

Proposal for a Cultural Heritage Application Schema within the INSPIRE directive

Carlos Fernández Freire
Unidad SIG (CCHS – CSIC).
Spanish National Research Council
26-28 Albasanz
Madrid, Spain
carlos.ffeire@cchs.csic.es

Esther Pérez Asensio
Unidad de SIG (CCHS-CSIC).
Spanish National Research Council
c/ Albasanz 26-28
Madrid, Spain
esther.perez@cchs.csic.es

Isabel del Bosque González
Unidad de SIG (CCHS-CSIC).
Spanish National Research Council
c/ Albasanz 26-28
Madrid, Spain
isabel.delbosque@cchs.csic.es

Antonio Uriarte González
Instituto de Historia (CCHS –
CSIC)
Spanish National Research
Council
26-28 Albasanz
Madrid, Spain

Juan Manuel Vicent García
Instituto de Historia (CCHS-
CSIC).
Spanish National Research
Council
c/ Albasanz 26-28
Madrid, Spain

Alfonso Fraguas Bravo
Instituto de Historia (CCHS-
CSIC).
Spanish National Research
Council
c/ Albasanz 26-28
Madrid, Spain

César Parcero-Oubiña
Institute of Heritage Sciences (Incipit), Spanish
National Research Council (CSIC)
San Roque, 2
Santiago de Compostela, Spain
cesar.parcero-oubina@incipit.csic.es

Pastor Fábrega-Álvarez
Institute of Heritage Sciences (Incipit), Spanish
National Research Council (CSIC)
San Roque, 2
Santiago de Compostela, Spain
pastor.fabrega-alvarez@incipit.csic.es

Abstract

One of the nine themes listed in Annex I of the INSPIRE Directive is “Protected Sites”. The Protected Sites Data Specification has been developed by the Thematic Working Group on Protected Sites, focusing mainly on natural protected areas, connected to environmental data specifications under development in Annex III. What we present here is a Cultural Heritage Application Schema built as an interoperability framework for this particular kind of Protected Sites. It aims to offer a comprehensive support for heritage data publication via Spatial Data Infrastructures, trying to enable a complete management of all georeferenced Cultural Heritage data.

Keywords: Spatial Data Infrastructure, INSPIRE, Cultural Heritage, Data Model, Interoperability.

1 Heritage data in INSPIRE

Since Cultural Heritage data are included in the theme 9 of the INSPIRE Annex I (Protected Sites), guaranteeing their interoperability is a priority. The Protected Sites Data Specification deals with this subject, although it is more oriented towards environmental data. Therefore we assumed that the implementation of the Protected Sites document in the Spanish case was a good chance to adapt the generic model to the specificity of Cultural Heritage data.

Maintenance of this data in Spain is a complex matter, for there are 17 different regional administrations competent on the subject, responsible of data generation, along with other public administrations at a local, regional, national, European and worldwide level, as well as research organizations, universities and companies that also provide data; a circumstance that really calls for interoperability awareness. This data model also tries to solve such a situation for georeferenced heritage data under the INSPIRE Directive.

1.1 Interoperability

This crucial issue is addressed in two ways: interoperability with INSPIRE spatial data and interoperability among heritage data.

The first one is accomplished by the building of the data model as an application schema that develops the Protected Sites Data Specification, filling core INSPIRE documents and ISO 19100 series standards.

The main INSPIRE documents that shape the model are the specification on Protected Sites itself, the Generic Conceptual Model and the Methodology for the development of data specifications [1, 2, 3]. ISO 19101:2002, 19103:2005, 19109:2005 and 19108:2002 [4, 5, 6, 7] contain the General Reference Model, the Conceptual Schema Language, rules for building an Application Schema and the temporal schema, the essential reference to define classes, relations, stereotypes and every element generated for the application schema.

We expect to grant interoperability among heritage data organizing our schema according, where applicable, to the CIDOC Conceptual Reference Model (ISO 21127:2006) [8, 9,

10] as long as possible, and using the main classification outlined by the Dublin Core (ISO 15836:2009) [11] to arrange the documentary elements.

2 The Cultural Heritage Application Schema

2.1 Basic concepts

It is our aim to achieve a generic, extendable and interoperable schema, that relies on geographic and heritage concepts. The schema is designed to serve as an implementation basis for heritage spatial data with a known location, boundary and area, as stated in the Protected Sites Data Specification.

It should be generic enough to embrace all kind of heritage spatial data and extendable to entities that might be regarded as heritage in the future. In that sense, we regard the condition of Cultural Heritage not as something intrinsic to real – world entities, but to the way we look at them [12, 13, 14].

The effect of this distinction is the separation of the real world entities that might be regarded as heritage, to be filled in the Cultural Entity class, and their evaluation as some specific kind of heritage, present in their legal declaration through the *NatureOfProtection* attribute. This way a protected heritage place might be regarded in different ways depending on the legal nature of their protection, or change their designation through time, avoiding any repercussion on the entities described in the model.

2.2 Structure of the data model

There are three main, interconnected conceptual blocks in the schema: the *legal part*, the *cultural part* and the *documentary part*, a subdivision that shall enable different ways of extending the model depending on the nature of the implementation.

The legal part is concerned with the geographic place that is legally protected in account of the existence within it of anything considered of heritage value. It is just an extension of the main class in the Protected Sites Data Specification, adding a few attributes and setting others to mandatory (through a constraint), to convey a minimum set of 13 elements for all Protected Heritage Places.

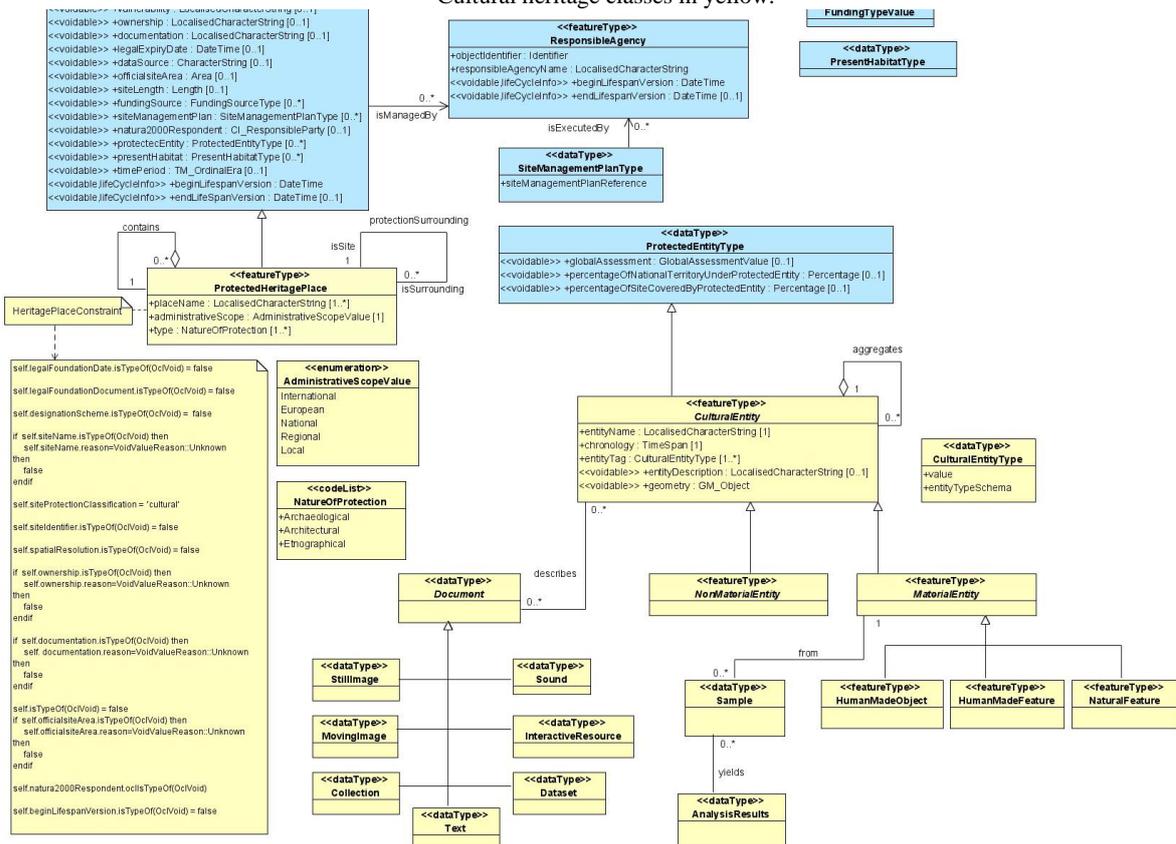
The cultural part is designed to record aspects of the real world entities that are considered of heritage value and that are protected by a legal regulation, as seen in the legal part. It inherits from the “voidable” attribute *protectedEntity* of the Protected Sites Data Specification, what means that it is an optional part.

The documentary part is also an optional set of classes designed to record any kind of documents, besides the legal documentation filled in the legal part, pertaining to the real world entities.

2.3 Main elements in the model

The class diagram revolves around three main classes that organize the three parts mentioned above. These are *ProtectedHeritagePlace*, *CulturalEntity* and *Document* (Figure 1 depicts part of the class diagram):

Figure 1: Cultural Heritage Application Schema. Class Diagram
Cultural heritage classes in yellow.



Source: Own elaboration

ProtectedHeritagePlace is the main class in the schema, the only required item to fill. It gathers information on its geometry, the legal document that creates the protected site, its designation by various national and international schemas, the agency responsible for the management, the scope of the legal protection and the kind of protected heritage place according to the usual categories of archaeological, architectural or ethnographical (*cf.* [15]), an elementary and widely applicable enumeration that might be extended if needed. Two self-aggregation relations have been established in order to specify which protected heritage places contain another object of the same kind and the link between a protected place and its protected surroundings, which constitute here two different protected places.

CulturalEntity is the key feature to the real world phenomena protected by the legal entity, subdivided in material and non material entities, according to their objective quality (*cf.* [16]). Material entities are themselves subdivided according to the criteria disposed in the CIDOC Conceptual Reference Model. It holds three compulsory attributes, to convey the name of the entity, its chronology and nature (Cultural Entity Type) according to any schema or thesaurus that must be specified. It may have its own geometry, different than that of the legal entity, which might be quite often the case. A Cultural Entity may also contain other objects of the same kind, e.g. a monastery containing several separate buildings (a church, a refectory, stables, barns...).

Document gathers all pieces of information associated to the features that make up a cultural entity or to the cultural entity itself: reports, pictures, drawings, maps,... Generic document types are specified according to the attribute *type* of the Dublin Core Metadata Initiative. This attribute establishes twelve specific kinds of documents according to the nature of the information they contain, seven of which have been selected for the aims of our data model.

3 Discussion

We expect that this Application Schema may fulfill the implementation of heritage spatial data in INSPIRE Directive, developing interoperability rules that will enable the harmonization and sharing of the Protected Heritage Sites dataset, through a Spatial Data Infrastructure for Cultural Heritage in Spain.

We also hope that the open nature and rather abstract condition of the model (i.e., not proposing specific types of heritage objects, but high level classes) will help to build bridges between datasets created and maintained in research environment and the strict legal designations that shape the INSPIRE document, a relation that holds a great potential in supporting policies and activities that impact upon a wide historic environment [17].

Different applications should be able to extend any of the three parts depending on their dataset nature without major drawbacks. We hope to have its soundness tested soon inside the Spanish National Research Council, as well as in other contexts.

4 Acknowledgements

A multidisciplinary team of heritage, geomatics and other specialists gathered under the Spanish SDI Working Groups to develop an Application Schema, a Metadata Profile, recommendations on geoservices, and so on. We would like to offer this document as a guide or a proposal for the Application Schema under development, starting from the work already done.

Many individuals and organizations have contributed to the development of this work: Juan M. Vicent (CCHS-CSIC) and Isabel del Bosque (CCHS-CSIC) as coordinators, Alfonso Fraguas, Antonio Uriarte, Juan Luis Pecharrómán and María Ruiz del Árbol from the *Instituto de Historia* (CSIC), Emilio Abad from the *Centro de Supercomputación de Galicia*, Francisco García Cepeda from the *Dirección General del Catastro*, Marta Criado from the *DMS Group*, Pilar Chías Navarro and Tomás Abad Balboa from the *Universidad de Alcalá de Henares*, Miguel Lage Reis-Correia from the *Fundación Las Médulas – Junta de Castilla y León*, Javier Márquez Piqueras from the *IDR – IDR – Universidad de Albacete*, Victorino Mayoral from the *Instituto de Arqueología de Mérida – CSIC*, Pastor Fábrega-Álvarez and César Parceró Oubiña from the *Incipit – CSIC*, Carlos Fernández Freire and Esther Pérez Asensio from the *Unidad de SIG – CSIC*, José Julio Zancajo from the *Universidad de Salamanca* and Antonio Vázquez Hoenhe, Arantza Respaldiza Hidalgo and Mercedes Farjas Abadía from the *Universidad Politécnica de Madrid*.

References

- [1] Thematic Working Group Protected Sites. *INSPIRE Data Specification on Protected Sites – Guidelines v3.1*. 2010
- [2] Drafting Team “Data Specifications”. *INSPIRE Generic Conceptual Model*. 2010
- [3] INSPIRE Drafting Team «Data Specifications». *Drafting Team «Data Specifications» Methodology for the development of data specifications*. 2008
- [4] AEN/CTN 148 Información Geográfica Digital. *UNE-EN ISO 19101. Información geográfica. Modelo de referencia*. 2006
- [5] ISO / TC 211. *New York item proposal: Revision of ISO/TS 19103:2005, Geographic information - Conceptual Schema Language*, 2010
- [6] ISO / TC 211. *ISO 19109. Rules for Application Schema*. 2005
- [7] ISO / TC 211. *ISO 19108:2002. Geographic information - Temporal schema*. 2002
- [8] Technical Committee ISO/TC 46. *ISO 21127:2006. Information and documentation - A reference ontology for the interchange of cultural heritage information*. 2006
- [9] M. Doerr 2003. The CIDOC Conceptual Reference Module. An Ontological Approach to Semantic Interoperability of Metadata. *AI Magazine*, 24 (3), 75-92
- [10] N. Crofts, M. Doer, T. Gill, S. Stead and M. Stiff, eds., 2011. *Definition of the CIDOC Conceptual Reference Model, version 5.0.3*. Available from: <http://www.cidoc->

- crm.org/docs/cidoc_crm_version_5.0.3.pdf [Accessed 15 October 2011].
- [11] ANSI / NISO Z39.85-2007. *The Dublin Core Metadata Element Set*. 2007
- [12] R. Mason 2004. Fixing Historic Preservation: A Constructive Critique of “Significance”. *Places*, 16 (1), 64-71.
- [13] M. Vecco 2010. A definition of cultural heritage: from the tangible to the intangible. *Journal of Cultural Heritage*, 11, 321–324.
- [14] César Gonzalez-Perez, and César Parcero-Oubiña (forthcoming). A Conceptual Model for Cultural Heritage Definition and Motivation. In Zhou, M., Romanowska, I., Wu, Z., Xu, P. and Verhagen, P. (eds) *Revive the Past, Proceedings of the 39th Conference on Computer Applications and Quantitative Methods in Archaeology*, Beijing, 12-16 April 2011. Amsterdam, Amsterdam University Press: 130-140.
- [15] María Ángeles Querol. *Manual De Gestión Del Patrimonio Cultural*. Madrid, 2010
- [16] UNESCO. *Convention for the Safeguarding of the Intangible Cultural Heritage*
- [17] Peter McKeague, Anthony Corns and Robert Shaw. Developing a Spatial Data Infrastructure for Cultural Heritage. *International Journal of Spatial Data Infrastructures Research*. Article under Review, submitted 2011-05-31.