



## **D5.1.1 –VISION DOCUMENT**

# **THE VISION FOR AN ENHANCED SOFTWARE DESCRIPTION METADATA SCHEMA AND FEDERATED SOFTWARE CATALOGUE**

Deliverable

**JOINING UP GOVERNMENTS**



**This report / paper was prepared for the ISA programme by:**

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## EXECUTIVE SUMMARY

The Interoperability Solutions for European Public Administrations (ISA) Programme of the European Commission currently encourages public administrations in Europe to share and reuse free and open source software (F/OSS) and give better visibility to this software through a "federation" of software descriptions on Joinup. This document formulates the vision and makes the business case for better interlinking on-line software repositories. This can be achieved by creating an enhanced software description metadata specification that will allow software forges to exchange *more* information about their software projects and software assets. In addition to this, this report analyses the benefits and costs of constructing and maintaining an EU-wide software catalogue for public administrations on the Joinup platform.

Based on a survey and online research, this report provides an overview of the policies for the reuse and sharing F/OSS by public administrations in Europe. Almost every country in Europe mandates the adoption of open standards and many encourage the sharing and reuse of F/OSS on the condition that it supports the adoption of open standards and keeps the total cost of ownership under control. To encourage the sharing and reuse at national level, 15 independent software forges and repositories have been constructed in seven different countries. This is another indicator that governments are aware of the importance of F/OSS.

The European Interoperability Framework (EIF) recommends public administrations to “*reuse and share solutions and to cooperate on the development of joint solutions when implementing European public services*”. In this context, the EIF encourages applying the principle of openness when jointly developing custom-made software systems. From the perspective of cross-border and cross-sector digital interactions between European public administrations, the situation of national software catalogues, repositories, and forges for development of F/OSS by public administrations is not ideal. It prevents them from obtaining an adequate overview of all available software from a single point of access. It is furthermore demonstrated that there are still considerable *information* barriers to the sharing and reuse of F/OSS among public administrations:

- Barrier 1: Lack of visibility;
- Barrier 2: Language barrier;
- Barrier 6: Lack of trust;
- Barrier 7: Lack of feature descriptions;
- Barrier 8: Lack of quality assurance;
- Barrier 9: Lack of information on implemented standards and specifications;
- Barrier 10: Selection costs; and
- Barrier 17: Community building.

The creation and maintenance of an enhanced software catalogue for the EU public sector will help overcome these *information* barriers. It will require the ISA Programme to initiate the following steps:

1. Convince stakeholders of the vision and business case for an enhanced catalogue of software descriptions.
2. Build agreement with stakeholders on a software description metadata schema to exchange information about software. The enhanced specification needs to be developed with a

community-perspective, meaning that the development process should include a broad number of stakeholders from both public administrations and F/OSS communities.

3. Encourage the implementation of the proposed specification in regional, national, European and possibly global catalogues, repositories and forges, so that software description metadata can be easily exchanged.
4. Implement an enhanced federated catalogue of software descriptions on Joinup.

It is important to realise that the creation of such an enhanced specification can leverage existing specifications such as the Description of a Project (DOAP) specification, on which existing software catalogues are built. The reuse and enhancement of existing specifications is beneficial to keep maintenance costs under control and ensure interoperability of software descriptions. Today, every project on SourceForge, for instance, has a machine-readable DOAP description. The use of open standards makes it possible for software projects from public administrations to be located on commercial software forges with better collaborative tools than Joinup, while retaining visibility in an enhanced catalogue of software aimed at public administrations.

The business case for the enhanced specification for software project metadata and its use in a catalogue for public administrations is made by distinguishing two investment options:

**Alternative 1:** Maintain the current federation of software forges, constrained by federating limited software project metadata and by depending on particular technology to implement the federation.

**Alternative 2:** Build an enhanced specification for software project metadata and leverage it to construct an elaborate catalogue of software projects by making this specification the foundation of an enhanced federation of different catalogues, repositories and forges.

For each alternative, a cost-benefit analysis is made and the results are applied to the identified barriers to reusing and sharing F/OSS by public administrations. Having no clear financial disadvantage, developing and using an enhanced specification for software project metadata and using it in a federation is shown to reduce these barriers in a significantly more effective and efficient manner than the current federation could accomplish.

## 1 INTRODUCTION

This document formulates the vision and makes the business case for interlinking national and other repositories containing free and open source software (F/OSS) with the objective of building a decentralised, enhanced and searchable catalogue of software available to public administrations.

### 1.1 CONTEXT

This report was created in the context of **Action 4.2.2** (ISA collaborative platform) of the **Interoperability Solutions for European public administrations (ISA) Programme**. A specific part of this Action is to support public administrations with regards to the reuse and sharing of **F/OSS**.

The ISA Programme (and its predecessor IDABC) has already some time ago developed the vision to encourage public administrations in Europe to share their software projects as F/OSS and give better visibility to this software through the "federation" of software descriptions. This federation of software descriptions was set up on the OSOR platform and is currently continued on the Joinup platform; making Joinup a catalogue of more than 2500 software projects useful to public administrations. The aim of the catalogue is to give better visibility and trigger the reuse of F/OSS by public administrations, which can be expected to contribute to the interoperability of electronic public services.

The advent of new software description metadata vocabularies (such as DOAP) and maturing data integration technologies (such as Semantic Web technologies) presents a huge opportunity to further enhance the information value of F/OSS catalogues and increase the visibility of software from public administrations as F/OSS on the Internet. This document analyses the stakeholder needs, benefits, costs, and risks related to this **enhanced federation of F/OSS**. The objective of this analysis is to secure formal approval to proceed.

This Vision Document is structured as follows. In Chapter 2 a general overview is given of F/OSS policies for public administrations in the Member States and the general benefits and barriers to the sharing and reuse of F/OSS are listed. Chapter 3 contains an analysis of the current situation, stakeholder needs, and lists the opportunity to construction a software catalogue for public administrations. Chapter 4 identifies two alternatives for constructing the software catalogue, analyses costs, benefits, and risks. Chapter 5 concludes by formulating a recommendation.

### 1.2 KEY DEFINITIONS

This section contains a list of key definitions which are used throughout the document. Essential is the difference between a software forge, registry, and catalogue.

**Interoperability Solutions for European public administrations (ISA):** [ISA](#) is a programme launched by the European Commission to run in the period 2010-2015. It has the objective to support cooperation between European public administrations by facilitating the efficient and effective cross-border and cross-sector interactions between such administrations, enabling the delivery of electronic public services supporting the implementation of Community policies and activities.

**E-Government:** According to [DG Information Society](#), e-Government is about using the tools and systems made possible by Information and Communication Technologies (ICTs) to provide better public services to citizens and businesses. ICTs are already widely used by government bodies, just as in enterprises, but e-Government involves much more than just the tools. Effective e-Government also involves rethinking organisations and processes, and changing behaviour so that public services are delivered more efficiently to the people who need to use them. Implemented well, e-Government enables all citizens, enterprises and organisations to carry out their business with government more easily, more quickly and at lower cost.

**Joinup:** Joinup will be the new collaborative platform of the ISA Programme which has the purpose to encourage e-Government professionals to share and reuse interoperability solutions for public administrations, including F/OSS. Joinup will replace the former OSOR and SEMIC platforms.

**Free (Libre) Open-source software (F/OSS):** F/OSS stands for Free (Libre) Open-Source Software. Both the [Open Source Initiative](#) and the Free Software Foundations have their own definitions for Free Software. According to the [Free Software Foundation](#), free software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it means that the program's users have the four essential freedoms:

1. The freedom to run the program, for any purpose.
2. The freedom to study how the program works, and change it so it does your computing as you wish. Access to the source code is a precondition for this.
3. The freedom to redistribute copies so you can help your neighbour.
4. The freedom to distribute copies of your modified versions to others. By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

**Software forge:** A platform enabling collaborative software development over the internet. A forge typically offers its users a wide range of functionalities, ranging from simple hosting of source-code to offering a complete stack of development tools including an issue tracker, version control system, mailing lists and wiki-like functionalities.

**Software repository:** A software repository is an infrastructure where software can be stored, documented and retrieved.

**Software catalogue/register:** A software catalogue/registry is an infrastructure where metadata about software artefacts is documented and can be retrieved, whereas the software artefacts themselves are located elsewhere.

## 1.3 PURPOSE

The purpose of this document is to analyse whether the development of a specification for enhanced software project metadata can contribute to an increase in visibility and usage of F/OSS in public administration projects by employing it a federation of software catalogues, repositories and forges. Two alternatives, maintaining the existing federation with a limited use of software project metadata and

building a catalogue of software projects with enhanced metadata based on this new specification, are analysed and compared. For each, a cost-benefit analysis is made and the results are applied to a number of barriers to using and sharing F/OSS in the Member States, taking expected costs and benefits into account.

## 1.4 SCOPE

This Vision document analyses the key needs, costs, benefits, and risks of putting in place an enhanced catalogue of F/OSS for public administrations, hosted on different software forges and repositories. The main information sources for this analysis are existing studies on F/OSS for public administrations by the Member States and the IDABC and ISA Programmes, and interviews with key stakeholders. The following is considered to be **in the scope** of this analysis:

- **high-level problem definition:** stakeholder groups, analysis of current situation, problem statement, opportunity statement;
- **identification of alternatives:** identification and analysis of alternative solutions for software repositories and users, objectives, assumptions and dependencies, cost and timing - Costs will be analysed as an estimate of the total cost of ownership for the Joinup platform and a “generic” federated software repository; and
- **Comparison of alternatives:** analysis of the business needs and corresponding system features.

The following is considered to be **outside the scope** of this analysis:

- Detailed analysis of business environment;
- Detailed analysis of the federation architecture or detailed functional analysis of the changes required to software forges, repositories, and catalogues, including the Joinup platform – this analysis will be part of Deliverable 6.2.

## 1.5 APPROACH

This study is conducted in three parts:

- **High-level overview:** The first part of the study consists of an investigation of policies, perceived benefits and barriers in the European Member States to the *sharing* and *reuse* of F/OSS by public administrations. The main data collection instrument for this step is a survey and on-line research. The results are shown in Chapter 2.
- **Opportunity statement:** the second part of the study reflects whether the construction of a catalogue of F/OSS used / to be used by public administrations would overcome important barriers and reinforce important benefits of F/OSS. The results are included in Chapter 3.
- **Cost-benefit-risk analysis:** the third part of the study contains an identification of the investment options and a high-level analysis of the required investment cost, expected benefits, and main risks. The results of the analysis are included in Chapter 4.

## 2 F/OSS IN THE EU PUBLIC SECTOR

This section gives an overview of perceived benefits, and perceived barriers for the sharing and reuse of F/OSS in the European public sector.

### 2.1 PERCEIVED BENEFITS

This section lists a number of perceived benefits of the reuse of F/OSS in the EU Member States in general. The source for these benefits is based on studies on F/OSS reuse carried out in the EU Member States, the IDA, IDABC, and ISA Programmes, and a survey conducted in the second half of November 2011, to which all Member States represented in the ISA Accompanying Measures cluster were invited to respond. Annex II gives an overview of policies for F/OSS sharing and reuse in the EU Public Sector.

**Table 1 Perceived benefits to the reuse of F/OSS by public administrations**

Benefit	Description
<b>Benefit 1: Interoperability</b>	<p><b>Benefit:</b> The reuse of F/OSS solutions enhances technical and semantic interoperability.</p> <p><b>Motivation:</b> F/OSS solutions often rigorously implement open specifications and standards. This is a prerequisite to semantic and technical interoperability. A fortiori, a standard is only truly open, when implemented in F/OSS solutions. This is demonstrated by research of Lundell &amp; Lings in the context of the Open Document Format</p> <p><b>Source:</b> (Lundell &amp; Lings, 2010)</p>

Benefit	Description
<p><b>Benefit 2: Freedom of choice</b></p>	<p><b>Benefit:</b> F/OSS solutions implementing open standards enhance vendor independence and flexibility.</p> <p><b>Motivation:</b> Because F/OSS vendors favour open standards, and their source code can be reused and redistributed with modifications, public administrations are less dependent of the F/OSS vendor. Hence, when reusing F/OSS, project success is less dependent on one supplier. The use of open standards will also increase flexibility, both during the implementation phase of the project and during its operational phase and will improve the ability to upgrade the project in the future in phased stages. In addition, procurement of F/OSS within public organisations enables a wider range of suppliers to compete for the tenders, increasing competition and benefiting SMEs, thus reducing vendor lock-in and consequent monopoly pricing. The availability of source code also provides a greater continuity and security against financial collapse of suppliers of key products.</p> <p>Furthermore, GBdirect reports that, in closed-source projects users of the software are at the mercy of the vendor’s internal processes when detecting defects. Typically a defect report needs to be filed and then there will be a delay before the vendor determines when or whether to issue an updated release. This is in clear contrast with the F/OSS arrangement, where the availability of the source code will allow a developer that discovers a defect to also fix it. With a community of administrations that use and possibly co-develop on the software, defect can be fixed and also shared with the community within hours of being detected.</p> <p><b>Source:</b> (OFE, 2011) (GBdirect, 2001)</p>
<p><b>Benefit 3: Reduced total cost of ownership</b></p>	<p><b>Benefit:</b> The reuse of software solutions as F/OSS among public administrations reduces the total cost of ownership.</p> <p><b>Motivation:</b> A case study of Magnusson shows that reuse of F/OSS will deliver immediate licensing reductions, and is especially beneficial in situations with a large number of users where license fees for proprietary products often are substantial. In addition, open procurement enables a wider range of suppliers to compete for tenders, increasing competition and pressing prices.</p> <p>Though F/OSS can bring additional set-up and support costs, the key savings are longer term by reductions in ongoing costs freeing up more project funds, generating greater flexibility and reducing total cost of ownership. In particular F/OSS brings lower barriers to exit, and possibility to terminate underperforming projects early and scale up successful projects.</p> <p><b>Source:</b> (Magnusson, 2011) (OFE, 2011)</p>

Benefit	Description
<p><b>Benefit 4: Support and accountability</b></p>	<p><b>Benefit:</b> The models for obtaining support and accountability for F/OSS are in many cases better than for proprietary software</p> <p><b>Motivation:</b> In some cases F/OSS seems to raise an insecurity surrounding who is liable if the software fails. However, in practice proprietary and F/OSS licences do not differ in this respect. Both licenses disclaim responsibility and liability, and – as <a href="#">documented</a> by <a href="#">The European Working Group on Libre Software</a> founded by the European Commission – suppliers of proprietary vendors will in practice only provide an illusion of an option to sue or pursue other remedies from a negligent supplier.</p> <p>F/OSS, like any software, varies in the level of support available and in the software's reliability. Unlike proprietary software, F/OSS communities can provide a fairly high level of support free of charge, even though this may not be recommended, and not a practical option for any but the smallest public administrations (or, at the other end, larger agencies with significant in-house IT skills). In addition, some F/OSS suppliers obtain large parts of their revenue from service and support, and other F/OSS consultants provide training and/or support for software they recommend. This brings the advantage that it is always possible to retain a supplier to provide support. As the source code is freely available, organisations are not limited to obtaining support from the authors, and as long as there is demand, suppliers will learn enough about the software to provide support.</p> <p><b>Source:</b> (Ghosh, Glott, Schmitz, &amp; Boujraf, 2010), (GBdirect, 2001)</p>
<p><b>Benefit 5: Auditability</b></p>	<p><b>Benefit:</b> The availability of the source code allows for inspection and auditing</p> <p><b>Motivation:</b> F/OSS allows ensuring that qualities such as security, freedom from backdoors, adherence to standards and flexibility in the face of future changes are in place. If the source code is not available, the user is forced to trust the vendor when claims for such qualities are made. <a href="#">The European Working Group on Libre Software</a> founded by the European Commission noted in their <a href="#">study</a> that <i>"We can easily see that open source software has a distinct advantage over proprietary systems, since it is possible to easily and quickly identify potential security problems and correct them. Volunteers have created mailing lists and auditing groups to check for security issues in several important networking programs and operating system kernels, and now the security of open source software can be considered equal or better than that of desktop operating systems. It has also already been shown that the traditional approach of security through obscurity leaves too many open holes. Even now that the Internet reaches just a part of the world, viruses and cracker attacks can pose a significant privacy and monetary threat. This threat is one of the causes of the adoption of open source software by many network-oriented software systems."</i></p> <p>An often-quoted example of this in real life is the Interbase server from Borland/Inprise. A <a href="#">CERT advisory</a> notice summarises: <i>"Interbase is an open source database package that had previously been distributed in a closed source fashion by Borland/Inprise. Both the open and closed source versions of the Interbase server contain a compiled-in back door account with a known password."</i> This back door account was discovered when Borland released the source code of the software for public use.</p> <p><b>Source:</b> (GBdirect, 2001)</p>

*The reuse of F/OSS by public administrations has the potential to bring enhanced interoperability, more freedom of choice in selecting service providers, and reduced total cost of ownership.*

F/OSS brings benefits on another level apart from re-use. These benefits come from sharing, which can lead to the formation of a community around the project.

**Table 2 Perceived benefits to the sharing of F/OSS by public administrations**

Benefit	Description
<p><b>Benefit 5: Reliability</b></p>	<p><b>Benefit:</b> The sharing of software solutions from public administrations as F/OSS among public administrations reduces costs and improves its quality for the entire community.</p> <p><b>Motivation:</b> Tests by the University of Wisconsin have shown that mature F/OSS projects often are more reliable than commercial counterparts. This is confirmed in an <a href="#">analysis</a> on the impact of F/OSS on the UK Government's policy where it is observed that <i>“Open Source software becomes highly robust at a surprisingly early stage of its development, and mature Open Source products are setting new industry standards for bulletproofness.”</i> However, this is only true if the F/OSS project is shared. Khajani and Sulaiman explains in their study that large peer-review improves the quality of the project, and allows the project to grow for the benefit of all. Due to having variety of contributors in F/OSS projects and the story of knowledge sharing among them, the project can grow substantially in size and quality. With a large enough community around the project, the amount of co-developers and, with that, testers, grows, with the result that problems can be characterised and fixed quickly. Raymond explains that the F/OSS model allows for effective peer-review, as a number of reviewers with different perceptual sets and analytical toolkits all have access to the code, allowing them discover diverse issues and to accurately point out the source of the problem. F/OSS allows leveraging the internet for collaboration and allows a small core-developers group to, with the help of the co-developers/users, innovate while avoiding bugs and development dead-ends.</p> <p><b>Source:</b> (The University of Wisconsin, 1995) (Khanjani &amp; Sulaiman, 2011) (Raymond, 2001)</p>
<p><b>Benefit 6: Network effects</b></p>	<p><b>Benefit:</b> Due to its nature, using and working with F/OSS tends to lead to an increase in knowledge sharing and openness.</p> <p><b>Motivation:</b> F/OSS dynamic and network effects improve sharing of knowledge, support, and even code between ICT departments with similar requirements. Problems can be solved more effectively when a community of professionals come together to solve them.</p> <p><b>Source:</b> (OFE, 2011)</p>

*The sharing of F/OSS among public administrations will enhance quality due to network effects.*

## 2.2 PERCEIVED BARRIERS

In theory reuse of F/OSS seems perfect in public administrations due to the public sectors' often scarce budget. Until now, however, usage of F/OSS generates both enthusiasm and concern. A [2010 study](#) conducted for the IDABC Programme shows that, although many countries encourage and enforce sharing and reuse of F/OSS through policies, actual procurement practices do not always comply. This might be, among others, attributed to existing barriers to the sharing and reuse of F/OSS. This section lists a number of those perceived barriers in the EU Member States. The barriers are structured according to the major steps that public administrations must take to reuse an F/OSS solution:

1. Identification;
2. Procurement;
3. Integration; and
4. Maintenance and support.

The purpose of listing these barriers is to identify which barriers are overcome or reduced by the construction and maintenance of a catalogue of F/OSS for public administrations.

**Table 3 Perceived barriers to the reuse of F/OSS by public administrations**

Step	Barrier	Description
Identification	<b>Barrier 1: Lack of visibility</b>	<p><b>Barrier:</b> An abundance of F/OSS solutions in the market can lead to that the solutions have limited visibility.</p> <p><b>Motivation:</b> There are hundreds, if not thousands, of F/OSS projects currently in existence, and F/OSS vendors generally cannot invest in branding and advertisement. These projects face growing challenges in terms of visibility and scalability.</p> <p>In addition, feature information is often not actively introduced to the procurers. Unlike proprietary software, F/OSS projects generally do not obtain an income via licensing and therefore do not invest in pre-sales activities as vendors of proprietary software do. Consequently, public administrations must overcome an information hurdle to identify and evaluate F/OSS as candidate IT solutions. Results from a <a href="#">COSPA</a> study indicate that up to 40% of the costs of migrating to F/OSS are incurred from searching for software and for documentation.</p> <p><b>Source:</b> (Johnson, 1999), (Magnusson, 2011)</p>

Step	Barrier	Description
	<b>Barrier 2: Language</b>	<p><b>Barrier:</b> An F/OSS project might only be available in a very limited number of languages.</p> <p><b>Motivation:</b> Not all software is described and has documentation available in English. This language barrier reduces the discoverability of software.</p> <p><b>Source:</b> ShareFOSS survey: <i>“The language barrier (in documentation and in code) was the prime challenge for cost-savings which therefore hinders a lot of efforts to market the reuse of these projects.”</i></p>
<b>Procurement</b>	<b>Barrier 3: Lack of awareness on existing F/OSS policies and regulations</b>	<p><b>Barrier:</b> Lack of awareness on existing policies and regulations related to open source software and open standards</p> <p><b>Motivation:</b> Lundell states in his report for the European Journal of ePractice that there is lack of leadership, awareness and know-how about F/OSS and open standards amongst practitioners. A study by IDABC confirms that many organisations are not aware of the existing regulations in sufficient detail, and do not adequately consider the underlying principles. Those organisations tend to violate the European regulation by not following the principles of transparency and non-discrimination. Especially when procuring for initial purchase of IT equipment, there seem to be a twist in favour of proprietary software from specific vendors. The study indicates that tenderers seem to simply put together a shopping list of proprietary hardware and software without preparing any functional requirements, or considering the intended lifetime of the procured software. Consideration does not seem to be given to the effect of initial procurement choices on future procurement.</p> <p><b>Source:</b> (Lundell, 2011), (Ghosh, Glott, Schmitz, &amp; Boujraf, 2010)</p>
	<b>Barrier 4: Community effects are not pursued</b>	<p><b>Barrier:</b> The mechanics and dynamics of an open source software community are not well understood or fit for a solution needed by public administrations.</p> <p><b>Motivation:</b> The benefit of F/OSS dynamic and network effects are typically not clearly understood and therefore not pursued. These effects are also often not specified as part of the procurement process nor recognised in TCO valuations.</p> <p><b>Source:</b> (OFE, 2011)</p>

Step	Barrier	Description
	<p><b>Barrier 5: Lack of unity in systems development by public administrations</b></p>	<p><b>Barrier:</b> IT departments in public administrations tend to work isolated and are not used to innovation and knowledge sharing.</p> <p><b>Motivation:</b> Purchasing of application suites is largely a matter of history rather than strategic decisions. This leads to the practice that an evaluation is not undertaken before the actual procurement of software. It seems that IT groups in public organisations tend to work independently, believing their requirements are unique, looking for bespoke services, not commodity.</p> <p>In addition, intentions towards adopting F/OSS are influenced not only by the innovation itself but also by factors both inside the organization and in its external environment. Such topics are e.g. training, mutual support between IT departments, legacy technology, skill sets of contractors, and knowledge of end-users favour incumbent solutions, which are typically proprietary.</p> <p><b>Source:</b> (Lundell, 2011), (OFE, 2011)</p>
	<p><b>Barrier 6: Lack of trust</b></p>	<p><b>Barrier:</b> Public administrations tend to not place the same amount of trust in an F/OSS solution.</p> <p><b>Motivation:</b> An F/OSS project is often ignored as a candidate as procurers tend to be more suspicious about F/OSS offerings. An F/OSS project which is not always backed up by a commercial vendor does not always exhibit the same level of trust as a similar solution backed by a vendor of proprietary software. However, as documented in Benefit 5: Auditability, such sense of trust is illusive.</p> <p>A good sales argument for software is a portfolio of projects for public administrations in which it has been successfully applied. This information is not readily available on the internet. There are few public sector case studies on open source as opposed to conventionally licensed technology, which make assessment difficult.</p> <p><b>Source:</b> (OFE, 2011)</p>
	<p><b>Barrier 7: Lack of detailed feature descriptions</b></p>	<p><b>Barrier:</b> Feature information is not actively introduced to the procurers.</p> <p><b>Motivation:</b> Unlike proprietary software, F/OSS projects generally do not obtain an income via licensing and therefore do not invest in pre-sales activities as commercial vendors do. Consequently, public administrations must overcome an information hurdle to identify and evaluate F/OSS as candidate IT solutions.</p> <p>M. Magnusson shows in her study among public administrations in Sweden that F/OSS systems are, in some areas, perceived as not fully developed for large organisations such as municipalities. Neither is the F/OSS consultancy market considered mature enough. F/OSS systems can therefore be discarded as not realistic alternatives to proprietary systems.</p> <p><b>Source:</b> (Magnusson, 2011)</p>

Step	Barrier	Description
	<p><b>Barrier 8: Lack of quality assurance</b></p>	<p><b>Barrier:</b> Despite the fact that the open source developments have seen remarkable successful in recent years, there are a perceived product quality issues.</p> <p><b>Motivation:</b> Today there are quality assurance methodologies available for open F/OSS development models, which aim to improve the software product quality against traditional methods and techniques. However, there still exists a perceived insecurity around F/OSS, mainly rooted in concerns on quality assurance of program code quality, maintenance of the code and its quality over the life-cycle of the product and third party usage.</p> <p>M. Magnusson shows in her study among public administrations in Sweden that F/OSS systems are, in some areas, perceived as not fully developed for large organisations such as municipalities. Neither is the F/OSS consultancy market considered mature enough. F/OSS systems can therefore be discarded as not realistic alternatives to proprietary systems.</p> <p><b>Source:</b> (Khanjani &amp; Sulaiman, 2011), (OFE, 2011), (Magnusson, 2011)</p> <p><b>ShareFOSS survey:</b> <i>“The quality and maturity of available software (i.e. stability, sustainability, size of communities and effective number of third party users) is still difficult to evaluate in OSOR/JOINUP.”</i></p>
	<p><b>Barrier 9: Lack of information on implemented standards and specifications</b></p>	<p><b>Barrier:</b> Although F/OSS more often support open standards, there is little or no information available on the standards and specifications implemented by a F/OSS package.</p> <p><b>Motivation:</b> When selecting software packages, one has to consider the IT environment in which they must operate. One of the key elements in this process is analysing the implemented specifications and standards to understand how these packages can interact with existing applications and IT infrastructure.</p>
	<p><b>Barrier 10: Selection costs</b></p>	<p><b>Barrier:</b> Initial investment in selecting the F/OSS package can at times be high as this might include carrying out proof-of-concepts.</p> <p><b>Motivation:</b> Depending on the project, F/OSS selection costs can be high. Please note that this is not always the case, when it comes to e.g. servers or document handling, Linux and OpenOffice are both well known and much used among public administrations and hence easily selectable and no proof-of-concept is needed.</p> <p><b>Source:</b> (Galoppini, 2007)</p>

Step	Barrier	Description
	<b>Barrier 11: Public sector procurement practices</b>	<p><b>Barrier:</b> Practices surrounding procurement processes can pose an insurmountable barrier to F/OSS vendors participating in public tenders.</p> <p><b>Motivation:</b> There are no sanctions that deter public administrations from violating regulations and principles of public procurement, leading to that there is virtually no comeback if procurement legislation/guidelines are not followed. Internal/Government audits challenge costs but seem ill equipped to challenge compliance with F/OSS policies or judge the potential of over-specification, network effects or neutrality.</p> <p>It's easier to prepare and manage a tender for one closed project, as opposed to a number of smaller interoperable projects with the same overall functionality. Suppliers including confidentiality clauses within contracts hide details of response limiting comparisons.</p> <p><b>Source:</b> (OFE, 2011), (Ghosh, Glott, Schmitz, &amp; Boujraf, 2010)</p>
	<b>Barrier 12: Legal issues</b>	<p><b>Barrier:</b> Legal issues are little understood (indemnities, warranties) with potential patent infringements seen as barrier.</p> <p><b>Motivation:</b> Due to lack of knowledge surrounding F/OSS licences, procurers might refrain from an analysis of the differences and implications between these licences and opt for a straight-forward commercial solution instead.</p> <p><b>Source:</b> (OFE, 2011)</p>
	<b>Barrier 13: Vendor lock-in</b>	<p><b>Barrier:</b> For several reasons, public administrations are in a lock-in situation regarding certain software solutions and suppliers of IT services.</p> <p><b>Motivation:</b> Existing legacy contracts and framework agreements make status quo the easy option. In addition, existing suppliers will likely make cuts to meet spending review target but this will not deliver transformation of public services</p> <p><b>Source:</b> (OFE, 2011)</p>
<b>Integration</b>	<b>Barrier 14: No multilingual user interface.</b>	<p><b>Barrier:</b> Not all software has a multilingual user interface, or has a user interface that can easily be ported to another user language.</p> <p><b>Motivation:</b> A F/OSS project is often started by a software developer, believing there is a shortcoming in existing solutions. As it is primarily started for his/her own purposes, multi-language support is not always important and neglected in the development process. This is mainly true for small non-commercial F/OSS projects. Commercial companies and public administrations developing F/OSS generally ensure easy portability to other languages. This allows the adopting administration to add its own translation.</p>

Step	Barrier	Description
	<b>Barrier 15: Lack of technical support skills</b>	<p><b>Barrier:</b> A public administration might not have the necessary technical skills in-house to support a chosen F/OSS solution.</p> <p><b>Motivation:</b> There exists a general misconception among managers assuming that support skills are not available for F/OSS. Many also believe that if an issue arises in relation to interoperating components, a single supplier is better placed to resolve than multiple suppliers, favouring monolithic project tenders. As documented in Benefit 4: Support and accountability this is a misconception.</p> <p><b>Source:</b> (OFE, 2011)</p>

Public administrations who consider the **reuse** of F/OSS solutions are faced with the following barriers:

- Barrier 1: Lack of visibility;
- Barrier 2: Language barrier;
- Barrier 3: Lack of awareness on existing policies and regulations;
- Barrier 4: Community effects are not pursued;
- Barrier 5: Lack of unity in systems development by public administrations;
- Barrier 6: Lack of trust;
- Barrier 7: Lack of feature descriptions;
- Barrier 8: Lack of quality assurance;
- Barrier 9: Lack of information on implemented standards and specifications;
- Barrier 10: Selection costs;
- Barrier 11: Public sector procurement practices;
- Barrier 12: Legal issues;
- Barrier 13: Vendor lock-in;
- Barrier 14: No multilingual user interface;
- Barrier 15: Lack of technical support skills.

**Table 4 Perceived barriers to the sharing of F/OSS by public administrations**

Barrier	Description
<b>Barrier 16: IPR</b>	<p><b>Barrier:</b> Public administrations do not know the legal implications of sharing software.</p> <p><b>Motivation:</b> Public administrations lack sufficient expertise to decide under which license they can publish custom-built software. This is especially true in cases where the published software reuse, modifies, or redistributes existing software licenses.</p> <p><b>Source:</b> ShareFOSS survey: <i>“There is still a lot of licensing fear (especially when linking existing components) even if the EUPL bring some solutions”</i></p>

Barrier	Description
<b>Barrier 17: Community building</b>	<p><b>Barrier:</b> Public administrations find it hard to effectively build a community of developers around their software.</p> <p><b>Motivation:</b> Software for public administrations often has a specific audience and tends to be of an administrative nature. The projects are less visible and have less appeal with software developers. Software developers are inclined to contribute to projects they find useful for their own purposes and/or wherein they can attain a certain visibility.</p>
<b>Barrier 18: Initial costs to sharing outweigh perceived benefits</b>	<p><b>Barrier:</b> public administrations having a large sunk-in cost in the development, and the initial costs to sharing may outweigh the perceived benefits</p> <p><b>Motivation:</b> This barrier can occur either within a public administration or between public administrations. Public administrations or business units therein, even if not working for profit, want to be perceived as successful and efficient. They will be less inclined to share custom-built software that helps them maintain the image of being more effective than other administrations. Also ,Public administrations might not want to share software because they do not want others to benefit from their expenses. Failing to see the benefits, they fear they do not get anything in return and that other organisations will only act as free-riders.</p>
<b>Barrier 19: Fear for misuse</b>	<p><b>Barrier:</b> Public administrations might not want to share software because they fear it could be misused by third parties.</p> <p><b>Motivation:</b> Public administrations might believe their software could be misused if shared with the general public and do not want to be held accountable. Furthermore, that it will be misused with malicious intent, for example to find security vulnerabilities and use them to attack the administration using the software itself.</p>

Public administrations who consider **sharing F/OSS** solutions are faced with among others the following barriers:

- Barrier 16: IPR;
- Barrier 17: Community building;
- Barrier 18: Initial costs to sharing outweigh perceived benefits;
- Barrier 19: Fear for misuse.

### 2.3 SOFTWARE CATALOGUES IN THE EU PUBLIC SECTOR

Table 5 lists a number of software catalogues in the EU public sector. The difference between a catalogue, repository, and forge is visualised in Figure 1. A catalogue only provides a listing with a description of software artefacts. A repository also contains the actual software artefacts and (re)distributes them. A forge on top of this provides collaborative tools for software development.

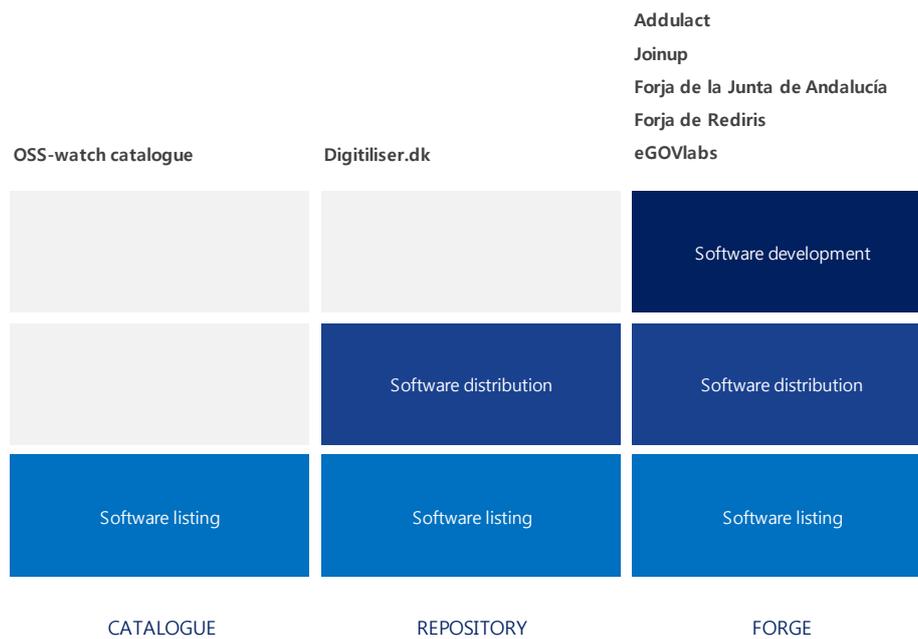


Figure 1 Software catalogue, software repository, and software forge

Table 5 Software catalogues, repositories, and forges in the EU public sector

Country	Repository	Type	Goals
AT	<a href="#">EGovLabs</a> , <a href="#">OpenSource</a> <a href="#">Plattform des Digitalen Österreich</a>	Software forge	The goal of the Austrian EGov Labs repository is to provide a solid base and framework for development of, communication about and distribution of open source software. Existing projects are welcome, but the repository especially welcomes new open source projects.
DK	<a href="#">Digitalisér</a>	Software repository	Digitalisér.dk is a single repository that supports digitisation in Denmark. It brings together key resources, recommendations and guidelines on IT, communication and IT development. The main goal of the repository is to strengthen cooperation between public and private parties. Digitaliser.dk is also a social networking platform that supports the development of relationships, network and knowledge sharing. Users have the possibility to produce, store and share content (resources, projects, news, discussions, etc.). Digitalisér.dk aims to be cross-domain and multidisciplinary networking of digitisation in Denmark.

Country	Repository	Type	Goals
ES	<a href="#">Technology Transfer Centre</a>	Software forge	<p>The Technology Transfer Centre has been created with the following objectives:</p> <ul style="list-style-type: none"> <li>To create a common repository of software for reuse in public administration Bodies.</li> <li>To share ICT project information (regulatory frameworks, projects carried out, services provided, infrastructure, communications, etc.).</li> <li>To provide a space for ICT projects, allowing them to manage their day-to-day running and development.</li> <li>To create a space where experiences in the field of ICT can be shared.</li> <li>To create an ICT knowledge base.</li> <li>To save effort when developing or implementing new projects.</li> </ul> <p>This website is aimed at any public administration, being of special interest for all staff working in the field of electronic administration.</p>
ES	<a href="#">Software Repository of the Junta de Andalucía</a>	Software forge	<p>By freeing software owned by Andalusia's government, the repository contributes to:</p> <ul style="list-style-type: none"> <li>enrichment of knowledge</li> <li>the improvement and clean-up of the liberated software itself</li> <li>the reinforcement of possibilities for cooperation with other administrations.</li> </ul> <p>In addition, opening up what has been developed promotes better quality and does not generate additional cost for the administration.</p>
ES	<a href="#">Forja Linex</a>	Software forge	<p>Forja Linex' objective is being a meeting place for developers of software. It offers all built-in functionalities of GForge 4.x. Linex is a free operating system intended to be used in schools, One of the objectives of this repository is to maintain this operating system.</p>
ES	<a href="#">La Farga</a>	Software forge	<p>The promotion and use of free software and open computer standards is one of the action items of the Government of Catalonia., La Farga is a platform promoting reflection, discussion and development of free software in Catalonia and made it available in their official language, catalan.</p>
ES	<a href="#">Mancomun</a>	Software forge	<p>Mancomun, as an initiative of the Galician government, is designed to support Galicia's progress towards the information society. The project promotes growth in the regional ICT sector through the advantages of free software and open standards. It intends to be a regional reference centre for open source.</p>
ES	<a href="#">Guadalinux</a>	Software forge	<p>Guadalinux is a free operating system based on Ubuntu, intended to be used in schools, libraries and other public institutions. The goal of the Guadalinux repository is to support this operating system by offering open-source software that is compatible and always available in the language of the Spanish region Andalusia.</p>

Country	Repository	Type	Goals
ES	<a href="#">The Free Knowledge Forge of the RedIRIS Community</a>	Software forge	The Free Knowledge Forge of the RedIRIS Community (Forja de Conocimiento Libre de la Comunidad RedIRIS) is a project driven by IRIS-Libre, one of the working groups of RedIRIS, aiming to improve the usage and development of free software in the Spanish scientific-academic environment. The RedIRIS repository is meant to support: <ul style="list-style-type: none"> <li>• Software development in the academic environment intended to be distributed as free software or open source software under free licences.</li> <li>• Related documentation to this software shared under the Creative Commons licence or similar.</li> <li>• Documents produced for teaching or research and published under the Creative Commons licence or similar.</li> </ul>
ES	<a href="#">CENATIC</a>	Software forge	CENATIC stands for the National Competency Centre for the application of open source technologies. It is a Public Foundation that represents a unique strategic project by the Spanish Government to promote open source software in all areas of the society.
EU	<a href="#">Joinup</a>	Software forge	The main goal of Joinup is to help European public administrations set up efficient and effective cross-border and cross-sector digital collaborations. Joinup allows professionals to share interoperability solutions for public administrations, and to find, choose, re-use, develop and implement Open-Source Software and semantic interoperability assets.
FR	<a href="#">Adullact</a>	Software forge	The objective of Adullact is to support and coordinate with local authorities, governments and hospitals in order to promote, develop, share and maintain a common store of free software useful to public service administrations and institutions.
IT	<a href="#">Ambiente di Sviluppo Cooperativo</a>	Software forge	ASC aims at supporting public administrations in finding open-source software projects at a higher quality than what is found in more general software repositories.
NO	<a href="#">Delingsbazaren</a>	Software forge	Delingsbazaren is a portal under the auspices of Friprog, where public businesses can share software developed with public funds. With 429 municipalities, 19 counties and 431 government agencies with many common needs, Delingsbazaren will make it easier to share software reuse good solutions and collaborate on the development.
UK	<a href="#">OSS-Watch</a>	Software catalogue	OSS Watch is an open-source software advisory service that provides independent advice on use, development and licensing of F/OSS to UK higher and further education. OSS Watch is funded by the Joint Information Systems Committee (JISC) of the UK higher and Further Education bodies and institutions. OSS Watch has created a OSS catalogue of software projects of the JISC and other UK Higher and Further Education based software development projects.

The analysis of existing infrastructures for sharing and reusing F/OSS by public administrations has brought to light that more than 7 European countries have started similar initiatives independently of one another. This is an indicator that the organising governments are aware of the importance of F/OSS for public administrations. However, it is not difficult to find example of relevant F/OSS that is available on non-governmental, third-party infrastructures, such as SourceForge, GitHub, the website of the Apache Software Foundation, Google Code, and many project-specific hosting solutions. The CENTOS Linux distribution, for example, a popular server operating system used by many public administrations, is made available via the centos.org platform.

*In recent years, 15 independent software forges and repositories have been constructed in 7 countries to encourage the sharing and reuse of F/OSS by public administrations. This is an indicator that the organising governments are aware of the importance of F/OSS for public administrations. However, these infrastructures are not the only location where to find information about F/OSS that is useful to public administrations.*

## 3 VISION OF A SOFTWARE CATALOGUE FOR PUBLIC ADMINISTRATIONS

The previous chapter identified perceived benefits and barriers to the sharing and reuse of F/OSS. This chapter establishes whether the creation of a software catalogue for public administrations responds to an actual need of stakeholders, can reinforce the identified benefits and help overcome the identified barriers.

### 3.1 STAKEHOLDER NEEDS

In a Digital Single Market, the delivery of electronic public services more and more takes place across the borders of individual Member States. Therefore, the European Interoperability Framework (EIF) for pan-European e-Government services recommends public administrations to “*reuse and share solutions and to cooperate on the development of joint solutions when implementing European public services.*” In this context, the EIF encourages applying the principle of openness when jointly developing custom-made software systems.

*The European Interoperability Framework (EIF) recommends public administrations to “reuse and share solutions and to cooperate on the development of joint solutions when implementing European public services. In this context, the EIF encourages applying the principle of openness when jointly developing custom-made software systems.*

Similarly, the Digital Agenda for Europe (European Commission, 2010) identifies **the need for better administrative coordination** for public administrations to develop and deploy cross-border public online services. According to the Digital Agenda for Europe, this need is justified as follows: “[...] *most public online services do not work across borders to the detriment of the mobility of businesses and citizens. Public authorities have so far focused on national needs and have not sufficiently taken into account the single market dimension of eGovernment. Yet several single market initiatives and legal instruments (such as the Services Directive or the eProcurement Action Plan) rely on the possibility for businesses to interact and do business with public administrations by electronic means and across borders. Therefore Europe needs better administrative cooperation to develop and deploy cross-border public online services. [...]*”.

In relationship to this, the Digital Agenda for Europe (European Commission, 2010) identifies **the lack of interoperability between public administrations** as one of the major obstacles to the Digital Single Market. Furthermore, it expresses **the need for interoperable applications that are based on standards and open platforms**. The Digital Agenda for Europe formulates this as follows: “*Europe does not yet reap the maximum benefit from interoperability. Weaknesses in standard-setting, public procurement and coordination between public authorities prevent digital services and devices used by Europeans from working together as well as they should. The Digital Agenda can only take off if its different parts and applications are interoperable and based on standards and open platforms.*” Interoperability is an essential element when public administrations connect to each other using digital means. Ultimately this will enable citizens to travel or live across Europe and businesses to expand

within the single market without facing costly and time-consuming administrative burdens. Interconnected and interoperable Public Administrations will further unlock the potential of the single market.

*The Digital Agenda for Europe identifies the needs for a **better administrative coordination** between public administrations and **applications that are interoperable and based on open standards and open platforms**.*

**Table 6 Stakeholder needs**

Stakeholder	Need
<b>Public Administrations</b>	<b>Reuse of F/OSS by public administrations.</b> Public administrations have an increasing need for cross-border and cross-sector digital interactions with external parties. They need to consider the reuse of F/OSS solutions, as they want to ensure the benefits listed in Section 2.3: interoperability, freedom of sourcing choice and reduced total cost of ownership.
<b>F/OSS projects</b>	F/OSS projects want to <b>attract public administrations</b> to reuse their software and want to <b>build a community of contributors</b> . Note that many F/OSS projects can be owned or funded by public administrations.
<b>ISA Programme</b>	<b>Encourage the sharing and reuse of interoperability solutions across border and sectors.</b> The ISA Programme has the objective to facilitate the <i>efficient</i> and <i>effective</i> cross-border and cross-sector interactions between public administrations (Decision No 922/2009/EC, 2009). As part of its Action 4.2.2, the ISA Programme encourages the <b>sharing</b> and <b>reuse</b> of common IT Solutions such as F/OSS by public administrations through the Joinup platform.
<b>National F/OSS initiatives for public administrations</b>	<b>Encourage/Mandate the sharing and reuse of IT Solutions.</b> Via forges, repositories and catalogues national initiatives aim to encourage the sharing or mandate and reuse of F/OSS by public administrations.

### 3.2 PROBLEM STATEMENT

In the previous section, it has been demonstrated that the sharing and reuse of F/OSS for public administrations across borders and sectors corresponds to an actual and increasing need of important stakeholders. Furthermore, in Section 2.4, it was shown that many countries and regions in Europe have already put in place national software catalogues, repositories, and forges for public administrations.

From the perspective of cross-border and cross-sector digital interactions between European public administrations, the situation of national software catalogues, repositories and forges for public administrations is not ideal. In these systems, monolingual information about software is made available through heterogeneous classifications and technologies. As these repositories are imperfectly linked and non-interoperable, it is impossible for someone to have an adequate overview of all software assets available from a single point of access. This is nonetheless an increasing need, as the delivery of

electronic public services more and more takes place across the borders of individual Member States, realising the vision of a Digital Single Market.

*The existence of national software catalogues, repositories, and forges prevents public administrations to obtain an adequate overview of all available software for public administrations from a single point of access.*

Furthermore, in Section 2.2, it was demonstrated that there are currently still considerable barriers to the sharing and reuse of F/OSS among public administrations. The construction of a software catalogue for public administrations can help overcome the barriers that relate to the lack of adequate information:

1. **Barrier 1: Lack of visibility:** In many cases, public administrations have only a limited view on the existing F/OSS solutions that are relevant in their domain. In some applications, public administrations have to interact with a large number of third parties (Other public administrations, businesses, and citizens).
2. **Barrier 2: Language barrier:** An F/OSS project might only be available in a very limited number of languages.
3. **Barrier 6: Lack of trust:** Public administrations cannot place the same amount of trust in a F/OSS solution, as F/OSS solutions are often delivered without any form of guarantee.
4. **Barrier 7: Lack of feature descriptions:** Feature information is not actively introduced to the procurers.
5. **Barrier 8: Lack of quality assurance:** Despite the fact that the open source developments have seen remarkable successful in recent years, there are a perceived product quality issues. This insecurity is mainly rooted in concerns on quality assurance of program code quality, maintenance of the code and its quality over the life-cycle of the product and third party usage.
6. **Barrier 9: Lack of information on implemented standards and specifications:** There is little or no information available on the standards and specifications implemented by an F/OSS package.
7. **Barrier 10: Selection costs:** Having only limited data readily available requires end-users to perform a more detailed analysis of the software to verify if a particular package fits their needs.
8. **Barrier 17: Community building:** Public administrations fail to capture community support and cannot build a community around their project.

By doing this, the F/OSS catalogue addresses the problem summarised in Table 7.

**Table 7 Problem statement**

<b>The problem of</b>	Information barriers to the reuse of F/OSS by public administrations, include among others: <ul style="list-style-type: none"> <li>• Lack of visibility;</li> <li>• Lack of multilingual information;</li> <li>• Lack of feature descriptions;</li> <li>• Lack of trust;</li> <li>• Lack of quality assurance;</li> <li>• Lack of information on implemented standards and specifications.</li> </ul>
<b>affects</b>	Public Administrations
<b>the impact of which is</b>	<ol style="list-style-type: none"> <li>1. Public Administrations choosing for proprietary software solutions.</li> <li>2. Vendor lock-in;</li> <li>3. Limited interoperability.</li> </ol>
<b>a successful solution would be</b>	<p>The creation and maintenance of a software catalogue for public administrations that:</p> <ul style="list-style-type: none"> <li>• Lists F/OSS for public administrations;</li> <li>• Provides multi-lingual information;</li> <li>• Provides accurate feature descriptions;</li> <li>• Provide validated metadata about F/OSS for public administrations;</li> <li>• Provides credentials (use cases) in the context of public administrations; and</li> <li>• Provides accurate information on implemented or related standards and specifications.</li> </ul> <p>The F/OSS catalogue is a single-stop-shop to identify and evaluate suitable F/OSS solutions for public administrations.</p>

*The creation and maintenance of an enhanced software catalogue for public administrations will help overcome the information barriers related to the sharing and reuse of interoperability solutions among public administrations.*

### 3.3 CURRENT SOFTWARE CATALOGUE ON JOINUP

Currently, Joinup can be conceived to be both a software forge (for the development projects is hosts) and a catalogue. It is a software forge, because it provides collaborative tools for more than 250 software development projects. It is also a catalogue, because Joinup currently federates more than 2490 software project descriptions from the so-called federated forges in Europe. This federation already gives an increased visibility to these software projects, because these projects now can be searched from a single point of access and all have an English translation. The federated forges are all running GForge 4.x / FusionForge. Because these forges are built on the same technology, it is possible to collect the following software project description from these federated forges:

1. Software name;

2. URL to the software project's location on the original forge; and
3. A short description of the software, which is afterwards machine translated.

The current situation, however, does have its limitations.

- Only software projects hosted on software forges based on GForge 4.x can be federated.
- Currently, it is *only* possible to search for federated software projects using plain text *keywords*. Very often, the short description of federated software is not meaningful enough to easily assess the actual features and quality of a software asset.
- Furthermore, the search results give little indication about the development status of the software, its software license, the degree of activity on the project, the programming language(s) in which it is written, the platform(s) for which it has been developed, or the communities or semantic assets that are related to the software.

*The current "federation" of software project descriptions does not overcome all information barriers to the sharing and reuse of F/OSS.*

The dependency on GForge 4.x leads to an additional problem. GForge was initiated in 2002 as a GPL-fork of the open-source code base that was developed by VA Linux to support the SourceForge.net services. At that time, VA Linux renamed itself to VA Software and continued development of a new SourceForge Enterprise Edition on a closed code base. In 2009, the GForge project went through the same evolution. GForge, in its 4.x release series, was ceased to be developed. The project owners instead started working on a closed-source version of GForge, dubbed GForge Advanced Server, leading to a new 5.x release series. The open-source GForge 4.x code base was subsequently forked and renamed to FusionForge to prevent further confusion with the now proprietary GForge 5.x solution (FusionForge).

At present, the majority of national forges depend on the older, open-source version of GForge 4. This is an unmaintained code base however, as all updates are now done in the FusionForge project. Forges depending on GForge 4.x are therefore excluded from security updates, maintenance releases and improvements.

*The current "federation" of software project descriptions is dependent on a technology that is specific to GForge 4 and FusionForge. Software description metadata from other infrastructures cannot be automatically retrieved.*

## 3.4 USE CASES OF AN ENHANCED SOFTWARE CATALOGUE

This section describes the use cases of an enhanced software catalogue for public administrations. For each use case, the business need, usage scenario and derived requirements are stated.

### 3.4.1 Explore and search software for public administrations

The main use case for the catalogue is to allow the exploration of and search for software.

**Business need:** Users need to be able to easily *explore* (IFLA, 2010), *find*, *identify*, *select*, and *obtain* (IFLA, 2008) F/OSS developed in *different* EU Member States, or other countries and organisations and originally catalogued or located in many *different* software catalogues, repositories, and forges. Furthermore, the enhanced software catalogue must help overcome the aforementioned information barriers to the sharing and reuse of F/OSS.

- To **explore** F/OSS that is available in a particular subject area and to explore the relationships between F/OSS in order to understand the structure of a subject area and its terminology;
- To **find** F/OSS that correspond to the user's stated search criteria (i.e., to locate either a single F/OSS or a set of F/OSS in *multiple* repositories or catalogues as the result of a search using a known attribute or relationship of the F/OSS);
- To **identify** F/OSS (i.e., to confirm that the F/OSS described corresponds to the F/OSS sought, or to compare two or more F/OSS with similar characteristics in *multiple* repositories or catalogues);
- To **select** F/OSS that is appropriate to the user's needs (i.e., to choose an F/OSS solution that meets the user's requirements with respect to content, format, etc., or to reject an F/OSS solution as being inappropriate to the user's needs);
- To **obtain** access to the F/OSS project described (i.e., to access an entity electronically through an online connection).

**Usage scenario:** Working on a new project for a public administration, a user might have information needs related to exploration and finding F/OSS solutions, for example a user is interested in the existence of F/OSS software libraries that allow him to manipulate spatial datasets that comply to the INSPIRE specifications.

- **Without the enhanced federation:** a user might try a keyword-based search on the current federation of Joinup, however, software catalogues such as Digitalisér and OSS Watch are not included in the federation. Alternatively, he can try a more elaborate search for (with translated keywords and properties) on each of the federated forges.
- **With the enhanced federation:** a user performs a single keyword-based and facet-based search on the enhanced catalogue. The catalogue provides detailed search results. To obtain the software, the user is directed to the URL on the software repository or forge (or another location) where the software can be retrieved.

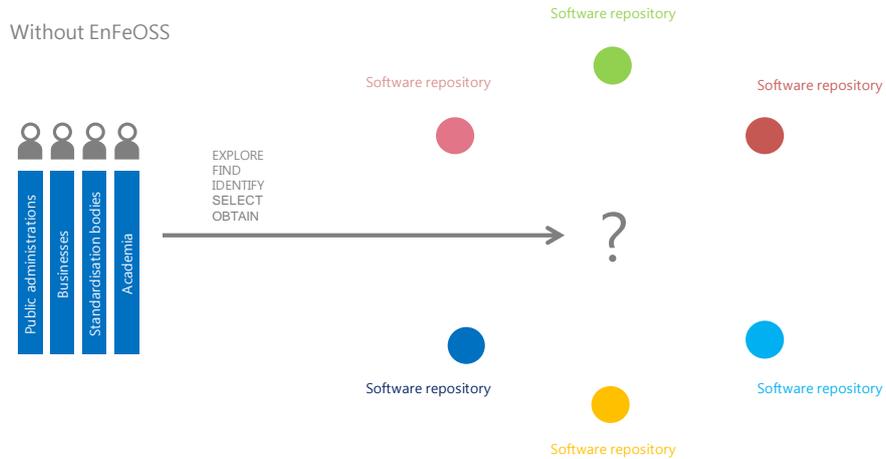


Figure 2 Without a catalogue for public administrations

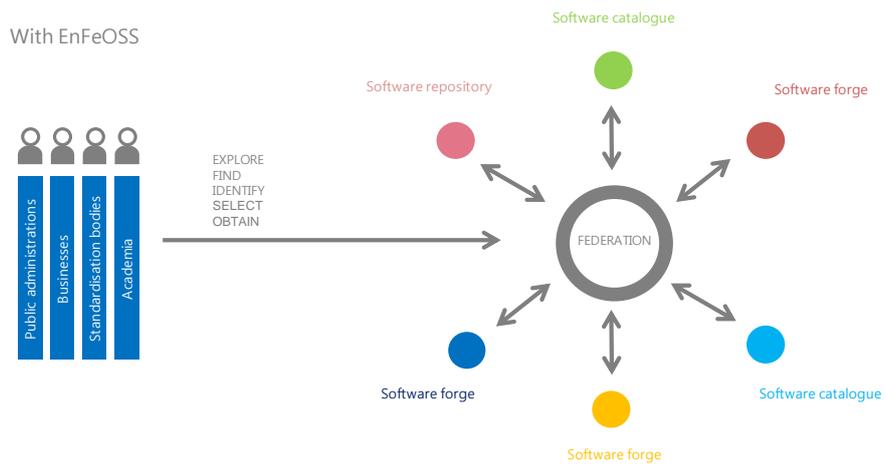


Figure 3 With a catalogue for public administrations

Similar to the Functional Requirements for Bibliographic Records (IFLA, 2008) the table below contains a list of conceivable asset metadata properties and relationships. Plotted against each property and relationship are the five generic user tasks (i.e., explore, find, identify, select, and obtain). The symbols used in the tables (■ □ ○) indicate the relative value of each attribute or relationship in supporting a specific user task focused on a particular entity. The symbol ■ signifies that an attribute or relationship is highly important for supporting the designated task; the symbol □ signifies moderate importance; and the symbol ○ signifies relatively low importance. The absence of a symbol indicates that the attribute or relationship has no discernible relevance to that particular user task or sub-task.

Table 8 Required fields to support the users tasks to explore, find, identify, select, and obtain F/OSS

Metadata category	Metadata property or relationship	Available in DOAP	Description	Explore	Find	Identify	Select	Obtain
descriptive metadata	title	name	the title of the software in multiple languages		■	■		■
	description	description, shortdesc	descriptive text in multiple languages		■	■		
	identifier		identifier for the software		■	■		■
	URI	location	uniform resource identifier		■	■		■
	version	version	version of the software release		■	■		■
	<i>related software</i>		related software		□			
	is replaced by		a newer version of the software		□	□		□
release	file-release	a release of the software					□	
applicability	domain		the domain of the software (e.g. using EuroVoc descriptors)	■	□		□	
	spatial coverage		geographic region in which the software can be used	■	□		□	
	multilingual		whether or not the software can be configured to have a multilingual user interface	□			□	
	language	language	natural language in which the software interface is available				□	
	related regulation		related regulations from which the software is derived	■				
provenance	origin		repository or catalogue that contains the primary description of the software	■	■			
	publisher	vendor	organisation responsible for the publication of the software	□	■	■		■
	publisher type		the kind of publisher	■				
	created	created	date of creation			■		
	modified		date of latest update			■		
People	developer	developer	person who developed the software	□				
	documenter	documenter	person who documented the software					
	maintainer	maintainer	person who maintains the software	□				
	helper	helper	person who helps with the software					
	tester	tester	Person who tests the software				□	
	translator	translator	person who translates the software					
format	programming language	programming -language	programming language of the software	■	□	■	■	
	software type	category	type of software (e.g. using descriptors of the Trove software map)	■	□	□	□	
availability	licence	license	A legal document giving official permission to do something with a resource				■	
	licence class		the class of licences that govern (re-)use of releases (e.g. BSD)	□		□		
	license type		coarse type of rights and obligations that come with the license	□				

Metadata category	Metadata property or relationship	Available in DOAP	Description	Explore	Find	Identify	Select	Obtain
	status		status in the context of a particular workflow process			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	platform	platform	the platform for which a binary distribution exists		<input type="checkbox"/>	<input type="checkbox"/>		
accessibility	access URL	download-page, download-mirror	URL of the software (release)					<input checked="" type="checkbox"/>
	documentation	blog, wiki, screenshots, mailing-list	documentation of the software					<input type="checkbox"/>
	homepage	homepage, old-homepage	an associated web page					<input type="checkbox"/>
interoperability credentials	implements specification	implements	the specification implemented by the software	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
usage credentials	used by		the organisations that use the software	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
	used in public service type		the electronic public service type in which the software is used			<input type="checkbox"/>	<input type="checkbox"/>	
metrics	#commits		the number of code commits to the software project, as an indicator of the project's activity					
	#downloads		the number of downloads of the asset (release)					

*The enhanced software catalogue must help overcome the information barriers related to the sharing and reuse of F/OSS by public administrations.*

### 3.4.2 Automated exchange of software project descriptions

**Business need:** the creation and maintenance of software description metadata in a software catalogue would be a laborious work if it were performed manually. One cannot possibly expect the maintainer of the catalogue to manually create or make all changes in the catalogue. The software catalogue should therefore make it possible to automatically exchange software description metadata from the original source. This source can be another software catalogue, repository, or forge.

**Business scenario:** The developers of an e-Health application decide to abandon their current project and join forces with a related project. They update the description and status information on their project website. The following day, the federated catalogue has automatically updated the development status of the discontinued project.

**Derived requirements:** the software catalogue must cater for the exchange of software project descriptions via lightweight, web-based protocols. The exchange can occur in two fashions.

- **Metadata harvesting** (pull scenario): A user can create (a set of) software metadata description(s) by providing the original source of the software description metadata, called the

harvest point. The catalogue stores this information as a source record. A harvester application will at consult this source record, retrieve the description metadata, and create corresponding entries in the catalogue. At predefined time intervals, the harvester application retrieves metadata from the harvest point and detects whether any changes have occurred.

- **Metadata sowing** (push scenario): A user can create (a set of) software description metadata by sending the software description metadata to the catalogue. The catalogue creates or updates the metadata descriptions accordingly.

*The enhanced software catalogue must allow the automatic exchange of software description metadata from a great variety of locations. This can include the exchange of a single software asset or an entire catalogue of relevant assets.*

### 3.4.3 Enrich software project descriptions

**Business need:** In some cases it is relevant for the ISA Programme to add additional metadata to software project descriptions which is not present in the original source. This is for instance the case for translations of title and descriptions, but also when assessment metadata (user review) or other information is added to the catalogue.

**Business scenario:** A user of the Joinup platform is able to propose a modification to the feature description of a particular software artefact included in the catalogue. In addition, he proposes a translation of the feature description into French. Additionally, he adds his own organisation as one of the users of the software artefact. A maintainer of the catalogue on Joinup is alerted of the proposed updates, and validates them. The catalogue is updated to reflect the proposal of the user.

**Derived requirements:** The software catalogue must have an internal data model and workflow to keep track of proposed changes and additions to the metadata descriptions, to deal with:

- Translations;
- User reviews;
- Assessments;
- Ratings; and
- User comments.

*The enhanced software catalogue must allow users to enrich the metadata beyond the information that is available in the source system.*

## 3.5 OPPORTUNITIES

This section lists a number of opportunities of which the ISA Programme can take advantage to create and maintain catalogues for public administrations.

### 3.5.1 Opportunity 1: Emerging standards for describing software projects

In the open-source community, there are several initiatives to harmonize metadata about software assets:

1. **Description of a Project (DOAP).** DOAP is an XML and RDF Schema to describe open-source software projects (Dumbill, 2011). Although DOAP provides detailed information about a software project, it does not include a software classification scheme such as the Trove software map, nor does it include software metrics. Due to significant community uptake, there are a number of generators, validators, viewers, and converters available to easily publish project metadata that adhere to the DOAP specification.
2. **Trove software map classification:** The Trove software map (Trove © SourceForge 2012 CC by) is a common classification schema to classify open-source software. Initial credits for implementing the Trove software map go to SourceForge. The Trove software map is also embedded in Fusionforge, based on the GPL branch of GForge which was in turn based on the last GPL version of sourceforge. Unfortunately, most forge software and forges have tailored (and translated) the Trove software map to their own needs. In consequence, there is currently no uniform taxonomy to classify software, but it seems likely that a greatest common denominator can be found among the existing software classification schemes.
3. **EuroVoc:** EuroVoc is a multi-lingual thesaurus of the activities of the European Union. Although not specifically designed as a classification system for open-source software assets, it has been suggested during the ISA Workshop on Supporting Measures of March 15 2011 to use the EuroVoc thesaurus to give a domain-based classification of open-source software for public administrations.
4. **FLOSSmetrics.** The FLOSSmetrics project (flossmetrics.org, 2006), together with other tools such as SLOCcount (Wheeler, 2004), have developed tools to obtain software metrics for GForge-based forges. Unfortunately, these projects do not suggest a uniform content format to exchange information about software metrics between Forges.
5. **Software Package Data Exchange (SPDX).** The Software Package Data Exchange (SPDX) specification is a standard format for communicating the **components, licenses and copyrights** associated with a software package. An SPDX file is associated with a particular software package and contains information about that package in the SPDX format.

None of the aforementioned initiatives by itself completely meets the requirements for improved federation that have been defined by the 2009 OSOR workshop. The DOAP specification and the Trove software map seem a good starting point for reuse.

*The DOAP specification has become a de-facto standard to describe software projects on the Web.*

### 3.5.2 Opportunity 2: Existing software catalogues

Currently, there are several software catalogues that leverage software descriptions via the DOAP specification:

- **[Simal](#) - The Software Catalogue of OSS Watch.** OSS Watch is an open-source software advisory service that provides independent advice on use, development and licensing of F/OSS to UK higher and further education. OSS Watch is funded by the Joint Information Systems Committee (JISC) of the UK higher and Further Education bodies and institutions. OSS Watch has created a DOAP-based OSS catalogue of software projects of the JISC and other UK Higher and Further Education based software development projects. This catalogue is called Simal, its source code is freely available. Although in an experimental stage, the catalogue contains 1915 software project descriptions and 1399 people descriptions. Figure 4 contains a screenshot of the online repository. Sander van der Waal, service manager at OSS Watch, points out the business case for the Simal catalogue: *“the DOAP specification allows us to maintain an accurate record of all F/OSS projects in which the JISC has been involved.”* To him the most important benefit is the provision of information: *“Especially information about the links between software projects and people is an important source of information. It allows project initiators to more easily identify what already exist and who has been involved in the past. It also allows gives more visibility to software projects in the catalogue which increases reuse.”* Sander further highlights that *“the use of the DOAP specification also limits maintenance costs: when a description is updated, it is automatically updated in the catalogue.”*
- **[SourceForge](#) - DOAP AP.** SourceForge offers an unmaintained RESTful API that exposes information about a software project using among others the DOAP XML format (sourceforge.net, 2011). This means over 325.000 projects on SourceForge are easily accessible through a machine-readable specification. The enhanced federation could use this API to import relevant software for public administrations that is hosted on SourceForge.
- **[The Apache Software Foundation projects.](#)** The Apache Software Foundation maintains a catalogue of all projects that are developed within the Apache community. All project data is maintained by the individual projects themselves.
- **[The Gnome Project Catalogue.](#)** Gnome requires all development projects to maintain a DOAP file that accurately describes the F/OSS development project.

*Several software catalogues provide or harvest software descriptions via the DOAP specification. Unfortunately, none of these projects share controlled vocabularies.*

**Simal Project and Community Registry Framework**

Simal Person Browser Category Browser Project Browser DOAP Form Reports Tools Add Project

### Project List

Name:

Showing 1 to 7 of 1915 << < 1 2 3 4 5 6 7 8 9 10 > >>

Name	Description
<a href="#">14-19 prospectus pilot in the East Midlands</a>	The project will aggregate 14-19 Area Prospectus course advertising information from at least four different areas into Aim Higher East Midlands' Progression Pathways database, as part of a wider pro
<a href="#">157 Group</a>	An examination of cloud computing opportunities through action research in 157 Group colleges.
<a href="#">18th Century parliamentary papers</a>	The 18th century printed British parliamentary papers proposal originated from the community consultation carried out in early 2003. The aim of the project is to digitise up to 900,000 pages 18th century House of Commons and House of Lords reports and bills, creating a

### People List

Name:

Showing 1 to 7 of 1399 << < 1 2 3 4 5 6 7 8 9 10 > >>

Name	Email	Project
<a href="#">Aaron Burrell</a>	Aaron.burrell [at] create...suffolk...ac...uk	The East of England's Educational Resource Network
<a href="#">Adam Mannis</a>	a.mannis [at] liverpool...ac...uk	Supporting Personalised and Collaborative E-learning in Foundation Degrees
<a href="#">Adam Rusbridge</a>	A.Rusbridge [at] hatii...arts...gla...ac...uk	UK LOCKSS Pilot Programme
<a href="#">Adele Edgar</a>	adele.edgar [at] gmsa...ac...uk	Supporting Ongoing Learning in Vocational Settings
		ASPIS Architecture for a Shihhaloth

Figure 4 [Simal](#) - The software catalogue of OSS Watch

<http://www.apache.org/>

ApacheCon NORTH AMERICA 2011 7-11 November Vancouver, BC

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**References & Thanks**

### Apache Batik

Batik is a Java-based toolkit for applications or applets to use images in the Scalable Vector Graphics (SVG) format for various purposes, such as display, generation and manipulation.

Programming Languages: [SVG](#)

Categories: [xml, graphics](#)

Mailing Lists: <http://xmlgraphics.apache.org/batik/mailling-list.html>

Bug/Issue Tracker: [http://issues.apache.org/bugzilla/buglist.cgi?query\\_format=specific&order=relevance+desc&bug\\_status=\\_open\\_&product=Batik&content=](http://issues.apache.org/bugzilla/buglist.cgi?query_format=specific&order=relevance+desc&bug_status=_open_&product=Batik&content=)

License: [Apache License Version 2.0](#)

Project Website: <http://xmlgraphics.apache.org/batik/>

PMC: [Apache XML Graphics](#)

---

**Project Release Information**

Releases can be downloaded from <http://xmlgraphics.apache.org/download.cgi>

Most recent releases:

Release	Version	Date
Batik 1.6	1.6	2005-04-11
Batik 1.7beta1	1.7beta1	2007-03-29
Batik 1.7	1.7	2008-01-09

Access to the source code:

Browse: <http://svn.apache.org/viewcvcs.cgi/xmlgraphics/batik/>

SVN Direct: <http://svn.apache.org/repos/asf/xmlgraphics/batik/trunk>

Figure 5 The Software Catalogue of the Apache Software Foundation

### 3.5.3 Opportunity 3: Asset Description Metadata Schema

The ISA Programme has already decided to proceed with initiate and support a Working Group with Member State representatives, Standards Organisations, and Academia to build consensus about an Asset Description Metadata Schema (ADMS). ADMS provides a common way to describe *semantic interoperability assets*. ADMS will be the main enabler for realising a loose federation of semantic assets repositories, and thus constructing a *central* catalogue of description metadata about semantic interoperability assets. From mid 2012, the Joinup platform, implemented under the ISA programme, will act as a one-stop portal to this federation from which users will be able to search for, identify and have access to a large number of semantic interoperability assets stored in several asset repositories in Member States, standardisation bodies and/or other repository owners.

The creation and maintenance of a central catalogue of semantic interoperability assets presents a considerable opportunity for the ISA Programme to bring this into relation with a central catalogue of software for public administrations. After all, systems from public administrations become more semantically interoperable when they *implement* the semantic interoperability assets for which consensus have been reached.

The ISA Programme is currently considering a proposal of the Member States to put in place an infrastructure that will enable the sharing and reuse of interoperability assets catalogued along the four levels of the European Interoperability Framework (EIF). This infrastructure will be called the European Federated Interoperability Repository (EFIR) and in a way generalises the aforementioned federation of semantic asset repositories and the federated software catalogue for public administrations.

*The Asset Description Metadata Schema and the European Federated Interoperability Repository (EFIR) entail a considerable opportunity for the ISA programme to relate interoperability assets, including semantic interoperability assets, to the sharing and reuse of, and free and open software by public administrations.*

### 3.5.4 Opportunity 4: Semantic Web

The exchange of software metadata happens at a time when initiatives such as the “Semantic Web” and “Linked Data” are gaining enormous momentum and are making it possible to integrate information from disparate information sources. These technologies represent an opportunity for the European Member States to publish the description metadata of their software –the descriptors of the software – both as human-understandable hypertexts (HTML), and as machine-readable metadata descriptions (RDF, or RDF annotations inside HTML). To realize this, repositories on the Web must adhere to the Linked Open Data (LOD) guidelines.

The publication of F/OSS from public administrations on the Web according to the LOD guidelines, will allow software forges, repositories, and catalogues to publish their software in a uniform, machine-

readable vocabulary, to easily create links between semantic interoperability assets on the Web and to seamlessly exchange software description metadata.

*The publication of software description metadata on the Web in an open, machine-readable format further enhances its visibility and reuse.*

### 3.6 SUCCESS CRITERIA

This section provides a profile of the stakeholders and users of the software catalogue, and the key problems that they perceive to be addressed by the proposed solution.

**Table 9 Success criteria for an enhanced catalogue of software for public administrations**

Stakeholder	Success criteria
<b>ISA Programme</b>	<ul style="list-style-type: none"> <li>• <b>Sharing of F/OSS.</b> Public administrations and software developers in general <i>frequently</i> use the Joinup platform to <b>share</b> the <i>descriptions</i> of their software, hosted elsewhere.</li> <li>• <b>Consultation of F/OSS.</b> The Joinup platform becomes a <i>frequently</i> consulted catalogue of interoperable IT Solutions for public administrations.</li> <li>• <b>Reuse of F/OSS.</b> The catalogue and accompanying information services on Joinup lead to an enhanced reuse of F/OSS by public administrations.</li> <li>• <b>Limited maintenance costs.</b> The maintenance costs of the F/OSS catalogue for public administrations are limited.</li> </ul>
<b>Public Administrations</b>	<ul style="list-style-type: none"> <li>• <b>Single stop shop.</b> Public administrations can use Joinup as a single-stop shop to retrieve all necessary information about software relevant to public administrations.</li> </ul>
<b>National F/OSS initiatives for public administrations</b>	<ul style="list-style-type: none"> <li>• <b>Public sector clients.</b> National F/OSS initiatives for public administrations can maintain their own catalogue or provide federated search services through the national platform.</li> </ul>
<b>F/OSS projects</b>	<ul style="list-style-type: none"> <li>• <b>Inclusion of relevant metadata in the F/OSS catalogue.</b> The inclusion in the F/OSS catalogue for public administrations enables F/OSS vendors to reach the public sector.</li> </ul>

## 4 MAKING THE BUSINESS CASE

The previous chapter has demonstrated how an enhanced software catalogue could contribute to the sharing and reuse of F/OSS by public administrations. This chapter analyses the business case and compares the benefits, costs, and risks of the enhanced software catalogue with the baseline situation, the current federation of software repositories on Joinup.

### 4.1 APPROACH

In order to adequately review both investment options, each will be first described and then subjected to a cost-benefit analysis. The objective of the cost-benefit analysis is to determine how well the alternative contributes to the benefits listed in Section 2.2 and how efficient it is in reducing the barriers described in Section 2.3. Table 10 lists the rating mechanism that is applied to each benefit and barrier.

**Table 10 Used ratings for benefits and barriers**

Impact	Rating
The option has no impact on the benefit or barrier.	0
The option has a minor positive impact on the benefit or helps reduce the barrier.	+
The option has a considerable positive impact on the benefit or greatly reduces the barrier.	++
The option has a minor negative impact on the benefit or further strengthens the barrier.	-
The option as a major negative impact on the benefit or adds considerably to the barrier.	--

In addition to the impact on the perceived benefits and barriers, each option will be investigated for possible associated risks, providing a probability and impact assessment for each option that can be identified.

Hereby, it is important to notice that the creation and maintenance of a software catalogue for public administrations cannot be an isolated measure. To overcome the barriers related to the sharing and reuse of F/OSS and to reinforce the benefits, policy makers and public administrations need to put in place a variety of measures, including among others:

1. The construction and maintenance of a catalogue of open-standards and a software catalogue for public administrations;
2. The provision of legal advice related to the sharing and reuse of F/OSS;
3. The creation of procurement policies, regulations, guidelines, and processes to support the procurement of F/OSS; and
4. Guidance with the effective support of a community of developers and users.

## 4.2 ALTERNATIVE 1: MAINTAIN THE CURRENT FEDERATION OF SOFTWARE FORGES

This section describes the possibility of a status-quo. The Joinup platform would continue to federate the project descriptions from the 12 federated forges in Europe, representing 4 different Member States.

### 4.2.1 General description

As reported in the section 3.3, the repositories in the federation are all built on the same technology: GForge 4.x or FusionForge. These software packages allows the use of a standard RSS export function to collect (limited) OSS project description from these federated repositories:

- Software name;
- URL to the software project's location on the original repository;
- A short description of the software project.

Alternative 1 maintains the RSS based federation as it is currently implemented on Joinup.

### 4.2.2 Cost-benefit analysis

This straight-forward implementation of a federation based on an RSS interface has one characteristic: simplicity. It requires no additional development and is easy to set up. It requires little efforts on behalf of the federated repositories. This simplicity is the greatest disadvantage at the same time however. The federation does not depend on a standard function or specification as such, but on one specific software implementation, namely the RSS interface offered by GForge 4.x based packages.

Table 11 lists all barriers to the reuse of F/OSS and indicates how the current setup affects these barriers. If Alternative 1 has an impact on a barrier, a description is given as to how this impact is expected to materialise.

**Table 11 Alternative 1: Impact on barriers to sharing and reuse F/OSS**

Type	Barrier	Impact	Description
Reuse	<b>Barrier 1:</b> Lack of visibility	+	Maintaining the federation as it is improves visibility of software projects as they can be discovered from a central location, albeit with limited project information. The federation only enhances visibility of projects located on either a GForge 4.x or FusionForge repository. Repositories that use another off-the-shelf solution or a custom developed package are excluded from the federation, unless they implement the same interface; By offering a wider selection of software from a central location, users gain better knowledge of existing solutions and can discover what projects are more used than others, implicitly leading to an increase in interoperability.
	<b>Barrier 2:</b>	+	Project metadata retrieved from the federated

	Language		repositories is translated into English. This reduces the language barrier as English is more widely used in software communities than other languages.
	<b>Barrier 3:</b> Lack of awareness on existing policies and regulations	0	
	<b>Barrier 4:</b> Community effects are not pursued	0	
	<b>Barrier 5:</b> Lack of unity in systems development by public administrations	0	
	<b>Barrier 6:</b> Lack of trust	0	
	<b>Barrier 7:</b> Lack of feature descriptions	0	
	<b>Barrier 8:</b> Lack of quality assurance	0	
	<b>Barrier 9:</b> Lack of information on implemented standards and specifications	0	
	<b>Barrier 10:</b> Selection costs	0	
	<b>Barrier 11:</b> Public sector procurement regulations	0	
	<b>Barrier 12:</b> Legal issues	0	
	<b>Barrier 13:</b> Vendor lock-in	0	
	<b>Barrier 14:</b> No multilingual user interface	0	
	<b>Barrier 15:</b> Lack of technical support skills	0	
<b>Sharing</b>	<b>Barrier 16:</b> IPR	0	
	<b>Barrier 17:</b> Community building	0	
	<b>Barrier 18:</b> Initial costs to sharing outweigh perceived benefits	0	
	<b>Barrier 19:</b> Fear for misuse	0	

Alternative 1 maintains the current situation and has no associated development costs as such. There are however maintenance costs that occur when new projects become visible in the federation. Each new project requires assessing its relevancy, validating and improving a machine-translated description and tagging it according to the taxonomies in use on Joinup. The total amounting costs are expressed on a yearly basis in Table 12.

**Table 12 Alternative 1: Yearly maintenance costs**

Activity	Description	Estimated cost (in man-days)
Maintain the existing federation	<p>The existing federation uses a schedule to retrieve project information from the federated repositories:</p> <ul style="list-style-type: none"> <li>- <b>350 new project descriptions</b> each year.</li> <li>- For a new project description, a check must be made whether it is relevant to be assessed: <b>x person hour</b>.</li> <li>- A machine translation for the new project must be checked and improved: <b>1 person hour</b>.</li> <li>- It must also be tagged according to the custom taxonomies used by Joinup: <b>x person hour</b>.</li> </ul>	x
<b>Total yearly maintenance cost</b>		<b>x</b>

### 4.2.3 Risks

Maintaining a status-quo on the existing federation is not risk-free. Table 13 lists the identified risks that are related to Alternative 1’s dependency on a particular software package. Although the probability of these risks is low, their impact is not to be underestimated as they can disrupt the entire federation.

**Table 13 Alternative 1: Risks**

Description	Probability / Impact	Contingency Plan
<p><b>Risk 1.1:</b> Uptake of another standard or interface. If another standard gains traction in software development communities, Joinup will be forced to migrate to this specification to maintain the federation.</p>	<p>Low / High</p>	<p>Adoption of the new interface or standard on Joinup.</p>
<p><b>Risk 1.2:</b> Abandoned development on the software package the federation is dependent on.</p>	<p>Low / High</p>	<p>Take over maintenance of the package. Migrate to another platform or standard.</p>
<p><b>Risk 1.3:</b> Diversion of functionality between the forges based on GForge 4.x and those on FusionForge. The majority of forges still depend on GForge 4.x, but a small number has already started using FusionForge. Development of GForge 4.x has been abandoned however, while FusionForge is still maintained. An update to FusionForge might break compatibility with the GForge 4.x package.</p>	<p>Low / High</p>	<p>Migration of GForge 4.x based forges to FusionForge. Implement another interface or standard on all forges.</p>

*Maintaining the current federation is not risk-free as this approach is entirely dependent on the future of one particular software implementation.*

## 4.3 ALTERNATIVE 2: BUILD A CATALOGUE LEVERAGING AN ENHANCED SPECIFICATION

This section provides an analysis of the alternative of creating and maintaining a catalogue on Joinup, leveraging existing specifications, such as ADMS and DOAP, and supplemented with non-standardised metadata in the form of a new, enhanced specification. The vision for this software specification and catalogue is described in Chapter 2.

### 4.3.1 General description

Alternative 2, an ad-hoc catalogue based on an enhanced specification leveraging existing specifications, proposes to use existing standards such as ADMS and DOAP to implement a more advanced federation of repositories. The federation would no longer depend on an interface exposed by a specific software package, but would require federated repositories to expose the project information using the DOAP specification.

### 4.3.2 Cost-benefit analysis

Public administrations – the target users of this catalogue – will benefit from this as it will allow them to more easily search and retrieve information about software and discover the semantic links between them.

*Public administrations will benefit from a catalogue of software projects as it allows them to more easily search and retrieve information about software and discover the semantic links between them.*

The benefits are not limited to the end-user however. Developers and project owners can freely choose a repository or forge that fits the needs of their project, without having to consider how large the audience supported by that particular repository or forge is. If the selected platform takes part in a federation and exchanges software description metadata with other repositories and forges, developers and project owners are ensured that their project is given wider visibility. The costs of choosing for a particular location to develop and store a software project are lowered, as long as the federated repositories and forges are able to exchange information and understand each other's metadata.

*The costs of choosing for a particular location to develop and store a software project are lowered, because the project's visibility is improved by exposing more metadata about the project in an enhanced federation.*

By giving both end-users and project owners the freedom to choose any repository or forge, the need for duplicating features of those platforms in a central, monolithic platform is reduced at the same time. There is no longer a requirement to have a centralised repository or forge that stores and offers all possible software projects in all possible domains and that fulfils the requirements of any type of user. Repositories can make use of standard software packages such as GForge 4.x / FusionForge or can be tailored to meet specific domain-requirements. Building and maintaining a central solution, attempting to be a catch-all for all possible software projects, is no longer necessary.

By exchanging metadata and by making software projects location-independent, these projects will gain improved visibility as they can now be discovered from a catalogue of software projects. Improved visibility is considered a prerequisite for an increase in reuse. It will make more users aware of the existence of software projects which will at least create the possibility that those projects are reused. As such, federation uses the same basic principle of search engine optimisation: by improving the visibility

of a website in the search results (e.g. ranked earlier or more frequently), one hopes to attract more actual visitors from the search engine's users.

*By exchanging metadata and by making software projects location-independent, these projects will gain improved visibility as they can now be discovered from a catalogue of software projects. Improved visibility is considered a prerequisite for an increase in reuse.*

Table 14 describes the impact of choosing Alternative 2 on the perceived barriers to sharing and reusing F/OSS (detailed in section 2.2). Each barrier is listed with the estimated impact Alternative 2 has on it, and, if such impact exists, how this is expected to be realised.

**Table 14 Alternative 2: Impact on barriers to sharing and reuse F/OSS**

Type	Barrier	Impact	Description
Reuse	<b>Barrier 1:</b> Lack of visibility	++	Developing and maintaining a software catalogue as a central access point for software projects will increase the visibility of these projects. As the catalogue will be based on a specification, there is no longer a requirement for projects to be located on either a GForge 4.x or FusionForge repository. Implementing a catalogue serves as a proper tool to identify projects to re-use instead of having public administrations re-invent the wheel.
	<b>Barrier 2:</b> Language	++	Using a specification to build a software catalogue will reduce the language barrier, as common software characteristics can be more easily translated and managed in the catalogue.
	<b>Barrier 3:</b> Lack of awareness on existing policies and regulations	0	
	<b>Barrier 4:</b> Community effects are not pursued	0	
	<b>Barrier 5:</b> Lack of unity in systems development by public administrations	0	
	<b>Barrier 6:</b> Lack of trust	++	The inclusion of a software package within the software catalogue, combined with validated metadata on its usage can help overcome the trust barrier. Information on where a particular software artefact has already been applied will inspire greater confidence in end-users considering the project.
	<b>Barrier 7:</b> Lack of feature information	++	Adopting a standard to describe software features gives users the opportunity to find the information they need more easily and with reduced efforts. Instead of consulting the project's documentation or even analysing the software itself, the information is provided by a catalogue in a standard format.

	<b>Barrier 8:</b> Lack of quality assurance	++	A more extensive specification including technical details (such as code-related metrics or unit-test results) gives a first indication of the level of quality that can be expected when using the software.
	<b>Barrier 9:</b> Lack of information on implemented standards and specifications	++	The appropriateness of a particular software project does not only depend on the business requirements but also on the IT environment in which it is expected to operate. Information on standards and specifications implements in a software package will help end-users assess the suitability of that package. A software catalogue including this information would greatly help end-users in this assessment process.
	<b>Barrier 10:</b> Selection costs	++	Additional metadata gives potential users better insights into the features of different software packages and offers a more comprehensive view on the different available software offerings, making the selection of a specific project easier.
	<b>Barrier 11:</b> Public sector procurement regulations	0	
	<b>Barrier 12:</b> Legal issues	0	
	<b>Barrier 13:</b> Vendor lock-in	0	
	<b>Barrier 14:</b> No multilingual user interface	0	
	<b>Barrier 15:</b> Lack of technical support skills	0	
<b>Sharing</b>	<b>Barrier 16:</b> IPR	0	
	<b>Barrier 17:</b> Community building	+	By exposing more information about the people and organisations involved in a F/OSS project, an enhanced specification serves as a recognition system, granting clear credit to the source of the F/OSS solution.
	<b>Barrier 18:</b> Initial costs to sharing outweigh perceived benefits	0	
	<b>Barrier 19:</b> Fear for misuse	0	

Alternative 2 requires developing and extending an existing specification for describing software projects. The associated one-off costs are summarised in Table 15. The major activities include identifying the stakeholders and subject matter experts that can contribute to the specification. Developing and delivering the specification will take part in a dedicated Working Group. Once the specification has been developed, it needs to be developed on Joinup. This requires a functional specification, the actual technical modifications and harvesting metadata from other catalogues, forges or repositories to construct the catalogue. To support adoption of the specification as much as possible, a cost is foreseen to develop a plug-in for FusionForge that allows exporting project metadata according to the newly developed specification. These additional development costs do not include the costs that have already been made to produce this vision and business case.

**Table 15 Alternative 2: Additional development costs**

Activity	Description	Estimated cost (in man-days)
Identification of stakeholders	Developing a new specification requires input from stakeholders and subject matter experts. This activity: <ul style="list-style-type: none"> <li>Identifies stakeholders;</li> <li>Organises a workshop to gather the stakeholders and identify potential members for a Working Group.</li> </ul>	x
Development of the specification	<ul style="list-style-type: none"> <li>Facilitate the Working Group in developing a specification for a software catalogue (4 meetings);</li> <li>Report on the activities of the Working Group;</li> <li>Deliver the specification;</li> </ul>	x
Implementation of the specification on Joinup	Improve Joinup by implementing the specification and creating an enhanced federation: <ul style="list-style-type: none"> <li>Report on the functional requirements;</li> <li>Harvest metadata from other catalogues / forges / repositories;</li> <li>Make Joinup aware of the additional metadata by implementing it in search .</li> </ul>	x
Implement and deploy a DOAP exporter plugin for FusionForge	Development of samples to help projects and communities export their existing software metadata, based on the developed specification, will help contribute to a faster adoption of the specification.	x
<b>Total development cost</b>		<b>x</b>

In addition to the one-off development costs, there also are also maintenance costs for Alternative 2. These costs occur when new projects become are added to the catalogue. Each new project requires assessing its relevancy, validating and improving a machine-translated description and tagging it according to taxonomies of the catalogue. The total amounting costs are expressed on a yearly basis in Table 16.

**Table 16 Alternative 2: Yearly maintenance costs**

Activity	Description	Estimated cost (in man-days)
Maintain the software catalogue	The existing federation uses a schedule to retrieve project information from the federated repositories: <ul style="list-style-type: none"> <li><b>500 new project descriptions</b> each year.</li> <li>For a new project, a check must be made whether it is relevant to be assessed: <b>x person hour</b>.</li> <li>A machine translation must be checked and improved: <b>1 person hour</b>.</li> <li>It must be tagged according to the custom and enhanced taxonomies used by Joinup: <b>x person hour</b>.</li> </ul>	x

<b>Total yearly maintenance cost</b>	<b>x</b>
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### 4.3.3 Risks

Bringing change to an existing situation induces a number of risks, summarised in Table 17. Most importantly, the newly developed specification might see limited adoption. Implementation by other catalogues, repositories or forges is crucial to the success of the software catalogue on Joinup. Otherwise, the Joinup catalogue will only expose additional metadata about software that is already maintained in the Joinup repository. Development of a plug-in or export tool for existing packages (in casu GForge 4.x or FusionForge) will greatly reduce the impact of this risk however. Other risks in Table 17 relate to the development and maintenance of the specification itself.

**Table 17 Alternative 2: Risks**

Description	Probability / Impact	Contingency Plan
<b>Risk 2.1:</b> Limited adoption of the developed specification.	Medium / High	Go/no go decision based on business case and initial buy in. Raise awareness about the specification. Provide ready-to-use tools or services to support forges / repositories and catalogues. Develop plug-ins for existing packages. Involve standardisation bodies and industry partners.
<b>Risk 2.2:</b> High costs for the catalogue maintainer to define the additional metadata or to validate the additional metadata if it were derived automatically. This risk might manifest when the additional metadata is not yet available (e.g. a catalogue, repository or forge does not yet use DOAP).	Medium / Medium	Consult project-owners to assist in defining or validating the additional metadata. Establish a community-service to assist in this process.
<b>Risk 2.3:</b> Mandatory fork of the DOAP project. DOAP is no longer actively being maintained by its creator.	Low / High	The DOAP specification must be reused instead of forked into a new specification.
<b>Risk 2.4:</b> For-profit repositories or commercial project owners might not consent with exposing <i>additional</i> metadata for their projects.	Low / High	Involve the wider audience during a public review of the specification. Promote the benefits of exposing additional information.
<b>Risk 2.5:</b> High costs to maintain and update the specification	Low / Medium	Contribute the specification to a dedicated standards organisation or community.
<b>Risk 2.6:</b> Alignment with ADMS. Whereas ADMS is a metadata vocabulary for semantic assets,	Low / Medium	

DOAP is a specification for software projects. It is not clear how to position and reuse from both specifications.		
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*The risks associated with a new specification can be mitigated by involving the right stakeholders during the development and by investing in tools to help users implement the specification.*

## 4.4 COMPARISON OF ALTERNATIVES

In order to be able to establish a choice on the preferred alternative and the future direction of Joinup, this section compares Alternatives 1 and 2 on their benefits, costs and risks.

### 4.4.1 Comparing benefits

Alternative 1 offers fewer benefits and the ones it does offer are more restricted than what Alternative 2 can achieve. The differentiator lies in the amount of information that is provided by both alternatives.

*A specification exposing more metadata about software projects has a greater effect on barriers related to a lack of information and visibility.*

Alternative 1 exposes only very limited information on a software project:

- Name;
- URL;
- A short description.

This limited metadata does not provide any insights into features, credentials or information on supported standards and specifications (Barriers 7, 8 and 9). As a result, it does not help the end-user in any way to make a selection between different projects (Barrier 10). The end-user must still analyse each project individually. Alternative 1 gives the opportunity to share more information and has therefore the capability of reducing these barriers.

**Table 18** Difference analysis of the impact on benefits and barriers

Benefit/Barrier	Alternative 1	Alternative 2
<b>Barrier 1:</b> Lack of visibility	+	++
<b>Barrier 2:</b> Language barrier	+	++
<b>Barrier 6:</b> Lack of trust	0	++
<b>Barrier 7:</b> Lack of feature information	0	++
<b>Barrier 8:</b> Lack of quality assurance	0	++

<b>Barrier 9:</b> Lack of information on implemented standards and specifications	0	++
<b>Barrier 10:</b> Selection costs	0	++
<b>Barrier 17:</b> Community building	0	+

Although limited, Alternative 1 does contribute to an improved level of interoperability as it makes software more easily discoverable (Benefit 1 and Barrier 1). The information exchanged in the federation is also translated, so it helps reduce the language barrier as well (Barrier 2). Alternative 2 shares the same benefits and reduces the same 2 barriers but with a substantial increase in information quality as additional metadata can be specified.

By exposing more information about the people involved, software developers might be more inclined to work on F/OSS projects from public administrations as it helps build standing in the open source community (Barrier 17). Additional metadata will also clearly indicate what organisation is behind the project, giving credit to the source and therefore likely reducing the perceived barrier of competitiveness as users will clearly see who developed the software.

#### 4.4.2 Comparison of costs

Being a continuation of the as-is situation, Alternative 1 has no associated development costs. There are however yearly maintenance costs that arise from the fact that newly added projects must be assessed, translated and organised according to the taxonomies used by Joinup. To further support the collaborative features of Joinup, additional development support maintenance costs are also needed.

*Developing a software catalogue leveraging a specification does away with the need for any specific software; it is a standards-based approach and is fundamentally different from relying on an implementation itself.*

Alternative 2 requires development of a specification and updates to the Joinup platform. There are thus non-recurring development costs. Implementing the enhanced specification will also lead to an increase in the number of projects becoming part of the software catalogue as new projects no longer need to be part of a repository based on GForge 4.x or FusionForge. This also removes the need for Joinup to act as software forge. Continued development of the collaborative platform is therefore no longer needed. The enhanced specification is however also more complex than the current one, requiring additional time to catalogue each new project.

**Table 19 Comparison of costs between Alternative 1 and 2**

Alternative	Total costs in Y1	Total costs in Y2
Alternative 1: Maintain the current federation	x	x
Alternative 2: Build a catalogue leveraging the DOAP Specification	x	x

### 4.4.3 Comparison of risks

The comparison of Alternatives 1 and 2 has so far focused on the benefits and costs associated with sharing and reusing software. In addition to these benefits and costs, one also has to consider the advantages and risks resulting from the differences in approach.

Alternative 1, maintaining the RSS based federation, is entirely dependent on the use of a specific software package. This dependency introduces a number of risks:

- Development of the software package can be abandoned, requiring taking over development and maintenance to resolve issues and deliver new features. This risk has already manifested itself for the forges depending on GForge 4.x, as described in section 3.3, but might also occur for FusionForge;
- In addition, there is no guarantee that the current functionality will be supported in future releases. Even at present there is already a potential problem as some of the national forges have already started using FusionForge, while others still depend on the unmaintained GForge 4.x release;
- The RSS export feature is not a standard. It is a feature of this specific software package, preventing other repositories and forges from becoming part of a federation;
- Another approach or specification might become a standard. If this is not implemented on the specific software package, it becomes isolated.

Alternative 2 does away with the need for any specific software; it is a standards-based approach where a specification is implemented. This is fundamentally different from relying on an implementation itself.

The previous chapter has demonstrated how a software catalogue for public administrations could contribute to the sharing and reuse of F/OSS by public administrations. This chapter presents an overview of the different options that can be considered for a future catalogue of software for public administrations. Each option is first described and then subjected to a cost-benefit analysis. Risks of each option are also identified.

## 5 CONCLUSION

According to the European Digital Agenda there is a need for a better administrative coordination between public administrations and applications that are interoperable and based on open standards and open platforms. In the study, it is demonstrated that almost every (candidate) Member State in the European Union mandates the adoption of open standards and that many encourage the sharing and reuse of free and open-source software (F/OSS). 7 countries in total maintain 15 independent software forges and repositories encouraging the sharing and reuse at national level. Although this is an indicator that governments are aware of the importance of F/OSS for public administrations, it is also a barrier to the cross-border and cross-sector exchange of F/OSS solutions among public administrations. First of all, these repositories and forges do not host *all* or not even the most important F/OSS solutions relevant to public administrations. Second, the existing situation of disparate national software catalogues does not encourage public administrations to share and reuse F/OSS solutions across borders and sectors. What is lacking is for public administrations to obtain an overview of all available software for public administrations from a *single point of access* which provides sufficiently rich metadata to overcome important *information* barriers to the sharing and reuse of F/OSS among public administrations:

- **Barrier 1: Lack of visibility;**
- **Barrier 2: Language barrier;**
- **Barrier 6: Lack of trust;**
- **Barrier 7: Lack of feature descriptions;**
- **Barrier 8: Lack of quality assurance;**
- **Barrier 9: Lack of information on implemented standards and specifications;**
- **Barrier 10: Selection costs;** and
- **Barrier 17: Community building.**

The study puts forward the vision of an enhanced software catalogue that is based on the reuse and extension of existing specifications, such as DOAP, which is beneficial to keep maintenance costs under control and ensure interoperability of software descriptions with independent third-party software hosting infrastructures. The study makes the business case for the enhanced software catalogue for public administrations by comparing the enhanced catalogue to the baseline situation, i.e. the alternative of keeping the current “federated forges” feature of Joinup:

1. **Alternative 1:** Maintain the current federation of software forges.
2. **Alternative 2:** Build a software catalogue leveraging existing specifications.

Weighing off benefits, the creation and maintenance of an enhanced software catalogue for public administrations has a significant and positive impact on information barriers related to the sharing and reuse of interoperability solutions among public administrations. The software catalogue will provide information about F/OSS from a single point of access. The software catalogue will foster the sharing and reuse of F/OSS by public administrations across borders and sectors.

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## ANNEX I. GLOSSARY

The glossary below provides the reader with an overview of terms used throughout this vision document.

Term	Description
Stakeholder	An individual who is materially affected by the outcome of the information system. Stakeholders of an information system (amongst others) are : the business units, the users of the system, the supplier of the system, etc.
TCO	Total Cost of Ownership. The TCO of an information system defines the total estimated cost to develop the system, to put it into production, to operate it, to support it, to maintain it, to phase it out at the end, etc. The cost estimation is as comprehensive as possible and should include all costs from the very inception of the system until its phase out.
IDABC	IDABC was a programme run by the European Commission. IDABC that stands for “Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens”. It uses the opportunities offered by information and communication technologies to encourage and support the delivery of cross-border public sector services to citizens and enterprises in Europe, to improve efficiency and collaboration between European public administrations and to contribute to making Europe an attractive place to live, work and invest. Since 2010, ISA ‘Interoperability Solutions for European Public Administrations’ is the IDABC follow-on programme.
ISA	Interoperability Solutions for European public administrations (ISA). ISA is a programme launched by the European Commission to run in the period 2010-2015. It has the objective to support cooperation between European public administrations by facilitating the efficient and effective cross-border and cross-sector interactions between such administrations, enabling the delivery of electronic public services supporting the implementation of Community policies and activities.
e-Government	According to DG Information Society, e-Government is about using the tools and systems made possible by Information and Communication Technologies (ICTs) to provide better public services to citizens and businesses. ICTs are already widely used by government bodies, just as in enterprises, but e-Government involves much more than just the tools. Effective e-Government also involves rethinking organisations and processes, and changing behaviour so that public services are delivered more efficiently to the people who need to use them. Implemented well, e-Government enables all citizens, enterprises and organisations to carry out their business with government more easily, more quickly and at lower cost.
Joinup	Joinup will be the new collaborative platform of the ISA Programme which has the purpose to encourage e-Government professionals to share and reuse interoperability solutions for public administrations. Joinup will replace the former OSOR and SEMIC platforms.
Free (Libre) Open-source software (F/OSS).	F/OSS stands for Free (Libre) Open-Source Software. Both the Open Source Initiative and the Free Software Foundations have their own definitions for Free Software. According to the Free Software Foundation, free software is a matter of the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it means that the program's users have the four essential freedoms: The freedom to run the program, for any purpose.

	<p>The freedom to study how the program works, and change it so it does your computing as you wish. Access to the source code is a precondition for this.</p> <p>The freedom to redistribute copies so you can help your neighbour.</p> <p>The freedom to distribute copies of your modified versions to others. By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.</p>
Software forge	A platform enabling collaborative software development over the internet. A forge typically offers its users a wide range of functionalities, ranging from simple hosting of source-code to offering a complete stack of development tools including an issue tracker, version control system, mailing lists and wiki-like functionalities.
Software repository	A software repository is an infrastructure where software can be stored, documented and retrieved.
Software catalogue/register	A software catalogue/registry is an infrastructure where metadata about software artefacts is documented and can be retrieved, whereas the software artefacts themselves are located elsewhere.
DOAP	DOAP is an XML Schema and RDF Schema to describe open-source software projects (Dumbill, 2011). Although DOAP provides detailed information about a software project, it does not include a software classification scheme such as the Trove software map, nor does it include software metrics.

## ANNEX II. POLICIES FOR F/OSS IN THE EU PUBLIC SECTOR

This section provides a brief overview of the policies for sharing and reuse of F/OSS in the European public sector. It is based on the results of a survey on F/OSS conducted in the second half of November 2011, to which all Member States represented in the ISA Accompanying Measures cluster were invited to respond. The results have been supplemented with an analysis of policy documents published by the Member States and the IDA, IDABC, and ISA Programmes, the thus compiled information is included in table below.

*Almost every (candidate) Member State in the European Union mandates the adoption of open standards. Many encourage the sharing and reuse of free and open-source software (F/OSS) on the condition that it supports the adoption of open standards and keeps the total cost of ownership under control.*

**Table 20 Overview of existing F/OSS policies in the Member States (according to November 2011 survey)**

Country	F/OSS Catalogue(s)	Policy on open standards and F/OSS
AT - Austria	<a href="#">EGov Labs: OpenSource</a> <a href="#">Plattform des Digitalen Österreich</a>	<p><b>Reuse:</b> All F/OSS related activities in the Austrian public sector appear to have taken place without a formal policy encouraging open source reuse. An example of such an activity includes a plan in the City of Vienna to migrate desktops to Linux(Aslett, 2008).</p> <p><b>Sharing:</b> The goal of the Austrian EGov Labs repository is to provide a solid base and framework for development of, communication about and distribution of open source software.</p>
BE - Belgium	-	<p><b>Reuse:</b> In June 2004, the Belgian Federal Council of Ministers approved new directives and recommendations for the use of open standards and open source software. According to these directives, new ICT systems must be based on open standards; new software will have to be delivered with source code and without licensing restrictions. It is recommended that federal authorities should try to avoid proprietary software, but should make final decisions based on total cost of ownership(Ghosh, Glott, Schmitz, &amp; Boujraf, 2008).</p> <p><b>Sharing:</b> In Belgium, there are no formal initiatives to encourage the sharing of software applications among public administrations. However, some organisations, such as FEDICT, have shared software on OSOR.EU.</p>

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BG - Bulgaria	-	<p><b>Reuse:</b> In March 2003, some members of Parliament proposed a draft bill mandating the use of open source software, open standards, and open file formats by the public sector; this was not adopted. However, in early 2008, the Bulgarian government announced a review of its national IT strategy and its willingness to consider open source software in the process (Ghosh, Glott, Schmitz, &amp; Boujraf, 2008). Later the same year the Bulgarian government launched a programme aimed at accelerating the development of Information Society. The programme introduces a concept of 'inclusive information society' and in the National Interoperability Framework for Governmental Information Systems an equal treatment of the participants in an exchange is defined as an objective. No specific policy on F/OSS appears to have been adopted (ePractice, 2011).</p> <p><b>Sharing:</b> There is no explicit policy to encourage the sharing of software applications among public administrations.</p>
CY - Cyprus	-	<p><b>Reuse and sharing:</b> The Cyprus Information Systems Strategy (ISS) lays down the principles and standards to which system development by public administrations in Cyprus must adhere. However, there appears to be no explicit policy on the sharing and reuse of F/OSS (Ghosh, Glott, Schmitz, &amp; Boujraf, 2008).</p>
CZ – Czech Republic	-	<p><b>Reuse:</b> The Czech Republic currently does not have an explicit policy for the sharing and reuse of F/OSS. There have been F/OSS initiatives in the Czech public sector (e.g. a decision of the City of Prague in 2001 to migrate to open source software). The government encouraged the use of open source and helped to form the <a href="#">OSS Alliance</a> to provide technical analysis, recommendations, case studies and support services to schools and public administrations (Aslett, 2008). In 2008 the Czech republic signed a strategic agreement with Microsoft aimed to ensure the legalisation of software used and effective spending of funds from the state budget (Microsoft, 2008).</p> <p><b>Sharing:</b> <a href="#">Liberix</a> is a Czech non-profit organization set up to support the development, documentation, translation, and distribution of free and open source software.</p>
DE - Germany	-	<p><b>Reuse:</b> The then German Secretary of State in the Federal Ministry for Economy and Technology signalled in 2000 the federal Government's official support for F/OSS. Since then, the German Government has followed up with agreements and reports. In 2003 the government published <a href="#">guidelines</a> to help federal agencies, state and local governments, and other public-sector administrations migrate to open source software. An updated version of the <a href="#">guidelines</a> was delivered in 2005, followed by a third version in 2008 (Aslett, 2008).</p> <p><b>Sharing:</b> There are no explicit policies to encourage the sharing of software applications among public administrations.</p>

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DK - Denmark	<a href="#">Digitalisér</a>	<p><b>Reuse:</b> In the autumn of 2002 the Ministry of Science, Technology and Innovation formulated the <a href="#">Danish Software Strategy</a>. The strategy favours the reuse of F/OSS only to the extent that a number of principles are respected such as interoperability, innovation, freedom of choice, maximum value for money.</p> <p><b>Sharing:</b> There are no explicit policies to encourage the sharing of software applications among public administrations. The Danish Agency for Digitisation houses a parliament-funded knowledge centre for Open Standards and Open Source. They also run the public sector collaboration platform Digitaliser.dk which includes The Software Exchange, a catalogue of F/OSS made available by Danish (public) organisations.</p>
EE - Estonia	<a href="#">ESTONIA forge</a> (Estonia plans to move its forge to Joinup)	<p><b>Reuse:</b> The Estonian government encourages reuse of F/OSS in public administrations. In 2005, a national interoperability Framework was published by the Department of State Information Systems (RISO), part of the Ministry of Economic Affairs and Communications. As part of the framework, RISO presents a <a href="#">software framework</a> where reuse of F/OSS is encouraged. The framework is currently under <a href="#">public review</a>.</p>
GR - Greece		<p><b>Reuse:</b> There appears to be no national policy specific on the (re)use of F/OSS in the Greek public sector. However, the Operational Programme 'Digital Convergence' specifies the strategy and actions aimed at the efficient utilisation of ICT in the period 2007-2013. It includes open source as basic common principles and strategies to be followed. The Digital Greece 2020 Forum includes a specific working group on Free / Open Source Software (FOSS) and Open Data which operates at two levels: producing firstly a specific report on the status of F/OSS and Open Content in Greece and secondly a set of specific policy recommendations relating both to the European 2020 Agenda and the individualities of the Greek political economy (ePractice, 2011).</p> <p><b>Sharing:</b> There are no explicit policies to encourage the sharing of software applications among public administrations. Ellak.gr (EA/AAK ); the Greek Free / Open Source Software Society( GFOSS ) is a non-profit organisation, which was founded in 2008 by 25 Universities, Technological Education Institutes, Research Centres and the Greek Research and Technology Network(GRNET). Its major goal is to promote the use and development of Open Technologies for Education, Public Administration and Business in Greece(Greek Free / Open Source Software Society, 2011).</p>

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ES – Spain	<a href="#">Technology Transfer Centre</a> <a href="#">Software Repository of the Junta de Andalucía</a> <a href="#">Forja Linex</a> <a href="#">La Farga</a> <a href="#">Mancomun</a> <a href="#">Guadalinux</a> <a href="#">The Free Knowledge Forge of the RedIRIS Community</a> <a href="#">CENATIC</a>	<p><b>Reuse:</b> In 2006, the Spanish Parliament unanimously agreed upon a resolution urging the government to actively promote F/OSS and its use in the Administration. In <a href="#">Ley 11/2007</a> criteria and recommendations to be taken into account by Public Administrations when adopting technological decisions are introduced. The Spanish <a href="#">National Interoperability Framework</a> is put in place to ensure interoperability, and the concept of 'reuse' is introduced as principal element. This Framework has as a main principle the technological neutrality. The reuse of applications between public administrations is promoted as is the use of open source. The Estrategia Pública Digital establishes the use of F/OSS whenever possible.</p> <p><b>Sharing:</b> Ley 11/2007 introduces the concepts 'share' and 'collaborate' as principal elements in the framework to ensure interoperability. These concepts are further elaborated in the Spanish National Interoperability Framework, released in 2010 (Spanish National Interoperability Framework, 2010).</p> <p>Although the National Administration has also been responsible for initiatives and policies with a national impact and for implementing important OSS project, most OSS projects in the administration have been carried out at the regional administration level, Among the regional initiatives, the projects carried out in Andalusia are especially noteworthy (although there are also noteworthy and important initiatives also in other regions). Andalusia adopted in 2005 a bill stating that all government developed software must be made open-source (Junta de Andalusia, 2005).</p>
EU – European Union	<a href="#">Joinup</a>	<p><b>Reuse:</b> Both the European Commission European Interoperability Framework (EIF) (European Commission, 2010) and the Digital Agenda for Europe (European Commission, 2010) mandate the use of open standards.</p> <p><b>Sharing:</b> The EIF is based on “<i>applying the principle of openness when jointly developing custom-made software systems, European public administrations generate results that can be interconnected, reused and shared, which also improves efficiency.</i>” It recommends public administrations to “<i>reuse and share solutions and to cooperate on the development of joint solutions when implementing European public services.</i>”</p>
FI - Finland		<p><b>Reuse:</b> There appears to be no explicit national policy for F/OSS in Finland. However, the Finnish Government has recommended its use for years. In 2003, the Finance Ministry issued a <a href="#">report</a> containing recommendations regarding F/OSS use, which stressed the need to ensure access to source code for customised developments and favoured the use of open interfaces and standards. The <a href="#">Centre for Open Software Solutions (COSS)</a> was founded in 2003 to promote F/OSS in the public and private sectors. (CENATIC, 2010)</p> <p><b>Sharing:</b> In 2003, the creation of the <a href="#">Applied Linux Institute</a> was announced, with collaboration from three public institutions: the Department of Communications, the Institute of Adult Education at the University of Helsinki and the Department of Education in the city of Vantaa. Its objective is to promote the use and development of F/OSS around the world, particularly in developing countries.</p>

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FR - France	<a href="#">Adullact</a>	<p><b>Reuse:</b> The French government was among the first to consider setting up a F/OSS policy. In 1999 the French Parliament considered the project Lafitte, Trégouet and Cabanel, and in 2000 Congressmen Le Déaut, Paul and Cohen considered Law 117. Both projects aimed to reinforce use of F/OSS in the Public Administrations. The projects were not adopted at the time. However, following these unsuccessful efforts the French ATICA (currently the ADAE) <a href="#">announced in 2001</a> that it was going to promote the use of open standards and OSS for electronic administration applications. In 2002, the French Administration's policies moved toward clear support for F/OSS, when it release a guide "Guide de choix et d'usage des licences de logiciels libres pour les administrations" which was aimed to facilitate the selection and use of F/OSS by the Public Administrations (CENATIC, 2010)</p> <p><b>Sharing:</b> In 2002, the General Plan Commission published an analysis on the French software industry, in which it recommended that the Public Administrations promote the development of open standards and F/OSS. In 2007 the Ministry of Defence, came out in favour of OSS projects, both those developed internally and those subcontracted.(CENATIC, 2010)</p>
HU - Hungary	-	<p><b>Reuse:</b> In 2009 the Hungarian Public Administration IT Committee published the National Interoperability Framework (HNIF). This was the first version of the Hungarian e-Public Administration Framework. The Government <a href="#">announced</a> the same year that the annual budget for IT would be equally divided on proprietary and F/OSS software. (ePractice, 2011)</p>
HR - Croatia		<p><b>Reuse:</b> On 12 July 2006, the Croatian government adopted a free and open source software (F/OSS) policy. The Croatian <a href="#">Open Source Software Policy</a> presents guidelines for developing and using open source software in public administrations (Babic, 2010).</p> <p><b>Sharing:</b> By participating in the ISA programme (former IDABC), Croatia is got involved in the process of developing an e-public administration programme in the EU and a European interoperability framework. In line with this, the country has begun to develop open technical specifications for electronic public tenders within the framework of implementing the European Commission Action Plan (Babic, 2010).</p>
IE - Ireland	-	<p><b>Reuse and sharing:</b> There seems to be little support for F/OSS from the Irish Government. There is an initiative, "Reach Interoperability Guidelines (RIG)", but most of the guidelines in the RIG have not been institutionalised. In 2004, the then Minister of State with responsibility for the Information Society, Mary Hanafin, stated that <a href="#">"the use of open standards is critical to the government's plans....but it is important to remember that open standards are not the same as open source"</a>. In 2005, the Minister for Trade &amp; Commerce, Michael Ahern, stated that <a href="#">"open source software is used quite widely and successfully across the Irish public sector. Ultimately it is used wherever it makes operational and economic sense in Departments and Offices"</a>.</p>

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IT - Italy	<a href="#">Ambiente di Sviluppo Cooperativo (ASC)</a>	<p><b>Reuse:</b> In 2002, the Commission for OSS Use was created by the Public Administration to study OSS adoption. The Commission suggested that OSS use should be considered for electronic administration projects. The procedure was included in public tenders, and OSS use in the directive of 18 December 2003, referred to as Legge Stanca. In 2004 a working group, CNIPA (National Centre for Information Technologies in the Public Administration), was created. The working group published a <a href="#">document</a> with instructions on how to comply with the directive. The Italian OSS Observatory was also created. In 2008 a public OSS purchasing guide was published.</p> <p><b>Sharing:</b> In 2007, Italy launched an OSS repository for Public Administrations, called the ASC or the Ambiente di Sviluppo Cooperativo, as a means for co-developing open code applications with other Public Administrations, developers, research institutes, etc.</p>
LT - Lithuania	-	<p><b>Reuse and sharing:</b> There is no interoperability framework in Lithuania which promotes the sharing or reuse of F/OSS (ePractice, 2011). However, in 2001 a public movement “<a href="#">Open Source Lithuania</a>” was established by informatics students at Lithuanian Universities with the mission to promote the use of F/OSS in Lithuania. This movement was registered as a non-profit organisation in 2003, and partners now with the Information Society Development Committee to the Government of the Republic of Lithuania among others.</p>
LV - Latvia	-	<p><b>Reuse and sharing:</b> There seems to be no policy that explicitly addresses F/OSS in Latvia. However there are two major organisations that support F/OSS initiatives in Latvia: <a href="#">LATA</a>; Latvian Open Technology Association and LAKA; Latvian Open Source Association. The associations differ on the representatives groups, however both share the same objective on contributed to popularize open standards and the potentials of open source based software application and to ensure equal competition in ICT tenders in Latvian public and private sectors.</p>
LU - Luxembourg		<p><b>Reuse and sharing:</b> Luxembourg does not appear to have an explicit policy on either reusing or sharing of F/OSS. The Public Research Centre Henri Tudor, governed by the 1987 law on the organisation of technological research and development in the public sector and on technology transfer and scientific and technical cooperation between companies and the public sector, has <a href="#">a department</a> dedicated to “Free and Open Source” innovation however.</p>
MT - Malta	-	<p><b>Reuse:</b> Malta’s policy is based on best value for money, irrespective of FOSS/COTS. It also asks for acquisition of free software as F/OSS.</p> <p><b>Sharing:</b> MITA, the Maltese Government ICT Agency asks for public administrations to acquire rights to the maximum extent possible and consider making the code available in a National Forge (if available), OSOR.eu and alternatives.</p>

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NL – The Netherlands	-	<p><b>Reuse:</b> In The Netherlands the reuse of open-source software is encouraged to the extent that it caters for the use of open standards. Key driver for the interoperability initiatives in the Netherlands is the Action Plan NOIV – “Nederland Open in Verbinding” (The Netherlands in Open Connection) dated November 2007 and approved by the Dutch parliament. In this plan, several actions have been defined, including the publication of the (abovementioned) list of open standards, and the introduction of the <a href="#">comply-or-explain</a> governance for implementation of these standards in the various layers of government.</p> <p><b>Sharing:</b> There are no explicit policies to encourage the sharing of software applications among public administrations.</p>
NO – Norway	<a href="#">Delingsbazaren</a>	<p><b>Reuse:</b> In 2001, the public company Statskonsult wrote a report recommending the use of F/OSS in the public sector and in education. One year later, the Norwegian Government decided not to renew a contract with Microsoft to foster competition among software companies and, in particular, F/OSS. In 2004, an independent advisory group also recommended that the government create pilot initiatives to stimulate F/OSS development in the country in a <a href="#">Software Policy for the future</a>. In 2007, the Norwegian Government decided to mandate use of open formats on all produced documentation.</p> <p><b>Sharing:</b> In 2008 the government created the Norwegian F/OSS Competence Centre, <a href="#">Friprog</a>, to advise the Ministry of the Administration and Government Reform. This centre provides advice on the use of F/OSS in both the public and private sectors, and also participates in the creation of F/OSS policies. The Friprog centre also runs a catalogue for public administrations to share F/OSS developed by public funds.</p>
PT - Portugal		<p><b>Reuse:</b> Portugal promotes greater use of F/OSS in the public sector in an non-binding resolution adopted in 2002, as noted by the Center for Strategic and International Studies. A bill presented in 2003 required the use of F/OSS. The bill was, however, rejected by the government with the argument that it preferred a more pragmatic and non-discrimination approach. In 2005, the government’s Technology Plan for an Agenda for Growth stated that promotion of non-proprietary open source operating systems, where appropriate, was a part of mobilizing Portugal’s IT industry.</p>
PL - Poland	-	<p><b>Reuse and sharing:</b> The Polish <a href="#">National Interoperability Framework</a> promotes the sharing and reuse of open-standards, but does not explicitly mandate the reuse of F/OSS. The Polish government has had a couple of attempts at delivering a set of guidelines for the adoption of F/OSS, before recommending the use of open standards in 2007 (Aslett, 2008). There is no explicit policy on the sharing of F/OSS.</p>
RO - Romania		<p><b>Reuse and sharing:</b> There appear to be no F/OSS policy (Aslett, 2008). However, a community of people formed in 2006 the <a href="#">Romanian Open Source and Free Software Initiative (ROSI)</a>, to unite local groups and promote F/OSS at all levels (business, governmental and academically).</p>

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SE - Sweden	<a href="#">Nordic Open Source Initiative Network (NOSIN)</a>	<p><b>Reuse:</b> In its IT Bill (<a href="#">2004/05:175</a>), the Swedish Government declared that the use of open standards and open source software should be promoted and that developments in the open source software domain should be followed up on a regular basis (the bill was approved by the Riksdagen 16 mars 2005). This was reinforced in 2009, when the Government established an expert group and stated at policy level in <a href="#">Directive 2009:19</a> that “...administrative e-services should, as far as is possible, be based on open standards and use software based on open source software and solutions that progressively frees management from reliance on individual platforms and solutions.”</p> <p><b>Sharing:</b> Aimed at public administrations at the local and regional level, <a href="#">Programverket</a> in Sweden provides a platform for sharing specialised software on a FLOSS basis. This platform was under construction in 2008, aiming to be an outlet for a new level of cooperation between public bodies. This initiative later became an <a href="#">Open Nordic project</a> where Sweden, Denmark, Norway, Iceland and Finland teamed up to form a virtual Nordic repository. As a result, all countries have national code sharing sites, and the <a href="#">Nordic Open Source Initiative Network (NOSIN)</a> was created to connect those repositories to facilitate that both code and business can flow across the Nordics. The project also actively contributed in the creation of OSOR. NOSIN is a forum for general cooperation on open source software used in national spatial data infrastructures in the Nordic countries.</p>
SI – Slovenia	-	<p><b>Reuse and sharing:</b> Slovenia adopted a clear policy on reusing and sharing open source software in 2003 with <a href="#">The Policy of the Government of the Republic of Slovenia on development, implementation and usage of open source software code and solutions based on open source</a>. The main principle of the Slovenian policy is the adoption of an equal stand towards open source and proprietary software. The document calls for public sector bodies to develop and adopt a rational and technologically neutral attitude towards developing or acquiring software and systems. Provided that this attitude is adopted, the policy supports open source initiatives and usage of open standards. The Slovenian government also commits releasing accepted information solutions funded from the budget for public use under the same licence under which it acquires them, unless there are valid security or other grounds for acting otherwise</p>
SK - Slovakia	-	<p><b>Reuse and sharing:</b> The <a href="#">e-Government strategy</a> of Slovakia promotes the adoption of standards in public administration information systems. However, according to its <a href="#">e-Government strategy</a> Slovakia does not seem to have an explicit policy on either reusing or sharing of F/OSS. According to <a href="#">soit.sk</a>, open licences, such as the GPL or the CC are considered to be not valid by the country’s Copyright Act as it requires a signed contract between the copyright holder and the licensee. This situation is expected to change in the near future.</p>

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UK – The United Kingdom	-	<p><b>Reuse:</b> In 2003, <a href="#">nine government agencies tested</a> F/OSS to measure the effectiveness and the costs/benefits of systems based on F/OSS. The same year, the e-Envoy Office and the British Department of Trade and Industry (DTI) declared that the government's default position was to adopt F/OSS licenses. In 2004, based on the trials, the British Office of Government Commerce (OGC) published a <a href="#">"Proof of Concept" report</a> which concluded that F/OSS is a viable, credible alternative to proprietary software and recommended that the public sector consider development and migration to OSS. The UK government, reflecting this trend, defined a policy in 2004 that aimed to deliver value for money by ensuring that procurement in the public sector considers open source alongside closed source. This policy was re-iterated in 2009, in the <a href="#">Open Source, Open Standards and Re-Use: Government Action Plan</a>, and again in 2010. The document states that, <i>"Where there is no significant overall cost difference between open and non-open source products, open source will be selected on the basis of its additional inherent flexibility"</i>(CENATIC, 2010),(OSS Watch, 2011).</p> <p><b>Sharing:</b> The <a href="#">Open Source, Open Standards and Re-Use: Government Action Plan</a> states that <i>"We want to share and re-use existing purchases across the public sector – not just to avoid paying twice, but to reduce risks and to drive common, joined up solutions to the common needs of government."</i> Actions 3 and 7 reinforce sharing both knowledge and software.</p>