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Experiences in the Use of an ISO19115 Profile within the Framework of the Spanish SDI

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Abstract

The Spanish National Spatial Data Infrastructure (IDEE for Infraestructura de Datos Espaciales de España), is a project started up in 2002 and coordinated by the National Geographic High Council, a governmental body composed by representatives of producers of reference and thematic digital geographic data at national level (National Geographic Institute, Ministry of Agriculture, Cadastre, etc.), regional level (Cartographic Institutes and Regional Services of Cartography) and local level. One of the main services offered by IDEE is the Data and Services Catalogue. This service has to contain high quality metadata of the resource produced in public and private organizations of Spain but the generation of metadata is not simple. This paper is focused on the description of the different initiatives and actions that the IDEE has promoted to easier a suitable and generalized creation of metadata in the organizations of Spanish Public Administration. The developed work to create and divulge methodologies and the measures to facilitate it with the objective of nourishing the IDEE Metadata Catalogue are presented. The baggage of accumulated experience in the process of creation of metadata according to the Spanish Metadata Core (Núcleo Español de Metadatos - NEM) is summarized.

Introduction

Metadata is one of the main components of an SDI (Spatial Data Infrastructure). They describe Geographic Information and they are an essential requirement to locate, describe and evaluate the available data [Cookbook SDI 2004].

The generation of the metadata is not simple, by several reasons [Wayne 2005]:

- Complexity of metadata standards and too difficult to implement. In order to use ISO19115, a deep knowledge of it contents is required.
- Shortage of time and resources available at many organizations to create by themselves metadata of their products.
- There are few tangible benefits and incentives for metadata production.
- There is a lack of qualified personal.
- Problems in the usage of metadata generation tools.

To solve those problems the Metadata Working Group of the Working Group for the IDEE, belonging to the Geomatic Commission of the National Geographic Council, has promoted several initiatives. One of them is being carried out by the National Geographic Institute in collaboration with the Technical University of Madrid and the University of Zaragoza, by means of an Collaboration Agreement under the title of "Agreement for the Complementary Development of the Technology and Methodology of Geographic Information Metadata Capture, IDEE Metadata Catalogue and the National Geographic Institute Node of Geographic Data and Services Distribution".

In this paper some of the completed actions within the framework of this agreement are presented:

- Creation of a "NEM User Guide" (NEM "Metadata Spanish Core" is an ISO 19115 profile).
- Creation of a Metadata Expert Group specialized in metadata generation to assist and support to the different organizations involved in metadata creation.
- Establishment of an Education and Training Plan on metadata generation for data producers from Public Administration at national, regional and local level.
- Incorporation of additional utilities in the Open Source Tool "CatMDEdit", application for Metadata generation according the most frequently used geographic metadata standards.

The rest of the paper is structured as follows. Next section describes the main characteristics of the NEM, a profile which is the origin of the implementation initiatives. Then the developed work is described and finally some conclusions, result of the accumulated experience in this type of project, are presented.

1 Metadata Spanish Core

Metadata Spanish Core or NEM, acronym of "Núcleo Español de Metadatos", is a metadata recommendation approved by the National Geographic High Council through its Geomatics Commission (National Geographic High Council 2005).

NEM is an ISO 19115:2003 profile representing the "minimum" metadata set needs for

geographic information by its utility and relevance. It allows quickly, practically, easily and reliably searches, comparisons, etc, from metadata coming from several sources on different datasets. It is defined to be used by all catalogues generated in the different geographic information organizations, so that metadata interoperability is obtained for all the Spanish Catalogues.

It is a consolidated, consensual, steady and non-restrictive profile and it has elements of the two most important metadata standards at the present: ISO 19115:2003 "Metadata" and ISO 15836:2003 "The Dublin Core Metadata Element" and also considering the most relevant projects in this matter, especially the Water Framework Directive and the regional SDI initiatives. This set of elements has been considered according to (Figure 1):

- Elements belonging to ISO 19115 Core (Core Metadata for Geographic Datasets). It is essential a basic minimum number of metadata elements required to identify a dataset: 22 elements, of which 7 are mandatory element and 15 are optional or conditional element.
- Additional elements compatible with Dublin Core initiative. They don't have an equivalent element in the ISO 19115 Metadata Core, so additional elements were included such as additional information, by example: credits and constrictions on the resource.
- Additional elements for detailed description of the quality of Geographic Information resources. Geomatics Commission was considered that lineage element included in ISO 19115 Metadata Core for geographic datasets was insufficient to detail the quality of a resource, so the inclusion of additional elements of ISO 19115 General Model was proposed.
- NEM Experts Working Group proposed to include additional elements of ISO 19115 General Model. The following elements have been proposed: "keywords", "presentation form", "hierarchy level" "resource purpose" and the "description of the resource", specific uses". Some of these proposals agree with the recommendations and guides, such as the Water Framework Directive GIS Guide (which establishes a framework for water policy based on the principle of integrated river basin management and it is currently in the initial phase of implementation in the Member States Directive (2000/60/EC)), INSPIRE Draft Implementing Rules Metadata (based on the metadata requirements for data and services as expressed in the proposal of the INSPIRE Directive of July 2004) or metadata profiles proposed in the context of SDIGER project (Latre M.A. 2005) (Zarazaga 2006).



Figure 1: NEM definition

In the following paragraph, a detailed analysis of different initiatives to encourage the use of NEM, the metadata creation and the progress and enlargement of IDEE catalogue will be described.

2. Measures to promote the Use of the Metadata Spanish Core (NEM)

In the introduction of this paper, several problems have been described by the generation of metadata. Different initiatives were planned in order to overcome them, as shown in Table 1.

Obstacle	Initiative
Extensive Metadata standards	NEM (Section 1)
Complex Metadata standards	NEM User Guide (Section 2.1)
Lack of qualified personal.	Creation of a Metadata Expert Group specialized in metadata creation and establishment of an Education and Training Plan for data producers from Public Administration at National, regional and local level. (Section 2.2).
Shortage of time and resources available at many organizations	Creation of a metadata creation methodology based on questionnaires (Section 2.3).
Problems in the use of metadata generation tools	Development and maintenance of the Open Source application "CatMDEdit" (Section 2.4).

Table 1.	Obstacles	and	Initiatives	table.
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2.1 NEM User Guide

Metadata implementation is a difficult and complex. It is a task that requires a certain specialization, its necessary to know: the basics and technical characteristics of the resource, what information is necessary to collect in each item and how and with what criteria fill each element.

To solve this problem the Metadata Working Group has promoted the necessity to elaborate a document: "NEM User Guide" that describes for each one of the NEM elements the criteria to follow to fill up it, helping the metadata creation in each organization and making possible a common interpretation to all the metadata users.

The principal points of this guide are:

- A brief description of the different levels of metadata, according to the recommendation NEM, can be created for.
- A table with NEM elements, describing the criteria to follow to fill up each one of them, as well as a several recommendations for each item with examples associated.
- Examples of application of those criteria for different products from Geographic Information (reference and thematic data of different organizations).



Figure 2. NEM User Guide

This User Guide and the document about NEM can be downloaded through the IDEE Geoportal (www.idee.es).

2.2 Creation of a Cataloguing Experts Group

Nowadays, the producers of data need to create metadata for their Catalogues, which allows the possibility of searching and locating geographic data by means of its metadata, but they have few time to generate them (Cookbook SDI 2004), and lack of qualified personal.

To solve these problems, an Experts Group has been defined. This group acts as trainer and consultant in the matter of Geoinformation Metadata, to support and assistance to the organizations and institutions of National, Regional and Local Public Administrations.

The objective of this group is to help data producers in the generation of metadata, by means of:

- Introductory level metadata courses.
- Advanced level metadata courses.
- Give advice to organizations for implementation of NEM and ISO 19115 standards.
- Individualized assistance for the definition of products profile and templates and for different organizations or institutions.

The Cataloguing Expert Group created belongs to the Geographic Information Technology Laboratory (Laboratorio de Tecnologías de la Información Geográfica -LatinGEO) of Technical University of Madrid, and this group is supported by the personal of the National Geographic Institute in the realization of the described tasks.

2.3 Creation of a Metadata Questionnaire

In order to decrease the negative effects derived from the lack of time and qualified human resources, a methodology of metadata creation has been designed based on a Questionnaire. This questionnaire contains the necessary information to complete the metadata using simple, familiar questions and giving examples, which will guide the data producer to fill the questionnaire.

The purpose of these questionnaires is that the data producers, or person or persons that best knowing the principal product characteristics, be able to provide all the necessary information for the creation of metadata of their products without needing to know the NEM Profile, in this manner cooperating in the development of the descriptive documentation of each of their products, therefore in the enrichment of the existing catalogues in the SDIs.

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Figure 3. Metadata Questionnaire

The Questionnaire (Figure 3) is available for all those who wish to collect information

to generate Geographic Information metadata based on ISO 19115 and NEM, with the purpose of feeding the IDEE Metadata Catalogue with high quality metadata.

2.4 CatMDEdit: Tool for Metadata Creation

CatMDEdit (Zarazaga 2003) is a metadata editor tool that facilitates the documentation of resources, with special focus on the description of geographic information resources. It is an Open Source tool which has been developed by the TeIDE Consortium11 with the support of several institutions and projects (see http://catmdedit.sourceforge.net/), the support granted by the National Geographic Institute in its work of coordinator in the creation of the IDEE (http://www.idee.es/) standing out among them.



Figure 4. Window of Metadata Visualization and Edition

The tool, whose layout is shown in Figure 4, has been entirely developed in Java. It presents the following functionalities:

- Metadata edition in conformance with the "ISO19115. Geographic Information -Metadata" standard. Four interfaces are provided for the edition of metadata records:
 - A detailed interface following the ISO19115 comprehensive profile.
 - A simplified interface following the "Núcleo Español de Metadatos" (NEM).
 - An interface following the SDIGER INSPIRE metadata profile, which has been developed under the framework of the SDIGER project (Latre 2005) (Zarazaga 2006). This profile is based on the international standard ISO19115 that was customized to meet the requirements set up in the proposal for a Directive of the European Parliament and of the Council establishing an infrastructure for spatial information in the Community (INSPIRE).
 - An interface following the SDIGER WFD metadata profile, which has been developed under the framework of the SDIGER project. This profile is based on the international standard ISO19115 customized to follow the guidelines for metadata to implement the GIS Elements of the Water Framework Directive (Vogt 2002).
- Metadata edition in conformance with the SDIGER Dublin Core Metadata Application Profile for geographical data mining, which has been developed under the framework of the SDIGER project. This profile is based on the Dublin Core Spatial Application Profile developed by the European Standardization Committee (CEN/ISSS Workshop on Metadata for Multimedia Information - Dublin Core) to improve the discovery of geographic information.

¹ TeIDE is a Spanish consortium constituted by the R&D groups of the University of Zaragoza (Computer Science and Systems Engineering Dept.), the Universitat Jaume I (Dept. of Information Systems), and the Technical University of Madrid (Topography and Cartography Dept.), whose objective is to encourage the research and the technological development of Spatial Data Infrastructures.

- Exchange of metadata records according to different standards and formats: ISO19115, Dublin Core and CSDGM (Content Standard for Digital Geospatial Metadata).
- Different styles for presentation of metadata records in HTML and Excel formats.
- Additional tools to facilitate the edition of metadata: agenda of contacts, thesaurus management and conversion of coordinate systems.
- Automatic generation of metadata for some data transfer formats such as Shapefile, DGN, ECW, FICC, GeoTiff, GIF/GFW, JPG/JGW, or PNG/PGW.
- Multi-platform support (Windows, Unix), thanks to the use of Java as programming language.
- Multilingual support. At present the application is accesible in six languages: Spanish, English, French, Portuguese, Polish and Czech.

It should be noted that this tool, as others with similar functionalities, are in constant evolution and development. The importance of metadata for the integration of the different resources offered by SDI, the complexity of metadata standards and the little maturity of these standards (ISO 19115 was approved only three years ago) force a constant improvement of the tools, so as to make them more efficient and coherent for the users. The ideal objective would be to achieve a perfect synchronization of the processes of data and metadata creation, facilitating at maximum the automation in the creation of metadata.

Thus, this research project has decided to promote the development of this tool in the following aspects:

- Enhance the ergonomy of the application to improve the interaction with the user as much as possible. The various actors of a SDI share the perception that metadata creation is a tedious, time-consuming task. Consequently it is very important to research the usability of the editing tools so that users will consider them as a real help to carry out their tasks. Based on usability studies and accessibility regulations, it will be possible to try to minimize the time spent by users for the creation of a metadata record and to improve the usability of the tool (Manrique 2006).
- Promote the implementation of the technical specification ISO 19139, describing the XML encoding of the metadata model proposed in ISO 19115. Hopefully, after several years of drawing up drafts, a definitive version will be available in 2006, allowing interoperability between different cataloguing tools.
- Promote metadata creation for the description of services. Different standards and initiatives have arisen recently for the description of services. It is necessary to study and analyze which are the most suitable ones for their integration within the CatMDEdit tool.
- Support the cataloguing of collection of resources (e.g., cartographic series) and their components.
- Promote technological advances in quality, multilingualism and information classification in the realm of metadata for geospatial data. It is expected to make advances in certain aspects such as the estimation of metadata quality, multilingual information retrieval and the development of Knowledge Organization Systems (thesauri, taxonomies and ontologies) for a better classification of information resources.

Conclusion

This paper has presented a set of activities oriented to facilitate the creation of metadata, one of the key components of an SDI (either at the local, institutional, regional, national or the global level).

This set of adopted measures has tended to the metadata creation, at least complying with the NEM, a profile whose first version was published in 2005 and after a year of

life within the Spanish user community it is possible to say that NEM is a consolidated, consensual, steady and non-restrictive Spanish profile.

It has described several initiatives to easier and promotes the work of metadata creation. One of these initiatives has been the creation of a guide to describe each element of NEM and furthermore we have counted on a Cataloguing Experts Group capable of providing metadata training and support at somebody interested. One of the tasks of this Cataloguing Experts Group has been the creation of a metadata questionnaire for information collection, which will facilitate the metadata creation in the different organizations.

Finally, we have described how the development and evolution of the technology of Geographic Information metadata capture has been supported in the research project and we have also highlighted the most innovating aspects where an investment of efforts will be worthwhile.

Metadata catalogues may look like a colossal titans whose construction appears to be extremely difficult to start, however we believe that the set of implemented measures support their creation and represent a significant advance in support of metadata developers.

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### GSDI - 9

November 6 -November 10, 2006

#### Theme: Spatial Information: Tool for reducing poverty

Technical sessions below are linked to the <u>Schedule Overview</u>. Exhibits will be open from Tuesday 10:30 through Thursday 17:30. Posters will be on display from Wednesday 8:30 through Thursday 17:30 with judging to occur during the lunch period on Thursday. Silent Auction bids will close at the end of the afternoon coffee break on Thursday.

#### Monday, 6 November

08:00- Museum Entrance	Registration
09:00-10:30 11:00-12:30 Court Yard	Plenary Workshop 1 – A Spatial Technology Infrastructure Vision and its Practical Implementation INTERCRAPH [description]
12:30-14:00 Los Naranjos	Lunch
14:00 - 15:30, 16:00 - 17:30 Court Yard	Plenary Workshop 2 – GIS: The Spatial Information Platform for Reducing Poverty
18:00-20:00 Court Yard	[description] Inauguration Ceremony
	Welcome and Opening, Colonel Luis A. Alegría Matta, Director, Military Geographic Institute of Chile (IGM) and President, GSDI9 Conference

- National Authority
- Welcome Address, Professor Harlan J. Onsrud, President, GSDI Association, Critical Issues in the Alleviation of Poverty and the Relevance of Geographic Tools and Data

Welcome Reception, Sponsor: Intergraph, Los Naranjos

INTERGRAPH

#### Tuesday, 7 November

08:30 -Museum Entrance Registration

16:00-17:30 Room 3	TS 17 - Partnerships In Creating SDI Building Blocks Moderators: Alessandro Annoni
	TS 17.1 A Successful Alternative Method for Funding and Implementing National SDI: The Australian PSMA Experience; Peter Holland, Ollie Hedberg, Dan Paull, Martin Holmes (Australia)
	[abstract] [paper 1] [paper 2] [paper 3] [paper 4] [paper 5] [paper 6] [paper 7] [slides]
	<b>TS 17.2 Basic Registrations for Geo Information</b> ; Jaap Besemer, Peter Laarakker, Leen Murre, Niels Zuiderveen Borgesius, Ruud Ten Kroode (The Netherlands) [abstract] [paper] [slides]
	TS 17.3 Arreglos Institucionales para Implementacion de la Infrastructura Colombiana de Datos Espaciales; Dora-Inés Rey-Martínez (Colombia) [abstract] [slides]
	TS 17.4 Partnerships in North-Rhein Westphalia for SDI Development and Installation; Heinz Brueggemann (Germany) [abstract] [slides]
16:00-17:30 Room 4	<u>TS 18</u> – Web-based Services serving Latin America Moderators: Tatiana Delgado, GeoCuba (Cuba)
	TS 18.1 The Nature Conservancy's Conservation Information System for Mesoamerica and the Caribbean; Steven Schill (USA) [abstract] [slides]
	<b>TS 18.2 The Mesoamerican and Caribbean Geospatial Network</b> ; Eric van Praag (USA), Boris Ramirez (Panama), Vincent Abreu (USA) [abstract] [slides]
	TS 18.3 Implementación de un Portal de Servicios Geográficos en Línea, como Factor de Desarrollo de Infraestructuras de Datos Espaciales en Colombia; Lilia- Patricia Arias (Colombia) [abstract] [slides]
	TS 18.4 Atlas Nacional Interactivo de México: Geoportal para México; Antonio Hernández-Navarro, Enrique Navarro-Luevano (Mexico) [abstract] [paper] [slides]
16:00-17:30 Auditorium	TS 19 – Standards Moderators: Ignacio Guerrero, Intergraph (USA); David Danko, ESRI (USA)
	TS 19.1 The Requirements and a Proposal for a Compatible SDI Standards Suite; Doug Nebert (USA), Carl Reed (USA), Roland Wagner (Germany) [abstract] [paper]
	TS 19.2 The Role of Standards in Spatial Data Infrastructures- The Zimbabwe Case; Gerald Chiwozva (Zimbabwe) [abstract] [paper]
	TS 19.3 Experiences in the Use of an ISO19115 Profile within the Framework of the Spanish SDI; Daniela Ballari, Alejandra Sánchez Maganto, Javier Nogueras-Iso, Antonio Rodriguez Pascual, Miguel Ángel Bernabé (Spain) [abstract] [paper]
	TS 19.4 Dealing with Diversity: From Data to Standards-based Domain Model; Clemens Portele (Germany) [abstract]