1. Publishable Summary

Introduction

PublicaMundi is a research project originating from everyday problems faced by open data publishers and data consumers alike. Simply stated, open geospatial data are cumbersome to easily *publish* and *consume* for non-GIS experts. While most data publishers and developers are familiar with handling and using typical data (e.g. csv), they are not familiar with the intricacies of geospatial data. Different coordinate reference systems, geospatial databases, map servers, special standardized APIs are some of the tools and know-how required to publish and reuse open geospatial data.

PublicaMundi aims to democratize open geospatial data publishing and reuse, making easier for publishers to share data and for developers to discover and reuse data.

- Project web site: www.publicamundi.eu
- Source code repository: www.github.com/PublicaMundi

The PublicaMundi Consortium comprises "Athena" Research Center (coordinator), rasdaman GmbH, GeoLabs SARL, and Get Ltd.

Motivation

Open data and information provided by the public sector constitute a significant opportunity for transparency, accountability, better governance, and citizen participation. Reuse of open data can also serve as an instrument for growth, leading to innovation through research, better products and services, new jobs and economic advancement. The Vickery report estimates the benefits of extended PSI (Public Sector Information) reuse for the EU27 economy at 140b€/year (1.7% GDP 2008).

These financial benefits will be materialized through the establishment of a Data Economy, led by SMEs providing added value services by repurposing and extending open public data.

Geospatial data account for an estimated 80% of public sector information and are the most significant category of open public data due to their high production, procurement and update costs, as well as their relevance in multiple thematic areas and domains. The availability of such high value open data has the potential to create and sustain a multi-billion market of applications and services. By nullifying the extremely high costs associated with geospatial data production, SMEs can have unprecedented access to a valuable body of knowledge, enabling novel value added applications and services.

Despite the importance of open geospatial data, they are increasingly difficult to discover and reuse, especially in a cross-boundary multilingual context. The vast majority of open data catalogues in the EU have limited support for geospatial information, across all phases of their lifecycle. Geospatial data are treated as *second class citizens,* with insufficient capabilities in publishing methodologies and tools, limited technical foundations to support value added services, and simplistic non-scalable support for geospatial data visualization. These problems directly influence the capacity of SMEs to reuse open geospatial data and deliver value added applications.

Goals

PublicaMundi will provide reusable tools and technologies for comprehensive, sophisticated and scalable publishing of open geospatial data, with emphasis on streamlining and maximizing their reuse in value added services and applications. Are goals are to deliver:

- A sustainable, efficient, traceable and easy to use publishing methodology, fully supporting the entire *lifecycle* of open geospatial data.

- An open geospatial data catalogue with full support for open geospatial data curation and *management*, integrating the developed data interlinking, multilinguality, processing, analysis, mapping, and visualization software components.
- Technologies and tools to assist in interlinking and multilingual support of open geospatial data in order to increase their value, relevance, and applicability for value added applications.
- Reusable software components implementing mapping and analytics services for demand-aware visualization of open geospatial data, enabling rapid integration in multimodal and value added applications.
- Reusable software components implementing processing and analysis services for demand-aware processing and analysis of open geospatial data, enabling rapid integration in multimodal and value added applications.
- Comprehensive, real-world validation through geodata.gov.gr, of the project's methodologies and software *components* regarding usability, sustainability and purposefulness for developing valued added applications
- A showcase of EU innovation for open geospatial data, mobilizing EU members states, SMEs and individuals towards realizing the EU data economy

Results of the Second and Final Year

PublicaMundi aims to make open geospatial data easier to discover, reuse, and share by fully supporting their complete lifecycle in open data catalogues. To achieve this, we have extended and integrated leading open source software for open data publishing and geospatial data management. In this manner, the PublicaMundi technologies can be applied as a whole, or through its individual components, by thousands of developers and real world systems worldwide.

During the second and final year of the project, we have focused on developing, testing, and validating the PublicaMundi software as a *feature-complete* and *turn-key solution* for open geospatial data publishing. Towards this, we have invested extra effort towards simplifying the deployment of PublicaMundi, enriching the documentation, as well as applying feedback from all stakeholders to improve all aspects of the system. We have reached all milestones and objectives of the project and delivered the final PublicaMundi system, readily available to all stakeholders and the open source community.

We have dedicated significant effort towards improving and finalizing the integration of all PublicaMundi software components in a coherent and highly scalable manner, minimizing administrative overhead. Towards this, we have simplified and automated the deployment process, applying this work to perform the integration and deployment of PublicaMundi to labs.geodata.gov.gr (*testing environment*) and geodata.gov.gr (*production catalogue*). Further, we have collaborated with the open source community and interested stakeholders to further simplify the use of PublicaMundi software, both as a complete system and as individual components.

The complete PublicaMundi system has further matured through this process and reached a level where it can address the requirements and needs of diverse stakeholders. PublicaMundi can handle the roles of a data catalogue, a geospatial data catalogue, a Spatial Data Infrastructure, and a Web GIS. Further, it ensures compliance with de facto and de jure standards for open data catalogues, geospatial data, and the INSPIRE Directive. Finally, it can be deployed in a distributed manner, providing services on a local, national, or international level, while also repurposing and providing added value to existing investments in SDIs and open data catalogues

PublicaMundi has been deployed in a production setting on geodata.gov.gr, the Greek Open Geospatial Data Catalogue. All catalogue's data are available through PublicaMundi services (OGC, Data/Mapping API), as well as in different languages. Consequently, PublicaMundi's output has been tested and validated under *public scrutiny* and in a *real-world* setting. We have extensively tested and validated our work, exploiting feedback from users to further

improve and optimize our software. We organized our 2nd PublicaMundi GeoDataCamps (Athens, Bremen), where all system aspects were tested and validated by a representative sample of open data stakeholders.

The reception from citizens, scientists, the public sector, as well as the private sector has been extremely positive. The advanced functionalities and the streamlined publishing workflow have reinvigorated the interest of data publishers (*new publishers, updated data*), developers (*Data/Mapping APIs*), the public sector (*custom/embedded maps*), and of course citizens (*interactive maps and view/authoring tools*). Our testing environment (*labs.geodata.gov.gr*) continuous to serve as test-bed for technical improvements and as a training infrastructure for data publishers and developers.

With the PublicaMundi project officially completed, the focus of the partners now shifts entirely to the exploitation of the project's output. The targeting of the project towards open source software, and especially software pioneered by the individual partners, enabled us to begin our exploitation activities only a few months after the project started. The roll-out of PublicaMundi's output in rasdaman, ZOO-WPS and GET SDI has been constant and extremely successful. Similarly, our efforts towards improving existing open source projects (e.g. CKAN, pycsw) has been publicly acknowledged by the community, and was integrated in real-world data catalogues.

The Consortium is eager to *observe* and *contribute* to the continuing exploitation of PublicaMundi's output from the open source community, open data stakeholders, and Data Economy innovators developing value added services with open geospatial data. We believe that the foundations we have established in the project, on the technology and community levels, will ensure the sustainability of our work.

The PublicaMundi Consortium

- The "**Athena**" Research Centre is a research and technology body, founded under the auspices of the Greek Ministry of Development in 2001. Athena RC participates in PublicaMundi through the Institute for the Management of Information Systems (www.imis.athena-innovation.gr). IMIS was founded in 2007, with the mission to conduct research in the area of data management and large-scale information systems. In this small time-frame IMIS has been established as one of the leading EU research institutions in Big Data and Semantic Web technologies, i.e. the foundations of the Data Economy. IMIS is actively promoting the open data agenda in Greece, having founded geodata.gov.gr (the first open data portal in Greece) and by regularly organizing Open Data days and hackathons in order to democratize open data technologies and tools. IMIS is at the forefront of open innovation and active participation in Greece through several other technical and policy initiatives.

- **RASDAMAN** (www.rasdaman.com) is a high-tech SME (rasdaman.com) and research spin-off specialized on Big Raster Analytics, centered around the first and leading Array Database, rasdaman (an OSGeo incubation project). The rasdaman technology, developed over a series of EU FPx and ESA projects, provides fast, scalable, flexible and open standards-based analytics on multi-dimensional raster data in Earth, Life, Space science and engineering. In close cooperation with Jacobs University it transforms leading-edge research results into marketable innovative products.

- **GEOLABS** (www.geolabs.fr) is a high-tech SME providing geospatial management solutions world-wide based on open source technologies. GeoLabs is leading the development of numerous open source geospatial projects and provides SaaS/PaaS services for geospatial data. GeoLabs has developed MapMint (mapmint.com), a complete web based web mapping infrastructure, participated in the development of geoportail.fr, the development of the Senegal's National Cadastre. Further, it provides commercial cloud-based GIS services, and contributes in numerous open source projects.

- **GET** (www.getmap.gr) is a high-tech SME active in the entire lifecycle of geospatial data. It produces, maintains and curates geospatial data and develops high-value geospatial

applications. GET has significant market experience, networking ties, and exploitation channels, with emphasis in cost effective open-source based services. Further, GET is the first Greek company of the GIS sector actively promoting and monetizing open source technologies in large-scale ICT projects.