PlanetData

Network of Excellence

FP7 – 257641

D20.3 Call 2: Linked Map Exploitation plan

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Deliverable nature:	Report (R)
Dissemination level: (Confidentiality)	Restricted to group (RE)
Contractual delivery date:	M48
Actual delivery date:	M48
Version:	1.0
Total number of pages:	19
Keywords:	Linked data, geographic information, maps, exploitation, dissemination

Abstract

This deliverable describes the plan for exploiting the Linked Map project results. The proposed plan aims to reach three different audiences: Linked Data users, thanks to the distribution of some components of the project as open source software as well as disseminating the results in conferences or publications; Data producers, by means of developing tools based on the results of the project to make easier the data production; and finally, general public using some components developed in the project as part of final applications.

Executive summary

This report has as goal to identify exploitable outcomes of the Linked Map subproject of the PlanetData project and to elaborate plans for their exploitation by partners involved in the Linked Map subproject. Exploitable outcomes, henceforth products, include software artefacts, methodologies and skills developed and acquired during the project that could be transferred to a third party as a product or service.

The development of exploitation plans has involved the identification of candidate products, the description of each partner's context, including the respective intellectual property rights, the realization of a market analysis, the assessment of the potential of each candidate product, the decision on the best exploitation strategy and the development of different exploitation plans.

Candidate products include the Linked Map Service (LMS) technology (server and client) which was described in the deliverables D17.1 and D17.2, web applications for assessing quality of GI using a crowdsourced approach which was described in the deliverables D18.1 and D18.2, and services based on the technical expertise acquired for transforming spatial databases into RDF data, spatial data integration, provenance management and crowdsourced quality assessment of spatial data which was described in the deliverables D16.1, D16.2, D16.3 and D16.4.

Exploitation plans have been conditioned by two conclusions drawn from the market analysis:

- There is not yet an addressable European market for geosemantic web technologies.
- There is a European market for tools that support public bodies publishing geographic information.

As consequence, LMS technology has been identified as exploitable as open source software, and acquired technical expertise as the basis for a consultancy service to public bodies that produce geographic information interested in publishing their geographic information assets as Open Linked Data Partners will continue the development of the remaining products within their research lines.

Document Information

IST Project Number	FP7 - 257641	Acronym	PlanetData
Full Title	PlanetData		
Project URL	http://www.planet-data.eu/		
Document URL	http://wiki.planet-data.eu/web/D20.3		
EU Project Officer	Leonhard Maqua		

Deliverable	Number	D20.3	Title	Call 2: Linked Map Exploitation plan
Work Package	Number	WP20	Title	Call 2: Linked Map Project dissemination

Date of Delivery	Contractual	M48	Actual	M48
Status	version 1.0		final ☒	
Nature	prototype □ report ☒ demonstrator □ other □			
Dissemination level	public □ restricted to group ☒ restricted to programme □ consortium □			

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Abstract (for dissemination)	This deliverable describes the plan for exploiting the Linked Map project results. The proposed plan aims to reach three different audiences: Linked Data users, thanks to the distribution of some components of the project as open source software as well as disseminating the results in conferences or publications; Data producers, by means of developing tools based on the results of the project to make easier the data production; and finally, general public using some components developed in the project as part of final applications.
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Version Log			
Issue Date	Rev. No.	Author	Change
2014/07/08	0.1	Jesús Barrera Francés	Template instantiation
2014/08/16	0.2	Francisco J Lopez-Pellicer	First draft
2014/08/28	0.3	Jesús Barrera Francés	Revision
2014/09/01	0.5	Francisco J Lopez-Pellicer	Last review for QA
2014/09/16	0.6	Jesús Barrera Francés	Revision
2014/09/16	0.9	Francisco J Lopez-Pellicer	Last review for AL checking
2014/24/16	1.0	Francisco J Lopez-Pellicer	Final version

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Abbreviations

GI	Geographic Information
IPR	intellectual property rights
LMS	Linked Map Service
LGPL	GNU Lesser General Public License
PSI	Public Sector Information
SME	small and medium enterprises
SWOT	strength, weakness, opportunity and threats
WMS	OGC Web Map Server

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1 Introduction

This report has as goals the identification of exploitable outcomes of the Linked Map subproject of the PlanetData project, and the elaboration of plans for their exploitation by partners involved in the Linked Map subproject. Exploitable outcomes, henceforth products, include software artefacts, methodologies and skills developed and acquired during the project that could be transferred to a third party as a product or service.

The European Commission and Linked Map partners (UNIZAR and GEOSLAB) are the intended audience for this report. In the first case, this report aims to communicate to the European Commission the different exploitation plans elaborated for the exploitable outcomes of this subproject of Planet Data. In the second case, this report makes explicit the agreement of UNIZAR and GEOSLAB in relation to the exploitation of the outcomes of the project.

The development of exploitation plans has involved the following activities:

- Identification of candidate products.
- Description of the context of exploitation.
- Identification of intellectual property constraints (IPR).
- Elaboration of a market analysis.
- Assessment potential of candidate products.
- Decision on exploitation strategy for each product.
- Development of exploitation plans.

The report is structured as follows. Section 2 describes the methodology that has been applied in the preparation of the initial exploitation plans. Section 3 reports different stages that collect required information for the development of the plans by partners. Section 4 presents the elaborated exploitations plans for products. The document concludes with a summary and some remarks related to the implementation of the plans.

2 Methodology

This section describes the methodology that has been applied in the preparation of the initial exploitation plans for partners (Section 4). The methodology is based on existing literature on FP7 exploitation plans (e.g. [1]). This methodology involves two activities. The first activity named preparation gathers all the data required for the development of exploitation plans. The second activity is the development of exploitation plans for partners using gathered data.

The preparation involves several tasks:

- *Identify candidate products* (sections 3.1 and 3.2). A candidate product is a project result (research result, software, service) that can be considered a result of the Linked Map project that a partner believes that can be transformed into an exploitable product. Therefore, it is first necessary to identify project results that fulfil such definition.
- *Internal context* (Section 3.3). Linked Map partners are the internal context of the exploitation plan. Each partner has its own background that may positively or negatively affect the exploitation of the products. Consequently, a brief description of each partner's context is required.
- *Identify IPR constraints* (Section 3.4). Each partner has his own IPR policies that may constrain the way of exploitation of candidate products. In addition, some candidate products may depend on other components with their own terms and condition that may restrict or prohibit some ways of exploitation.
- *Perform a market analysis* (Section 3.5). Partners should identify the envisaged target markets for the candidate products and then perform an analysis of such markets. For this purpose, a preliminary market study is conducted for identifying potential users, barriers of adoption, competitive products and services, and potential market size. This study is based on partners' knowledge, as well as existing literature and surveys.
- *Assess potential of candidate products* (Section 3.6). Each candidate product is reviewed for identifying potential strengths, unique opportunities, possible threats and known weaknesses.
- *Decide exploitation strategies* (Section 3.7). In this step, partners take a decision on the exploitation strategy (as scientific research, as commercial products, as open source software or abandon) for each candidate product, based on the available information (IPR constraints, market analysis, potential assessment).

Once all the required data is gathered begin the development of exploitation plans (Section 4). Each exploitation plan details the exploitation strategy, actions to perform, timetable and responsible partner for each viable candidate product.

Partners can later reformulate the exploitation plans found in this deliverable after performing more detailed market and domain studies.

3 Preparation

This section describes the activities done that are required for the definition of the exploitation plans.

3.1 Candidate software products

- *Web map server enhanced with Linked Data***.** The rise of web mapping has lowered the barrier to organizations for starting to serve their georeferenced data on maps on the web. Web maps can easily deliver up to date information as personalised images. Building a web map that supports hyperlinks to other information on the web is complicated because many technologies and modules have to be integrated. LMS described in D17.1 [2] has the advantage that simplifies the development of applications that requires web maps with hyperlinks because it integrates in the same endpoint access to maps and linked data. LMS as a product is flexible because it can be deployed on top of a standard web map server (WMS) [3]. Ownership of this software belongs to UNIZAR.
- *Web map client enhanced with Linked Data*. This web map client is complementary but independent of the above. The web map client described in D17.2 [4] can easily evolve into a web map client able to query a SPARQL [5] endpoint with GeoSPARQL [6] support. The software can be used to add to the map an overlay layer that renders semantic geospatial content (e.g. DBpedia geospatial content [7]) and adds hyperlinks to such content. Ownership of this software belongs to GEOSLAB.
- *Web application for voluntary assessment of quality of georeferenced information*. The platform described in D18.1 [8] and D18.2 [9] is a product that can be of interest for organizations willing to leverage quality assessment produced by crowds in the domain of georeferenced information. In this candidate product, the information to be assessed should not be restricted to mappings. Ownership of this software belongs to GEOSLAB.

3.2 Candidate service products

- *Transform spatial databases into RDF data keeping provenance data*. The transformation of spatial databases into RDF data (see D16.1 [10] and D16.2 [11]) has relied on mature and pre-existing tools that are freely available and could be reused easily. Technical expertise acquired includes skills for transforming existing provenance data into RDF data and documenting the transformation process in RDF. The technical expertise acquired is easily reusable. For example, it may be used as a model for offering third parties involved in open data initiatives the transformation of their spatial databases into RDF data. Technical expertise has been acquired by both UNIZAR and GEOSLAB.
- *Simple spatial data integration based on gazetteer core properties***.** The creation of RDF links based on gazetteer core properties (name, type, location) [12] has relied on pre-existing semantic tools that are freely available (see details in D16.3 [13] and D16.4 [14]). Technical expertise acquired could be reusable in scenarios where an automated integration of sources is needed due to the size of the datasets. For example, gazetteers such as GeoNames are widely used for filtering resources using location facets [15], geocoding resources [16] and enriching resources [17]. Therefore, being able to integrate two or more gazetteers into a larger and richer gazetteer dataset might be a relevant complement in offers and calls for tender in some sectors such as tourism. Technical expertise has been acquired by both UNIZAR and GEOSLAB.
- *Crowdsourced quality assessment of GI data*. The crowdsourced quality assessment of GI data relies on web tools developed in the project (e.g. the Linked Map platform described in D18.1 [8] and D18.2 [9]). Producers of geographic information may be interested in similar tools for using the wisdom of the masses for assessing the quality of its datasets. The technical expertise for developing a website that allows this quality assessment has been mainly acquired by GEOSLAB.

3.3 Internal context

Partners constitute the internal context of the exploitation plan. This section provides a description of each partner along with its respective context.

- *UNIZAR*. The University of Zaragoza is the unique public university in the Aragón Region in Spain and it is the main centre of technological innovation in the Ebro Valley. The *Advanced Information Systems Laboratory*[1] (IAAA), within the Department of Computer Science and Systems Engineering, is a multidisciplinary R&D unit specialized on the informatics aspects of geospatial information. IAAA research lines are focused on web-based distributed systems and semantic Web technologies applied to GI. The outcomes of such activity are an important number of research papers and a large amount of research projects and technology transfer. In addition, IAAA members have collaborated with standardization organizations for geographical information at national (AENOR) and international (CEN/TC 287, ISO/TC 211, OGC, INSPIRE) levels.
- *GEOSLAB*. GeoSpatiumLab[2] is a SME technology company specialized in digital processing of geospatial and georeferenced information and their application areas. GEOSLAB is a university spin-off generated in UNIZAR. GEOSLAB has participated in a substantial form in the deployment of several spatial data infrastructures in local, regional and national public bodies in Spain. GEOSLAB is involved in several national and international R&D projects. GEOSLAB has developed the most part of software components of the project.

3.4 Intellectual Property constraints

This section describes the intellectual property rights (IPR) associated with Linked Map products. Our IPR strategy is to release results and products under appropriate licenses to enable an effective re-utilisation of results. Hence, unless partners' specific conditions, appropriate Creative Commons (CC) licences and GNU General Public License (GPL) licenses will protect creative works and technological development derived from the project. Note that some results are subject to IPR restrictions propagated from underlying datasets/components/libraries developed by third parties.

Each partner has its own additional IPR conditions derived from its nature:

- *UNIZAR*. UNIZAR promotes the management of different forms of IPR protection with the intention of strengthening the relationship between the worlds of science and business. UNIZAR also promotes the use of open source software licenses. To be aligned with UNIZAR objectives, where appropriate, the Knowledge Transfer Office[3] and the European Projects Office[4] of UNIZAR will advise on any specific IPR constraint on candidate products developed by UNIZAR.
- *GEOSLAB*. The business model of GEOSLAB is centred mainly on developing and selling proprietary services and products. However, some GEOSLAB products developed jointly with UNIZAR, such as CatMDEdit[5], ThManager[6] and SpatiumCube[7], are distributed under a GNU Lesser General Public License (LGPL). Different IPR strategies may be adopted on a case-by-case basis on candidate products developed by GEOSLAB.

Given the general policies of each company about IPR restrictions, the licenses listed below have been selected to distribute project results:

- Datasets created in the context of the project will be licensed under a Creative Commons Attribution 3.0 Unported license.

[1] http://iaaa.unizar.es/

[2] http://www.geoslab.com/

[3] http://www.unizar.es/otri/

[4] http://ope.unizar.es/

[5] http://catmdedit.sourceforge.net/

[6] http://thmanager.sourceforge.net/

[7] http://spatiumcube.sourceforge.net/

- Software developed in Linked Map project will be distributed under a GNU Lesser General Public License (LGPL). This license makes compatible the distribution of new libraries as open source with the use of previously developed libraries owned by GEOSLAB.

3.5 Market analysis

The first priority of the market analysis has been the identification of the market with more potential for the candidate products and services. We think that the target market for such products is the GI segment of the public sector information (PSI) market.

- Nearly rephrasing Talis CEO Dave Errinton [18] we must acknowledge sadly that **there is not yet an addressable European market for geo semantic web technologies**. Reference research and analysis firms such as Gartner or Forrester have not published yet market studies on the generic semantic technologies markets topics although they acknowledge semantics as a top technology trend [19]. In addition, the perception of the market share of semantic web technologies by practitioners is disappointing [20]. In this scenario, we could not find a compelling case, except the success of Ordnance Survey [21], for predicting a niche market based on geosemantic technologies with potential revenue streams.
- **There is a European market for tools that support public bodies publishing geographic information.** PIRA (2000) and MESPIR (2006) studies are often used for providing estimates of different PSI markets in Europe [22], [23]. Although their estimates are rough and can be discussed, both studies reveal that the geographic information market is about one half of the total PSI-related market.

Next we performed a preliminary market study on the size of the geospatial PSI market based on existing studies. Despite the geographic information sector seems to be a defined area, there are barriers to measuring the size of related markets. For example, geographic information is often sold below cost to final users that in turn reuse for obtaining intangible benefits (e.g. better decision making, improved customer service, easier access to data, improved data quality) [24]. Precise estimates are only calculable when information is sold at market prices (e.g. [22], [23]).

The study review of Vickery (2011) gives an estimated European geographic information market of around EUR 27.9 billion in 2008 [25]. Various studies elaborated in the midst of the Great Recession (2008-2013) have reported growth rates for geospatial PSI markets of 6-18% per year [26], [27]. Vickery suggests that removing current barriers to access data and improving the underlying infrastructure could increase by 10-40% economic benefits in the geographic information domain. In particular, productivity gains from geospatial applications in local government could double over 5 years if better policies are adopted. Therefore, there exist opportunities for sustainable revenue streams through public contracts and calls for tender.

We should not forget that a Linked Map partner, GEOSLAB, is a Spanish SME. Therefore, the market analysis cannot be complete without analysing the Spanish market. APORTA (2010-2012) [28] surveyed more than 150 PSI integrators in Spain. Business turnover related to geographic information of surveyed companies is between EUR 100 and 165 million. This survey also reveals that these companies are mainly SME that are creating products and applications related to geographic information provided by Spanish national agencies. Finally, APORTA study shows that policies related to PSI are valued as useful for improving the quality of information. That is, quality tools for geographic information could be of interest in the Spanish market.

3.6 SWOT analysis

Table 1 presents a SWOT matrix [29] whose aim is to identify the key internal and external factors to take into account in the exploitation plan of Linked Map products and services. The analysis is based on facts and data presented from Section 3.3 to 3.5.

Table 1 – SWOT analysis for Linked Map

	HELPFUL	HARMFUL
INTERNAL ORIGIN	**STRENGTHS** • Partners have contacts with public geographic information producers • Partners can collaborate on extending results after the end of the project • UNIZAR is involved in standardization activities related to geographic information	**WEAKNESSES** • Lack of contacts with private geographic information producers. • GESOLAB activity is often restricted to the Spanish market due to lack of stable links with EU partners (research & enterprises).
EXTERNAL ORIGIN	**OPPORTUNITIES** • Growing demand for Open Data related services • 30-50% of PSI is geographic information • Investment in publishing and improving products related to geographic information is perceived as an opportunity by public bodies	**THREATS** • Fierce local competition on geographic information related products triggered by the crisis • Public bodies have budget constraints due to the crisis • Linked Data and crowdsourcing slide into the trough of disillusionment because experiments and implementations fail to deliver

3.7 Exploitation strategies

This section describes the decision on the exploitation strategy (scientific, commercial, open source and abandon) for ensuring sustainability of Linked Map results. Table 2 summarizes the decisions.

Table 2 – Exploitation strategies

	REQUIRE FURTHER R&D	COMMERCIAL EXPLOITATION	OPEN SOURCE EXPLOITATION
UNIZAR	• Transform spatial databases into RDF data keeping provenance data • Spatial data integration based on gazetteer core properties	• Publishing spatial databases as Open Linked Data[a]	• Web map server enhanced with Linked Data
GEOSLAB	• Crowdsourced quality assessment of geographic data • Web map client enhanced with Linked Data • Web application for voluntary assessment of quality of georeferenced information	• Publishing spatial databases as Open Linked Data[a]	

[a] Merges transform spatial databases into RDF data keeping provenance and spatial data integration based on gazetteer core properties

Partners consider that many of the candidate products and services have not reached a mature level of development. Products that require further R&D are candidates for scientific exploitation, for example, as basis for future publications. UNIZAR has started to publish and present Linked Map research outcomes. There are several publications planned for 2015. On GEOSLAB side, it is expected that products in development will be matured in future R&D projects.

Commercial exploitation often implies to exploit something very straightforward in a simple way. In this sense, although there are subtle complexities related to spatial modelling and data conflation, publishing spatial databases as open source RDF datasets may be added to the consultancy services offered by GEOSLAB. Transformation must be as simple as possible (similar to the experience described in D16.3 [10]). UNIZAR may support GEOSLAB in complex publishing scenarios where this hypothesis fails.

Open source gives several opportunities for sustaining Linked Map results. In particular, third parties may sustain results if they engage a critical mass of developers. Additionally, open source products may trigger future consultancy services related to the software and to the topic. GEOSLAB has experience in this field, but none of its products has strong IPR constraints. Regarding to UNIZAR, a reference implementation of the Linked Map Service extension for WMS is the best candidate.

Neither party has considered abandoning a result of the project.

4 Exploitation plan

This section describes exploitable products and services identified by partners. Note that products and services can be exploited as a future research activity part of a research line. Each exploitation plan details planned actions, estimated duration and partners involved. At the moment of writing, budget, milestones and scope are difficult to be estimated, and therefore they are not included in the plans.

4.1 Web map server and client enhanced with Linked Data

The web map server and web map client both enhanced with Linked Data specified in section 3.1 can be exploited as know-how or as open source components for commercial products and research projects. UNIZAR will support the development of the web map server enhanced with Linked Data by means of releasing it as open source software and using it in R&D projects. GEOSLAB will use the acquired know-how on using Linked Data in web map clients in future R&D projects.

The following actions are planned:

- Release LMS code under a LGPL license (UNIZAR – ongoing).
- Write publications to exploit knowledge produced in the project (UNIZAR – ongoing)
- Check for potential applications with existing contacts, such as CNIG and Zaragoza City Council (UNIZAR, GEOSLAB – 6 months beginning in autumn 2014).

4.2 Publishing spatial databases as Open Linked Data

The service amalgamates two candidate service products described above in section 3.2: the transformation of spatial databases into RDF data keeping provenance data, and simple data integration based on gazetteer core properties. UNIZAR and GEOSLAB have acquired technical skills that can be offered as a consultancy service to public bodies that produce geographic information interested in publishing their geographic assets as Open Linked Data. In addition, the strategy chosen by UNIZAR focuses on performing further research and dissemination on these topics.

The following actions are planned:

- Write articles in order to disseminate the approach for publishing and enriching spatial data (UNIZAR – ongoing).
- Preserve and maintain results of Linked Map product as a showcase of the potential results of the consultancy service (UNIZAR – to begin in autumn 2014, see details in D20.5 [30]).
- Develop service concept of publishing and enriching spatial data consultancy services for public bodies (GEOSLAB – 6 month beginning in autumn 2015).

4.3 Research lines

This section deals with innovative candidate products and services that require further research and those that partners do not consider mature for commercial exploitation or being open sourced yet. The technical and scientific expertise acquired by UNIZAR related to the transformation of spatial databases into RDF data keeping provenance data, and the integration of spatial data based on gazetteer core properties could lead to additional results if further research is done after the end of the project. GEOSLAB has created several components related to publishing and viewing data (e.g. web map client enhanced with Linked Data) and supporting crowdsourcing initiatives (e.g. platform for crowdsourcing assessment of GI data) that are not yet mature. However, GEOSLAB consider that they could lead to commercial products and services.

The following actions are planned:

- Continue research efforts in publishing and enriching spatial data using semantic web technologies (UNIZAR – to begin in autumn 2014).

- Analyse sustainability of research efforts in the improvement of quality assessing technologies based on crowdsourcing (GEOSLAB – to begin in autumn 2014).

5 Conclusions

This deliverable has presented the methodology that has been applied in the preparation of the initial exploitation plans for partners. The methodology includes the identification of candidate products, the description of each partner's context, including the respective IPR, the realization of a market analysis, the assessment of the potential of each candidate products, the decision on the best exploitation strategy and the development of different exploitation plans.

Candidate products include the LMS technology (server and client), web applications for assessing quality of geographic information using a crowdsourced approach, and services based on the technical expertise acquired for transforming spatial databases into RDF data, spatial data integration, provenance management and crowdsourced quality assessment of spatial data.

Exploitation plans have been conditioned by two conclusions drawn from the market analysis:

- There is not a European market for geo semantic web technologies yet.
- There is a European market for tools that support public bodies publishing geographic information.

As consequence, LMS technology has been identified as exploitable as open source software and acquired technical expertise as a consultancy service to public bodies that produce geographic information interested in publishing their assets as Open Linked Data. Remaining products will be exploited in the corresponding respective research lines of partners.

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