo
	Barbora Kudzmanaite
	Clare O'Donohoe
	Eleonora Zoboli

Contact OSOR

EU-OSOR@ec.europa.eu

https://interoperable-europe.ec.europa.eu/collection/open-source-observatory-osor

@InteroperableEU

Disclaimer

Updated in February 2025

Table of Contents

Estonia

Executive summary

Estonia, one of the world's most digitally advanced countries whose public services have been fully available online since 2024,[1] has increasingly turned towards open source software (OSS). In a digitalisation plan published in 2021, the government introduced the principle that all taxpayer-funded software should be released under an open source licence.[2]

Open source and interoperability have long been the backbone of Estonia's e-government development. Since 2001 the X-Road initiative, or X-tee for its Estonia-only development, has enabled the secure exchange of information between different branches of the country's public services. Through X-Road, open source is also a core element of Estonia's digital diplomacy efforts to encourage the development of reusable and interoperable 'Govstack' modules. Estonia joined with Finland in 2017 to create the Nordic Institute for Interoperability Solutions, which oversees the open source development of X-Road. Other key elements of Estonia's e-government development efforts, including eID and eVoting, have also been developed using open source.

In recent years the government has developed open source AI modules for public services as a key objective of the national AI strategy known as Kratt[3] – in reference to an Estonian mythological creature. As part of this strategy, Estonia was the first country to launch an open source AI chatbot to provide around-the-clock access to public services information and services: Bürokratt.

[1] e-Estonia: Story
[2] Estonia Digital Agenda 2030
[3] New e-Estonia factsheet: National AI "Kratt" Strategy

Actors

This section presents the key governmental bodies and strategic players influencing awareness and uptake of OSS within Estonia's government and the public sector.

Policymakers

- The Ministry of Justice and Digital Affairs (Justiits- ja Digiministeeriumiks)[4]: In 2024 the Estonian Parliament approved an amendment to the Government of the Republic Act, transferring all responsibilities linked to e-government and the development of digital society – including online public services, state information systems, and cybersecurity – to the newly formed Ministry of Justice and Digital Affairs. This new ministry began work on 1 January 2025, with several government agencies related to digitalisation coming under its remit, including the Information Systems Authority. This merger of the legal and digital aspects of Estonian society was intended to protect people's fundamental rights in the face of "rapid digital development". Previously, the development and promotion of the digital public sector and information society were under the auspices of the Ministry of Economic Affairs and Communications, including through the e-State Development Department[5] and the Information Society Services which maintained a GitHub page.[6]

- The Information System Authority (Riigi Infosüsteemi Amet – RIA)[7]: RIA is the national competence centre responsible for managing the technological infrastructure underpinning Estonia's e-government system, arising from the merger and evolution of different institutions including the Estonian Informatics Fund established in 1990. RIA has existed in its current form since 2011 and is one of the main agencies in Estonia providing ICT support for the public sector. RIA is managed by the Ministry of Justice and Digital Affairs[8] and is responsible for the implementation of the Estonian Digital Agenda 2030[9] in the areas of digital public services and cybersecurity[10]. Core to RIA's responsibilities are X-Road / X-tee[11] (see below), eID and eVoting, which are all partially or fully based on OSS. RIA is active on GitHub.[12]

- e-Estonia[13]: The e-Estonia centre is the window to showcase Estonia's success with digitalisation and e-government, and as such plays a key role in Estonia's digital diplomacy efforts. It acts as an information and advisory centre for private entities and governments wishing to learn more about e-Estonia. Though e-Estonia's website does not directly mention open source, a number of the milestones listed on its page on "the story of the world's most advanced digital society" are based

[4] Ministry of Justice is now the Ministry of Justice and Digital Affairs
[5] Information System Authority
[6] Information Society Services - GitHub
[7] Information System Authority
[8] RIA - Task and Structure of the Authority
[9] Estonia Digital Agenda 2030
[10] RIA Strategy 2021-2025
[11] RIA - Introduction of X-Tee
[12] Estonian Information System Authority - GitHub
[13] e-Estonia

on open source or related to open source governance, e-ID and digital signature, i-voting, and the NIIS / X-Road initiative.[14]

Strategic players

- Alvatal[15] is a free and OSS association which unites Estonian companies, non-profit associations, and volunteers with the aim of ensuring transparency in their use of software and hardware. Several government bodies have partnered with Alvatal to support their activities. Alvatal was mostly active in the educational sector and has implemented various pilots on cloud computing, desktop migration, and the use of different OSS applications.

- Nordic Institute for Interoperability Solutions (NISS)[16]: NISS was founded jointly by the governments of Estonia and Finland to collaborate on the development and management of X-Road, the interoperable data exchange system initially developed by Estonia.[17] NIIS is responsible for the technical maintenance of X-Road and is also a "network and cooperation platform" for the different governments using it. As of February 2025, Iceland is also a member of NISS, with Ukraine, the Faroe Islands, and the Government of Åland having partner status. NIIS has its own internal IT resources including a Chief Technology Officer but also coordinates code contributions to X-Road, including through a public programme for coding funded by its three member governments. Since 2015-2026, NIIS maintains the GitHub page for the X-Road source code repository.[18]

Policy and legal framework

This section summarises the main digital and public services policies relating to open source software in Estonia, including landmark strategies documents and implementation frameworks. The list is presented in a chronological order, starting from the most recent milestone.

- Digital Agenda 2030, 2021[19]: The latest version of Estonia's digital agenda lays out a long-term plan to achieve the objectives of the broader Estonia 2035 strategy through digital technology. The Digital Agenda lists the development of digital government as one of its core objectives, with a focus on user experience and sustainability of digital government applications. There are multiple references to open technologies and open standards in the Digital Agenda, for example that "open standards and solutions based on them" are preferred for the digitalisation of Estonia. The use of OSS is also listed as a key result to be achieved in relation to open innovation and govtech development. Specifically, the Digital Agenda states that software developed with taxpayers' money

[14] e-Estonia - This is the story of the world's most advanced digital society
[15] Alvatal
[16] Nordic Insitute for Interoperablity Solutions
[17] History of NIIS
[18] NIis / X-Road, GitHub
[19] Estonia Digital Agenda 2030

and under the public sector's intellectual property (IP) should be published under an open source licence, unless there are concerns for national security. The focus on developing an AI government also further anchors OSS in Estonia's e-government strategy. As of February 2025, the main e-government AI applications developed in Estonia, such as Bürokratt, are open source (see more in the next section).

- Amendments to the Estonian State Property Act, 2021[20]: Aligning with the Digital Agenda 2030 objectives outlined above, this amendment lays out the rules for open source software development by the public sector. It specifies what information is required by the developing authorities when making software publicly available, including a description and the conditions of its use. The amendment also specifies that when only parts of the software are owned by the Estonian government, these still fall under the open source requirement.[21] This amendment builds on the previous legislative framework, including the Interoperability Framework of the State Information System (2011) which favoured open source alternatives for the public sector but did not mandate it.[22]

- AI Strategy 2022-2024[23]: The 'Kratt' strategy[24] is under the responsibility of the Ministry of Justice and Digital Affairs and builds on the previous 2019-2021 national artificial intelligence strategy.[25] It outlines the planned activities to increase the development and use of AI in Estonia, for the public and private sector. Practically, the AI strategy plans to develop open source AI components by setting targets for the public sector to adopt and publish open source AI modules – including in reference to the targets and results achieved under the previous 2019-2021 strategy. The country's AI Task Force is currently preparing an updated strategy for 2024-2026.[26] This commitment to developing open source AI modules for e-government has been interpreted by commentators as Estonia building the "AI gov Stack".[27]

- RIA Strategy 2021-2025[28]: The implementation strategy for the Information System Authority, the RIA strategy is based on the Digital Agenda 2030 and focuses on building out Estonia's ambitions for developing the digital government and cybersecurity. While RIA is responsible for developing a number of e-government open source applications including X-tee and Bürokratt, the RIA strategy does not refer to open source software.

[20] Amendment to the Estonian State Property Act - Riigivaraseaduse muutmise seadus
[21] Open Source Observatory (2021), New Estonian law requires administration to make state-owned software publicly available
[22] See:
Interoperability Framework of the State Information System, version 3.0, 2011;
and Vallner Uuno X-tee), The Estonian IT Interoperability Framework, in *Baltic IT&T Review #41*;
[23] Estonia's National Artificial Intelligence Strategy or Kratt Strategy for 2022–2023
[24]The name of the AI strategy, "Kratt" refers to a magical creature in Estonian's mythology that would do menial labour and tasks for its master. See: New e-Estonia factsheet: National AI "Kratt" Strategy.
[25] Estonia's national artificial intelligence strategy 2019-2021
[26] Kratid - Vision and Strategy
[27] Flinders Karl (2022), Estonia is Building the AI Gov Stack, in *ComputerWeekly*
[28] RIA Strategy 2021-2025

- National Interoperability Framework of the State Information System, 2011[29]: The framework outlines the rules for compliance when public sector institutions are developing information systems. A chapter in the document is dedicated to software and specifications on interoperability and OSS. In the context of the Framework, the public sector must take into consideration alternatives such as open specifications, standards and software: "Public sector institutions should follow the principles of openness when developing the architecture of their information systems and procuring software." If a decision is taken to use proprietary software, it must be suitably justified. Furthermore, when procuring software, OSS alternatives must be taken into account.

Open source software initiatives

This section presents an overview of the main open source software-related initiatives in Estonia. The list is presented in a chronological order, starting with the most recent initiative:

- X-Road / X-tee, ongoing, 2001-onwards[30]: X-Road is an open source data exchange launched by the Estonian government in 2001 to provide the public sector with a standardised and secure way to exchange information between its various departments and systems. X-Road was initially developed on a closed model, but after a pilot introduction of the project in Finland and the United Kingdom led to a long-term collaboration between Finland and Estonia, an open source licence was chosen in 2014.[31] Open source has since allowed X-Road to expand, including into other countries. While the name X-Road is used to refer to the initial open source software for data exchange, it is adapted and used under a different name in each country where it is adopted. As such, X-Road is maintained by NIIS, but has been developed as X-tee[32] in Estonia where it is maintained by RIA.[33] Both X-Road's[34] and X-tee's[35] codes are publicly available online.

- Open Source AI investment, 2023[36]: Aligning with the Kratt - AI Strategy, the Estonian Ministry of Foreign Affairs announced a €20 million budget for investing in open source AI building blocks. The announcement was made during a session on digital public infrastructure at the 2023 United Nations SDG Action Weekend. This open source AI investment acts on Estonia's commitment to build the AI govstack in collaboration with international govstack initiatives.

- Veera disainisüsteemist, 2023[37]: The Veera Design System and Styleguide was launched in 2023 to streamline the appearance of the different online public services in Estonia, offering a harmonised experience with additional readability functions. The Veera design is also meant to facilitate the development of online public services by offering base HTML and CSS elements, and all

[29] National Interoperability Framework of the State Information System
[30] X-Road
[31] X-Road - Global History
[32] X-tee
[33] RIA - Introduction of X-tee
[34] X-Road - GitHub
[35] X-tee catalogue
[36] Open Source Observatory (2023), Estonia invests €20 million into open source AI
[37] Veera disainisüsteemist

components have been designed in consideration of the EU Accessibility Standard. Veera is open source both on the development side and on the user interface side, with a full set of ready-to-use and ready-to-adapt user interface design systems publicly available.

- Data Anonymiser, 2022[38]: A sub-project of Bürokratt, this tool enables the anonymisation of sensitive information and named entities (such as names, locations, dates, personal ID codes) in any documents submitted. Data Anonymiser can be used by the public sector and other organisations to anonymise data for different purposes, including for publication. The tool is based on the "Named Entity Recognition" (NER) Corpora datasets developed by the University of Tartu, but can also be trained on new and specific datasets. Data Anonymiser is listed on the Kratt website.

- Bürokratt, 2021[39]: "The official AI based virtual assistant for Estonia", Bürokratt is an open source AI chatbot developed by RIA and the Ministry of Economic Affairs and Communications, among other agencies, to facilitate access to and smooth communications with Estonia's digital public services. Bürokratt aims to offer a user-friendly experience of engaging with digital public services and to provide 24/7 information on and access to public services. This open source AI chatbot has already been integrated by several public administrations and the government of Estonia continues to build on its functionality, including efforts to deploy it in other countries.[40] The source code for Bürokratt is available on GitHub[41] and the project has been recognised in UNESCO's list of the top 100 best AI projects in 2022.[42] Bürokratt is Kratt's main project.

- Kiirkirjutaja, 2021[43]: A speech-to-text recognition tool, Kiirkirjutaja was developed for the real-time subtitling of TV broadcasts and streamed media. It was designed first and foremost for the subtitling of Estonian language, and as such is inscribed in the Digital Agenda 2030's principle of preserving the Estonian language and culture. An example of a government press conference with live subtitles generated using Kiirkirjutaja can be found online.[44] Kiirkirjutaja is listed on the Kratt website.

- Kratid repository, 2021[45]: As part of the AI Strategy, the Kratt website offers a repository of open source AI components that have been developed and/or used by the Estonian public sector. The Kratt repository lists a number of open source solutions that align with the objectives and principles of both the AI Strategy and Digital Agenda 2030 regarding developing a user-centric e-government and preserving the Estonian languages, amongst other objectives. The source code of all applications listed on Kratt are available on Koodivaramu and/or GitHub.

[38] Data Anonymiser
[39] Kratid - The virtual assistant Bürokratt
[40] IRCAI Global Top 100
[41] Invest in Estonia - Estonia's Bürokratt, a concept of how state could operate in the age of artificial intelligence
[42] IRCAI Global Top 100
[43] Kiirkirjutaja
[44] Kiirkirjutajaga tehtud reaalajas genereeritud subtiitritest
[45] Kratid - Reusable AI components

- TartuNLP Neurotõlge, 2020[46]: A natural language processing (NLP) translation tool, Neurotőlge is designed to improve the translation of Estonian and all Baltic languages. It supports 30 languages, including several small ones from the Finno-Ugric family. The tool is available online but can also be placed into a specific environment. The source code is available on Koodivaramu.[47] As Kiirkijutaja, TartuNLP Neurotõlge is aligned with the principle of preserving the Estonian language and is listed on the Kratt website.

- Koodivaramu, 2019[48]: The Estonian code repository for open source software, providing access to all the open source solutions developed by the public sector, Koodivaramu includes a publicly accessible repository as well as a protected one that is for now only accessible to individuals with an Estonian eID. As part of continuous shifts towards open source and reusable modules, the Estonian government plans to further develop Koodivaramu to provide full public access to all OSS.

- TEXTA Toolkit, 2017[49]: TEXTA Toolkit is an AI text-processing analytics software to support text data organisation - from extracting information to classifying texts and building metadata systems to perform audits. Though not developed by the Estonian government, TEXTA Toolkit has been used for a number of public services projects, including those related to the European Regional Development Fund, and by the Ministry of Education and Research to conduct a document management audit.[50] TEXTA Toolkit is listed on the Kratt website.

- Open Tartu, 2016[51]: The Smart and Open City of Tartu project began in 2016. The team scrapes information from the Tartu City document registry and presents it in a user-friendly manner for citizens and city officials. Citizens are given the opportunity to participate in the decision-making process by commenting on documents and attending meetings in order to give feedback.

- CitizenOS, 2015[52]: CitizenOS is a space where citizens can exchange knowledge and ideas about e-democracy and collectively overcome challenges while making use of innovative technologies. The platform can be used to start citizen initiatives and send them to the Estonian Parliament. The source code of CitizenOS is open source.

- Software Freedom Day, 2014[53]: In 2014, Alvatal and the State Information Systems Board organised a Software Freedom Day at the National Library of Estonia. Several presentations at this event focused on the use of OSS in education and in public administration.

[46] TartuNLP Neurotõlge
[47] Koodivaramu - TartuNLP Neurotõlge
[48] Koodivaramu
[49] Texta - Toolkit
[50] Texta - Blog
[51] OpenTartu - GitHub
[52] Citizen OS
[53] Software Freedom Day 2014 Tallinn, Estonia

- i-Voting, 2005[54]: The Estonian government has developed an eVoting system. It has published the source code for the electronic voting software, the control application, the mixing application, and the audit application. The latest updates are released on GitHub.

- ID card and mobile ID, 2001[55]: In 2001 the Estonian government, together with private-sector banks and telecom companies, began developing the ID card and mobile ID which provide secure online identification and authentication. The architecture of the ID software was released for international usage and can be found on GitHub. It is also used for digital signatures, for which the underlying software, DigiDoc, is also available on GitHub. DigiDoc is used all over the world. It was developed by RIA, and it allows users to open digitally signed documents, check the validity of signatures, digitally sign, and encrypt data.

- e-Estonia - open source based (EUPL), 2013[56]: The source code of various government-financed IT systems is based on EUPL. This includes systems such as eHealth, ePolice, eJustice, citizen and business portals, eProcurement and eInvoicing, document exchange, and digital culture portals.

- Estonian Open Data Portal[57]: Through the Estonian state open data portal, everyone has unrestricted access to open data, together with the right to re-use and redistribute it. The Estonian portal uses CKAN, the open source data management system.

- TAAT[58]: TAAT is the Estonian Academic Authentication and Authorisation Infrastructure (Eesti haridus- ja teadusasutusevahelise autentimise ja autoriseerimise taristu). It enables electronic identities (user accounts) issued by education or research institutions to be used to access several web-based services. Users do not need a separate user account for each service, and can instead use their existing account and authentication system of their home institution.

[54] Estonia eVoting - GitHub
[55] iD.ee
[56] e-Estonia: open source based
[57] Estonian open data
[58] TAAT