



# The European Public Sector Open Source Opportunity

Challenges and Recommendations  
for Europe's Open Source Future

**September 2023**

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# Open Source In Europe's Public Sector

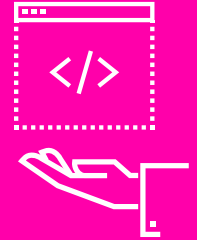
In digital transformation efforts, open source software (OSS) **increases transparency, reduces development costs, and enhances software security.**



By increasing transparency, **open source public services foster open government, enhance accountability, and enable scrutiny** from the public.



**Government organisations can nurture the OSS ecosystem** by participating in a Governmental Advisory Council, providing funding, or contributing code to projects.



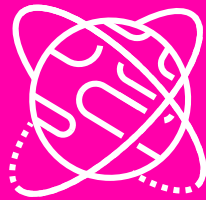
**Challenge:** There is still limited awareness among key decision-makers about OSS's value proposition.

OSS is a key enabler of **digital sovereignty**, as it facilitates greater control of IT systems and reduces vendor lock-in.



Open Source Programme Offices (OSPOs) and upstream contribution policies play a key role in facilitating contributions to the OSS ecosystem.

While championing digital sovereignty, **Europe should take an inclusive, global approach to OSS** that avoids regional fragmentation.

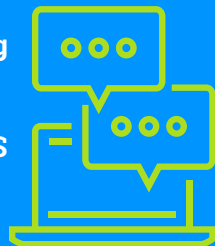


Outdated procurement processes, limited technical competences, and a lack of managerial buy-in are **preventing the public sector from realising the full potential of OSS.**

**Greater cross-sector coordination and expertise exchange** are needed to level up regional collaboration and supportive policymaking in Europe.



**Municipalities are increasingly collaborating** on the development, maintenance, and governance of shared OSS solutions for common business needs.



**Expanding the number of regional and national OSPOs in Europe will help to streamline open source operations and amplify open source activities in the public sector.**



Following in the footsteps of Germany's Sovereign Tech Fund, among others, governments should establish funding mechanisms to support the maintenance and sustainability of open source digital infrastructure.



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## Foreword

When I stood on the keynote stage in Dublin less than a year ago to launch Linux Foundation Europe, I committed to building a data-driven organisation focused first and foremost on learning the priorities of the European community and, in turn, supporting collaboration across the diverse constituents of this ecosystem, whether they be individual or corporate contributors or members of the public sector.

And while, through years of running collaborative projects, foundations have generally figured out how to balance corporate and individual contributors, having spent the better part of the last decade building FINOS, a global open source community in one of the most regulated industries in the world, it has become very clear that there's no blueprint for unleashing the still largely untapped potential of regulators and policymakers involved in the open source ecosystem .

In a year when software is becoming increasingly regulated in Europe, with legislation such as the CRA, PLD and AI Act, this realisation was the genesis for conducting an extensive set of interviews with a disparate group of European open source leaders to produce a report that explores the intricate relationship between open source and the public sector in Europe, hoping to draw a road map of sorts that hones in on the opportunity (and challenges) that this constituency faces to become not just a consumer or a regulator, but an active participant in open source projects.

This report is not just a compilation of data; it's a call to action. It's a call for Europe to lead the way in integrating open source into the very fabric of our society. The findings suggest that open source is not just a technological choice but a strategic one that can drive digital sovereignty, foster innovation, and build public trust. We're not just talking about software; we're talking about the software of democracy, the code that can rewrite the future of our nations and accelerate resolutions on some of the most important issues on a global scale. Europe has a unique opportunity to be the global vanguard in this arena.

We've seen the power of community-driven development, but let's take it a step further. Let's talk about community-driven governance. Imagine a Europe where citizens don't just use public services but contribute to them. Where the line between a public servant and a citizen developer blurs. That's the Europe this report envisions, and that's the Europe I believe we can build.

But let's not be naïve; there are hurdles on this path. First, there is the need for a cultural shift within public institutions and the importance of devising and implementing effective open source strategies and policies. This underscores the role of Open Source Programme Offices (OSPOs) in bridging the gap between policy and practice and the need for revising IT procurement processes to be more inclusive of open source solutions .

Regulation, often seen as a hurdle, can actually be a catalyst for innovation. As I've learned in the financial sector, regulation is one such double-edged sword: while it can give open source the legitimacy and maturity it deserves as a critical component of our core infrastructure, it can also become a bottleneck if not handled with care. Europe has the opportunity and responsibility to set the gold standard for regulating open source, ensuring it amplifies innovation rather than stifling it. We hope and believe this report can help in better understanding the dynamics of what is a fairly complex ecosystem.

One of the most pressing concerns this report indirectly touches upon is the risk of regional fragmentation or balkanisation, as open source becomes entangled in cross-regional geopolitics. Open source thrives on global collaboration, and any form of regional isolation only stifles its potential as well as the markets it creates. With the EU as a prime example of supranational collaboration, Europe can and should strive to set an example by fostering a unified open source ecosystem that transcends geopolitical boundaries.

Last is the elephant in the room: the security and sustainability of our ecosystem. As we integrate open source into the very fabric of our lives, we must ensure it meets the highest security standards. This isn't just an IT concern; it's a matter of national, even continental, security. As the report suggests, the public sector can and should play a major role in ensuring the continued sustainability of this ecosystem, first and foremost through consistent and strategic funding, but also by building the in-house capacity to consume and contribute, and by facilitating reuse through open source catalogues, guidance, and tools that can go a long way in this direction.

So, as you delve into this report, see it as a starting point for a broader, continent-wide dialogue—a dialogue that could shape the future of Europe. Dive deep into its implications. Challenge its conclusions. And then rise to answer its call. Let's use the findings of this report as a catalyst for action, for public-private collaborations, and for stewarding cross-constituency coordination to level up open source in Europe.

The open source wave is sweeping across the globe, and Europe has the chance to ride its crest. Let's make this more than a technological shift; let's make it a European technology renaissance. Too much is at stake, in Europe and globally, if we squander this opportunity.

To a future as open as our past is rich!

**Gabriele Columbro**  
**General Manager, Linux Foundation Europe**  
**Executive Director, FINOS**

# Executive Summary

The European Union (EU) and many of its member states have championed the innovative potential of open source software (OSS) for over a decade. Governments at all levels, from municipal governments to the European Commission (EC), are prioritising OSS in their strategies, establishing Open Source Programme Offices (OSPOs) and even mandating its use through legislation. This shift recognises the value that OSS brings to the digital transformation of public services and its promise for enhancing digital sovereignty. However, the public sector still lags behind in fully embracing the value of OSS. Policies that mandate OSS use and reuse miss the potential for contributions (i.e. “giving back”) and collective value creation by fostering collaboration between the public sector and all constituents in the global OSS ecosystem. This report emphasises the need for a cultural shift in the public sector’s perception of the value of OSS and for the public sector to pivot from a passive role as an OSS user to an active role as an OSS developer and leader.

With the public sector having so much to gain from open source, much must happen to create this shift. Furthermore, the untapped potential of open source in the public sector is of strategic relevance to the digital policy agenda of the EU. Current legislative proposals such as the Cyber Resilience Act (CRA) treat the open source ecosystem and the software industry as one, even though they are separate entities with distinct development and market entry dynamics. A better understanding of the collaborative development and market adoption of OSS technologies is therefore imperative among policymakers.

This report examines the present-day trends, challenges, and enablers of OSS adoption within the public sector in Europe. It explores the pivotal role of OSS in Europe’s digital sovereignty agenda and provides valuable insights into how public sector bodies are leveraging OSS to advance public policy agendas, build trust in digital transformation, and maximise value for citizens. Despite challenges such as software reusability, outdated procurement

regulations, and the ineffective implementation of laws, the report identifies key enablers driving OSS activity in the public sector, including the creation of OSPOs, practical guidance, and contribution policies. By doubling down on these enablers, the public sector in Europe can accelerate its open source journey, delivering innovative and cost-effective digital solutions while fostering a resilient and sovereign digital future for the continent. The overarching message of this report is the following: embracing OSS in the public sector is not just an operational necessity; it is a strategic lever that empowers governments to actively shape their digital future.

Towards this end, it provides a timely analysis of key priorities for a future where the public sector can become a model steward of OSS and concludes with a set of recommendations, including the following:

## **Accelerating the shift from OSS use to contribution**

The public sector needs to accelerate its shift from simply using OSS to actively nurturing the OSS ecosystem. This shift is as much about organisational culture as it is about the technical aspects of software development. With regards to contributing code, organisational policies that not only allow but encourage software developers to make upstream contributions during working hours are key enablers of this shift, while building internal communities and internal capacity have also proven to increase OSS reciprocity within the public sector. OSPOs are key facilitators when it comes to levelling up contributions by guiding the implementation of organisational policies, defining best practices, and mobilising internal capacity through events and hackathons, among others.

## **Investing in and empowering OSPOs to lead the way**

OSPOs have emerged as pivotal catalysts for levelling up open source operations and activity in the public sector, performing a variety of internal and external roles, from implementing

organisational OSS use, reuse, and/or contribution policies to engaging with OSS stakeholders and the open source ecosystem. Going forward, OSPOs promise to help public sector organisations contribute to OSS and leverage feedback and expertise from the OSS community. With several OSPOs already operational in Europe, some aiming to play a critical role in cybersecurity [1], policymakers should double down on the establishment of OSPOs to streamline open source operations and amplify open source activities in the public sector in Europe.

### **Stewarding cross-sector and cross-border coordination to level up OSS in Europe**

Enhanced cross-sector and cross-border coordination is essential to close gaps between the public sector, industry, and the OSS community. The focus should be on establishing multi-stakeholder working groups, similar to the European Multi-Stakeholder Platform on ICT Standardisation or the US's Cybersecurity and Infrastructure Security Agency's (CISA) working groups on software security; aligning OSS funding bodies; and cultivating relationships and expertise exchange between members of the OSS community and policymakers.

### **Exchanging expertise between policymakers and the OSS community**

Current legislative proposals often blur the distinctions between the OSS ecosystem and the software industry, underscoring a need for a better understanding of the OSS ecosystem among policymakers. Engaging with the OSS community can improve domain knowledge among policymakers and improve policymaking. Public sector bodies in Europe should look to models such as CISA's multi-stakeholder working groups or OpenForum Europe's annual Open Source Policy Summit as effective models for expertise exchange.

### **Funding our open source digital infrastructure**

Governments around the world increasingly recognise that OSS represents digital infrastructure and the need to do more to

sustainably fund its development, maintenance, and security. Germany's Sovereign Tech Fund (STF) is a notable example, taking concrete steps to financially support OSS projects that it depends on. However, this is just the start. We require a wider range of actors to fund OSS as well as better coordination of funders to maximise the impact of funding on OSS maintenance. This shift towards diversified and long-term funding is necessary for the stability and sustainability of open source digital infrastructure.

### **Supporting digital sovereignty but avoiding regional fragmentation**

In Europe, there is significant political interest in OSS as a key enabler of digital sovereignty, empowering governments to reduce dependencies on foreign software providers and to maintain control over their digital infrastructure. However, it's imperative to avoid regional fragmentation in the OSS ecosystem. Proposals advocating the creation of OSS by Europeans for Europeans could stifle valuable collaboration on global issues. For the EU to realise the benefits of OSS, it must encourage and engage in global collaboration, championing an inclusive approach that traverses regional boundaries and acknowledges the potential of open collaboration through its inherently cross-border nature.



## Introduction

The EU and its member states have championed the innovative potential of OSS for the digital transformation of public services for over a decade. From local municipalities to the EC, various public sector organisations have factored OSS into their digital strategies, resulting among others in the establishment of OSPOs and legislative mandates for its use and reuse [2]. More recently, the concern for digital sovereignty has drawn even more attention to OSS, which promises to reduce vendor lock-in and facilitate greater control of IT systems. Moreover, while the public sector faces unique challenges in unlocking the value of OSS, most OSS practitioners perceive that the benefits outweigh the costs and that OSS will be important to the future of the public sector [3]. While these benefits are becoming increasingly recognised, the public sector is lagging behind in its embrace of OSS and contribution to its ecosystem [3]. There may be an overly narrow appreciation of the value of OSS simply as a good to be used rather than built, which is not promising at a time when the EC's Open Source Strategy calls for public services to "get ready to contribute and be ready to accept contributions from citizens" [4].

This discrepancy calls for a comprehensive cultural shift in the public sector. While OSS use and code-sharing are crucial, they represent a fraction of the full potential value that OSS offers. The public sector could significantly benefit from OSS, not only as users but as creators and collaborators, contributing to the OSS ecosystem and harnessing its benefits for broader socioeconomic policy goals. Furthermore, the untapped potential of OSS is of strategic relevance to the digital policy agenda of the EU. Current legislative proposals such as the CRA treat the open source ecosystem and the software industry as one, with potential unintended consequences, even though the open source technology stack and software industry are separate entities with distinct development dynamics. This conflation underscores the need for a better understanding of the collaborative development of OSS

on the one hand and how software vendors introduce OSS to the market on the other.

This report examines current trends and developments in OSS adoption within the public sector in Europe, and it discusses necessary steps to transform the public sector into a model user and proactive steward of OSS. By focusing on crucial priorities, this study offers timely insights to address the gaps between current practices and future goals. The analysis underscores the strategic value of OSS beyond its conventional use, emphasising the necessity for the public sector to engage actively in OSS development and collaboration. In doing so, it paves the way for a more innovative public sector that sets an example for transparent, cost-effective digital transformation and leverages OSS towards socioeconomic goals.

The embrace of OSS by the public sector has been steadily on the rise in recent years, stemming from the increasing recognition that, as a collaboratively provisioned public good, OSS offers a compelling value proposition to the public sector. Among the many benefits that OSS presents, key benefits include: the speed and flexibility of software development, cost savings, security, customisability, localisation, and access to support from the OSS community. Furthermore, investment in OSS holds significant economic returns; for example, investments in OSS yielded between EUR 65 and 95 billion in the EU economy in 2018 [5]. Despite the persuasive evidence of the value that OSS offers and creates, there is still a need for greater awareness and buy-in among key decision-makers in order to level up open source activity in the public sector.

Digital sovereignty has emerged as a critical consideration in the embrace of OSS in the public sector, which allows governments to reduce dependencies, maintain control over critical technology

stacks, and safeguard their digital systems and processes. Governments are also increasingly recognising OSS's role as digital infrastructure. Major cybersecurity incidents such as Log4Shell have underlined the need to support the OSS developers and communities that build our critical open source digital infrastructure. However, as we navigate this path towards digital sovereignty, it is imperative to avoid isolating regional fragments within the OSS ecosystem. Proposals advocating the creation of OSS by Europeans for Europeans could stifle valuable global collaboration on global issues. Instead, we must champion an inclusive approach that traverses regional boundaries and acknowledges the potential of open collaboration through its inherently cross-border nature.

Governments are progressively implementing OSS in the interest of cost-efficiency, flexibility, and citizen-centric service delivery. Local IT providers, offering crucial support and consultancy services, have been integral to this trend. By working with local providers, governments have maximised OSS adoption and leveraged it for the development of enterprise-scale solutions. A prime example of a successful public-private collaboration is the Signalen project in the Netherlands. Stewarded by the Dutch Association for Municipalities, this initiative brings together municipalities and market providers to create a robust ecosystem for using, reusing, and improving OSS that provides key public services for city residents. Local SMEs play a key role, providing expertise and services to implement and scale this public sector OSS project. These cooperative endeavours not only underscore the potential of OSS in public service delivery but also highlight the value of local IT providers as enablers for effective OSS adoption.

OSPOs have emerged as key facilitators of open source operations and activity in the public sector. Internally, the OSPO serves as a central interface for open source-related activities across the organisation and brings together expertise from different stakeholders, including legal, economic, technical, or community perspectives. Externally, the OSPO serves as a vital bridge between an organisation and the open source community, helping

to ensure that the organisation is a good steward of OSS and can reap the benefits of open source adoption while minimising risks [6]. Furthermore, OSPOs play a key role in identifying ways for organisations to actively contribute to the open source community, be it financially, technically, or through active participation in the community. With several OSPOs already operational in Europe, policymakers aspire to establish more offices in municipal, regional, and national governments to amplify open source activities in the European public sector.

Governments across the globe increasingly recognise that OSS represents critical digital infrastructure and the need to do more to fund its development, maintenance, and security sustainably. While the private sector has historically been the largest funder of OSS, public interest in funding OSS has increased in recent years due to concerns about digital sovereignty and software security. Recent initiatives such as Germany's STF illustrate the public sector's emerging role in this funding equation, driving long-term investment in critical OSS projects and digital public goods. However, government funding efforts are still in their early days and generally fragmented or duplicative. The EU and the member states should expand and coordinate these efforts, with more stakeholders contributing to and coordinating funding for OSS.

There's an urgent need for greater cross-sector and cross-border coordination among Europe's OSS community to guide Europe's open source digital future. Such coordination can provide policymakers with a deeper understanding of OSS and open up channels for the public sector to support OSS practitioners, ultimately informing sound and effective policymaking. For example, the E.U. may gain valuable insights from the US's CISA, which convenes multi-stakeholder working groups that have developed resources for software security and organised events to facilitate expertise exchange. Through more proactive engagement with the OSS community, the EU can play a key role in fostering a resilient and sustainable OSS ecosystem.

## Methodology

We employed a qualitative research methodology, comprising an extensive literature review and 30 expert interviews. First, we conducted a comprehensive literature review about OSS in the public sector, encompassing peer-reviewed articles, practitioner reports, and government strategies. This review resulted in a comprehensive understanding of crucial policy discussions related to OSS in the public sector, covering strategies, common challenges, and enabling factors. Second, we conducted 30 semi-structured expert interviews with professionals from various sectors across 14 European countries [7]. To ensure diverse perspectives, we conducted interviews with 21 public sector representatives, spanning municipal, regional, and national governments, the European Commission, and nine individuals from industry, think tanks, and OSS foundations. Of the 30 interviewees, 20 were male and 10 were female. The interviewees represented a broad geographical range, including Belgium, Czech Republic, Denmark, Estonia, France, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Slovakia, Spain, and Sweden. We applied a thematic analysis as a systematic approach to analyse the interview data [8].

### INTERVIEW SAMPLE

21 PUBLIC SECTOR  
REPRESENTATIVES



9 INDUSTRY, THINK  
TANKS, AND OSS  
FOUNDATIONS  
REPRESENTATIVES



20 MALE AND  
10 FEMALE



14 EUROPEAN  
COUNTRIES



# The open source value proposition to the public sector

OSS has been climbing the priority list of governments in Europe in the last decade, from municipalities to the EC. A growing number of governments have adopted OSS strategies and have established OSPOs to coordinate their open source activity, with some even mandating the use and reuse of OSS. In recent years, there has been a significant increase in political interest in OSS triggered, among others, by the Log4Shell vulnerability, the drive to strengthen Europe's digital sovereignty, and the COVID-19 pandemic, which highlighted the need for public sector organisations to develop the digital capacity to foster resilience in times of crisis [9].

## Understanding the value proposition of open source

Several governments have been making software available on public repositories in the spirit of "Public Money? Public Code!" [10]. At the European level, the EC launched [code.europa.eu](https://code.europa.eu) in September 2022 to facilitate the development of open source projects by the Commission and other EU institutions [11]. With over 100 projects and 150 developers already onboard, the EC is taking strides to shift from being a user to a builder of OSS solutions. Several national initiatives, such as the Brno Open Source Declaration in the Czech Republic, the Free Software and Digital Commons Action Plan in France, and the Centre for Digital Sovereignty in Germany, demonstrate steps in this direction at the national level across the European bloc. Moreover, at the municipal level, programmes in the Netherlands, Denmark, Slovakia, Hungary, Latvia, and the Czech Republic provide ample examples of municipal governments embracing OSS in the interest of building the best possible public services for their citizens.

The embrace of OSS by the public sector stems from the increasing recognition that, as a collaboratively provisioned public good, OSS offers a compelling value proposition to the public sector. For example, Daniel Melin, a strategist at the Swedish Tax Agency, explained, "It is about the value that OSS brings to the digital

transformation of public services and governance, not necessarily the software itself." Similarly, for Bastien Guerry from the Free Software Unit in DINUM, the interministerial digital directorate in the French government, "OSS unlocks cost-effective and transparent digital transformation, which, in turn, enables public administrations to allocate taxpayers' money more efficiently." This is a widely held view: OSS should be at the heart of the public sector's digital transformation so that public money is optimally spent on free software that public sector organisations can share. Kristo Vaher, the CTO of Estonia, similarly underscored the promise of OSS use and reuse as a solution to the financial constraints faced by governments, allowing for more sustainable and cost-effective digitisation of government. Likewise Petra Džurovčinová, the first chief innovation officer of the City of Bratislava, explained open source is always a first-order consideration for how her team can deliver the greatest value for citizens.

Several interviewees commented that the value proposition of OSS for the public sector has become more widely understood in recent years, especially concerning transparent governance, control of IT systems, and reducing vendor lock-in. OSS offers many benefits as a technology, as an ethos, and as a way of working, including: speed and flexibility of development, cost savings, security, customisability, localisation, and support from the OSS community [3], [12], [13]. Beyond the many benefits for digital transformation, by endorsing the use and development of OSS, the public sector can support and promote competition in local software markets [4], [14], [15]. Public sector support for the OSS market promises non-trivial economic returns, too. For example, in 2018, companies located in the EU invested around EUR 1 billion in OSS, which generated between EUR 65 to 95 billion for the EU economy that year [5]. Interviewees commented that a more deliberate and systematic endorsement of OSS at the highest levels of government would lead to many positive

benefits for the public sector and the economy at large. To get there, though, we still need greater awareness and buy-in among key decision-makers.

### Driving digital sovereignty with open source

OSS has gained significant political attention in the debate about digital sovereignty, which is high on the agenda in Europe. Digital sovereignty refers to the self-determined use of digital technologies and systems by individuals, industry, and governments [17]. As a driver of digital sovereignty, OSS empowers governments to reduce dependencies, maintain control over processes, and foster a sustainable and inclusive digital infrastructure. In

particular, the embrace of OSS will “give Europe a chance to create and maintain its own independent digital approach and stay in control of its processes” [4]. The European Working Team on the Digital Commons, which comprised 19 member states and the EC in 2022, highlighted the importance of investing in OSS and the digital commons as a key approach to building sovereign digital infrastructure in its inaugural report, *Towards a Sovereign Digital Infrastructure of Commons* [16].

This view was widely held among our interviewees. Gijs Hillenius from the EC’s OSPO emphasised the significance of openness as a catalyst for achieving digital sovereignty, while Daniel Melin from

**TABLE 1**  
**BENEFITS OF OSS FOR THE PUBLIC SECTOR [12]**

<p><b>POLITICAL BENEFITS</b></p> <ul style="list-style-type: none"><li>Digital sovereignty</li><li>Transparent digital transformation</li><li>Trust in public institutions</li><li>Vendor independence</li><li>Customisation and localisation</li></ul>	<p><b>ECONOMIC BENEFITS</b></p> <ul style="list-style-type: none"><li>Cost savings and reduced licence fees</li><li>Scalability and reuse at minimal cost</li><li>Develop local/regional software market</li><li>Promote competition in the software market</li><li>Attract and hire IT talent to the public sector</li></ul>
<p><b>TECHNOLOGICAL BENEFITS</b></p> <ul style="list-style-type: none"><li>Open standards and interoperability</li><li>Software security and quality</li><li>Collaboration with the OSS community</li></ul>	<p><b>SOCIAL BENEFITS</b></p> <ul style="list-style-type: none"><li>Develop local/regional IT skill base</li><li>Local/regional employment creation</li><li>Reduce the digital divide via the affordability of OSS</li></ul>

the Swedish Tax Agency argued: “By embracing open source technology, we at least have the possibility to change things, develop solutions, and fix vulnerabilities. Open source is the path forward.” Several interviewees highlighted that political understanding of OSS as an enabler of digital sovereignty is crucial to level up the public sector’s adoption and development of OSS. For example, Jacco Brouwer from the Dutch Association of Municipalities explained that concept of digital sovereignty resonates with politicians, particularly in light of current geopolitical events, such as the Russia-Ukraine war.

Alongside digital sovereignty, governments increasingly recognise the importance of OSS as digital infrastructure and the need to sustainably fund its development, maintenance, and security [18]. It is estimated that OSS is present in 96% of codebases [19] and constitutes between 70-90% of software stacks [20]. Furthermore, a report by the EC’s OSPO highlights the growing reliance of European public services on OSS and proposes funding mechanisms to ensure the long-term viability of critical OSS projects [21]. In addition to dependence, cybersecurity incidents such as the Heartbleed and Log4Shell vulnerabilities underscored the need for increased investment in OSS maintenance and security. As a result, there is an emerging consensus on the need to financially support OSS developers and communities that build the libraries, protocols, databases, and programming languages that public sector organisations and the digital economy depend on. Proposals for sustainable funding interventions include the establishment of OSS Trust Funds [22] and Public Technology Funds at the EU level [23], [24].

While the public sector has lagged behind other sectors in terms of funding, the recent establishment of the STF demonstrates Germany’s readiness to support critical OSS projects and to promote long-term investment in digital public goods [17]. Joining the ranks of a handful of other public sector funds, such as the Next Generation Internet initiative by the EC, the STF is spearheading a shift in governmental approaches to funding OSS. Adriana Groh from the STF underlined the power of the

*“Rightly supported digital commons can increase their role as a pillar of Europe’s digital sovereignty — one that fosters innovation and empowers states and individuals by increasing the European Union’s capacity to act and reduce dependencies and vulnerabilities with the aim of shaping the digital world with our values, norms, and principles and along European interests.”*

— EUROPEAN WORKING TEAM ON THE DIGITAL COMMONS [16]

*“We need more actors funding OSS because funding the maintenance of our open source digital infrastructure is a common task, and we need more coordination of funders.”*

— FIONA KRAKENBÜRGER, SOVEREIGN TECH FUND

digital infrastructure metaphor for mobilising support for the fund because it is one that politicians and the public can understand and are getting behind. Fiona Krakenbürger added that a priority for the STF is to “push out the narrative and make it more tangible and understood that the public should also be part of this equation”. However, this is only the beginning, explained Krakenbürger: “We need more actors funding OSS because funding the maintenance of our open source digital infrastructure is a common task, and we need more coordination of funders.”

## SPOTLIGHT

# The Sovereign Tech Fund

## SOVEREIGN TECH FUND

Established in October 2022, the STF financially supports the development, improvement, and maintenance of open source digital infrastructure. According to the STF, funding open source matters because “the open source ecosystem, while incredibly successful, is also increasingly fragile. Many more people are using the software than contributing to it. It is time to invest in digital commons, volunteer communities, and the open source ecosystem to build the digital world we want to see”. The STF argues that no digital sovereignty can exist without a robust open source ecosystem.

The German Ministry for Economic Affairs and Climate Action funds the STF, and SPRIND GmbH, the federal agency for disruptive innovation, currently houses it. It has a budget of EUR 11.5 million for 2023 alone, and it is already sponsoring several projects, from curl to OpenBLAS. On 2 May 2023, it invested EUR 875,000 in the OpenJS Foundation, the largest one-time government support investment ever in a Linux Foundation project. As one of the first governmental funds dedicated to OSS, the STF is spearheading a critical shift in how governments invest in the long-term viability of OSS and digital public goods.

Beyond funding open source digital infrastructure, the STF’s funding-based approach to improving the security of critical open source projects is noteworthy at a time when policymakers in the EU and beyond are weighing up policy options about how to ensure greater cybersecurity. The STF is striking an appropriate balance between, on the one hand, seeking to improve (open source) software security and, on the other hand, understanding open source development cultures and practices.

## Challenges & enablers for an open source public sector

Implementing and developing OSS in the public sector brings with it a unique set of challenges that organisations must navigate. While the benefits of OSS are evident, success lies not solely in the technology itself but in the ability of organisations to adapt and embrace the open development approaches it offers [25]. It is crucial to remember that there's no one-size-fits-all approach to OSS adoption and development, as every organisation and context is different [12], [26]–[29]. Furthermore, challenges often manifest at various organisational levels, including within, between, and beyond organisations [27]. This section provides an overview of the major challenges as well as enablers experienced by public sector organisations in Europe.

### Changing institutional culture, one step at a time

Some aspects of institutional culture, including inertia, resistance to change, and risk aversion, are the most significant challenges when public sector IT teams seek to embrace OSS. Boris van Hoytema from the Foundation for Public Code explained, “Open source works because you share your failures, but this is not how the public sector works.” Several interviews highlighted risk aversion among management, who typically prefer packaged software solutions that come with support services. Resistance to change also holds back organisations that already have enabling levers in place, including OSPOs. For example, Gijs Hillenius from the EC commented, “We could do [many things] tomorrow if we wanted to, but we have to get the organisation to walk the path with us. Because changing the way these organisations work is, you know ... We have to change people's minds to be more efficient, more effective.” This resistance to change can hinder the adoption and implementation of OSS, particularly in organisations accustomed to outsourcing their IT solutions.

Rasmus Frey, chief executive and secretary of OS2, a bottom-up network of municipal governments that collaborate on OSS

*“The cultural aspect is the biggest challenge that the public sector needs to overcome. The fear of change is always present, especially in the public sector, where officials seek stability and are resistant to change. How can we motivate these individuals to have ideas and a desire to learn? How can we foster a culture of communication where things are discussed openly? If this happens, the entire digital transformation will improve.”*

— TOMAS OLIVARES, ANDES DIGITAL

solutions, emphasised patience as crucial for practitioners in the public sector seeking to promote OSS adoption or collaboration, acknowledging that the public sector may require time to understand the benefits of open source. He underlined that to level up OSS in the public sector, you need to understand the needs of key decision-makers in the bureaucracy. He explained: “Everyone involved in OSS in the public sector is already bought in. But the person on the other side of the table—for example, from the municipality or a state department—may just need a cost-effective IT system that works and therefore doesn't get the importance of open source. So, to make open source collaborations possible, you need to put yourself in their shoes.”

According to Astor Nummelin Carlberg, executive director of OpenForum Europe, there are two key steps to building the enabling institutional infrastructure within the public sector to deliver the promise of OSS: “For the individual public sector organisation, the first step is the formulation of a strategy that



acknowledges the role of open technologies, and the second is building OSPOs with the mandate and capacity to meet the goals outlined” [30]. In the subsequent sections, we will discuss key challenges and enablers with regard to these key steps.

### **OSS strategies and policies do not guarantee action**

Strategies and policies serve as the foundation for embracing open source within the public sector. Europe is in a fortunate position in that it has ample policies to learn from. While many legislative frameworks authorise or even prioritise open source, the real challenge lies in their effective implementation and operationalisation, as highlighted by Boris van Hoytema from the Foundation for Public Code. “There are lots of laws, which are very important, but they don’t guarantee action,” explained Bastien Guerry. Another interviewee described the “open, unless” (“open, tenzij”) policy in the Netherlands, which mandates public sector organisations to openly release the source code of IT projects unless they have justifiable reasons not to, as one of the least adhered to policies in the country. Many interviewees highlighted the difficulty of bridging the gap from publishing policies to their practical implementation. Issues arise when government teams lack practical tools, communities, and guidelines to facilitate the adoption and reuse of OSS.

For example, Leonardo Favario, the former head of open source at the Italian government, explained that while in Italy there has been a law with provisions supporting the acquisition and reuse of ICT solutions in the public sector, including OSS, namely Articles 68 and 69 of the Digital Administration Code (CAD), these provisions were rarely followed until recently. There was a significant gap between the existence of the law and its practical implementation, Favario explained. While the law mandated public sector organisations to release software as open source or prioritise OSS use, the public sector lacked effective tools and support for implementation [31]. Favario emphasised that a key lesson from the Italian experience was the need to complement policy (i.e. the CAD) with practical tools and a community of experts who could bridge the

*“We see in Europe that in terms of legislation and policies, open source is really a priority for public administrations. We see in many countries in Europe that open source is either preferred or required for a whole bunch of things. That is not the problem. The problem is almost always how to actually get it to work.”*

—BORIS VAN HOYTEMA, FOUNDATION FOR PUBLIC CODE

gap between policy and practice. For example, the Team Digitale created a catalogue of open source solutions by and for public sector bodies and practical guidance on OSS reuse, which created visibility of OSS solutions and provided step-by-step advice on how to implement them, ultimately leading to more OSS reuse in the Italian public sector [32]. This example underscores that policies or laws alone do not suffice to observe greater OSS activity in the public sector as well as the impactful role that OSPO can play in supporting the implementation of an OSS policy or law.

What is more, while several governments have introduced policies encouraging OSS reuse, they often overlook the potential for “giving back” or contributing to the OSS ecosystem. Effective contribution channels include contributing code to OSS projects, funding OSS projects, or participating in a Governmental Advisory Council (GAC) if one exists. With regard to code contributions, making this shift is key, given the sector’s dependence on OSS and its ranking as one of the sectors that contributes the least code to the OSS ecosystem [3]. By developing and implementing a policy for upstream contributions, the public sector can become a more proactive contributor. The French government’s approach provides insightful lessons in this regard. In May 2018,

it published a policy for OSS contributions (“Politique de contribution aux logiciels libres de l’État”), outlining ways in which public sector organisations could contribute to OSS [33]. It emphasises that any public official has the right to contribute to OSS, provided line manager approval, and that they could seek assistance from DINUM if they seek to sign a contributor license agreement. It is relatively simple, essentially stating, “You can do it,” explained Bastien Guerry. To date, the major use of this policy has been to locate published source code by public sector organisations and to launch code.gouv.fr. Guerry admitted that, to the best of his knowledge, it has not hugely boosted upstream contributions, but at the same time it is difficult to detect contributions. While no perfect solution exists yet, this example highlights the potential enabling role of upstream contribution policies in the public sector’s shift from OSS user to contributor.

### Going from policy to practice with OSPOs

OSPOs have emerged as a powerful catalyst for driving open source adoption and collaboration in the public sector. Initially inspired by industry models, OSPOs are now spreading as an institutional framework and practice in governments across the world [2]. Organisations across the public and private sectors are establishing OSPOs designed to be the centre of competency for an organisation’s open source operations and structure. While each OSPO is unique to its organisation, they serve as a vital bridge between an organisation and the open source community, helping to ensure that the organisation is a good steward of OSS and can reap the benefits of open source adoption while minimising risks. OSPOs can support organisations with OSS use, participation, contribution, and leadership [34]:

- 1. Usage:** Establish an internal infrastructure that enables proper open source practices and incorporates open source policies, processes, checklists, and training.
- 2. Participation:** Engage with the open source community on communication platforms and at events. Sponsor projects

and organisations that are important to the OSS that your organisation relies on for its products and services.

- 3. Contribution:** Hire or train developers that focus specifically on open source contributions, and deploy the necessary tools to support internal open source engineering.
- 4. Leadership:** Increase engagement with open source communities, open standards bodies, and open source foundations; launch new open source initiatives and projects; and increase your organisation’s visibility in open source communities.

So far, the EC, 12 member states, and a number of regional and municipal governments in Europe have established OSPOs to accelerate their OSS journeys. OSPOs come in many different shapes and sizes, and have taken different approaches. Gijs Hillenius from the EC highlighted that the internal impacts of its OSPO range from removing legal and organisational barriers for OSS adoption to providing guidance and assistance to developers seeking to openly release source code. The French government’s OSPO, DIMUM, has taken an innovative approach to scale its impact in light of limited capacity. Rather than answer every request they get themselves, they have focused on building micro-communities around OSS solutions that are recommended by the Interministerial Free Software Catalogue (SILL). On the SILL platform, public sector developers can connect and exchange expertise about specific OSS solutions. “For example, if you want to work with PostgreSQL, you can see there are at least 10 experts. The aim is to facilitate expertise exchange. We think the catalogue should evolve as a place where people can interact,” explained Bastien Guerry from DINUM.

In addition to their internal impact, OSPOs serve as crucial intermediaries in external engagements. They act as diplomats, representing organisations to open source communities, foundations, and developers, forging strategic partnerships and enhancing collaboration [35]. Sven Herpig from Stiftung Neue Verantwortung emphasised that OSPOs are more than just

internal and external diplomats, as they actively work on practical implementation OSS policies and solutions. For Leonardo Favario, OSPOs should help developers in the public sector go beyond “picking whatever is good out there and putting it into practice” by identifying avenues for giving back: “Many organisations consume OSS, but it’s time to give back right. The OSPO is the place where you figure out how to give back; it could be financially, it could be technically, it could be opening pull requests, or just being there.”

Despite the progress made, challenges remain in the establishment and operation of OSPOs. Budget constraints and the need for management support pose obstacles, requiring continued

*“The Open Source Programme Office acts as connective tissue between different facets of an organisation internally as well as the external points of contact necessary for that organisation to collaborate and co-create with open source communities. I use the metaphor connective tissue very deliberately, as a well-functioning OSPO is much the same as the fibres that bind together our physical bodies—required as the fundamental foundation for activity but invisible except in a time of dysfunction. OSPOs act as a neutral body responsible for stewardship of both the agency it represents and the projects with whom that agency must interface; the team in this role has the unique responsibility of advocating for the interests of all players involved and acting as ambassador and diplomat to both coworkers and external collaborators alike.”*

— LESLIE HAWTHORN, REDHAT

advocacy and resource allocation. Bridging the gap between EU, national and regional governments is also essential, as OSPOs need to effectively translate EU and national laws into practical actions at regional and local levels. However, by investing in OSPOs, nurturing open source competency, and implementing best practices, organisations can foster a culture of reciprocity, reap the benefits of open source, and drive innovation in the public sector.

### **Building in-house capacity with OSS champions, mentors, and hackathons**

The lack of in-house resources and competence poses another obstacle to OSS adoption and development. The adoption of OSS requires a combination of technical and soft skills, from expertise in OSS packages to working knowledge of the OSS ecosystem. In some cases, developers do not want others to see their code due to bad documentation or code quality issues, and often developers are concerned about accidentally sharing hard-coded passwords. Limited resources and small IT or OSPO teams further compound this challenge. Another issue raised by interviewees is a “strategy loop,” where governments outsource the development of innovation strategies to external consultants without domain expertise, which has resulted in ineffective OSS strategies.

OSS champions, mentors, and hackathons are powerful catalysts for driving cultural change and building internal capacity within the public sector. These initiatives play a crucial role in fostering collaboration, empowering government agencies, and embracing open innovation. Open source ambassadors and mentorship programmes can actively support individuals within public sector organisations, guiding them in the adoption and understanding of open source principles, explained by Miguel Díez Blanco from the EC’s OSPO. Mentors play a vital role in shifting mindsets and promoting the benefits of OSS within organisations. Hackathons serve as mechanisms for driving cultural shifts and exchanging expertise between OSS mentors and developers. The EC’s OSPO has organised hackathons to foster creativity, teamwork, and

collective problem-solving. These events bring teams together to collaborate on open source code, resulting in the development of solutions that address real-world challenges.

Community building is key to fostering cultural change. The NOSAD network in Sweden and France's internal community of experts on its SILL catalogue are prime examples of initiatives that promote collaboration and knowledge sharing. These communities serve as invaluable platforms for expertise exchange, discussion, and guidance, enabling the effective utilisation of OSS solutions. We can learn an important lesson from the French example mentioned above. Since the national OSPO cannot answer every request or question that they receive, they are focusing on building micro-communities around software listed in the SILL catalogue. By building "a social network of internal experts who can discuss software with each other," this approach taken by the OSPO builds internal capacity that not only eases OSS adoption but also supports collaboration within the government.

### **Facilitating reuse through OSS catalogues, guidance, and tools**

The public sector faces significant challenges in the reuse of OSS, from limited awareness of available repositories to a lack of resources or know-how to implement OSS. This was a major issue that municipalities faced in the Netherlands. While the city of Amsterdam, which is larger and better resourced than other cities in the country, had published software on GitHub, many other municipalities struggled to implement the software in their own jurisdictions. This is why the Dutch Association of Municipalities is facilitating intercity collaboration on the reuse of the Signalen software for nuisance and service requests, as explained above. The Dutch Association of Municipalities acts as the key stakeholder to bridge that gap between the offer, which is out there on GitHub, and the capability of reusing that software within other municipalities.

Italy presents a further example of OSS reuse challenges, despite the provision of favourable laws. Leonardo Favario underscored

*"OSS is not the aim; rather, it is the means of ensuring public sector control of software solutions."*

—RASMUS FREY, CHIEF EXECUTIVE AND SECRETARY OF OS2

the need for a mindset shift, explaining that merely opening the repository is insufficient. To facilitate OSS reuse, it is key to provide a mechanism to discover existing OSS solutions, such as through catalogues, and it is helpful to provide guidance on how to implement the solutions.

Indeed, catalogues have been key to tackling the discoverability problem. Governments have tried different approaches. In France, DINUM has created and maintains the SILL, which helps IT teams in the French government navigate and select recommended OSS solutions. Currently, the SILL contains 396 recommended OSS solutions and applications, 1,013 users, 199 'referents' (i.e. users who can be contacted with enquiries about a specific OSS solution), and 54 registered public sector organisations. As mentioned above, DINUM is building internal expert communities on top of this catalogue, whereby registered developers can communicate and collaborate on OSS use cases and challenges. The goal to increase open source resource pooling and expertise sharing within the public sector guides this approach.

Meanwhile, in Italy, Team Digitale developed a centralised hub on developers.italia.it, similarly with a targeted focus on OSS development and use by public sector organisations. The catalogue showcases OSS solutions made by public sector organisations, simplifying the acquisition process and promoting code inspection. A noteworthy feature of the Italian approach is the inclusion of publiccode.yml in each repository, which the catalogue uses to automatically track and update metadata about each repository on a daily basis, including updates and reuse figures. Leonardo

Favario highlighted the success of this approach to the OSS catalogue. By July 2023, it contained 380 OSS solutions; Italian public sector organisations had published 327 of these solutions, and software providers and open source developers had contributed the rest. Furthermore, Favario pointed out that the catalogue reported 2,455 instances of OSS reuse, indicating an average reuse rate of over six times per software item. These examples show that catalogues empower practitioners to easily access and adopt open source solutions, fostering a culture of sharing, collaboration, and the efficient use of public resources.

In addition to discoverability, interviewees from various countries, including the Netherlands, Italy, and Spain, stressed the importance of practical guidance, which is both comprehensive and easy to understand, as a key enabler of OSS sharing and reuse

*“For me, the first step is opening the repository, and then the challenge begins. Then, you need to have a strategy; you need to have a roadmap and a community of people; you need to communicate with them; you need to follow the issues, follow the pull requests, and so on. For the public administration, opening the repository is often the last step because it’s written in the law that is all they have to do, and that’s it. So, this is the big challenge. And it’s a total mindset shift. You need to explain the benefits of open source. You know, it’s not just about complying with the law; it’s about being part of the open source community.”*

—LEONARDO FAVARIO, PAGOPA S.P.A, ITALY

because, to date, many IT teams did not know how to interpret legislation. According to Koos Steenbergen from the Dutch Interior Ministry, “The key mechanisms for turning policy into practice are firstly practical guides and tools to support a more open (source) culture within organisations, and secondly a community of practitioners.” For example, the “Guía de Boas Prácticas para Liberación de Contidos e Software” by the regional government of Galicia, Spain (“Xunta de Galicia”), provides valuable advice on content and software release [36], while Italy’s Team Digitale’s “Guidelines for the Acquisition and Reuse of Software for Public Administration” translates legal jargon into a step-by-step guide [32].

Alongside guidance, the availability of implementable tools is equally crucial in driving open source adoption. One interviewee cited effective precedents in the automotive industry, including the OSS Review Toolkit project and the Mercedes FOSS Manifesto [37], and underlined the need for the development of similar tools in the public sector, which provide practical guidance on licensing, security, and collaboration, empowering stakeholders to adopt and implement OSS effectively. In addition to guidance and tools, the sharing of success stories is crucial for garnering support for OSS. Persuasive success stories are crucial for increasing the visibility of open source alternatives, which can convince key decision-makers and the public of the value and impact of OSS, further driving its adoption and acceptance.

### **Revising IT procurement to open the doors to OSS**

The design of procurement regulations did not have OSS in mind, presenting a significant obstacle to procuring OSS. Decision-makers in public sector organisations often lack familiarity with platforms such as GitHub and struggle to find the software they need, explained Leonardo Favario. Procurement officers tend to focus on price rather than public value, which further hampers the adoption of OSS, explained Koos Steenbergen from the Dutch Interior Ministry. Since the legacy of proprietary software and vendor lock-in, as well as the lack of coordination between

*“The thing is, if you build it, they will not necessarily come. It’s not good enough just to build and publish open source and then hope that re-usability and engagement from users will come. It’s very rare when that happens. The lesson learned from Estonia is that by publishing open source, you’re increasing your own maintenance costs because you need to host the software and maintain the quality and security of it without the guarantee that anyone is actually using it. So, open sourcing software involves additional work. From my perspective, however, this work is worth it. But there are a lot of development teams that say that they are already stretched too thin; they don’t want this extra effort, and it is hard to change this mindset.”*

— KRISTO VAHER, THE CTO OF ESTONIA

*“Discoverability is one of the biggest issues. Most of the time, the people making decisions inside public administrations, the people doing procurement of software, don’t know how to use tools like GitHub. They don’t have a clear marketplace where to go and find the information they need or find the software they need.”*

—LEONARDO FAVARIO, PAGOPA S.P.A., ITALY

governmental agencies, poses hurdles to acquiring and implementing OSS, the situation calls for a change.

France has spearheaded an innovative approach to the procurement of OSS and support services. In 2020, the Ministry of Economy initiated two key tenders with service providers to support the life cycle of OSS in its IT systems, which any ministry can benefit from. The first provides software support, maintenance, and monitoring reports to IT teams, while the second offers various expertise services in OSS, including development and implementation assistance. By leveraging such interministerial tenders, this approach eliminates the need for ministries to initiate procurement processes from scratch for each IT project involving OSS implementation or development, not only saving valuable time and resources but also promoting cost savings and scalability within the public sector. Bastien Guerry explained that this tender has great potential, but it could have even more impact. Currently, the Ministry of Economy is the main beneficiary (this ministry spends 80% of the money in this tender). This initiative reflects the value of revising procurement practices in the public sector and enabling ministries to collaborate and pool their procurement efforts, ensuring a more efficient and streamlined approach to OSS adoption and implementation.

# Practical insights from open source success stories

## OSS builds trust in digital government

OSS serves as a trust builder in the digitisation of public services by opening up government processes for public inspection and scrutiny. As Petra Dzurovčinová from the City of Bratislava highlights, open source presents a way to address a deep-seated scepticism that hinders trust in the public sector. In Sweden, the national Employment Agency openly released the source code behind their unemployment benefits programme to create transparency and trust in the system. Maria Dalhage explained: “By sharing the source code, not only developers but also non-technical individuals can inspect the logic behind the software used in decisions about the allocation of unemployment benefits.” In addition to building trust, the transparency and inclusive participation that characterise OSS present an attractive alternative to proprietary software supplied by the private sector. Unlike closed source proprietary solutions, OSS allows for open examination, collaboration, and modification by a wider community of stakeholders. By embracing OSS, governments can thus demonstrate a commitment to transparency, empower citizens, and foster a more inclusive and trustworthy digital government ecosystem.

## The case for an open source approach to the European digital wallet

OSS represents a collaborative and inclusive approach to the realisation of public sector technology projects. OSS offers a transformative solution to the EU’s pursuit of a personal digital wallet that will transform identity verification and service accessibility across the EU. By fully embracing open source principles and an open development approach, the EC and member states can drive progress towards the development of this digital wallet while

reducing dependence on tech giants, promoting interoperability, and supporting competition and innovation. Tony Shannon, head of digital services at the Irish government, highlighted the importance of cultivating an open source kernel for digital wallets and commended the approach taken by the Open Wallet Foundation (OWF) as a potential pathway to making the EU’s digital wallet ambition a successful reality.

## Public-private collaborations on open source and open data

Public sector agencies are collaborating with the private sector to leverage OSS for collecting and sharing open data. An illustrative case is the partnership between the Swedish Public Employment Services and private job boards. “Our goal is to understand the job market ... and to do that we need data. So, we are using open source to get data to inform policy interventions,” explained Maria Dalhage. The agency uses a web scraper to collect unstructured data from job ads on various job board websites, and it has published the resulting open data alongside the source code for the scraper and code used to structure and enhance the data on GitLab. This approach resulted in a 30% increase in job ads in their system, a better understanding of the labour market, as well as mutually-beneficial collaborations with job boards seeking to share and improve their data. Now, the agency is working with up to 30 job boards to maintain this public-private collaboration to understand the Swedish labour market better. This collaborative approach has overcome challenges for the Swedish Public Employment Services to monitor the labour market, has improved data quality, and has provided improved services for job seekers and employers.

## SPOTLIGHT

# OpenWallet Foundation



The OWF was established to be a neutral home for open source projects supporting the development of interoperable digital wallets. It is a consortium of companies and nonprofit organisations collaborating to drive global adoption of open, secure, and interoperable digital wallet solutions as well as providing access to expertise and advice through a GAC

The OWF aims to set best practices for digital wallet technology through collaboration on standards-based OSS components that issuers, wallet providers, and relying parties can use to bootstrap implementations that preserve user choice, security, and privacy. In Europe, one key project will be to support the OSS community for the EUDI Wallet.

To maximise the acceptance of the OWF's technical efforts among governments and regulators, it has established a GAC to advise the OWF Governing Board on various public policy issues that impact the future of the development and regulation of digital wallets. The OWF GAC is a forum for discussing government and other public policy interests and concerns; it facilitates information sharing and lessons learned from the various jurisdictions. It enables a constructive dialogue with the OWF private sector members and explores ways to better bridge the private sector's innovation with the expectations and requirements of governments. Governments around the globe—regional, provincial, state, and local public authorities—and intergovernmental organisations participate in the GAC, catalysing an internationally aligned ecosystem that offers trusted, open, and inclusive tools for a safe and sound global economy.



## OSS in the city: Developing citizen-centric services with open source

Municipal governments are increasingly embracing OSS to develop citizen-centric digital public services. The Fab City Manifesto [38], co-signed by cities including Paris, Barcelona, and Helsinki, highlights the importance of adhering to open source and open data principles to foster innovation and shared solutions between cities. The objective driving the adoption of OSS by municipalities is to create the best possible public services for their citizens, explained Petra Dzurovčinová. Municipalities are leveraging OSS to develop high-quality digital services that respond to the needs and expectations of residents. In doing so, they strive to enhance efficiency, accessibility, and user satisfaction, ultimately improving the public service experience.

Cities such as Budapest and Bratislava are notable examples of municipal governments actively using OSS in their local services. For Budapest, cost efficiency and flexibility were key factors driving their adoption of open source solutions, beginning during the COVID-19 pandemic. By revising legislation concerning the use and reuse of OSS, they were able to publish software built for COVID-19 test appointment booking under the MIT licence on GitHub and open the door for reuse for other needs post-pandemic. Meanwhile, Bratislava is building enterprise-scale solutions using an open source tech stack. Its digital services, such as BratislavaID, focus on resident needs and offer features such as digital tax payments. By releasing the codebase on GitHub, they intend to promote transparency, foster innovation, and enable others to benefit from their work.

In a number of member states, municipalities are working together to develop OSS solutions for common business needs. OS2, the public digitalisation network in Denmark, is a noteworthy example of OSS collaboration between municipalities. Initiated in 2012 by five municipalities, OS2 now includes 80 out of 98 Danish municipalities and stewards a growing portfolio of

24 OSS solutions, which any municipality can use regardless of their membership status [39]. By supporting municipalities to jointly develop, mature, and maintain public code, the OS2 aims to increase public sector control of IT systems while decreasing vendor lock-in and costs. Rasmus Frey, chief executive and secretary of OS2, explained, "OSS is not the aim; rather, it is the means of ensuring public sector control of software solutions." The OSS products have gained significant traction, with popular examples including an easy-to-implement two-factor authentication system and KITOS, an IT portfolio management system, an IT portfolio management system that 80 municipalities use. In addition to providing a comprehensive overview of their portfolio, which in Denmark ranges between 400 and 600 systems per municipality, KITOS has enabled municipalities to identify common contracts with other municipalities and, in turn, to procure software together, further saving taxpayers money. Frey offered key insights into the enablers of this collaborative endeavour. After four years of unfunded collaboration, OS2 introduced a membership fee and a pay-per-use scheme to fund full-time staff, product development, hosting, and maintenance. According to Frey, securing the funds through membership fees was key to ensuring the sustainability of the OS2 network and its growing portfolio of products. An additional enabler was the creation of communities around each product, including active coordination groups of municipalities that use, develop, and/or maintain the products.

The LocalGov Drupal initiative in the U.K. and Ireland also exemplifies the enabling role of communities for collaboration among municipal governments. In this initiative, a community of policy-makers, developers, and designers from 36 local councils and local suppliers actively contribute to the development and maintenance of a common web publishing tool [40]. Through collaboration and expertise-sharing, the power of OSS is becoming apparent. With central funding and the active involvement of the community, local councils can adopt and benefit from open source solutions, driving innovation and efficiency in the delivery of public services.

The Open Cities nonprofit in the Czech Republic provides another example. It serves as a platform for coordinating and guiding cities in their adoption of OSS products. Recognising the conservative nature of the public sector when it comes to innovation, the organisation aims to provide cities with the necessary knowledge and tools to embrace OSS as easily as possible. Currently, it offers six OSS products. The most used tool is Cityvisor, which facilitates the visualisation of budgets, enabling cities to enhance transparency and improve financial decision-making. Building on its success, the Open Cities Programme now focuses on expanding its reach and establishing a national OSPO that can further promote the adoption of OSS throughout the country. With an eye to the future, Lucie Smolka, chair of the Open Cities Programme, commented, “It’s important for us to cooperate with other countries because as Open Cities, we are trying to do our best, but we are not able to provide every software for every city in the Czech Republic. By cooperating with other organisations from abroad, we would be able to see what other cities do, and we could use their software and provide ours, too.”

Collaboration among municipalities does not come without challenges. For example, Jacco Brouwer from the Dutch Association of Municipalities explained that, in the Netherlands, while larger municipalities such as Amsterdam have taken the lead in publishing software repositories on platforms such as GitHub or GitLab, there exists a gap between the availability of software and its practical adoption by other municipalities, which do not have comparable resources. Overcoming this challenge requires a combination of strategic coordination, technical support, and guidance to ensure that other municipalities can implement and utilise the available OSS. Jacco Brouwer elaborated that, “The role of the Dutch Association of Municipalities is similar to an incubator, facilitating open source collaboration between municipalities, organising the governance in which we work, and coordinating with market parties, which are essential to scaling. So, we’re doing a little bit of everything, and that makes us the social glue when it comes to scaling these collaborations.”

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— LUCIE SMOLKA, CHAIR OF THE OPEN CITIES PROGRAMME

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— JACCO BROUWER FROM THE DUTCH ASSOCIATION OF MUNICIPALITIES

## **Applying the open source ethos to digital public service design**

Ireland's "Build to Share" programme exemplifies the government's commitment to the digital public goods ethos in its digital transformation of essential public services. Collaborating with three Irish SMEs, the programme focuses on creating reusable software building blocks for vital, "cradle to grave" citizen services. Tony Shannon highlighted the goal of fostering collaboration, driving efficiency, and reducing costs by sharing software across government bodies. By embracing the power of open source principles and collaborating with local IT providers, Ireland is setting a noteworthy example for other governments, showcasing the benefits of combining the open source ethos with working with local SMEs to build cost-effective, citizen-centric solutions.

### Lessons from overseas: Stewarding open source expertise

There is growing concern that the EU is not sufficiently engaging with OSS communities when developing legislation related to OSS, for example, when it comes to the CRA. To address this, one interviewee suggested that the EU can learn from the approach taken by the US CISA, which has established multi-stakeholder working groups on software security. These working groups have convened experts from various sectors to collaboratively develop shared resources for software security, including guides and templates for Software Bills of Materials (SBOMs) and minimum requirements for Vulnerability Exploitability eXchange (VEX). Since 2018, the work on SBOM and VEX resources has made significant progress through the collaborative efforts of the working groups and community events, including conferences and workshops. We applaud these efforts, as the SBOM has emerged as a best practice to manage software supply chain risks effectively [2], and it presents at least three benefits: it enhances cybersecurity, prevents misuse of OSS, and facilitates legal compliance [41].

Meanwhile, in April 2023, the Department of Homeland Security's (DHS) Science and Technology Directorate announced the formation of a new cohort of seven startups to strengthen software supply

chain visibility tools [42]. The "Software Supply Chain Visibility Tools" topic call selected this group, which sought innovative technologies for providing SBOM capabilities to stakeholders across the enterprise, system administration, and software development communities. These companies, funded through the Silicon Valley Innovation Programme, will develop two main software modules: a multi-format SBOM translator and a software component identifier translator. The goal is to enhance transparency within the software supply chain and provide new risk assessment capabilities for DHS components and programmes, including the CISA. The seven companies selected for the project will work to deliver these modules as open source libraries and integrate them with their SBOM-enabled commercial products. The collective effort aims to mitigate software supply chain risks and respond more efficiently to new threats, improving overall cybersecurity.

The EU has a valuable opportunity to learn from the U.S.'s approach and enhance the security and quality of software solutions. By establishing mechanisms that foster collaboration with the OSS community and contributions to the OSS ecosystem, Europe can leverage the expertise of open source communities to develop useful guidance and toolings that improve software security practices. This collaborative approach can accelerate Europe's progress in securing its open source digital infrastructure and promoting a more resilient software ecosystem. To achieve this, governments must take the lead, actively engage with open source communities, and participate in initiatives that advance SBOM practices and toolings. By working together, Europe can strengthen its digital resilience and establish a framework that encourages the exchange of expertise, knowledge, and best practices in software security. Through collaborative efforts and engagement with the OSS community, Europe can enhance its position as a leader in software security, fortify its digital infrastructure, and ensure the resilience of its software ecosystem in the face of evolving cyber threats.

## SPOTLIGHT

# Signalen Project: Public-Private Collaboration to Deliver Municipal Services in the Netherlands



The Signalen project is an exemplary public-private collaboration in the Netherlands that aims to improve public services and customer satisfaction regarding nuisance reports and service requests. Building on the success of Amsterdam, which developed and shared the source code for Signalen on GitHub, the Dutch Association of Municipalities set out to replicate the software in other cities. In less than two years, the collaboration scaled from one to approximately 13 municipalities, with further expansion planned. The achievements of the Signalen project showcase the potential for successful replication of OSS, highlighting valuable insights and requirements for sustainable collaboration.

The Dutch Association of Municipalities played a key role in the growth of the Signalen project by bringing together municipalities and market providers, championing the merits of code reuse, and devising a cost-effective approach to OSS implementation and maintenance. Jacco Brouwer from the Dutch Association of Municipalities commented that being able to clearly explain the total cost of ownership to prospect municipalities has helped persuade them of the project's value and benefits. Brouwer also underlined the critical importance of market service providers, which provide hosting and support services, for the success of the Signalen project. However, for more OSS projects like the Signalen project to scale up, Brouwer argued that the public sector needs service providers to adapt their business models. "If public sector bodies start to focus on developing OSS, third parties need to change their IP-driven business models to service-driven models. A sustainable business model is a must; otherwise, the market parties won't have an incentive to support the mission, and that makes the collaboration weak because we need the expertise and the operational power of market parties."

### TOTAL COST OF OWNERSHIP:

- € 0,00 Signalen source code
- € 15K Out-of-pocket implementation and consultancy services
- € 10K Yearly hosting & support "Signalen as a Service" by a third party
- € 40K/20K/12.5K/2.5K Financial contribution Signalen community (city size)

## Conclusion and key recommendations

This report has described how public sector organisations in Europe are leveraging OSS to propel policy agendas, bolster trust in digital public services, and generate societal value. Although challenges such as reusability, outdated procurement regulations, and ineffective implementation of laws exist, the report has illuminated key facilitators that drive OSS engagement in the public sector, such as OSPOs, practical guidelines, and community support. By capitalising on these enablers, the public sector can speed up its OSS journey, thereby delivering innovative, cost-effective digital solutions, whilst fostering a resilient and digitally sovereign future for Europe. Against this backdrop, the next section offers a set of recommendations for the public sector to actively leverage OSS for the benefit of citizens and society.

### Shifting from using OSS to nurturing the OSS ecosystem

While several governments have introduced policies or legislation encouraging OSS use and reuse, they often overlook the potential for contributing to or leading projects in the OSS ecosystem. Currently, the public sector lags in its OSS engagement; it is one of the sectors in Europe that contributes the least code to the OSS ecosystem. This must change in line with the EC's Open Source Strategy, which urges the public service to be ready to contribute and accept citizens' contributions. Effective contribution channels include contributing code, funding OSS projects, and participating in a GAC if one exists. For example, by implementing a policy for upstream contributions, the public sector can become a more proactive contributor, either directly or by procuring upstream development work from suppliers. Once upstream policies are in place, OSPOs are useful organisational levers to facilitate upstream contributions by building internal communities and capacity within public sector organisations. Actions taken to facilitate OSS

reuse can also enable collaboration and contributions to the OSS ecosystem. Kristo Vaher, the CTO of Estonia, recommends that public sector developers should, "only design, develop, and deploy what you know best, use and reuse everything else, and always design for more than just one user or use case". Before releasing OSS, developer teams should ensure they provide comprehensive documentation about the software and consider whether it is possible to release software in smaller modules, which ease reuse and development, suiting different contexts and needs.

### Investing in and empowering OSPOs to lead the way

The establishment of national and regional OSPOs is a crucial step towards bridging the gap between policymaking and practical implementation across various levels of government. OSPOs work with all team units within government organisations, enforcing open source policies and strengthening open source governance [6]. This can help organisations ensure compliance, mitigate open source security risks, and facilitate effective coordination between different governing bodies, ensuring a harmonious approach to open source engagement. Furthermore, OSPOs play a key role in identifying ways for organisations to actively contribute to the open source community, be it financially, technically, or through active participation. This not only serves the broader open source community but also offers organisations competitive advantages and increased productivity by way of feedback processes and learning from experienced developers in the community. Ambitions, ranging from the establishment of one OSPO in some countries to the establishment of an OSPO in every ministry in France, demonstrate the transformative potential of these entities. A more widespread implementation

of this model could see profound advancements in open source engagement and development across Europe.

### **Stewarding cross-constituency coordination to level up OSS in Europe**

Enhancing cross-sector coordination in Europe is vital to bridging the existing divide between public sector organisations, industry, and OSS communities and foundations. It is evident that the public sector needs to bolster its understanding and expertise in building and managing OSS. Taking inspiration from overseas, the advice is to create platforms similar to multi-stakeholder working groups that can effectively deal with critical issues such as cybersecurity. There is also an emphasis on careful orchestration of support mechanisms to prevent diverging efforts. The focus should be on developing a connective tissue that encourages community outreach and promotes the use of existing resources instead of constantly starting from scratch. We need more case studies, practical guidance, and facilitation of human-to-human connections for successful open source adoption and development across various sectors. Furthermore, there's an urgent need for aligning OSS funding bodies at the EU and member state levels, along with establishing robust communication channels between these open source communities and policymakers.

### **Exchanging expertise between policymakers and the OSS ecosystem**

The untapped potential of open source is of strategic relevance to the digital policy agenda of the EU. Current legislative proposals such as the CRA treat the OSS ecosystem and the software industry as one, even though they are separate entities with their own development and market entry dynamics. This conflation underscores the need for a better understanding of the collaborative development of OSS and its unique market entry dynamics. Engaging with open source communities can enhance policymakers' understanding of the unique dynamics and potential of the OSS ecosystem, significantly impacting digital policy decisions. OSS foundations and think tanks have a role to play in facilitating the exchange of expertise through multi-stakeholder workshops and conferences to inform sound policymaking regarding OSS, building on existing initiatives such as OpenForum Europe's annual EU Open Source Policy Summit. Europe can also look to the U.S. for effective models, such as CISA's multi-stakeholder working groups for software security. By adopting a cross-sector, collaborative approach to issues such as software security, involving stakeholders from the OSS community, Europe can strike an appropriate balance between the need to improve software security on the one hand and understanding open source development cultures and practices on the other.

## **Funding the maintenance of our open source digital infrastructure**

Governments around the world increasingly recognise that OSS represents critical digital infrastructure and the need to do more to fund its development, maintenance, and security sustainably. While the private sector has historically been the largest funder of the open source ecosystem, government interest and involvement in funding OSS have increased in recent years due to concerns about digital sovereignty and software security. Germany's STF is a notable example, taking concrete steps to financially support critical OSS projects that governments—not just the German government—and the wider global digital economy depend on. However, this is just the start. We require a wider range of actors to invest in OSS—and better coordination of these funders—to collectively maintain our open source digital infrastructure. This shift towards diversified and long-term funding is necessary for the stability and sustainability of open source digital infrastructure.

## **Supporting digital sovereignty but avoiding regional fragmentation**

Across Europe, OSS is championed as a key enabler of digital sovereignty, empowering governments to reduce dependencies on foreign software providers and to maintain control over their digital infrastructure. While openness stands as a pivotal mechanism to achieve digital sovereignty, for the E.U. to realise the benefits of the open source ecosystem, it must encourage global collaboration and avoid regional fragmentation in the OSS ecosystem. Proposals advocating the creation of OSS by Europeans for Europeans could stifle valuable collaboration on global issues. Instead, we must champion an inclusive and collaborative approach that traverses geographical boundaries and, like a rising tide, benefits all stakeholders in the global OSS ecosystem.

# Resources for public sector engagement with OSS

## OSS observatories

- **The Open Source Observatory (OSOR):** The EC's [OSOR](#) is a trustworthy observatory that provides FOSS expertise and information as well as serves as a middle ground to connect European public administrations with other relevant stakeholders. Its [Knowledge Centre](#) gives you access to key information published by the OSOR as well as external resources to learn more about the development of OSS. Its [OSPOs and OSS Governance page](#) aims to help public administrators set up their own OSPOs and encourage them to share their experiences, while its [Cities and Regions](#) page provides a comprehensive guide for cities considering or already using open source solutions, providing valuable insights, testimonies, and lessons from local administrations.

## From OSS use to contributions

- **LF resources on OSPOs:** To guide organisations on their OSPO journey, resources from the TODO Group offer guidance regarding OSPOs, such as a [glossary](#), [guides](#), [mind map](#), or [101 course](#).
- **The Fintech Open Source Foundation (FINOS):** FINOS provides a number of resources that support organisations in the financial services sector to engage with and contribute to the OSS ecosystem. Resources include the [Open Source Body of Knowledge](#) (OSBOK), a collaborative project aimed at developing a comprehensive body of knowledge on OSS and its ecosystem; the [Open Source Licence Compliance Handbook](#), which provides information on how to comply with some common open source licences under a specific set of use cases; and an [OSS policy template](#), which includes sample provisions governing the use of OSS and contribution to OSS projects.

## Examples of OSPOs or similar bodies in Europe

- **The EC:** The [EC OSPO](#) was created in 2020 as the first concrete action of the latest [OSS Strategy for 2020 to 2023](#). It acts as a facilitator for activities outlined in the strategy and the action plan guided by six principles: think open, transform, share, contribute, secure, and stay in control.
- **Czech Republic:** In 2022, the Czech government published the [Brno Open Source Declaration](#), which set out the next steps for the creation of the Czech national OSPO. Through its [national open source portal](#) and multiple projects, the Czech Republic has managed to better organise its use of open source in public administration. The Declaration builds on those past efforts from different public and civil society actors to move towards a more organised form of open source governance, a national OSPO.
- **Denmark:** The [OS2 community](#) is a collaboration among public authorities that want to create, share, and maintain open source solutions with the help of private IT suppliers. It is their philosophy that using open methods and sharing software can solve the common needs of the public sector in collaboration.
- **Germany:** The [Centre for Digital Sovereignty \(Zentrum für Digitale Souveränität\)](#) is a central coordinating body for the promotion of OSS in the public administration in Germany.
- **France:** [The Free Software Unit](#) is driven by [Etalab](#), a department of [DINUM](#). It is responsible for open source policy and leads the OSS and Digital Commons Action Plan, both created in 2019. The Free Software Unit has also been part of creating the [Digital Republic Bill](#), which created the “open by default” principle for data within the French government.



- **Italy:** Established in 2016, [The Digital Transformation Team \(Team Digitale\)](#) exists to build the “operating system” of Italy, a series of fundamental components on top of which the public sector could build simpler and more efficient services for the citizens, the public administration, and businesses through innovative digital products. Team Digitale [supports a community of developers](#) who design and code Italian digital public services and [guide the \(re\)use of OSS](#) within the Italian public sector.

### Examples of public sector funding for OSS

- **STF (Germany):** The [STF](#) supports the development, improvement, and maintenance of open digital infrastructure. Its goal is to sustainably strengthen the open source ecosystem. It focuses on security, resilience, technological diversity, and the people behind the code.
- **Horizon Grants (EU):** [Horizon Europe](#) is the EU’s key funding programme for research and innovation, with a budget of EUR 95.5 billion.
- **Next Generation Internet (EU):** [Next Generation Internet](#) is an EC initiative that aims to shape the development and evolution of the Internet into an Internet of Trust. With an initial EC investment of EUR 250 million (2018–2020) and EUR 62 million (2021–2022), it has already supported around 1,000 Internet researchers and innovators involved in many hundreds of projects in the areas of Trust and Data Sovereignty on the Internet; Trustworthy Open Search and Discovery; Internet Architecture and Decentralised Technologies; and enhanced EU-U.S. and EU-Canada cooperation and collaboration.

### Examples of inter-regional collaboration

- **U.S.-EU Transatlantic Tech Council (TTC):** The [U.S.-EU TTC](#) aims to promote U.S. and EU competitiveness and prosperity and the spread of democratic, market-oriented values by increasing transatlantic trade and investment in products and services of emerging technology, strengthening our technological and industrial leadership, boosting innovation, and protecting and promoting critical and emerging technologies and infrastructure. We plan to cooperate on the development and deployment of new technologies based on our shared democratic values, including respect for human rights, that encourage compatible standards and regulations.

### Exchanging expertise between policymakers and OSS communities

- **OpenForum Europe (EU):** [OpenForum Europe](#) is a not-for-profit, Brussels-based independent think tank that explains the merits of openness in computing to policymakers and communities across Europe. It also hosts an independent global network of OpenForum Academy Fellows, each contributing significant innovative thought leadership on core topics, to provide new input and insight into the key issues that impact the openness of the ICT market. OpenForum Europe works closely with the EC, the European Parliament, and national and local governments.
- **Open Policy Alliance (U.S.):** The design of the [Open Policy Alliance](#) is to bring nonprofit organisations together to participate in educating and informing U.S. public policy decisions related to OSS, content, research, and education.

- **CISA (U.S.):** CISA convenes multi-stakeholder working groups on software security, which to date have developed many resources for software security, including for [SBOMs](#), and it has organised events to facilitate exchange between diverse members of the software community, including the [2023 SBOM-a-rama](#).

### Examples of public–private sector OSS collaboration

- **OWF GAC:** The OWF GAC advises the OWF Governing Board on various policy issues that impact the future of digital wallets’ development and regulation. The OWF GAC is a forum for discussing government policy interests and concerns; it facilitates information sharing and lessons learned from the various jurisdictions, enables a constructive dialogue with the OWF private sector members, and explores ways to better bridge the private

sector’s innovation with the expectations and requirements of governments. Governments around the globe— regional, provincial, state, and local public authorities and intergovernmental organisations—participate in the GAC, catalysing an internationally aligned ecosystem that offers trusted, open, and inclusive tools for a safe and sound global economy.

- **ICANN GAC:** The [ICANN GAC](#) serves as the voice of governments and international governmental organisations in ICANN’s multi-stakeholder representative structure. Its key role is to provide advice to ICANN on issues of public policy, especially where there may be an interaction between ICANN’s activities or policies and national laws or international agreements.

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**Mirko Boehm** is a free and OSS contributor, community manager, licensing expert, and researcher, with contributions to major open source projects such as the KDE Desktop (since 1997, including several years on the KDE e.V. board), the Open Invention Network, the Open Source Initiative, and others. He is a visiting lecturer and researcher on free and OSS at the Technical University of Berlin. Mirko Boehm has a wide range of experience as an entrepreneur, corporate manager, software developer, and German Air Force officer. He joined the LF in June 2023 as senior director for community development for LF Europe, where he focuses on driving engagement and collaboration between all European open source stakeholders. Mirko speaks English and German and lives in the Berlin area.

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## Acknowledgments

For their invaluable input and support, the authors wish to thank Gabriele Columbro, Hilary Carter, Susan Remmert, Anna Hermansen, Keegan McBride, Astor Nummelin Carlberg, Paula Grzegorzewska, Ciarán O'Riordan, Axel Thévenet, Jaakko Karhu, Lina Cebollas, Daniel Melin, Marcel Falcke, Thomas Fricke, Jacco Brouwer, Koos Steenbergen, Leonardo Favario, Thomas Steenbergen, Fiona Krakenbürger, Adriana Groh, Frank Karlitschek, Sven Herpig, Miguel Diez-Blanco, Gijs Hillenius, Egons Spalāns, Maria Dalhage, Tomas Olivares, Dániel Szabó, Bastien Guerry, Louison Magro, Karen Vega, Marelisa Blanco, Boris van Hoytema, Petra Dzuřovčínová, Kristo Vaher, Leslie Hawthorn, Lucie Smolka, Jiri Marek, Tony Shannon, and Rasmus Frey.

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To reference the work, please cite as follows:

**Callean Osborne, Mirko Boehm, and Ana Jimenez Santamaria, "The European Public Sector Open Source Opportunity: Challenges and Recommendations for Europe's Open Source Future," foreword by Gabriele Columbro, The Linux Foundation, September 2023.**