UNITED NATIONS **E/CONF.97/6/IP. 7**

ECONOMIC AND SOCIAL COUNCIL

Seventeenth United Nations Regional Cartographic Conference for Asia and the Pacific
Bangkok, 18-22 September 2006
Item 7 of the provisional agenda*

INVITED PAPERS

THE CONTRIBUTION OF INTERNATIONAL STANDARDS TO SPATIAL DATA INFRASTRUCTURE AND DISASTER MANAGEMENT

Submitted by ISO/TC 211 Geographic Information/Geomatics **

*** E/CONF.97/1**

**** Prepared by Prof. Olaf Østensen, Chairman of ISO/TC 211 Geographic Information/Geomatics.**

17th UN Regional Cartographic Conference for Asia and the Pacific

Bangkok, Thailand
September 18-22, 2006

The contribution of international standards to spatial data infrastructure and disaster management

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Norwegian Mapping and Cadastre Authority

Content

- Introduction
- International standards status
- The way forward
- An example
- Conclusions

The challenge

In a world with more and more international operations

- for peace-keeping
- for rescuing and disaster management
- for protecting the environment
- etc.

we will need to ***discover***, ***access***, ***understand***, ***assess***, ***integrate***, and ***use*** geographic information from sources anywhere in the world

standards are imperative in such a scenario

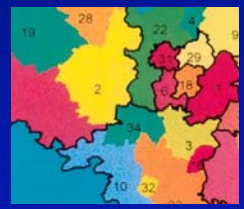
- Any ***international operation***
  - whether disaster management, environmental management, or anything else

- requires ***interoperability***

- and can be greatly simplified by an underlying ***spatial data infrastructure***

Spatial Data Infrastructures (SDI) exist at all levels

Local



National

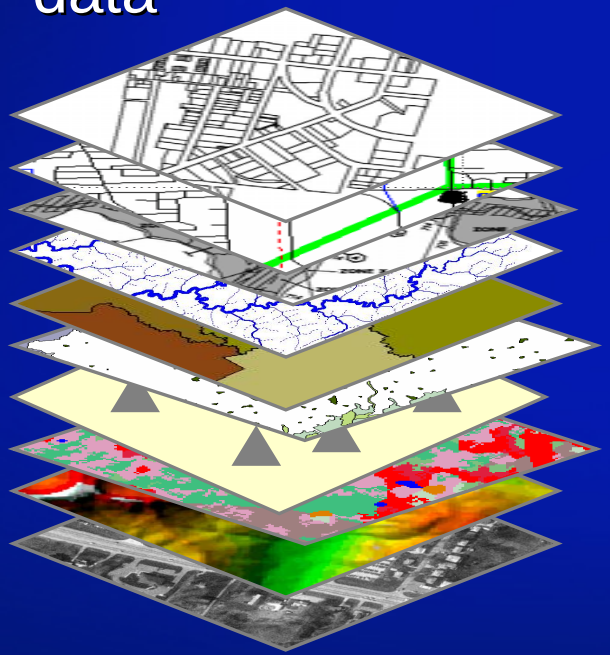
Regional

Global

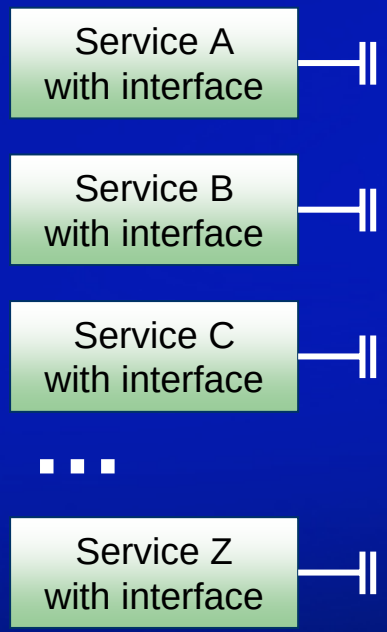
SDI ideally supports

the development of *any* potential application for any geospatial information community!!

a variety of content, reference and thematic data

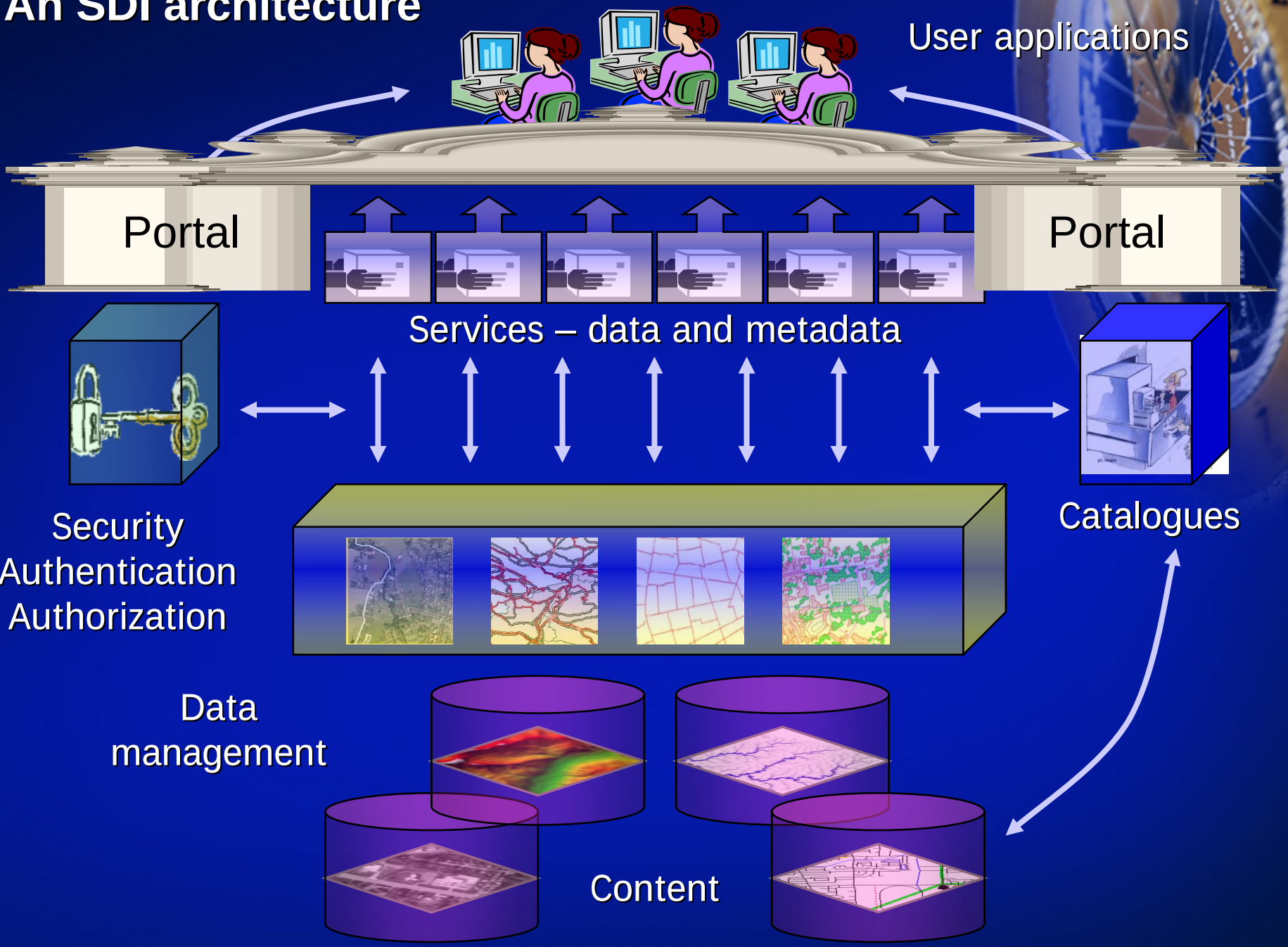


a rich set of functionality - services



a variety of appli-cations

An SDI architecture



ISO and the global approach …

The goal of ISO/TC 211...

... is to develop a family of international standards that will

- support the understanding and usage of geographic information
- increase the availability, access, integration, and sharing of geographic information, enable inter-operability of geospatially enabled computer systems
- ease the establishment of geospatial infrastructures on local, regional and global level
- contribute to a unified approach to addressing global ecological and humanitarian problems
- contribute to sustainable development




Who are we ? ...member list

Active members (P-members), 29 countries

Australia
Austria
Belgium
Canada
China
Czech Rep.
Denmark
Ecuador
Finland
Germany
Italy
Japan
Republic of Korea
Malaysia
Morocco
Netherlands
New Zealand
Norway
Portugal
Russian Federation
Saudi Arabia
Serbia
South Africa
Spain
Sweden
Switzerland
Thailand
United Kingdom
United States of America

Member list

Observing members (O-members), 31 countries

Argentina
Bahrain (corr.)
Brunei Darussalam (corr.)
Colombia
Croatia
Cuba
Estonia (corr.)
France
Greece
Hong Kong (corr.)
Hungary
Iceland
India
Indonesia
Isl. Rep. of Iran
Ireland
Jamaica
Kenya
Mauritius
Oman
Pakistan
Philippines
Poland
Romania
Slovakia
Slovenia
Tanzania
Turkey
Ukraine
Uruguay
Zimbabwe

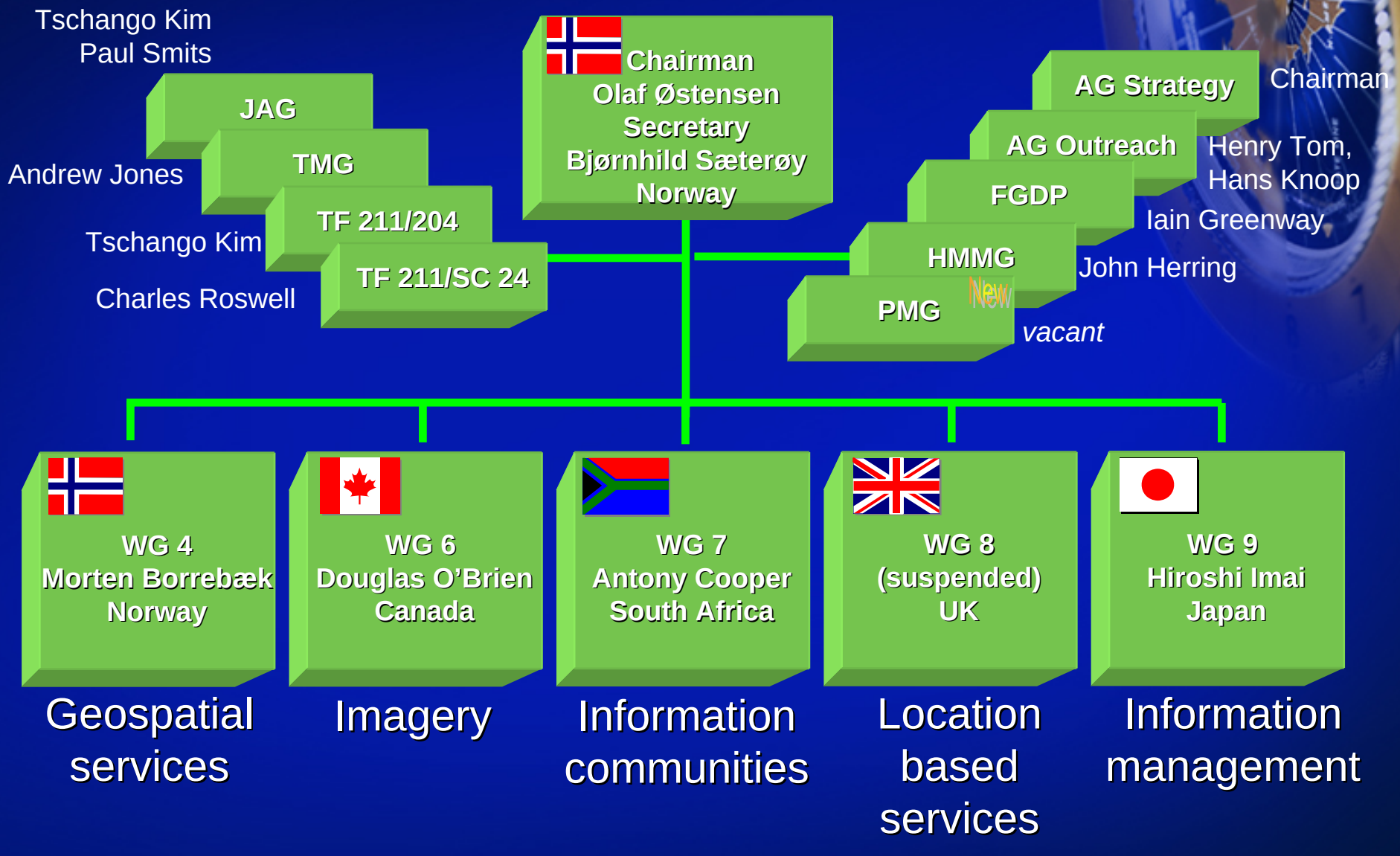
External liaisons (27), 1 of 2

- CEN/TC 287, Geographic information
- CEOS, Committee on Earth Observation Satellites
- DGIWG, Digital Geographic Information Working Group
- ESA, European Space Agency
- EuroSDR, European Spatial Data Research
- FAO, Food and Agriculture Organization of the UN
- FIG, International Federation of Surveyors
- GSDI, Global Spatial Data Infrastructure
- IAG, International Association of Geodesy
- ICA, International Cartographic Association
- ICAO, International Civil Aviation Organization
- IEEE Geoscience and Remote Sensing Society
- IHB, International Hydrographic Bureau
- ISCGM, International Steering Committee for Global Mapping
- ISPRS, International Society for Photogrammetry and Remote Sensing

External liaisons, 2 of 2

- JRC, Joint Research Centre, European Commission
- OGC, Open Geospatial Consortium, Incorporated
- OGP, International Association of Oil and Gas Producers
- PAIGH – Pan American Institute of Geography and History
- PC IDEA, Permanent Committee on Spatial Data Infrastructure for the Americas
- PCGIAP, The Permanent Committee on GIS Infrastructure for Asia and the Pacific
- SCAR, Scientific Committee on Antarctic Research
- UN ECE, UN Economic Commission for Europe, Statistical Division
- UN ECA, UN Economic Commission for Africa
- UNGEGN, United Nations Group of Experts on Geographical Names
- UNGIWG, United Nations Geographic Information Working Group
- WMO, World Meteorological Organization

ISO/TC 211 organization



Status

Published standards i)

- ISO 6709:1983 Standard representation of latitude, longitude and altitude for geographic point locations
- ISO 19101:2002 Geographic information - Reference model
- ISO/TS 19103:2005 Geographic information - Conceptual schema language
- ISO 19105:2000 Geographic information - Conformance and testing
- ISO 19106:2004 Geographic information - Profiles
- ISO 19107:2003 Geographic information - Spatial schema
- ISO 19108:2002 Geographic information - Temporal schema
- ISO 19109:2005 Geographic information - Rules for application schema
- ISO 19110:2005 Geographic information - Methodology for feature cataloguing
- ISO 19111:2003 Geographic information - Spatial referencing by coordinates
- ISO 19112:2003 Geographic information - Spatial referencing by geographic identifiers
- ISO 19113:2002 Geographic information - Quality principles
- ISO 19114:2003 Geographic information - Quality evaluation procedures
- ISO 19115:2003 Geographic information – Metadata
- ISO 19116:2004 Geographic information - Positioning services
- ISO 19117:2005 Geographic information - Portrayal
- ISO 19118:2005 Geographic information - Encoding
- ISO 19119:2005 Geographic information - Services

Published standards ii)

- ISO/TR 19120:2001 Geographic information - Functional standards
- ISO/TR 19121:2000 Geographic information - Imagery and gridded data
- ISO/TR 19122:2004 Geographic information / Geomatics - Qualification and certification of personnel
- ISO 19123:2005 Geographic information - Schema for coverage geometry and functions
- ISO/RS 19124 Geographic information - Imagery and gridded data components
- ISO 19125-1:2004 Geographic information - Simple feature access - Part 1: Common architecture
- ISO 19125-2:2004 Geographic information - Simple feature access - Part 2: SQL option
- ISO/TS 19127:2005 Geographic information - Geodetic codes and parameters
- ISO 19128:2005 Geographic information - Web Map Server Interface

- ISO 19133 :2005 Location based services tracking and navigation
- ISO 19135 :2005 Procedures for registration of geographic information items

Still under work

- ISO 19101-2 - Reference model - Part 2: Imagery
- ISO 19104- Terminology
- ISO 19115-2 - Metadata - Part 2: Extensions for imagery and gridded data
- ISO 19126 - Profile - FACC Data Dictionary
- ISO 19129 – Imagery, gridded and coverage data framework
- ISO 19130 - Sensor and data model for imagery and gridded data
- ISO 19131 - Data product specification
- ISO 19132 – Location based services framework
- ISO 19134 - Multimodal location based services for routing and navigation
- ISO 19136 – Geography Markup Language (GML)
- ISO 19137 - Core profile of the spatial schema
- ISO 19138 – Data quality measures
- ISO 19139 - Metadata – XML schema implementation
- ISO 19140 - Technical Amendment to the ISO 191** Geographic information series of standards for harmonization and enhancements
- ISO 19141 - Moving features schema
- ISO 19142 – Web feature service
- ISO 19143 – Filter encoding
- ISO 19144-1 Classification Systems – Part 1: Classification system structure
- ISO 19144-2 Classification Systems – Part 2: Land Cover Classification System LCCS
- ISO 19145 Registry of representations of geographic point location
- ISO Amendment to ISO 19113:2002 Geographic information - Quality principles and ISO 19115:2003 Geographic information - Metadata

New work under consideration

- NWIP Geographic information - Location Based Services - Linear Referencing System
- NWIP Geographic information - Location Based Services - Transfer Nodes
- NWIP Geographic information - Methodology for feature cataloguing, Amendment 1
- NWIP Geographic information — Feature concept dictionaries and registers
- NWIP Geographic information — Cross-domain vocabularies
- Draft NWIP Geographic information — Rights expression language for geographic information — GeoREL

Expected

- Catalog services *from OGC*

ISO/TC 211 – working together …

Cooperative Agreements
- an instrument for close cooperation

Established between ISO/TC 211 and

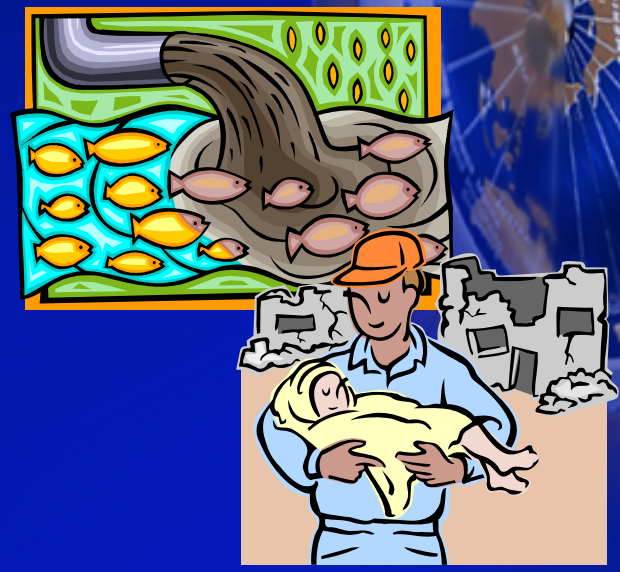
- OGC – long and extensive cooperation
- DGIWG – active member, will base future standards on ISO 191xx
- IHO – active member, will base future standards on ISO 191xx
- FAO – new, active liaison
- ISO/TC 204 – cooperation in location based services
- ISO/IEC JTC 1 SC 24 – close cooperation with SC 24 in imagery and in synthetic environment and simulation

The way forward

A regional approach

Start by this …

- Identify requirements
  - Environmental management
  - Disaster management
  - …
- Identify content needed
  - Basic/reference datasets
  - Thematic datasets

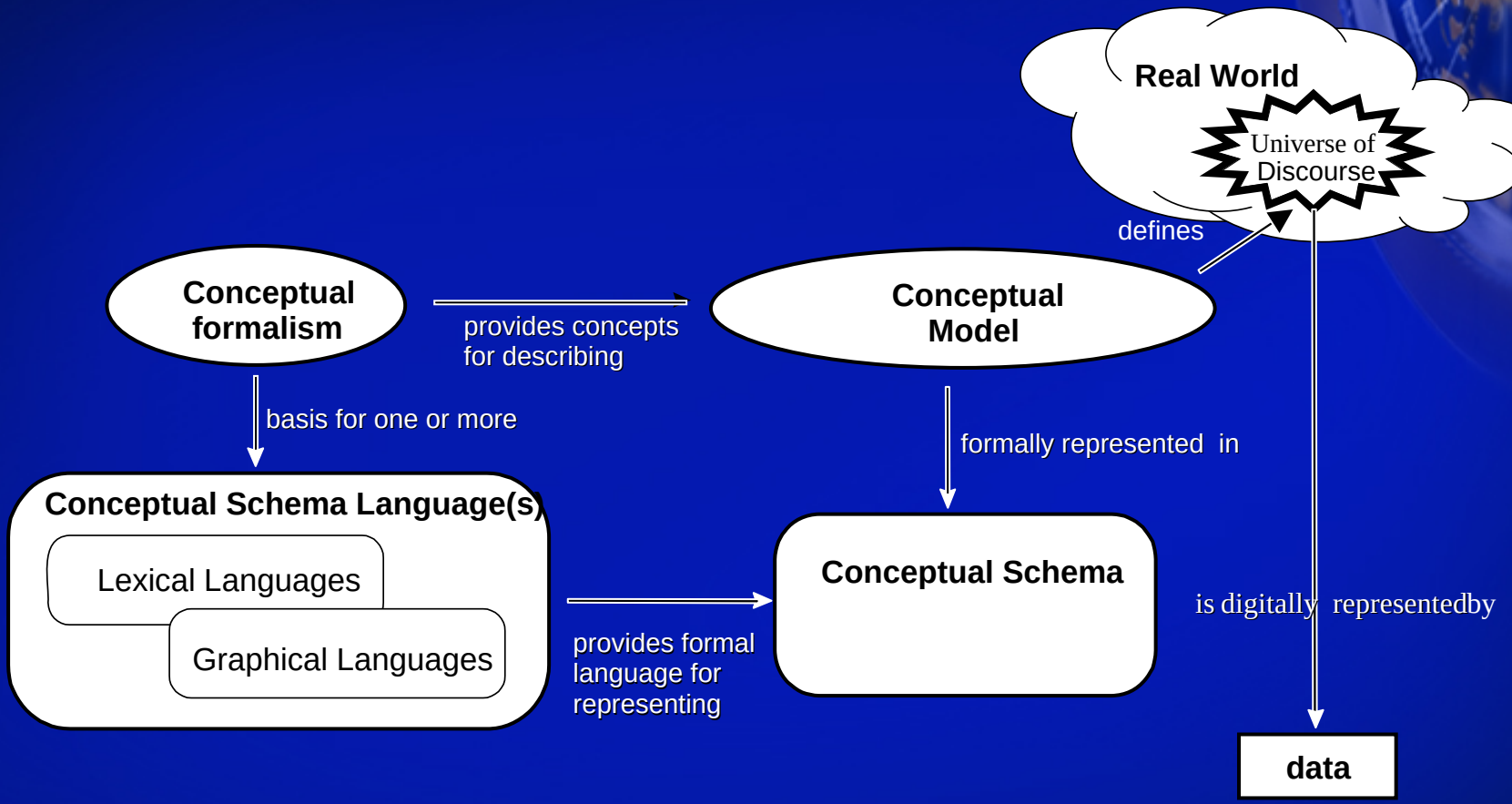


Specify data …

- Define features and attributes
  - Feature cataloguing
  - ISO 19110
- Define your application schemas
  - Rules for application schemas
  - ISO 19109
- Define data products
  - Data product specification
  - ISO 19131

the list of ISO standards is not complete

From real world to knowledge representation



ISO 19101 Geographic information – Refence model

Design Process

Community

6. Forward Draft for Review and Approval

3. Review

1. Requirements
4. Comments

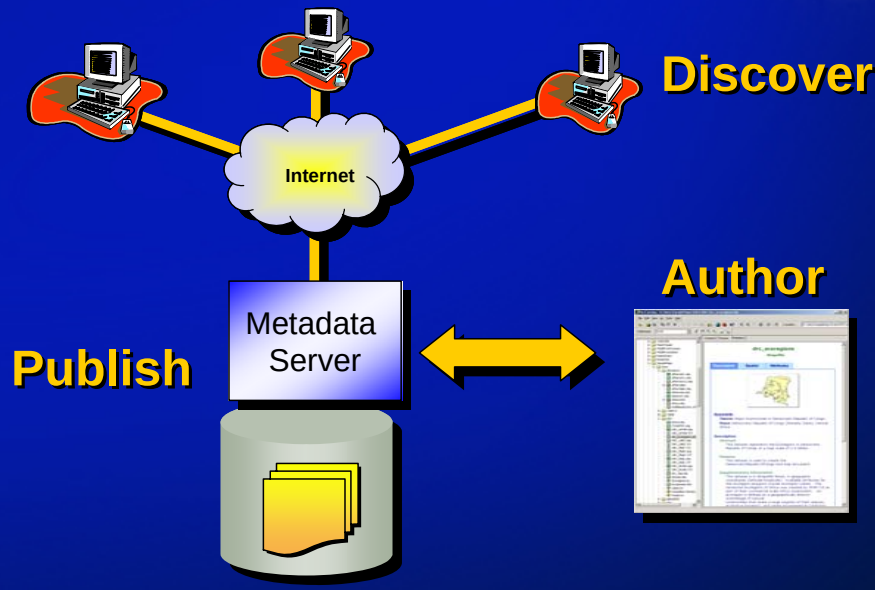
2. Design
5. Refine

Modeling Advisory Team (Team of Experts)

(after Nebert)

Define and publish metadata …

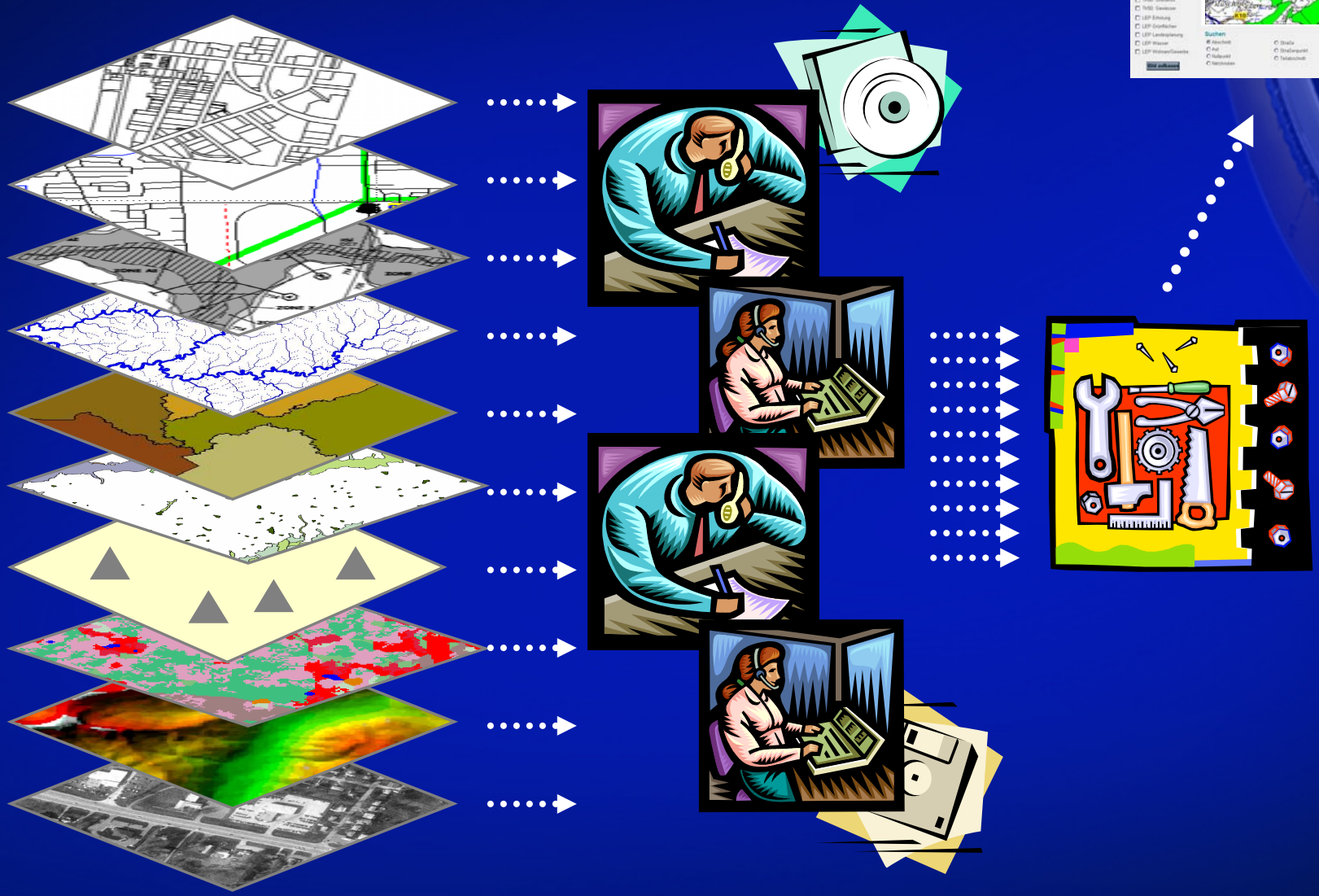
- Metadata specification
  - ISO 19115 – general metadata
  - ISO 19115-2 – imagery metadata
  - ISO 19119 – services metadata
- Publish metadata
  - XML encoding
    - ISO 19139
  - Cataloguing
    - OGC specifications



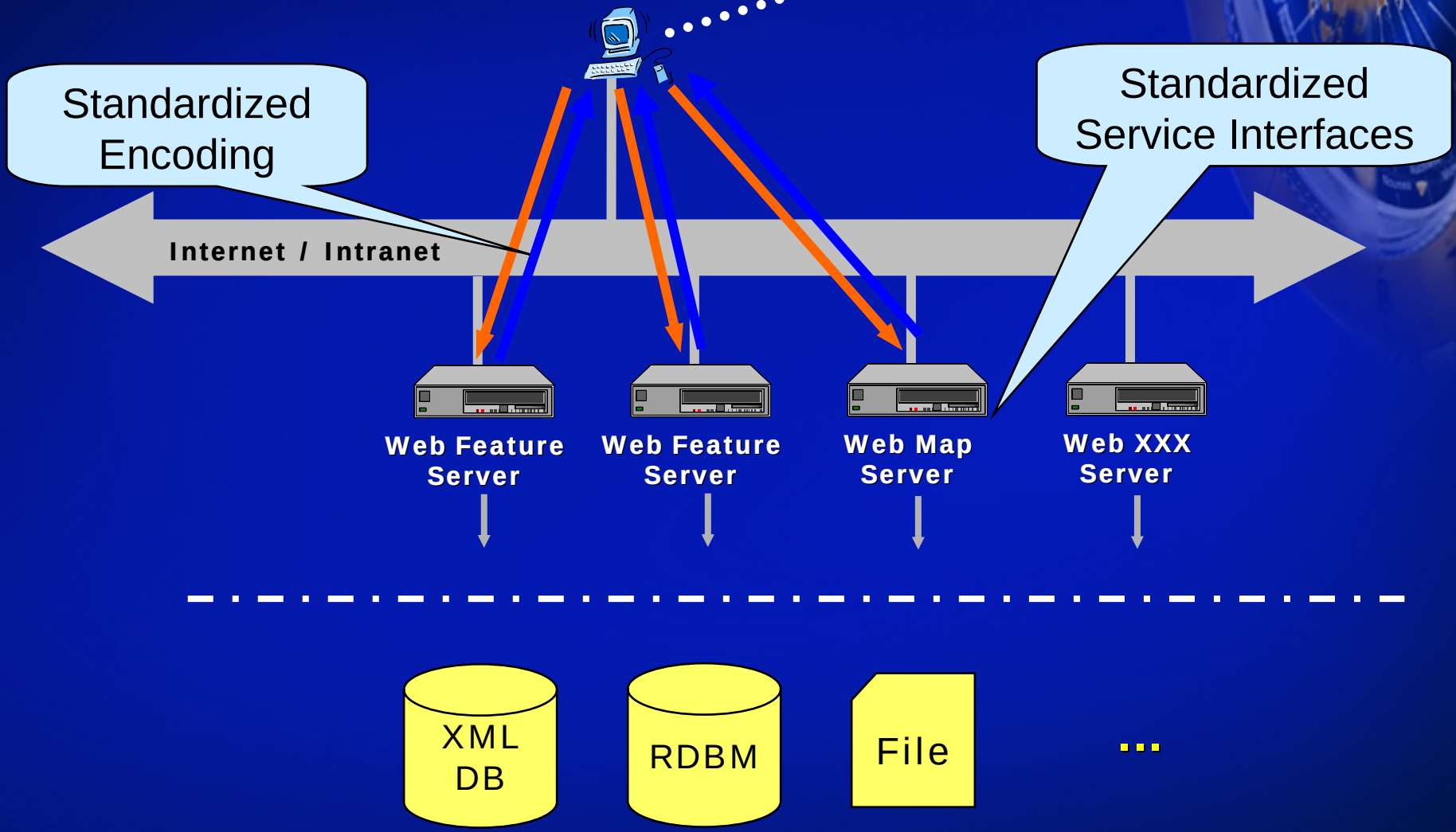
Define services …

- Discovery services — simple metadata
- Assessment services — full metadata
- View services — cartographic view
- Download services — access data itself
- Geoprocessing services — analysis etc.
- Orchestrate services — complex services

Previously …


XtraWMS Applikation V0.33
interactive instruments
Ebenenauswahl
Suchen
Arnsberg Niedereimer

Now,
a service oriented SDI



Network services and standards

discovery and assessment services
- CSW ISO 19115/19119 AP + UDDI?

view services
- WMS = ISO 19128

download services
– WFS = ISO 19142 ++

geoprocessing services
- OGC Coordinate Transformation Service +++

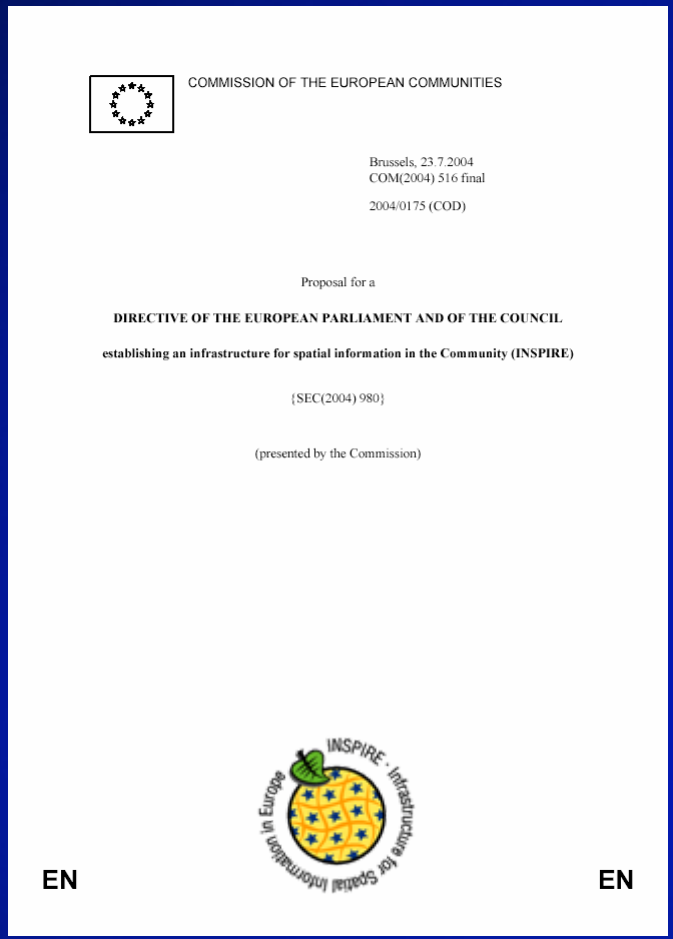
orchestrate services
– BPEL

Define data encoding …

- Data encoding for exchange and streaming
  - GML – Geography Markup Language
  - ISO 19136

```
<Road gml:id="o.1f75dc">
        <name>I95</name>
        <class>Interstate</class>
        <centerLine>
                <gml:Curve>...</gml:Curve>
        </centerLine>
        <maintainer>
                <auth:Authority gml:id=„o.1f32a3">
                        <name>xyz</name>
                        <type>DOT</type>
                </auth:Authority>
        </maintainer>
</Road>
```

Example: Formalized SDI
Proposed EU Directive - INSPIRE



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 23.7.2004
COM(2004) 516 final

2004/0175 (COD)

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

establishing an infrastructure for spatial information in the Community (INSPIRE)

{SEC(2004) 980}

(presented by the Commission)

EN **EN**

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

establishing an infrastructure for spatial information in the Community (INSPIRE)

Components

standards

- Directive itself
  - Framework
- Implementing rules
  - Technical details
- Implementation in national legislation
  - National laws and regulations

The INSPIRE Directive will give


COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 23.7.2004
COM(2004) 516 final
2004/0175 (COD)

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{SEC(2004) 980}

(presented by the Commission)

EN EN

detailed Implementing Rules for

- ***Harmonized data content***
- ***Network services***
- ***Metadata for data content and services***
- Datasharing
- Monitoring and reporting

INSPIRE content

Annex I Themes

Coordinate reference systems

Geographical grid systems

Geographical names

Administrative units

Transport networks

Hydrography

Protected sites

Annex II Themes

Elevation

Addresses

Cadastral parcels

Land cover

Orthoimagery

Geology

INSPIRE content

Annex III Themes

Statistical units
Buildings
Soil
Land use
Human health and safety
Utility and Government services
Environmental monitoring facilities
Production and industrial facilities
Agricultural and aquaculture facilities
Population distribution – demography

Area management/restriction/ regulation zones & reporting units
Natural risk zones
Atmospheric conditions
Meteorological geographical features
Oceanographic geographical features
Sea regions
Bio-geographical regions
Habitats and biotopes
Species distribution
Energy resources
Mineral resources

Harmonized Data Content - recommendations

Rules for Application Schemas

- Based on ISO 19109 and ISO/TS 19103 – with some constraints on the GFM and the use of UML

ISO 19100 Profile

- Identification of a profile of ISO 19107/19108/19123/etc. not possible due to the wide range of spatial information in the themes
- Recommendation to use the Simple Feature profile of the spatial schema (ISO 19125-1) when possible

Harmonized Data Content - recommendations

Multilingual text and CLA

- Based on recommendations of CEN draft technical report
- Conceptual model may be based on ISO/TS 19139
- Requirements for multilingual/multicultural support in ESDI need more discussion

Coordinate reference system and units model

- Based on revision of ISO 19111 (CRS) and ISO 19136 (units)
- Known limitations of today‘s standards: linear reference systems, CRS using physical parameters (e.g. pressure)

Metadata - recommendations

- support for ISO 19115 for data content
- support for ISO 19119 for service metadata
- ISO 19139 XML schema encoding
- Catalogue services – emphasis on OGC ISO 19115/19119 application profile

The INSPIRE example shows …

- that a formal standards based SDI approach is feasible
- a huge investment in this direction is taking place in Europe
- most of this development can be reused in other regions
- it is an open, well documented development

Conclusions ...

- standards are an integrated component of any spatial data infrastructure
- no easy sharing of geographic information is possible without standards
- interoperability is only achieved by standards
- standards *are* available today
- the standards provide a methodology for building the SDI

Conclusions, continued

- Standards are well defined and implemented for
  - data specifications and documentation
  - metadata
  - access services
  - data integration

but, …

- standards must be based upon close contact with the user communities
  - nations, regions, thematic communities
- standards need to be disseminated and marketed
  - outreach a very important task
- training and education – capacity building – still a problem!
  - standards are complex
  - a funding issue!

Thank you !

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ISO/TC 211 ...

… building the foundation of the geospatial infrastructure, brick by brick ...