

## **The framework of standards for the Dutch SDI**

Authors: Jandirk Bulens, Wies Vullings, Joep Crompvoets, Marcel Reuvers

[jandirk.bulens@wur.nl](mailto:jandirk.bulens@wur.nl), [wies.vullings@wur.nl](mailto:wies.vullings@wur.nl), [joep.crompvoets@wur.nl](mailto:joep.crompvoets@wur.nl), [m.reuvers@geonovum.nl](mailto:m.reuvers@geonovum.nl)

Alterra Centre for Geo-Information, Wageningen University, Geonovum

### **INTRODUCTION**

The development of SDI's has been an important policy issue during the past decade. Worldwide rapidly increasing spatial data exchange, results in an increasingly consciousness to accomplish this by standardization. Worldwide efforts are being made to set up standards in the spatial domain to support information exchange. Technical and content related issues are discussed in a variety of national and international standardization organizations to achieve a common agreement in using spatial information. The technical field most progress has been made and a set of standards made by the Open Spatial Consortium (OGC) and ISO, the 19100 series are commonly used now. Content related standards are much more complicated due to the differences by domain and by country or even region. In The Netherlands much progress is made by defining a Base Geo-Information model for all spatial domains (NEN3610, 2005). This base model is used as a starting point for a number of spatial domains to build there semantic models.

In 2006 these developments resulted in setting up a framework of standards. This initiative is taken by the former Ravi, now Geonovum, which is an independent organization that carries out the national standardization program. In this paper the framework and its position in the Dutch context will be discussed.

### **WHAT IS THE FRAMEWORK**

The framework is a document describing a set of standards to be used in The Netherlands. These standards are compiled in a context of an SDI that is taking shape in the present. The selection of the set of standards is made in a process to obtain commitment amongst the people working in the spatial domain. Experts in standards made an initial proposal which was discussed in a broader setting being a representation of all the people working in the spatial domain. These included a variety of organizations from governmental bodies, universities and knowledge institutions, and industry.

#### **For who is the framework?**

The people targeted to use the framework are:

- People responsible for making conditions to make SDI's feasible
- Experts in IT and e-government from the spatial domain
- Developers of standards
- People involved in implementing the standards in there own organizations and in connection with other organizations (nation and international)

#### **Purpose of the framework**

The purpose of the framework is twofold:

- Determine standards and specifications needed to implement the Dutch NSDI
- Determine standards and specifications needed to connect the Dutch NSDI to the European SDI (ESDI)

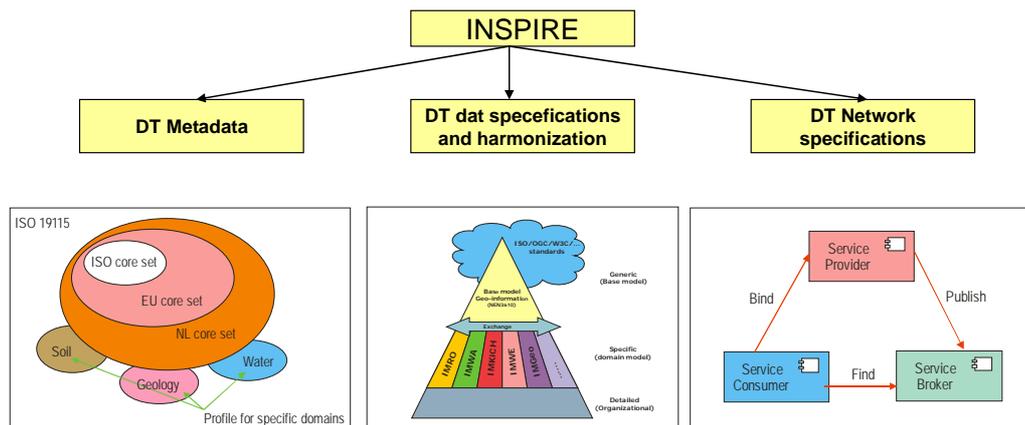
### Coherence

The coherence in the framework is based on the division in three parts, metadata, information models and network services. In the three parts the standards are categorized to obtain a good connection to existing (inter)national standards, including INSPIRE standards. The following table shows how this is elaborated and it also gives an overview of what is described by the framework

	Used in The Netherlands	Based on...
Metadata	Dutch metadata standard for geography  Dutch metadata standard for services	Related standards from the ISO 1900 series, OGC and W3C standards.  Connection with the INSPIRE set, Advise overhead (a Dutch program of the Ministry of internal affairs), user needs, etc.
Information models	NEN3610-Base model geo-information as a generic semantic model  Derived form NEN3610 information models for Spatial planning (IMRO), Water (IMWA), Topography scale 1:10.000 (TOP10NL) and large scale (IMGeo), Cultural inheritance (IMKiCH), Cables and pipes (IMKL), Soil (IMBOD), and so on.	Related standards from the ISO 1900 series, OGC and W3C standards.  The information models for the domains are made through harmonization by representatives in the domains
Network services	Profiles for WMS, WMS-SLD and WFS (work on this is in progress).  International standards	Related standards from the ISO 1900 series, OGC and W3C standards.  Set up is based on principles of Services oriented Architectures (SOA)

**Relation to INSPIRE**

INSPIRE will have a major impact on how NSDI has to be implemented, so the framework is organized according to INSPIRE. An additional reason for this is the involvement of The Netherlands as a member state in the working program of INSPIRE. The framework translates as much as possible INSPIRE implementing rules for The Netherlands and extends this for the specific Dutch situation. The following figure illustrates the relation between INSPIRE and the framework



*Figure 1: relation to INSPIRE.*

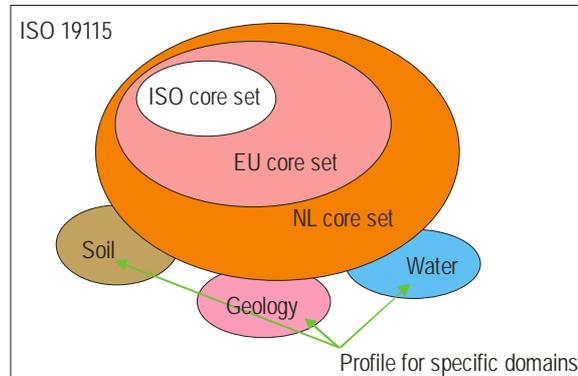
**Metadata**

Metadata is often called “data about data”. In the geographical domain we can have a description of spatial data (spatial data metadata), a service (service metadata) or a special analysis process (process metadata). Most for the standardization work is done for data metadata, however service- and process metadata is becoming increasingly important.

Metadata is used in discovery mechanisms to bring spatial information providers and users together. The following mechanisms are recognized:

- Discovery: which data source contains the information where I am looking for?
- Exploration (or evaluation): do I find within the data sources the right information to suit my information needs?
- Exploitation (use and access): how can I obtain and use the data sources?

Each mechanism has its own use of metadata. The selected standards should fulfill the needs to carry out services using these mechanisms. In the framework two profiles for the metadata standards are made available and in addition there is now one regional profile based on an X-border implementation of a SDI. The Dutch profiles are using the guidelines of “Advies Overheid” of the Dutch government, which on its turn is based on de Dublin Core standard metadata element set for information and documentation (ISO15836). The next figure gives insight in the nesting of the different standards.

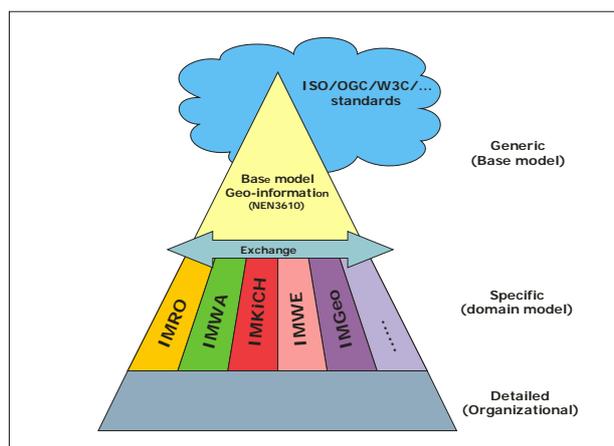


**Figure 2:** Hierarchy in Metadata.

**Information models**

An information model is a conceptual model with formal definitions of objects (features), attributes, relations and rules for a specific domain. It is an abstraction of the real world (Universe of Discourse) defined for that specific usage, usually a domain. This information model is structuring the information to be able to exchange information without information loss. It is a semantic model because it describes the meaning of the objects for its usage. The meaning comprises the definition, the properties, the behavior of that object and all relations with other objects to describe its coherence (Reuvers, 2006). To come to a commonly accepted model terms and definitions must be tuned. This harmonization is carried out by representatives working within that specific domain.

In The Netherlands for the spatial domain there is the Base Geo-information model recorded (NEN3610, 2005) as NEN3610 by the NEN, the Dutch normalization institute. This base model is an abstract model from which in a second layer specific domain models can be derived. There is a third layer to specify the most detailed models on the level of a group or a single organization. The goal is to be able to exchange content related information without information loss. The pyramid shows schematically how the information models relate.



**Figure 3:** Pyramid of information model.

In order to be able to exchange information, the abstract information model (in UML) should have at least one implementation. For that purpose an implementation is provided in XML/GML (ISO19136), the internet based standard for spatial data.

In The Netherlands information models are made or being made for several domains. The Dutch approach is to extend the (technical) spatial standards into the semantics in the different domains. Semantically the spatial object (geo-object or feature) is seen as the base unit for carrying information. These information models are:

- NEN3610:2005 base model Geo-information
- IMRO:2006 Spatial Planning
- IMWA:2006 Water
- IMKiCH:2006 Cultural inheritance
- Top10NL small scale topography (1: 10.000)
- IMWE:2006 Regulations on the external appearance of the build environment (in Dutch "Welstand")
- IMKL Cables and pipes (subsurface)
- IMGeo Large scale topography
- IMBOD Soil and geology
- GRIM the "Green space" (Agriculture, Nature, recreation, etc)

On the organizational level a first draft information model is made for Rijkswaterstaat, the Dutch Directorate for Public Works and Water Management, called the GBR (large scale base map Rijkswaterstaat)

## Services

Services play an essential role in the use of SDI. The selection, presentation, transformation and integration of data are all done by services. A service is a component with a standardized task that communicates by a standardized interface. A simple service is the presentation of a spatial dataset on a standardized way. Services can also be combined to form a new service. This is called service chaining. For the description of a service the ISO 19119 standard is used (service metadata). The OGC has been active in the formulation of implementation specifications for services.

Standards in this area follows the principles of a Services Oriented Architecture (SOA). Within SOA two types of services can be distinguished:

- Request – response (primarily OGC focus)
- Publish – subscribe

These types of services are worked out in service stacks in the framework. In the service stacks the used international standards from OGC, W3C, OASIS and profiles of WS-I are addressed. National profiles are developed for WMS, WFS and WMS/SLD.

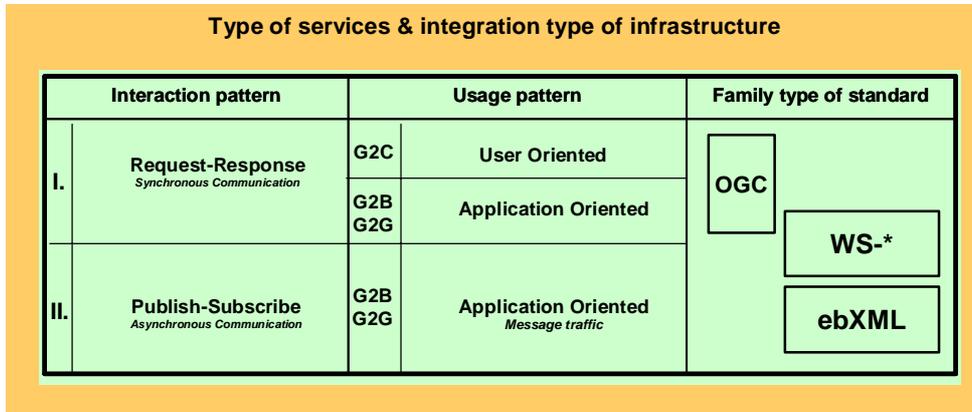


Figure 4: service types & integration type of infrastructure.

### Standards and Architecture

In this part an attempt is made to place standards in an architecture describing the framework. This is based on key documents in this field:

- All documents produced by OGC, including the Open GIS reference Model (ORM0 (OGC2003)
- INSPIRE Architecture and standards position paper (Smits 2002)
- Geospatial interoperability reference model (GIRM) (Evans, 2003)

All these documents relate specifically to the spatial domain. As is obvious this is not a domain in isolation, so we need to extend this to underlying domains as well (mainly IT-standards). For the Dutch situation reference is made to the Dutch architecture developed by the ICTU program of the Dutch government. They developed the Dutch Government Reference Architecture (NORA). This is still in progress but already useful to position the standards from this framework. In the figure 5 is indicated what area is covered by the standards from the framework (the central area).

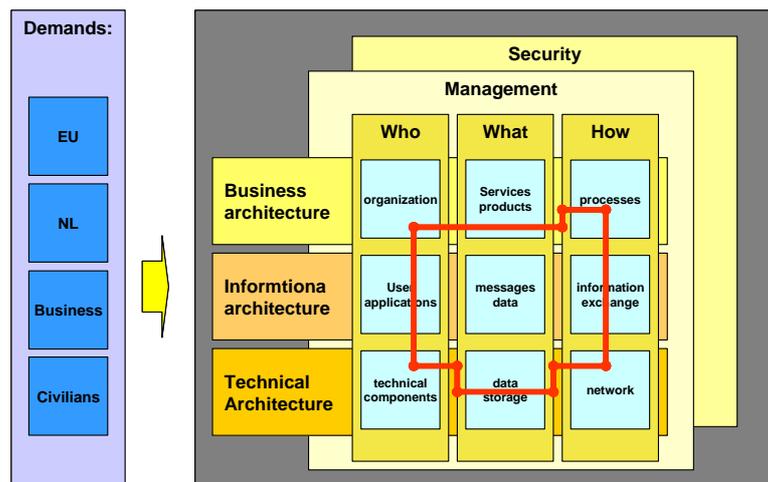


Figure 5: Coverage by Framework standards in NORA.

## CONCLUDING REMARKS

Version 1.1 of the framework document is released in June 2006. This was the first version of the document distributed widely. It was introduced as a dynamic document, to be extended and improved in time.

Despite the fact the framework document is not complete the acceptance in The Netherlands is very wide. In The Netherlands there is an innovation program "space for Geo-Information", with its main goal to improve the Dutch SDI. The program made the framework mandatory for all projects carried out. A second major step is the acceptance by the Geo-Information Council (GI-beraad) a Dutch council for the spatial domain of the Dutch government as a base for developing all activities to realize the NSDI.

To conclude, so far only few experiences in applying the Dutch standards in the different profiles are registered, but it is expected that it will result in time in an increase in operability in exchanging information over different domains.

## BIBLIOGRAPHY

- CEN/TC287, 2005. Geographic information - Standards, specifications, technical reports and guidelines, required to implement Spatial Data Infrastructure. 80
- E-ESDI Organisation and E-ESDI Action Plan, 2001. [Online] <http://www.ecgis.org/inspire>
- Evans John D. (editor), 2003, A Geospatial Interoperability Reference Model (G.I.R.M.) Prepared by the FGDC Geospatial Applications and Interoperability (GAI) Working Group Version 1.1, December 2003 [Online] <http://gai.fgdc.gov/girm/v1.1>
- Geographic Data Exchange Standards. [Online] <http://www.diffuse.org/gis.html>
- Global Spatial Data Infrastructure, 2000. SDI cookbook.. [Online] <http://www.gsdi.org>
- ISO homepage, 2002. [Online] <http://www.iso.org>
- Kresse, W. and Fadaie, K., 2004. ISO standards for geographic information. Springer, Berlin, 322 pp.
- NEN3610, 2006. Ravi. Basic scheme for geo-information - Terms, definitions, relations and general rules for the interchange of information of spatial objects related to the earth's surface, NEN Delft, [Online English version] [http://inspire.jrc.it/ir/reference\\_material\\_view.cfm?id=4615](http://inspire.jrc.it/ir/reference_material_view.cfm?id=4615)
- OGC Reference Model , 2003, Editor: George Percivall, Version: 0.1.3, Reference number: OGC 03-040, [Online] <http://orm.opengeospatial.org>
- OpenGIS Abstract Specification Topic 13: Catalog Services. Version 4. [Online] <http://www.opengis.org/techno/abstract/99-113.pdf>
- OpenGIS Implementation Specification, OpenGIS - Catalog Interface Implementation Specification (Version1.0). [Online] <http://www.opengis.org/techno/specs/99-051.pdf>
- Reuvers M., (editor), 2006. Raamwerk van standaarden voor de Nederlandse Geo-informatie infrastructuur, Stichting Ravi, Amersfoort. [Online] <http://www.ravi.nl>
- Smits P., (editor), 2002, INSPIRE Architecture and Standards Position Paper, Architecture And Standards Working Group.JRC, ISPRA [Online] <http://www.ec-gis.org/inspire>
- Spatial Data Infrastructures: Country reports. Geographic Information Network in Europe (GINIE), [Online] <http://www.ec-gis.org/ginie>
- W3C, Web Services Architecture Requirements. 2002. [Online] <http://www.w3.org/TR/2002/WD-wsareqs-20020819>. (working draft)