case study

The Asset Description Metadata Schema (ADMS)

A common vocabulary to publish semantic interoperability assets on the Web

July 2011

The Asset Description Metadata Schema (ADMS)

This case study describes the initiative of SEMIC.EU to collaboratively specify and build a consensus on the ADMS, a vocabulary to publish asset description metadata on the Web.

The publication of e-Government metadata as an enabler of semantic interoperability

Semantic interoperability is a necessary condition for the electronic exchange and usage of information across the boundaries of information systems. The European Interoperability Framework (EIF) (European Commission 2010) defines semantic interoperability as the ability of organizations to process information from external sources in a meaningful manner. It ensures that the precise meaning of exchanged information is understood and preserved throughout exchanges between parties. For public administrations in Europe achieving semantic interoperability is becoming an increasingly important challenge. One important driver for this is the increasing demand for cross-border or cross-sector interoperability of electronic public services in the context of among others the European Internal Market.

The **publication of e-Government *meta*data** on the Web is an important enabler for semantic interoperability. SEMIC.EU calls such e-Government metadata rightfully semantic interoperability *assets,* as they are of considerable value to public administrations. These *assets* include among others containers of code lists, taxonomies, data models, and full-fledged ontologies. Since its start in 2008, the SEMIC.EU project has been supporting public administrations to share and publish semantic interoperability assets in the SEMIC.EU asset repository. The publication of semantic interoperability assets allows others to (re)use these semantic interoperability assets in among others the following ways:

1. to analyse the semantic differences between countries or domains;
2. to develop new or redesign existing electronic public services that reuse the semantic interoperability asset as part of their interface;
3. to extend the semantic interoperability asset; and
4. to use the semantic interoperability asset in the design of back-office applications for e-Government.

Unfortunately, not all countries have an elaborated approach to manage and publish such metadata. In the worse case scenario, some countries do not have any metadata defined at the national level and e-Government projects are using ad-hoc schemas. For these countries, the first step is to become aware that metadata is indeed a valuable asset and that this asset should be managed by collecting, agreeing, and publishing semantic interoperability assets at the national level.

Other countries are managing their metadata using catalogues, or have already begun to organize their metadata in repositories, such as the British GovTalk.gov.uk repository, the Danish Digitalisér.dk platform or the German XRepository. However, the latter situation is not yet ideal either, because semantic interoperability assets are available in different repositories, using different

classifications and technology and accessible through different interfaces. As these repositories are unlinked and non-interoperable, it is impossible for someone to have an overview of all the semantic assets available from this set of decentralised European repositories (European Commission, ISA Programme 2011). The need to have an overview on metadata in these repositories is nonetheless increasing, as the delivery of electronic public services more and more takes place across the borders of individual Member States.

The Semantic Web: Linked Open Data

The publication of semantic interoperability assets in these disparate repositories happens at a time when initiatives such as the "**Semantic Web**" are gaining enormous momentum. Currently, the Web is a transforming from being *only* a human-understandable "Web of linked hypertexts" into a "Web of hypertexts and linked data" that are not only human understandable but can also be meaningfully processed by machines (computers). The World Wide Web Consortium (W3C) has proposed a wide number of standards such as the Resource Description Framework (RDF) and the SPARQL (pronounce 'sparkle') query language for RDF that build on current Web technology to enable the Semantic Web vision.

These semantic web technologies represent a huge opportunity for the European Member States to publish the *description* metadata of their semantic interoperability assets –the descriptors of the asset as a whole, not the code lists, taxonomies, data models, and ontologies that they contain – both as human-understandable hypertexts (HTML), and as machine-understandable **metadata descriptions** (RDF, or RDF annotations inside HTML). To realize this, interoperability repositories on the Web must adhere to the Linked Open Data (LOD) guidelines proposed by Tim Berners-Lee (Berners-Lee 2006):

1. Use Uniform Resource Identifiers (URIs) to uniquely identify semantic interoperability assets on the Web;
2. Use HTTP URLs corresponding to these URIs so that information can be retrieved;
3. Provide metadata using open standards including RDF(S) and XML;
4. Include links to related semantic assets, so that people can discover more.

The publication of semantic interoperability assets on the Web according to the LOD guidelines, will allow repositories of semantic interoperability assets to publish their assets in a uniform, machine-readable vocabulary, to easily create links between semantic interoperability assets on the Web and to seamlessly exchange asset description metadata with other repositories. Public administrations – the target user of these repositories – will benefit from this as it will allow them to more easily search and retrieve information about semantic interoperability assets and discover the semantic links between them.

The Asset Description Metadata Schema (ADMS)

The third guideline of the above-mentioned LOD guidelines requires a vocabulary (in RDF or XML) to represent information about semantic interoperability assets on the Web. SEMIC.EU calls this the Asset Description Metadata Schema (ADMS). The work on defining the ADMS has already started. In November 2010, SEMIC.EU has started with an informal community on SEMIC.EU which has lead to the specification of the ADMS v0.6, which is to be considered as a working draft for further discussion (Arndt, et al. 2011).

The ADMS vocabulary will specify what constitutes a valid representation of asset description metadata on the Web. Figure 1 shows the draft ADMS data model represented as a UML Class Diagram. Its main use case is a common vocabulary to publish the description metadata of semantic interoperability assets stored in separate systems facilitating the federation of repositories on the Web.

The ADMS adheres to a number of design principles that are defined in the draft specification of the ADMS v0.6 (Arndt, et al. 2011), including the following:

- The ADMS has to be restrictive enough to avoid major semantic conflicts and to allow for the aim of federating distributed resources.
- The ADMS has to be flexible and extensible enough to allow various repositories to use and to participate in the federation of repositories.
- The ADMS has to reuse existing metadata standards and vocabularies such as DCAT, DC, FOAF, DOAP, and SKOS.
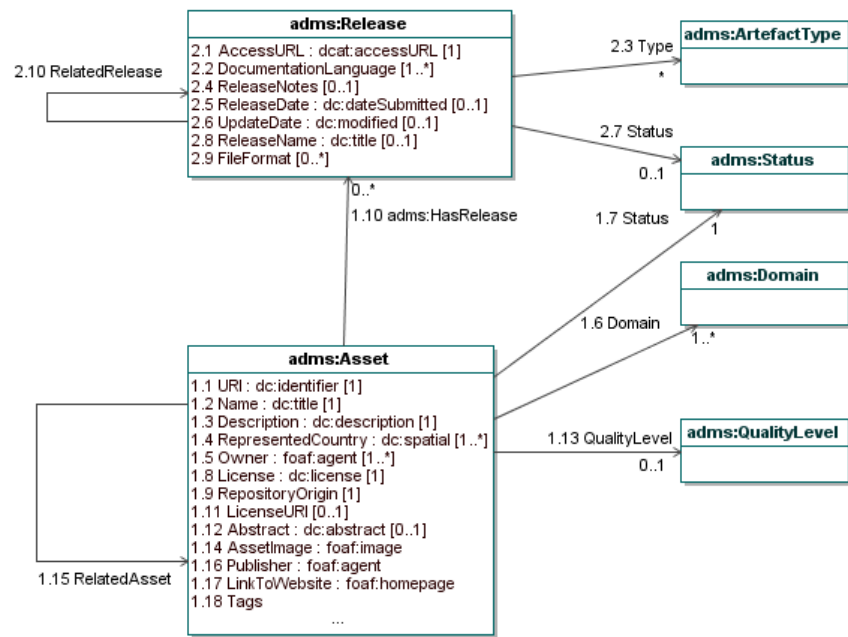

Figure 1 UML Diagram: Visualisation of ADMS Asset and Release **(Arndt, et al. 2011)**

Federation of asset repositories: a single point of access into national repositories

Once the ADMS specification is finalised via consensus building with all stakeholders, and provided that it is adopted by the National asset repositories, Member States will publish their semantic interoperability assets on the Web using a common vocabulary. In turn, this situation will facilitate the *federation of National asset repositories* at the EU level. This federation will consist of SEMIC.EU (and its successor, the new ISA Collaborative Platform) setting up an infrastructure to provide a single point of access allowing users to cross-query and discover relevant assets stored in different repositories (European Commission, ISA Programme 2011), respecting the autonomy of each repository . Another use case is to allow semantic interoperability assets to be retrieved, compared and potentially linked to one another in a cross-border or cross-sectoral setting, allowing users to more easily detect semantic commonalities and differences. As argued in the introduction of this document, the publication of e-Government

metadata as semantic interoperability assets is an important enabler of semantic interoperability.

Federation Prototype

The Digital Enterprise Research Institute (DERI) of the National University of Ireland has, in collaboration with SEMIC.EU, developed a [live prototype][1] of a federated asset repository that federates the Danish [Digitalisér.dk] platform, the German [XRepository], and the SEMIC.EU asset repository, and that uses the ADMS as an internal representation (Shukair, et al. 2011). Figure 2 provides a screenshot of this prototype. The prototype demonstrates how semantic assets hosted in different national repositories can be queried, discovered and retrieved through a single point of access, implemented as a SPARQL endpoint. The authors also sketch how a general federation architecture could consist of two important application programming interfaces (APIs):

1. **Publishing API**: disparate national repositories can publish their asset description metadata to the central federation repository using a Publishing API and services.
2. **Querying API**: Services and (third-party) applications, such as data mashups and faceted browsers, use the Querying API of the central federation repository to offer federated search capabilities. These services can be offered by the disparate national repositories.
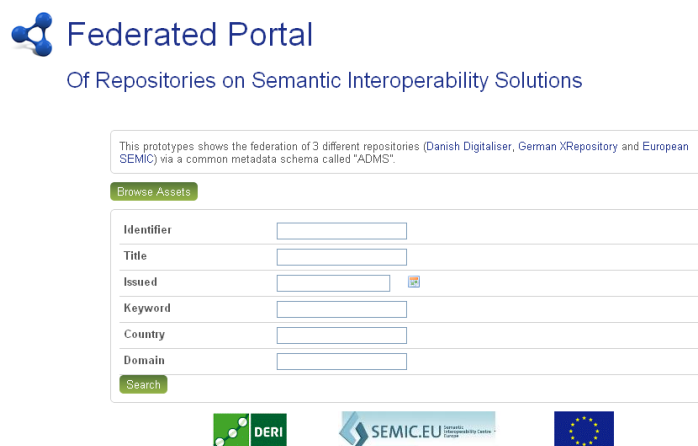

Figure 2 Screenshot of the federation prototype **(Shukair, et al. 2011)**

Next Steps

SEMIC.EU has put the following steps onto its 2011-2012 agenda:

- To promote awareness on the importance of publishing e-Government metadata;

- To design the ADMS and discuss it with Member States and broader communities;

- To create a federation of metadata catalogues / repositories; and

- To develop a portal as part of the SEMIC.EU infrastructure to support pan-EU federation, querying, browsing of semantic assets.

---

[1] The ADMS prototype is available at http://vmudi205.deri.ie/elda/index.html (Shukair, et al. 2011)

To know more

Arndt, Adam, Renke Fahl-Spiewack, Nikos Loutas, Vassilios Peristeras, Sebastian Sklarß, and Sofia Zapounidou. "ADMS - Asset Description Metadata Schema - Draft Specification v0.6a for Community Consultation." *semic.eu*. 17 03 2011. http://www.semic.eu/semic/view/documents/adms-specification-v0.6.html.

Berners-Lee, Tim. *Linked Data - Design Issues*. 27 07 2006. http://www.w3.org/DesignIssues/LinkedData.html.

European Commission. *European Interoperability Framework (EIF) for European public services*. 12 2010. http://ec.europa.eu/isa/strategy/doc/annex_ii_eif_en.pdf.

European Commission Information Society. *Digital Agenda for Europe 2010 - 2020*. May 2010. http://ec.europa.eu/information_society/digital-agenda/index_en.htm (accessed January 2011).

European Commission. "The European eGovernment Action Plan 2011-2015 - Harnessing ICT to promote smart, sustainable & innovative Government." Vers. COM(2010) 743. *European Comission*. 15 December 2010. http://ec.europa.eu/information_society/activities/egovernment/action_plan_2011_2015/docs/action_plan_en_act_part1_v2.pdf (accessed April 2011).

European Commission, ISA Programme. "Federation of Semantic Assets Repositories - The SEMIC.EU approach." *SEMIC.EU*. May 2011. http://www.semic.eu/semic/view/documents/federation-of-repositories.pdf (accessed June 2011).

Ministerial e-Government Conference. "Ministerial Declaration on e-Government." *ICT for Government and Public Services*. 18 November 2009. http://ec.europa.eu/information_society/activities/egovernment/events/past/malmo_2009/press/ministerial-declaration-on-egovernment.pdf (accessed February 2011).

Peristeras, Vassilios, Nikolaos Loutas, Sotirios K. Goudos, and Konstantinos A. Tarabanis. "A conceptual analysis of semantic conflicts in pan-European e-government services." *J. Information Science* 34, no. 2 (2008): 877-891.

Shukair, Gofran, Nikos Loutas, Vassilios Peristeras, Klaus Reichling, Fadi Maali, and Konstantinos Tarabanis. "Towards a Federation of Government Metadata Repositories." *Share-PSI.eu - Workshop*. May 2011. http://share-psi.eu/papers/DERI-Peristeras-init-federation.pdf.