PlanetData

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D21.1 Call 2: Linked Map Project handbook

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Abstract

This deliverable is the management handbook of the Linked Map project. It does not attempt to cover every management aspect of the Linked Map project, instead of that this document focuses on the project charter, administrative management, quality assurance management and risk management.

Executive summary

The purpose of this Handbook is to establish the project charter and to summarize the main aspects for the successful management of the Linked Map project from two different points of view: the administrative management and the quality assurance & risk management.

The project charter states the scope, the objectives, the stakeholders, the constraints and the success criteria of the project.

The administrative management focuses on the administrative project coordination, in particular:

- Ensures the fulfilment of the project objectives.
- Acts as an intermediary with the Commission and PlanetData.
- Implements procedures to ensure appropriate communication between participants.
- Manages budget and manpower situation to ensure an efficient use of resources.

In order to achieve these goals, this handbook identifies the project objectives, the partners and their roles and the management structure among these partners and the PlanetData consortium.

The quality assurance & risk management takes the overall responsibility of ensuring that all the deliverables are generated according to the project requirements and all the risks are under control. Quality and risk management is implemented by internal and external reviews against technical and contractual aspects. Best software engineering practices (e.g. web-based collaboration tools) will be followed to ensure a high-level quality of the overall project and the deliverables, and reduce technical risks.

This handbook describes the quality assurance procedures that must be applied during the project execution and analyses the risks that may endanger the execution of the project.

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Abbreviations

BCN25 Base Cartográfica Numérica 1:25.000 (Numeric Cartographic Base 1:25.000)

BTN25 Base Topográfica Nacional 1:25.000 (National Topographic Base 1:25.000)

GI Geographic Information

IAAA Advanced Information Systems Laboratory

PB Project Board

OGC Open Geospatial Consortium

PC Project Coordinator

SDI Spatial Data Infrastructure

SPICE Software Process Improvement Capability Determination

VGI Volunteer Geographic Information

WMS OGC Web map service

WPL Work Package Leader

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1 Introduction

This deliverable is the management handbook of the Linked Map project. It does not attempt to cover every management aspect of the Linked Map project. Instead, this document focuses on the project charter, administrative management, quality assurance management and risk management.

The project charter is a statement of scope, objectives, partners, stakeholders, constraints and success criteria of the project.

Administrative management ensures correct coordination of activities in order to achieve the project objectives. It plays a dual role during the project. In its internal facet, it includes the coordination of the distinct tasks of the project with the aim that the results will be coherent and consistent, and the deadlines will be accomplished. It also includes setting up communication, coordination and control mechanisms among the different work groups of the project. In its external facet, it assures an open communication channel between the project partners and the PlanetData consortium.

Sections 2 and 3 collect the main aspects that guide the administrative management:

- Section 2 describes project partners and identifies goals to be achieved by the project. It also includes an identification of the potential stakeholders that can be interested in the results of the project and the constraints and success criteria that will drive the project development.
- Section 3 exposes the project management structure and the relationships between the Linked Map partners and the PlanetData consortium.

Quality assurance and risk management ensures that all deliverables are generated according to a set of minimum quality criteria and that all probable risks are under control. The description of these activities is included in sections 4 and 5:

- Section 4 describes quality assurance procedures that will be applied to each deliverable obtained as a result of the project. Two quality assurance systems will be applied in this project. First, the results will be verified according to internal processes defined by the two core partners of Linked Map project, the Advanced Information Systems Laboratory (IAAA) [1] of UNIZAR and GEOSLAB, which have a certified Integrated Management System for Quality and Environment, and secondly, the deliverables will be reviewed according to the PlanetData assurance procedure.
- Section 5 identifies risks that may endanger the execution of the project. These risks are categorized according to their probability of occurrence and impact. Then a contingence plan for each risk is defined.

2 Project charter

2.1 Vision and scope

The Linked Map project envisions a read-write Linked Data enabled Web map service standard (WMS) [2] established by the Open Geospatial Consortium (OGC)[1]. In contrast to other approaches, such as Janowicz et al [3], where semantics are relevant only for the production of the map, Linked Map does not consider the map as a sink or final step where semantics are just visualized in a picture. This vision is aligned with industry that expects from researchers hints on how to transform a map into linked data [4]. A digital map conveys such amount of rich aggregated semantic information that each pixel deserves to be a potential link to underlying data. The project Linked Map plans to enable (1) users to understand a visually rich representation and its relation with other geo-referenced machine-processable data, and (2) applications to capture the whole semantic context of user's edits. As application case, we envision a platform based on WMS enhanced with read-write Linked Data support. This platform will be applied to improve through crowdsourcing methods the quality of an automatic combination of authoritative geographic information (GI) and volunteer geographic information (VGI), that is, geographic data provided voluntarily by individuals in initiatives such as OpenStreetMap. We believe that this platform could help the adoption of both VGI and Linked Data in large GI producers.

We have identified four goals for fulfilling this vision.

1. Development of methods that use Linked Data for the integration of governmental GI and VGI, and its application to large datasets.
2. Development of guidelines for extending WMS with read-write Linked Data support, and the implementation of a reference service. We name this service Linked Map.
3. Development of a Web platform for testing crowdsourcing techniques based on WMS and Linked Data with provenance and access control support.
4. Design of metrics and experiments for the evaluation of crowdsourcing techniques on the platform and how crowdsourcing can help to improve the integration of a governmental geographic dataset with several VGI datasets.

2.2 Project partners

2.2.1 Universidad Zaragoza (core partner)

The Universidad Zaragoza (UNIZAR) is the only public university in the Aragón Region in Spain and it is the main centre of technological innovation in the Ebro Valley. The IAAA, within the Dept. of Computer Science and Systems Engineering, is a multidisciplinary R&D unit specialized on the computational aspects of geospatial information. IAAA activity is focused on web-based distributed systems and semantic Web technologies in areas such as Geographical Information Systems, Remote Sensing, Location Based Services and, with a special emphasis, Spatial Data Infrastructures (SDI). In addition to an extensive academic activity on those topics, an important number of research papers, and a large amount of research projects and technology transfer, its members have collaborated with standardization organizations for geographical information at national (AENOR) and international (CEN/TC 287, ISO/TC 211, OGC, INSPIRE) levels.

2.2.2 GeoSpatiumLab, S.L. (core partner)

GeoSpatiumLab (GEOSLAB) is a software engineering enterprise devoted to the development and implementation of technology focused on the management and broadcasting of geographic information and spatial data based on Spatial Data Infrastructures (SDI). GEOSLAB has participated in a substantial form in the deployment of several SDIs (Spanish SDI, IDEZar that is the SDI of the City council of Zaragoza, and

[1] The Open Geospatial Consortium is an international industry consortium of 472 companies, government agencies and universities participating in a consensus process to develop publicly available interface standards for geospatial content and services (http://www.opengeospatial.org/)

IDEEbro that is the SDI for the Ebro River basin authority). The company was involved in several R&D projects such as España Virtual at national level, and the FP7 EuroGeoSource at the European level; it is currently involved in the FP7 Cantogether project. The company will make the most part of the technological development that provides the project with software packages for the information linkage, as well as corresponding editors and web applications.

2.2.3 CNIG (associate partner)

The CNIG (National Center for Geographic Information in Spain) is the governmental organization responsible by law for the planning and management of the geographic information structure in Spain and it will give support as an associate partner providing access to the governmental geographic data which will be used in the experiments. The evaluation of the usefulness of Linked Data for integrating VGI with authoritative datasets for their combined use by government agencies and entities is an issue of interest for the CNIG. The CNIG brings specialized knowledge as massive producer of geographic data and potential consumer of VGI data, and, in addition, helps to disseminate the results of the project between stakeholders.

2.3 Project objectives

We have identified the integration of a large National Map with several VGI datasets as a high impact application case. The national map selected is the Spanish Numerical Cartographic Database (BCN25/BTN25) or one of its derivatives (products based or derived from the BCN25/BTN25), which can be downloaded free for non-commercial use. Its use in the production of Linked Data is well documented [5]. The VGI datasets to provision and integrated with the BCN25/BTN25 should include at least a "pure" VGI dataset (e.g. OpenStreetMap), the geographic subset of a cross-domain dataset (e.g. Wikipedia), and the updates of both datasets. The data provision can be based on their Linked Data equivalents (e.g. LinkedGeoData for OpenStreetMap, DBpedia for Wikipedia).

The vision and application scenario translates into the following four measurable research objectives.

1. *Geographic data provisioning*. Research and develop the provisioning of several large VGI sources (one must be a large geographic dataset, and other must be the geographic part of a large cross-domain dataset) and their integration with a large authoritative dataset (BCN25/BTN25 or an authoritative derivative dataset). Hence, the scope of integration is restricted to Spain because the associate partner (CNIG) that will provide the governmental datasets is a Spanish authority.
2. *Geographic data access*. Research and develop a read/write Linked Data enabled OGC WMS.
3. *Crowdsourcing platform*. Research and develop a platform that will serve as test-bed for crowdsourcing experiments. To achieve this objective, the project will develop an enriched crowdsourcing workflow that involves access to machine data about the map images, user comments and VGI data updates.
4. *Quality experiments*. Investigate experimentally different factors that affect the quality metrics and crowdsourcing techniques. Analyse, propose and evaluate metrics that take into account the spatial nature of information. Analyse and evaluate the availability and quality of provenance information.

2.4 ICT Infrastructure

2.4.1 Supporting infrastructure

The development team IAAA Group has available a complete infrastructure to support the project. The project work will be carried out mainly in the laboratories at its disposal the IAAA group Ebro River Campus of UNIZAR. The laboratories have a combined area of approximately 150m^2 and have an equipment of high performance computers (50 computers, 10 of which are working as servers for different purposes such as database servers, application servers, Web servers, etc.. all with their corresponding UPS), peripherals (such as two printers, plotter A0, A3 scanner and portable secondary storage devices of 60 and 100 Gb), and a communications infrastructure of high quality. It also has a room equipped for high-end servers (high-performance PCs and UNIX multiprocessor machines), personnel for system administration and support. It also provides software licensing for GIS (Geomedia all products, ArcGIS, ArcView 3, Manifold 4.5, etc.), Databases (Oracle 9i, Informix, SQL Server, Access, PostgreSQL, MySQL) and development tools (for Java, C++, Web, Net, etc.).

Additionally, the team has the support of the Transfer Office of Research Results of the University of Zaragoza, as well as the Department of Computer and Systems Engineering and the Engineering Research Institute of Aragon. The resources discussed above are available directly from the development team for the job, however the full support of UNIZAR provide access to other facilities: laboratories, servers, printers, personal computers, network communications, service units, supporting research and considerable expertise in different areas, that the reader will understand that it would be unnecessary to detail but reduce the risk in the unlikely event of any technical problems during the project.

GEOSLAB also will put its infrastructure to support the project. The company has an office of 125m^2 located on Carlos Marx Street, 6 (Zaragoza, Spain), with 17 workstations and room for meetings. Its Data Processing Center (DPC) is equipped with dedicated physical servers and SUN machines and intended Supermicro virtualized on VMware systems. The infrastructure for the development is located on a wide array of Linux and Windows Server machines, as well as management systems databases, web servers and application servers, deployed specifically for the needs of each project. The data integrity is ensured through the daily-automated policies of incremental backup, the weekly full backup of the virtualized machines, and a fireproof independent chamber for storing the backup copies. The security is completed through two hardware firewall working in parallel on working environment. GEOSLAB network also has two autonomous communications outputs, one on high-speed optical fibre.

2.4.2 Dedicated infrastructure

For the purposes of the project, UNIZAR will set up a dedicated server to host the Linked Map Website and the crowdsourcing platform. Meanwhile GEOSLAB will contribute to the project with its own Data Processing Centre (DPC) for large computational processes, a dedicated server for testing and at least four workstations for development. If the DPC was not enough, we will use additional resources from UNIZAR to increase the computing capability.

2.5 Stakeholders

Linked Map could be useful to people with different interests and incentives. The following classification identifies stakeholder groups that can play an active role during the Linked Map project:

- *Very Large Producers of GI*. This group is composed of governmental entities, publicly owned corporations and private corporations that produce large volumes of authoritative GI (e.g. projects such as the Spanish PNOA[2] produces about 45TB/year of uncompressed data), which can be interested in the evaluation of the use of Linked Data and VGI in their data production workflow. These entities show interest in Linked Data but they perceive a technological mismatch between the Linked Data approach and existing technologies (e.g. OGC standards). They are often worried by the lack of information about the quality, the provenance and the semantics of VGI data. These stakeholders may invest in Linked Data technologies and VGI initiatives if the evaluation is positive. The CNIG is a representative member of this group.
- *VGI consumers*. This group is composed of entities part of the state, publicly owned corporations, private corporations, civil society organizations and research entities that use VGI data. This group can be characterized as data as-is consumers. That is, they will consume VGI data without performing transformations. They feel that the quality of information is good enough because it is supported by crowd consensus. However, the use of VGI data is often restrained due to the lack of clear semantics, issues with quality and unclear provenance.
- *VGI producers*. This group is composed mainly by geo hackers, that is, simple citizens that without financial support create and publish online GI. Entities part of the state, publicly owned corporations and civil society organizations may drive to some extent geo hackers work in some scenarios (e.g. emergency crises). This group is becoming more and more technologically sophisticated. OpenStreetMap, a collaborative project to create a free editable map of the world, is member of this group. VGI producers seldom show interest in Linked Data best practices. For example, the conversion of VGI into Linked Data is performed mainly by Linked Data practitioners (e.g. Linked Geo Data [6],

[2] http://www.ign.es/PNOA/

Geo Linked Data [5]). A seamless integration of Linked Data with existing tools used by geo hackers may increase the use of Linked Data in this community.

- *Linked Data practitioners*. This group seeks to make sense out of the huge amount of data continuously published online using Linked Data best practices. Members of the PlanetData consortium are recognized practitioners, experts and technology evangelists. This group of stakeholders pays particular attention to advances in the use of Linked Data in different domains (e.g. GI domain). If we restrict the context to the PlanetData Call 2, data quality metrics, provenance and control access are key issues for this group of stakeholders.

2.6 Project constraints

Constraints impose boundaries and restrictions for a project within the team must operate. Constraints must be clearly defined in the initial phase of a project in order to prevent efforts deviations and to make it clear what aspects are more flexible and which are limiting when new features are defined. The initial constrains for Linked Map project are collected in the Table 1.

Table 1 – Constraints

Constraints	Descriptions
Geographic domain	The dataset which will be selected for the experiments must be restricted to Spain, according to the objectives in the proposal.
Staff restrictions	The personnel involved in the project are fixed. According to the UNIZAR administrative restrictions, the researchers who are going to participate in the project were already specified in the proposal and the technical staff will be specifically hired for this project. Assignation of GEOSLAB staff is more flexible because recruitment is not subject to a specific public policy. However, the cost restrictions may be taken into account.
Schedule	The ending date of the project and deadlines of the deliverables are milestones that must be fulfilled. Tasks and efforts should be planned to meet these milestones.
Cost	Cost is a main restriction. All actions have to be proposed without increasing the final cost.
Features	The main features of the project are specified in the proposal and will be reflected in the requirements. However new features might arise along the project to improve the results. Cost and scheduled restrictions may be taken into account when new features are proposed.

2.7 Project success criteria

The success criteria help to evaluate whether a project has met its main objectives and if the results were satisfactory. Also, success criteria are critical when making decisions that may affect the final results of the project. Project success criteria which have been identified for Linked Map project are collected in the Table 2.

Table 2 – Project success criteria

- The total project cost does not exceed 10% of the initial budget.
- The project is finished before the expected ending date.
- All deliverables are submitted on time.
- At least external volunteer contributions from five different sources are received.
- All requirements are fulfilled. The requirements will be described in the deliverable D15.1.
- The project is disseminated in at least four conferences along the year and several social media channels (external blog, mailing lists...). Social media channels are described in the deliverable D20.1.
- The Linked Map website is regularly updated (at least two or three times a month) and new content is posted on the project blog.

3 Administrative management

Linked Map is configured as a sub-project inside the European Network of Excellence PlanetData. This way, it has dependencies both with the Network and with the Commission. The management structure and procedures will be adapted to a model that has proven successful in previous research projects managed by the partners. This chapter describes this management structure, the Linked Map work plan and the kind of reports that will be produced.

3.1 Roles and structures

Defined tasks and responsibilities will achieve an effective control of the project on three levels:

- At the strategic level, where the Project Board (PB) decides the overall strategic orientation of the project, agree plans, monitor milestones and approve the results.
- At day-to-day operation, where the Project Coordinator (PC) conducts the daily affairs.
- At the technical level, where the WP Leaders (WPL) steers the technical activities of the project and ensure the technical quality of the deliverables.

3.1.1 Overall management organisation

The overall management organisation is shown below.

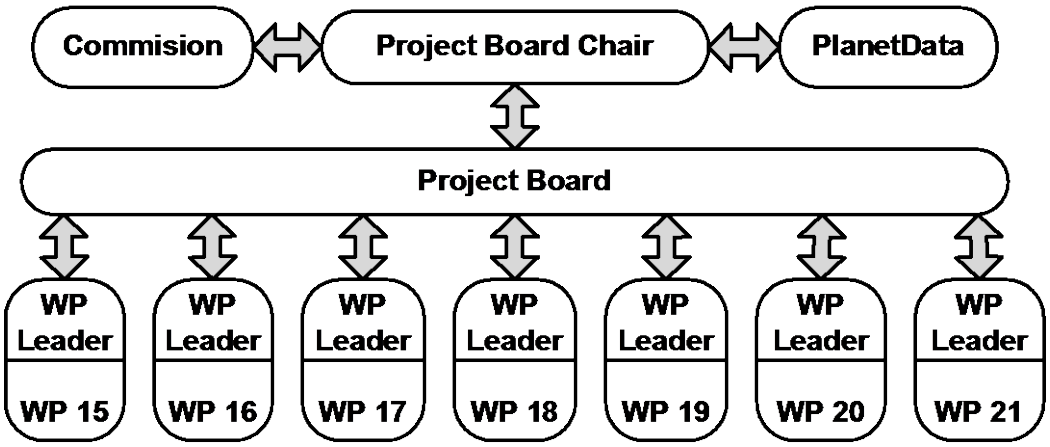

Figure 1 – Management structure

3.1.2 Project Board

The PB consists of the PC and one representative of each core partner. The PB is responsible for the overall policy of the consortium, modifications or extensions of the consortium agreement. The PB works continuously by e-mail and audio conferences and meets regularly. The PB is in charge of performing the ordinary management of the project, i.e. checking the compliance of the work with the project work plan and evaluating deviations from planned schedule/cost, deciding the strategies of the project within the framework of the contract, reviewing or amending the project work plan, proposing amendments to the Technical Annex of the contract, and all contractual matters such as the approval of significant changes in the development plan and changes that affect the delivery of a contractual item to be submitted to the Commission.

3.1.3 Project Coordinator

The PC is the intermediary between the consortium and both the European Commission and PlanetData. The PC provides technical and strategic leadership for the project; coordinates and controls its major activities; and supervises the progress against the planned work plan in time, budget and manpower. The PC of the proposal is Dr. Francisco J Lopez-Pellicer, who is affiliated with UNIZAR.

3.1.4 Word Package Leader

Every WPL is responsible for project and technical management of the work package assigned. He/she establishes the detailed schedule, organizes production, controls the deliverables and assesses the PC of the progress of his/her work package reporting major deviations from the project work plan. Work packages (which will be described in section 3.2) and respective leaders are reported in the following table.

Table 3 – Work Package Leaders

WP No	WP Title	Leader
WP 15	Requirements definition	UNIZAR
WP 16	Linked Data provisioning	UNIZAR
WP 17	Map-based Linked Data access framework	GEOSLAB
WP 18	Platform integration & deployment	GEOSLAB
WP 19	Quality & crowdsourcing experiment	UNIZAR
WP 20	Dissemination	UNIZAR
WP 21	Project management	UNIZAR

3.1.5 Decision making structure and conflict resolution

Conflict resolution has three levels: first level within the WP, a second level in the PC, and the third level in the PB (last escalation level, strategic issues). At the same time, it is expected that WPL of interdependent tasks will consult concerned WLPs before making any decision that could affect other WPs in order to avoid unforeseen side effects and overheads.

3.2 Work Plan

The Linked Map work plan is divided into seven work packages. These work packages are described in Table 4.

Table 4 – Work Package descriptions

WP Number	WP Title	Description
WP 15	Requirements definition	This work package is responsible for: • The development of conceptual architecture. • The definition of the data provisioning requirements. • The definition of the technical and interface requirements for the read-write Linked data enabled Web map service and client. • The definition of the Web user interface.
WP 16	Linked Data provisioning	This work package focuses on: • The conversion of the authoritative geographic dataset BCN25/BTN25 into Linked Data. • The development of provisioning mechanism for Linked VGI datasets and their updates. • The development of a schema for storing provenance and ACL information. • The creation and maintenance of links between BCN25/BTN25, VGI datasets and their updates. • The setup of read-write SPARQL endpoints supporting GeoSPARQL specification.

WP 17	Map-based Linked Data access framework	This work package focuses on: • The development of an extension to OGC Web Map Server specification compatible with read-write Linked Data. • The development of a Web map client able to use that extension in a Web browser.
WP 18	Platform integration & deployment	The goal of this work package to integrate results from work packages WP 16 and WP 17 into a test platform used for evaluation of crowdsourcing approaches for data curation. In detail, the objectives are: • The integration into a coherent platform of the outcomes of work packages WP 16 and WP 17. • The deployment of such platform. • The monitoring of such platform.
WP 19	Quality & crowdsourcing experiment	This work package covers topics of interest of the call focusing on: • the analysis and the identification by empirical studies of the trade-offs associate with crowdsourcing techniques applied to improving the quality of authoritative and VGI datasets. • the analysis and the development in such studies of metrics that take into account the spatial nature of the information. • the analysis and the evaluation in such studies of the availability and quality of provenance data.
WP 20	Dissemination	The work package is responsible for the successful dissemination of research results and has as objectives: • The proper dissemination of research results into academia, government, industry and stakeholders. • The development of an exploitation plan. • The engagement in standardization activities.
WP 21	Project management	The work package is responsible for the successful management of the project and has as objectives: • The project is on time and within the budget, monitoring technical progress and financing. • The overall coordination of the project and activities throughout the project. • The management of quality aspects and risks of the project. • The delivery of internal and external reporting. • The administrative management.

Each work package includes two or more tasks which are described in the following tables (from Table 5 to Table 11).

Table 5 – WP15 - Tasks

Task	Task Title	Description
Task 15.1	Detailed requirements	This task analyses the different aspect of the project (e.g. analysis scenarios, data provisioning needs) deriving development and research requirements from them. The compilation of these requirements will serve as a baseline for being completed during the progression of the project.
Task 15.2	Conceptual architecture	This task details the envisioned framework, data structures, OWL ontologies, RDF vocabularies, the read-write Linked data enabled Web map service and client, interfaces and APIs using Unified Modelling Language (UML). The goal is to harmonize all the efforts that are going to be developed by the parties. The conceptual architecture is a live document that will be refined continuously based on the progress of the project.

Table 6 – WP16 - Tasks

Task	Task Title	Description
Task 16.1	Conversion into Linked Data	The goal of this task is the conversion of the authoritative geographic dataset into Linked Data reusing existing Linked Data datasets when appropriate.
Task 16.2	GI Provenance & ACL Schemas development	This task focuses on the development of GI provenance & ACL schemas and their corresponding implementation.
Task 16.3	Development of Linked VGI provisioning mechanism	This task will research a provisioning mechanism for Linked VGI Data. The provisioning mechanism will keep updated a local store with the change sets from the different Linked VGI Data providers considered.
Task 16.4	Integration of Linked Data contributors	This task will research on the integration of Linked Data contributors using BCN25/BTN25 as hub. This task is based on the outcomes of the previous tasks, and provides a SPARQL node for read-write the data, including integration and provenance data. The node shall be compliant with OGC GeoSPARQL specification.

Table 7 – WP17 - Tasks

Task	Task Title	Description
Task 17.1	Development of Read-write Linked Data enabled OGC Web map server	This task deals with the development of a prototype of the Linked Data enabled OGC web map server. In order to keep implementation efforts as low as possible, the prototype will be based on an existing open source Web map server. The outcome of this task is susceptible to be part of the efforts of standardization.
Task 17.2	Development of Read-write Linked Data enabled Web map client	The task foresees the development of visual widgets for rendering data, editor widgets for adding or curating data and map drawing widgets able to interoperate with the prototype developed in Task 17.1. In order to ease the diffusion of the technologies, the implementation will be based on existing open source Web map client libraries.

Table 8 – WP15 - Tasks

Task	Task Title	Description
Task 18.1	Platform development	This task assembles and deploys all components into a first version of the platform combining semantic integration, data querying and visual interface. That is, it includes the access or update, if applicable, to all the authoritative data with the links using a Linked Data publishing interface, the SPARQL node, the Linked Data enabled OGC Web map server or the Linked Data enabled Web map client.
Task 18.2	Platform refinement	This task represents the maintenance activities of the platform, including synchronization with VGI data sources.
Task 18.3	Platform monitoring	This task will establish mechanism to monitor the platform, including the use of Web analytics platforms, log file analysis, user surveys, etc.

Table 9 – WP19 - Tasks

Task	Task Title	Description
Task 19.1	Analysis of quality factors	This task will analyse different aspects related to the data quality in VGI communities identifying factors and quality metrics connected to the spatial distribution of data and the availability of provenance information. Instruments are literature reviews, analysis of VGI communities, tools and workflows, and analysis of VGI datasets provisioned in work package WP 16. This task will be the basis to test the most promising factors to improve with the support of Linked Data best practices the quality of existing VGI datasets with the support of authoritative data, and amending existing authoritative datasets with VGI data.
Task 19.2	Evaluation of quality factors	This task will evaluate the effect of different factors and the usefulness of quality metrics identified in Task 19.1 in the platform. Instruments are data from WP 16, and the experimental evaluation of the quality of the outcome of crowdsourcing activities in scenarios involving authoritative and VGI datasets with different availability and quality of information (e.g. provenance)

Table 10 – WP20 - Tasks

Task	Task Title	Description

Task 20.1	Dissemination exploitation	This task deals with dissemination and exploitation activities but Web presence and standardization. The dissemination activities are focused on conferences and stakeholders related to PlanetData partners, academic communities, government and industry involved in the management of large datasets of geographic information.
Task 20.2	Web presence activities	This task is responsible for the creation and maintenance of the Web presence, which includes the site developed in WP 17.
Task 20.3	Standardization	This task will monitor OGC and W3C for emerging standards related to Linked Data best practices and geographic information that are applicable to this proposal. This task is also responsible for the proper use of relevant standards in the proposal, especially in work packages WP 16 to WP 18. Researchers involved in this project will contribute project's results to standardization forums and working groups

Table 11 – WP21 - Tasks

Task	Task Title	Description
Task 21.1	Administrative management	This task focuses on the administrative project coordination, in particular: • Developing and maintaining necessary project documentation (e.g. Project Management Handbook). • Acting as an intermediary with the Commission and PlanetData. • Implement procedures to ensure appropriate communication between participants. • Manage budget and manpower situation to ensure efficient use of resources.
Task 21.2	Quality assurance & risk management	This task takes the overall responsibility of quality assurance and risk management. The quality and risk control is implemented by internal and external reviews against technical and contractual aspects. Best software engineering practices (e.g. web-based collaboration tools) will be followed to ensure a high-level quality of the overall project and the deliverables, and reduce technical risks.

Figure 2 shows the planned schedule for the execution of all the work packages. Requirement descriptions (WP 15), Linked data provisioning (WP 16), Read-write Linked data WMS framework (WP 17), Platform integration & development (WP 18) and Quality & crowdsourcing experiments (WP 19) have been designed to optimize personnel resources committed to the project (e.g. several researchers participate in all packages) and enabling parallel development (e.g. completing some tasks in a WP may trigger the beginning of a WP). Project management (WP 21) must start the first day of the project and end the last day of the project. This is the usual and classic approach for every project management. Dissemination activities (WP 20) span the same
period.

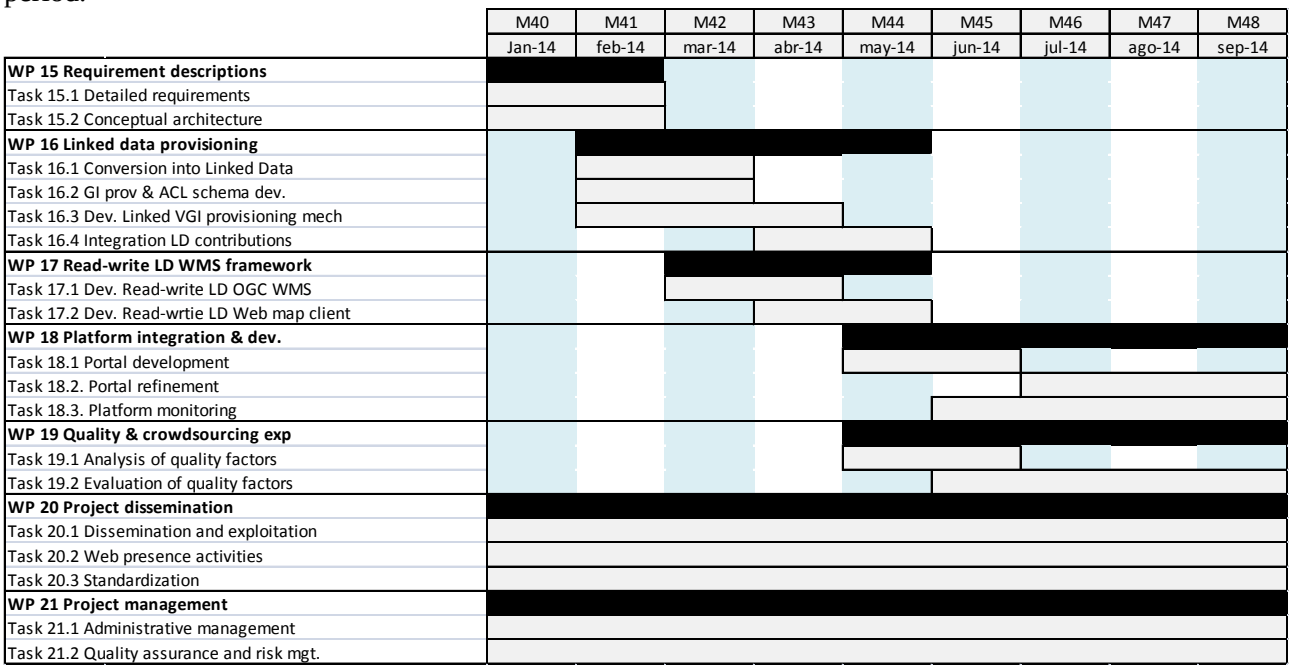

Figure 2 – Schedule

3.3 Reporting

Reporting about the Linked Map project will be made by means of the planned deliverables. The list of deliverables is showed in Table 12. This table indicates the nature of the deliverable according to the following codes:

- R = Report
- P = Prototype
- D = Demonstrator
- O = Other

Also Table 12 indicates the dissemination level using one of the following codes:

- PU = Public
- PP = Restricted to other programme participants (including the Commission Services).
- RE = Restricted to a group specified by the consortium (including the Commission Services).
- CO = Confidential, only for members of the consortium (including the Commission Services).

Table 12 – List of deliverables

Number	Title	WP	Nature	Disesemination level	Proposed delivery date
D15.1	Requirement definition and conceptual architecture	15	R	CO	M41 (feb-28)
D16.1	VGI provenance schema	16	O	PU	M42 (mar-31)
D16.2	Provisioning service	16	P	RE	M42 (mar-31)
D16.3	Authoritative dataset	16	O	PU	M43 (apr-30)
D16.4	Data access/update service	16	P	PU	M44 (may-31)
D17.1	Read-write LD OGC WMS	17	P	PU	M43 (apr-30)
D17.2	Read-wrtie LD Web map client	17	P	PU	M44 (may-31)
D18.1	Platform alpha version	18	O	PU	M45 (jun-30)
D18.2	Platform beta version	18	O	PU	M48 (sep-30)
D18.3	Platform monitoring report	18	R	RE	M48 (sep-30)
D19.1	Report on VGI data quality factors	19	R	PU	M45 (jun-30)
D19.2	Report on crowdsourcing trade-offs for geospatial data curation	19	R	PU	M48 (sep-30)
D20.1	Web site, social media channels, fact sheet	20	O	PU	M41 (feb-15)
D20.2	Community awareness plan	20	R	RE	M44 (may-31)
D20.3	Exploitation plan	20	R	RE	M48 (sep-30)
D20.4	Standardization report	20	R	PU	M48 (sep-30)
D20.5	Web enabled public showcase	20	O	PU	M48 (sep-30)
D21.1	Project handbook	21	R	CO	M41 (feb-15)
D21.2	6-montly report	21	R	RE	M43 (apr-30)
D21.3	Final report and project showcase	21	R	PU	M48 (sep-30)

Therefore the project will generate a list of reports at different dissemination levels. For those deliverables whose nature is not a “Report”, we will create also an associated document describing the deliverable which will be sent to the Commission as a report.

4 Quality assurance management

Quality assurance management must be described from two different points of view. On the one hand the Linked Map project partners have their internal processes to ensure the results of the project fulfil their own quality requirements and on the other hand the PlanetData consortium has its own quality assurance procedure for each deliverable created in the context of PlanetData project.

The following sections describe the main issues of these two different quality assurance procedures.

4.1 The internal quality management system

IAAA and GEOSLAB have participated together in several R&D projects. Quality improvement and environmental care are always among their main objectives. With this aim, both entities have promoted an Integrated Management System for Quality and Environment based on the requirements of the ISO 9001:2008 and ISO 14001:2004 norms, for all its activities, complemented with the requirements of ISO / IEC 15504 "Software Process Improvement Capability Determination" (SPICE), capacity level 2, with the primary goal of satisfying customers by providing the highest quality services and respect for the environment.

4.1.1 Quality management by project

As part of its management system, IAAA and GEOSLAB have a specific common process whose objective is to control the quality requirements fulfilment during the whole work process, from the contract signature to the final delivery to the client. This process implies the following control activities:

- Initial revision of quality requirements of each work stage, including legal requirements, customer requirements and inner requirements.
- Detailed planning of responsibilities, tasks and resources.
- Requirements fulfilment checking, project manager approvals and customer revisions and approvals.
- Subcontractors control.
- Check on delivery and receipt of the work.

This process is complemented by requirements implemented regarding to SPICE, capacity level 2. In particular, the following processes have been defined to improve project management:

- ENG.1: Requirements Elicitation.
- MAN.3: Project Management.
- MAN.6: Measurement.
- SUP.1: Quality Assurance.
- SUP.8: Configuration Management.

Thanks to controls defined previously, the management system is able to detect potential deviations from provisions and provides, in that case, proper corrective measures (modifications in planning and resources allocation, etc.).

ENG.1: Requirements Elicitation. The objectives pursued in this process are:

- Obtain acceptance of the requirements of all participants in the project.
- Manage the change of requirements over the life of the project.
- Obtain and maintain traceability between requirements and the rest of the products obtained.
- Identify inconsistencies between requirements, changes to these requirements and in the rest of the products obtained.
- Verify that the requirements are used as a tool for software testing.

MAN.3: Project Management. The objectives of this process are:

- Define a project plan with a timetable and needed resources.
- Have control of the state of the projects, its current status, development costs, the problems encountered and the risks that may still arise.
- Be certain about the expected time of delivery and development costs.
- Establish the project profitability.
- Control issues with clients and the way in which these can affect the development of the current project and future projects.
- Control partial and final deliveries of the project, incidents, and coordination with financial management for billing.

SUP.1: Quality assurance. The quality assurance plan has the following objectives:

- Check the adequacy of work done with the objectives and scope proposed in the project.
- Ensure an appropriate level of quality of the project, according to the standards set by the organization.
- Assess the degree of progress of the project in line with the proposed work program.
- Review the documents provided by the work program in each of the major milestones and in each phase detailed in the project schedule
- Reduce, eliminate and prevent deficiencies of quality of the products to obtain.
- Ensure the alignment of the project results and the perception that users have of him.
- Identify any deviations in the standards applied, as well as the requirements and procedures.
- Verify that you have carried out the necessary preventive or remedial measures.

SUP.8: Configuration Management. Configuration management is a process whose purpose is to establish and maintain the integrity of work products and make them available to the parties affected. It includes:

- Identification of items / products to be controlled.
- Storage policies, backup and access control (if necessary).
- Naming and versioning policy.
- Release baseline policy.
- Change control policy.
- Specific policy for creation and management of branches.
- Backup policy which allows recovering any previous state of the configuration items.

To perform this configuration management, certain tools are used in order to facilitate the version control and the changes on software. Among these tools are worth highlighting:

- Subversion for version control.
- Maven to manage Java dependencies.
- Bugzilla for change management and software errors.

MAN.6: Measurement. The objectives pursued in this process are:

- Have useful indicators that reflect the reality of the organization.
- Systematize the collection and analysis of information.
- Publish the results of the indicators and their analysis.

4.1.2 Environmental Management

As part of their Quality and Environment Integrated Management System, IAAA and GEOSLAB have designed the process "Environmental Management" whose aim is to guarantee the fulfilment of legal environmental regulations as well as the identification, assessment and improvement of environmental issues affecting the companies activity and, if possible, that of third parties. This environmental management is based on the following points:

- Compliance with environmental legislation.
- Implementation of an internal code of good environmental practices focused on energy saving, reduction of water and paper consumption and proper waste management.
- Complementary instructions included in the system process manual to control environmental impacts.
- Improvement plans for all the significant environmental issues.
- Transfer of environmental requirements to allies, subcontractors and suppliers.

In short, as part of their commitment to environment, both entities promise to:

- Provide a maximum quality service that fulfils broadly customer and applicable environmental regulation and to set up our proper codes in those aspects where no regulation is implemented.
- Manage our activity under a preventive focus to avoid later corrections.
- Reduce, when possible, waste and emissions in our activity, in our own work and in that with suppliers.
- Promote energy efficiency, reuse and recycling, and, in general, resources saving, designing properly operating processes.
- Facilitate adequate environmental information to our staff, clients, allies, suppliers and subcontractors, training and encouraging them to apply environmental good practices.
- Set up a continuous improvement system for processes, procedures and services and evaluate periodically its objectives fulfilment.
- Promote a work environment that facilitates personal development, assigning properly functions and responsibilities, providing continuous training and motivation and enhancing human and environmental values.
- Compliance with legislation and professional code of ethics.

All these good practices are part of the inner working processes of both organizations. Regarding the project itself will be attempted whenever possible:

- Use digital documents instead of printed ones.
- Reuse paper for printing internal documents.
- Using electronic media to avoid using the printer or fax.
- Reuse folders, binding materials, etc.., to store internal documents.
- Minimize the amount of waste packaging generated by selecting the most appropriate forms of presentation.
- Encourage the purchase of resources (consumables, hardware, etc.) with energy efficiency certificates.
- Reduce travels by promoting teleconferences or videoconferences.

The fulfilment of the requirements stated before is controlled by two types of activities that ensure the adequate environmental management inside of the organizations at the same time that makes efforts to offer sustainable solutions to its client's demands. These activities are:

- Internal audits.
- Measuring and monitoring of processes.

4.2 The PlanetData Quality Assurance procedure

The PlanetData Quality Assurance procedure is described in detail in the PlanetData Project Wiki [7]. This chapter is only a transcription of this web page with the aim of providing an overview of the whole process of quality assurance in a single document. However, the most recent version of the PlanetData Quality Assurance procedure must always be consulted on the Project Wiki.

The quality assurance procedure is initiated four weeks before the final submission deadline.

There are five different people involved in the quality assurance procedure of each deliverable:

- two reviewers (each deliverable must have two reviewers who are assigned on a yearly basis),
- the coordinating author,
- the WP leader,
- the Activity Leader,
- the Project manager

The schedule followed to review a deliverable is:

- 4 weeks before the deadline: the reviewers receive the deliverable from the coordinating author (email attachment, link, etc.). The coordinating author uploads the deliverable to the wiki. The reviewers produce detailed reviews using a template, send the reviews to the coordinating author and upload them to the wiki.
- 3 weeks before the deadline: the deliverable is revised by the authoring team according to the review reports. The work package leader supervises this process in order to ensure that the deliverable implements the reviewer's comments. The work package leader returns it to the authoring team if deemed appropriate. Upon completion the revised deliverable is sent to the Activity Leader. The work package leader uploads the deliverable to the wiki.
- 2 weeks before the deadline: a final quality check is undertaken by the Activity Leader before submitting it to the EC. The coordinating author submits the final version to the Project Manager. The coordinator author uploads the final version to the wiki.
- 1 week before the deadline: the Project Manager ensures that the deliverable is submitted on time to the EC and (if public) is uploaded to the project Web site.

5 Risk management

The purpose of this section is to identify potential problems before they happen so that risk-handling activities can be planned and invoked as needed across the life of the project to mitigate adverse impacts on achieving objectives. First, potential problems, or risks, must be identified and described in an understandable way before they can be analyzed and managed properly.

Once risks have been identified, they must then be assessed as to their potential severity of impact (generally a negative impact, such as damage or loss) and the probability of occurrence. We will assign the levels of low, medium and high for both probability and impact in order to categorize each risk in accordance with the Risk Matrix defined in Table 13. This risk matrix and the description of each risk level have been defined according to the experience of UNIZAR and GEOSLAB in project developing and it is revised once a year.

Table 13 – Risk Matrix

PRIORITY		**PROBABILITY**		
		HIGH	MEDIUM	LOW
IMPACT	HIGH	HIGH	HIGH	MEDIUM
	MEDIUM	HIGH	MEDIUM	LOW
	LOW	MEDIUM	LOW	LOW

The levels of low, medium and high for the probability of occurrence have the following meaning:

- High: very likely, probability within 81% and 100%.
- Medium: it may occur, probability within 31% and 80%.
- Low: unlikely, probability within 0% and 30%

The levels of low, medium and high for the risk impact have the following meaning:

- High: delay on project schedule or increase of cost greater than 20%.
- Medium: delay on project schedule or increase of cost within 10% and 20%.
- Low: delay on project schedule or increase of cost smaller than 10%

A relative priority is determined for each risk based on the assigned risk parameters. The intent of prioritization is to determine the most effective areas to which resources for mitigation of risks can be applied with the greatest positive impact to the project.

Categorization of risks is therefore a very important task because it determines the priority given to each individual risk. This categorization is the result of several meetings between GEOSLAB and UNIZAR where each risk is discussed in depth. The last step in the risk analysis is defining a mitigation plan in terms of pro-active and corrective measures to be taken into account to reduce the impact or the probability of occurrence for each risk.

Table 14, Table 15 and Table 16 show a detailed analysis of risks that may endanger the execution of the project. First, the risks are identified, secondly they are categorized according to their probability of occurrence and impact and finally a contingence plan for each risk is defined.

Table 14 – Risk identification

Risk	**Description**
Too optimistic schedule	The schedule has been built according to estimations based on the consortium members' previous works. Nevertheless these estimations may not be real and the project could be delayed.

Low participation in crowdsourcing experiments	The project needs contributions from geographic information potential users. This could be a difficult task if they do not understand the advantages of the project and we cannot stimulate their interest.
Cost overrun	The fulfilment of the project objectives may require some additional investment to hire staff, purchase equipment or trips that were not initially planned.
Overlap with other projects	When the proposal was written we did not know exactly the amount of projects that could be in progress during the Linked Map project execution time. Now we can make a more accurate planning but new projects may arise along the year which can force to replanning the project.
Work team availability	Human resources may not be available when needed due to other works being carried out or contractual limitations.
Computational capacity	One of the goals of the project is to transform a large geographic dataset into linked data. This task requires a large computational capacity and the available hardware resources may not be enough.

Table 15 – Risk categorization

Risk	Probability (Oct 2012)	Probability (Jan 2014)	Impact	Priority
Too optimistic schedule	Low	Medium	Medium	Medium
Low participation in crowdsourcing experiments	Medium	Medium	Medium	Medium
Cost overrun	Medium	Medium	High	High
Overlap with other projects	---	High	High	High
Work team availability	---	Medium	High	High
Computational capacity	---	Low	High	Medium

Table 16 – Mitigation plan

Risk	Contingence plan
Too optimistic schedule	The deliverables are achievable, as they are purely based on the consortium members' previous work and their research areas of excellence. For each task, the plan should consider the impact of potential delays. If the potential delays may affect the project timing, the goals of the deliverables must be downsized.
Low participation in crowdsourcing experiments	To minimize this risk, the consortium will embark on intensive dissemination activities (WP 20) with the help of an associated partner (CNIG), in particular, for the diffusion of the crowdsourcing experiment among stakeholders.
Cost overrun	The first 5 months are crucial to keep the project on budget. To avoid cost overrun in work packages WP 16 to WP 19, WP 15 will analyse and prioritize features taking into account the budget available. Non-essential features will not be implemented if the cost overrun happens.
Overlap with other projects	To minimise this risk, for each task, the plan should consider the impact of reductions up to 50% of resources. If such scenario affects seriously the project timing, the goals of the affected deliverables must be downsized.
Work team availability	To minimise this risk, for each task, the plan should consider the impact of reductions up to 50% of human resources. If such scenario affects seriously the project timing, the goals of the affected deliverables must be downsized.

Computational capacity	UNIZAR has some associated research institutes that could provide their clusters of machines in the event that computers belonging to the IAAA research group are not enough.

6 Conclusions

In this document, the main aspects for the successful management of the Linked Map project have been summarized. First the document describes the goals to be achieved by the project, the partners that will be involved, the identification of the potential stakeholders which can be interested in the results of the project and the constraints and success criteria that will drive the project development. Then, the document describes the management procedures from two different points of view: the administrative management and the quality assurance and risk management.

The administrative management focuses on the administrative project coordination. Related to these topics in this handbook the project objectives have been described, the partners and their roles have been identified and the management structure among these partners and the PlanetData consortium has been detailed.

Regarding the quality assurance and risk management the quality assurance procedures that must be applied during the project execution have been described in this handbook and the risks that may endanger the execution of the project have been analyzed.

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