A guide for the interoperability of Cultural Heritage Data in INSPIRE

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1. Introduction
   - Protected Sites
   - Cultural Heritage Data

2. Cultural Application Schema
   - Interoperability
   - An extension of Protected Sites
   - The legal part
   - The real – world entities
   - Chronology

3. Conclusion
Introduction
1. Introduction

- The INSPIRE Directive includes Protected Sites in its Annex I, which means that they are considered as reference data.

  INSPIRE defines a protected site as an “area designated or managed within a framework of international, Community and Member States' legislation to achieve specific conservation objectives”.

- Nevertheless, the development of the Protected Sites theme is mostly oriented to environmental / natural issues.

  A specific development for Cultural Heritage information will help to overcame adaptation difficulties.
1. Introduction

Cultural Heritage sites are a particular kind of Protected Sites

Spanish Cultural Heritage data: internal issues

• Lack of standardization

• Heterogeneous integration in Information Systems (due to an heterogeneous management by different regional government agencies)

• A wide variety of things are regarded as Cultural Heritage:
  • A church
  • A wall
  • Rock Art
  • An hypogeum
  • A forest
  • A pilgrims way
  • A traditional feast
  • An archeological site
  • ...

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1. Introduction

Cultural Heritage sites are a particular kind of Protected Sites

Cultural Heritage as geographical data:

• Lack of georeferenced data

• A small part of Cultural Heritage has a spatial nature

• Problematic adaptation of Protected Sites to the thematic scope of Cultural Heritage data

Hence the necessity to build an interoperability schema
1. Introduction

GT-IDEE (Working Group of the Spanish Spatial Data Infrastructure):
- Applies, develops and extends INSPIRE in the Spanish context.
- Articulated by several workgroups devoted to specific issues.

GTT-PAH (Thematic Working Group on Cultural Heritage):
- Interdisciplinary group, set up by experts on Geomatics and Cultural Heritage (through 2010-2011).
- It has developed an interoperability framework for cultural heritage data.

This interoperability framework is expressed as an application schema, that contains the complete and precise definition of the content and structure of a data set (in our case, georeferenced cultural heritage data).
1. Introduction

SPANISH SDI THEMATIC WORKING GROUP

The work presented corresponds to a collective authorship, in which many individuals and organizations have contributed as experts in the different tasks of the development of this Conceptual Data Model for Cultural Heritage

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The Cultural Heritage Application Schema
2. The Cultural Application Schema

**Generic:** to embrace any kind of cultural heritage georeferenced data.

**Extendable:** to allow any kind of data producer to adapt the model to the nature of their own information.

**Interoperable:** to combine spatial data sets from different sources through network services, via Internet.
2. The Cultural Application Schema

Interoperability

Geographic information:

ISO 19100 series

- ISO 19101, 19103, 19109: Application schema development
- ISO 19108: Temporal Schema

INSPIRE

- Data Specification on Protected Sites
- Methodology for the development of data specification, Generic Conceptual Model...
2. The Cultural Application Schema

Cultural entities:

CIDOC Conceptual Reference Model (CRM) – ISO 21127:2006: “for describing the implicit and explicit concepts and relationships used in cultural heritage documentation”.

Information resources (documents):

2. The Cultural Application Schema

- Protected Sites Simple entities
- Protected Sites Full entities
- Cultural Heritage proposed entities
2. The Cultural Application Schema

Overview

LEGAL PART

CULTURAL ENTITY PART

Protected Sites Simple entities
Protected Sites Full entities
Cultural Heritage proposed entities
2. The Cultural Application Schema

Protected Sites Data Specification

Developed by the ‘Thematic Working Group Protected sites’.

Two Application Schemas:

- Simple
- Full

Only two non voidable attributes:

- geometry
- inspireID

Centered mainly on:

- Legal aspects
- Natural protected sites (e.g. Natura2000)

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### Simple Application Schema

- geometry: GM_Object
- inspireID: Identifier
- beginNotificationDate: DateTime [1]
- legalFoundationDocument: Citation [1]
- siteDesignation: DesignationType [1..*]
- siteName: GeographicalName [0..*]
- siteProtectionClassification: ProtectionClassificationValue [1..*]

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### Full Application Schema

- siteIdentifier: SiteIdentifierType [0..*]
- activitiesAndImpacts: ActivitiesAndImpactsType [0..*]
- spatialResolution: MD_Resolution [0..1]
- siteDescription: LocalisedCharacterString [0..1]
- qualityAndImportance: LocalisedCharacterString [0..1]
- vulnerability: LocalisedCharacterString
- ownership: LocalisedCharacterString [0..1]
- documentation: LocalisedCharacterString [0..1]
- beginNotificationDate: DateTime [0..1]
- dataSource: CharacterString [0..1]
- officialArea: Area [0..1]
- siteLength: Length [0..1]
- fundingSource: FundingSourceType [0..*]
- siteManagementPlan: SiteManagementPlanType [0..*]
- natura2000Respondent: CI_responsibleParty [0..1]
- protectedEntity: ProtectedEntityType [0..*]
- presentHabitat: PresentHabitatType [0..*]
- timePeriod: TM_OrdinalEra [0..1]
- beginLifeCycleInfo: beginLifeSpanVersion: DateTime [1]
- endLifeCycleInfo: endLifeSpanVersion: DateTime [0..1]
2. The Cultural Application Schema

Legal part: ProtectedHeritagePlace

New class: ProtectedHeritagePlace, built as an extension of ProtectedSites.

Area dedicated to the protection of cultural resources and managed through legal and administrative means.

It is the only mandatory entity.

It is a subclass of ProtectedSite entity: Establishes a subtype of protected site, specifically related to cultural features.

ProtectedHeritagePlace

+placeName : LocalisedCharacterString [1..*]
+administrativeScope : AdministrativeScopeValue [1]
+type : NatureOfProtection [1..*]
2. The Cultural Application Schema

ProtectedHeritagePlace

Mandatory attributes:

1. From ProtectedSite (mandatory in origin)
2. From ProtectedSite (mandatory through constraints)
3. Specific from ProtectedHeritagePlace

Legal Part

ProtectedHeritagePlace

+geometry : GM_Object
+insrRef : Identifier
+legalFoundationDate : DateTime
+legalFoundationDocument : CI_Citation
+siteDesignation : DesignationType
+siteProtectionClassification : ProtectionClassificationValue
+siteIdentifier : SiteIdentifierType
+spatialResolution : MD_Resolution
+siteDescription : LocalisedCharacterString
+siteEntryPoint : LocalisedCharacterString
+siteOwnership : LocalisedCharacterString
+siteDocumentation : LocalisedCharacterString
+legalExpiryDate : DateTime
+dataSource : CharacterString
+siteLength : Length
+siteManagementPlan : SiteManagementPlanType
+natura2000Responsible : CI_ResponsibleParty
+protectedEntity : ProtectedEntityType
+presentHabitat : PresentHabitatType
+timePeriod : TM_Calendar
+siteCycleInfo : +beginLifeSpanVersion : DateTime
+siteCycleInfo : +endLifeSpanVersion : DateTime
+protectionSurround
+contains
+isSurround
+isManagedBy
+placeName : LocalisedCharacterString
+administrativeScope : AdministrativeScopeValue
+type : NatureOfProtection
# 2. The Cultural Application Schema

**Legal Part**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identification attributes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>inspireID</td>
<td>External object identifier of the protected heritage place (according INSPIRE).</td>
<td>1</td>
</tr>
<tr>
<td>siteIdentifier</td>
<td>The identifier for the cultural heritage site using some national or international identification scheme.</td>
<td>1..*</td>
</tr>
</tbody>
</table>

**Spatial attributes**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>geometry</td>
<td>The geometry defining the boundary of the protected heritage place (that defined by the administration responsible for the protection and management).</td>
<td>1</td>
</tr>
<tr>
<td>placeName</td>
<td>Place name of the protected heritage place (that used in the legal foundation document).</td>
<td>1</td>
</tr>
<tr>
<td>spatialResolution</td>
<td>The spatial resolution of the cultural heritage place geometry. Expressed as equivalent scale or distance.</td>
<td>1</td>
</tr>
</tbody>
</table>

**Life cycle Attributes**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>beginLifespanVersion</td>
<td>Date and time at which this version of the spatial object was inserted or changed in the spatial data set.</td>
<td>1</td>
</tr>
</tbody>
</table>
## 2. The Cultural Application Schema

### Legal Part

Legal and administrative issues attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Multiplicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>legalFoundationDate</td>
<td>The date that the protected heritage place was legally created.</td>
<td>1</td>
</tr>
<tr>
<td>legalFoundationDocument</td>
<td>Reference of the legal act that created the protected heritage place (URL or text citation).</td>
<td>1</td>
</tr>
<tr>
<td>siteDesignation</td>
<td>The designation (type) of protected heritage place.</td>
<td>1..*</td>
</tr>
<tr>
<td></td>
<td>Designations may be available using a number of different designation schemes (all of which can be accommodated in the DesignationSchemeValue codelist).</td>
<td></td>
</tr>
<tr>
<td>siteProtectionClassification</td>
<td>The classification of the protected heritage place based on the purpose for protection. Always set to “cultural”.</td>
<td>1</td>
</tr>
<tr>
<td>administrativeScope</td>
<td>Administrative scope of the legal definition of the cultural heritage place.</td>
<td>1</td>
</tr>
<tr>
<td>dataSource</td>
<td>The agency or organization that is responsible for maintaining and providing the data about the protected heritage place.</td>
<td>1</td>
</tr>
<tr>
<td>type</td>
<td>Reason advocated for the site's protection.</td>
<td>1..*</td>
</tr>
</tbody>
</table>
2. The Cultural Application Schema

**siteDesignation schemes:**

*UNESCOWorldHeritageDesignationValue*

<table>
<thead>
<tr>
<th>&lt;&lt;codeList&gt;&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNESCOWorldHeritageDesignationValue</td>
</tr>
</tbody>
</table>
+natural
+cultural
+mixed

**BienesInteresCultural:** Highest protection that Spanish heritage administrations can give.

<table>
<thead>
<tr>
<th>&lt;&lt;codeList&gt;&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>BienesInteresCultural</td>
</tr>
</tbody>
</table>
+Monumento Histórico
+Jardín Histórico
+Conjunto Histórico
+Sitio Histórico
+Lugar Histórico
+Zona Arqueológica
+Zona de interés etnográfico o etnológico
+Conjunto de interés etnográfico o etnológico
+Sitio de interés etnográfico o etnológico
+Lugar de interés etnográfico o etnológico
+Paisaje Cultural
+Zona Paleontológica
+Hechos Culturales
+Bienes Inmateriales
+Parque Cultural
+Ruta Cultural
+Lugar Natural
+Parque Arqueológico
+Espacio de Protección Arqueológica
+Vía Cultural
+Lugar de Interés Industrial
+Zona Patrimonial

**ProtectedTargetValue:** Type of Protected Heritage Place according to the last UNESCO “Operational Guidelines for the Implementation of the World Heritage Convention”.

<table>
<thead>
<tr>
<th>&lt;&lt;codeList&gt;&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProtectionTargetValue</td>
</tr>
</tbody>
</table>
+Monument
+GroupOfBuildings
+Sites
+Mixed
+CulturalLandscape

Other schemes can be added...
2. The Cultural Application Schema

- **siteProtectionClassification**
  - **<<enumeration>>**
    - ProtectionClassificationValue
      - natureConservation
      - archaeological
      - cultural
      - ecological
      - landscape
      - environment
      - geological

- **administrativeScope**
  - **<<enumeration>>**
    - AdministrativeScopeValue
      - International
      - European
      - National
      - Regional
      - Local

New categories can be added.
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A cultural heritage place can be contained by another. 

- e.g., Protection of historic landscape
- Protection of archaeological sites

Relationship between a certain protected heritage place (A) and its corresponding protection surrounding (should there be) (B).
2. The Cultural Application Schema

A Cultural Entity is any real-world feature result of human action protected by a legal figure.

CulturalEntity is a subclass of ProtectedEntityType (preexisting class in the Data Specification on Protected Sites), that is, any kind of a real world feature susceptible of legal protection.

ProtectedEntityType is related to ProtectedSite.

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2. The Cultural Application Schema

**CulturalEntity**

Real-world entity result of human action and, consequently, susceptible to be protected as cultural heritage.

**Subclasses of Cultural Entity**

- NonMaterialEntity
- MaterialEntity
- Sample
- HumanMadeObject
- HumanMadeFeature
- NaturalFeature

**Samples and analysis**

- AnalysisResults

**Real-world entity**
## 2. The Cultural Application Schema

### CulturalEntity attributes

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
<th>Cardinality</th>
</tr>
</thead>
<tbody>
<tr>
<td>entityName</td>
<td>Name of the entity.</td>
<td>1</td>
</tr>
<tr>
<td>chronology</td>
<td>According to ISO 19108 Geographic information - Temporal schema.</td>
<td>1</td>
</tr>
<tr>
<td>entityTag</td>
<td>Assigns a certain cultural value or category (chronological, functional...) to the cultural entity. The cultural value must belong to a certain scheme or classification (e.g. a thesaurus).</td>
<td>1..*</td>
</tr>
<tr>
<td>entityDescription</td>
<td>Textual description of the cultural entity.</td>
<td>0..1</td>
</tr>
<tr>
<td>geometry</td>
<td>Spatial definition of the cultural entity. The data provider does not necessarily have to assign a geometry to a specific cultural entity.</td>
<td>0..1</td>
</tr>
</tbody>
</table>
2. The Cultural Application Schema

A cultural entity can be broken down into its parts or taken as a whole.
2. The Cultural Application Schema

Cultural Entity subtypes:

- **MaterialEntity**: Cultural entity with tangible materiality.
- **NonMaterialEntity**: Living cultural activity, whose existence depends on performance.
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According to CIDOC Conceptual Reference Model (CRM).

Subclasses:

- **HumanMadeObject**: physical feature created by human activity and that is physically from other objects.
- **HumanMadeFeature**: feature product of human activity integrated inside other objects.
- **NaturalFeature**: landscape feature singularly identifiable.
2. The Cultural Application Schema

This part enables the inclusion of analytical results taken on cultural material entities.

*Sample*: Fraction taken from a cultural material entity in order to develop analysis.

*AnalysisResults*: Results of the analysis carried out on a specific sample.
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Real-world entity

Document

Resource that contains information (in this case, about one or several cultural entities).

According to Dublin Core Metadata Initiative.
2. The Cultural Application Schema

According to the type attribute of the Dublin Core Metadata Element Set.

Seven subclasses of documents:
- **Text**: Primarily formed by words for reading.
- **StillImage**: Visual representation of static nature.
- **MovingImage**: Series of visual representation offering an impression of motion.
- **Sound**: Acoustic representation.
- **Dataset**: Set of data stored in a structured way (e.g. a table).
- **InteractiveResource**: Resource requiring interaction from the user.
- **Collection**: Aggregation of resources.
2. The Cultural Application Schema

Chronology

Creation, Occupation, Abandonment, Modification, Restoration...
Conclusion
3. Conclusion

- Interoperable schema for cultural heritage in the framework of INSPIRE European initiative for the standardisation and distribution of georeferenced data.

- Specificity of cultural places as compared with natural areas.

- Distinction between cultural entities (as real world things) and protected places (as administrative realities).

We hope that this work might be helpful for a future development of Cultural Heritage SDIs in an interoperable framework based on OGC Standards.
3. Conclusion

**Future implementations**

IDEARQ (Spanish National Research Council – CSIC)
- Different archaeological datasets: Radiocarbon, Metallurgy, Rock Art
- Supported by CONSOLIDER INGENIO 2010 (CSD2007-00058)

IDEPatri (CESGA, LBS, GEPN)
- Iron Age archaeological record in Galicia
- Supported by INCI.TE
Thank you for your attention

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