

Data Consistency and Multiple-representation in the European Spatial Data Infrastructure

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Purpose of the presentation: summarise technological, organisational, and policy aspects of multiple-representation and data consistency in SDI

- Multiple-representation and data consistency in SDI
- The INSPIRE Directive
 - Data harmonisation, multiple-representation, and data consistency in INSPIRE
 - Organisational and technological measures for consistent data management
- Conclusion: relation of legal framework and implementation

- Description of the real world
 - from multiple points of view
 - at different level of details
- Single purpose data collection replaced by information management permitting the
 - Reuse of data
 - Data and information integration from different sources
- Data and information supply to various users via
 - Interoperable services and
 - (when applicable,) harmonised data
- Technological, organisational and policy aspects need to be fixed:
legislative regulation of SDIs at different (national and supra national) levels

Multiple-representation and data consistency in SDI

SDI: framework for reusing and combining spatial data and communicating information from various sources without specific efforts of humans and machines

- Two ways of implementation
 - Interoperability of spatial data services (on the fly conversion and transformation)
 - Data harmonisation (agreements on conceptualisation and pre-defined rules for data)

Generalisation

**Multiple-
representation**



INfrastructure for SPatial InfoRmation in the European Community

- Directive (2007/2/EC of 14 March 2007) of the European Parliament and Council
- Legal act to be transposed in national legislation
- For the purposes of the Community environmental policies and the activities that may have an impact on the environment
- Technical and legal arrangements set in the Implementing Rules

Article 8

1. *In the case of spatial data sets corresponding to one or more of the themes listed in Annex I or II, the implementing rules [...] shall meet the conditions laid down in paragraphs 2, 3 and 4.
(...)*
3. *The implementing rules shall be designed to ensure consistency as between items of information which refer to the same location or between items of information which refer to the same object represented at different scales.*
4. *The implementing rules shall be designed to ensure that information derived from different spatial data sets is comparable as regards the aspects referred to in Article 7(4)
[...].*

Article 10

2. *In order to ensure that spatial data relating to a spatial feature the location of which spans the frontier between two Member States are coherent, Member States shall, where appropriate, decide by mutual consent on the depiction and position of such common features.*

Coherent information integration through data harmonisation

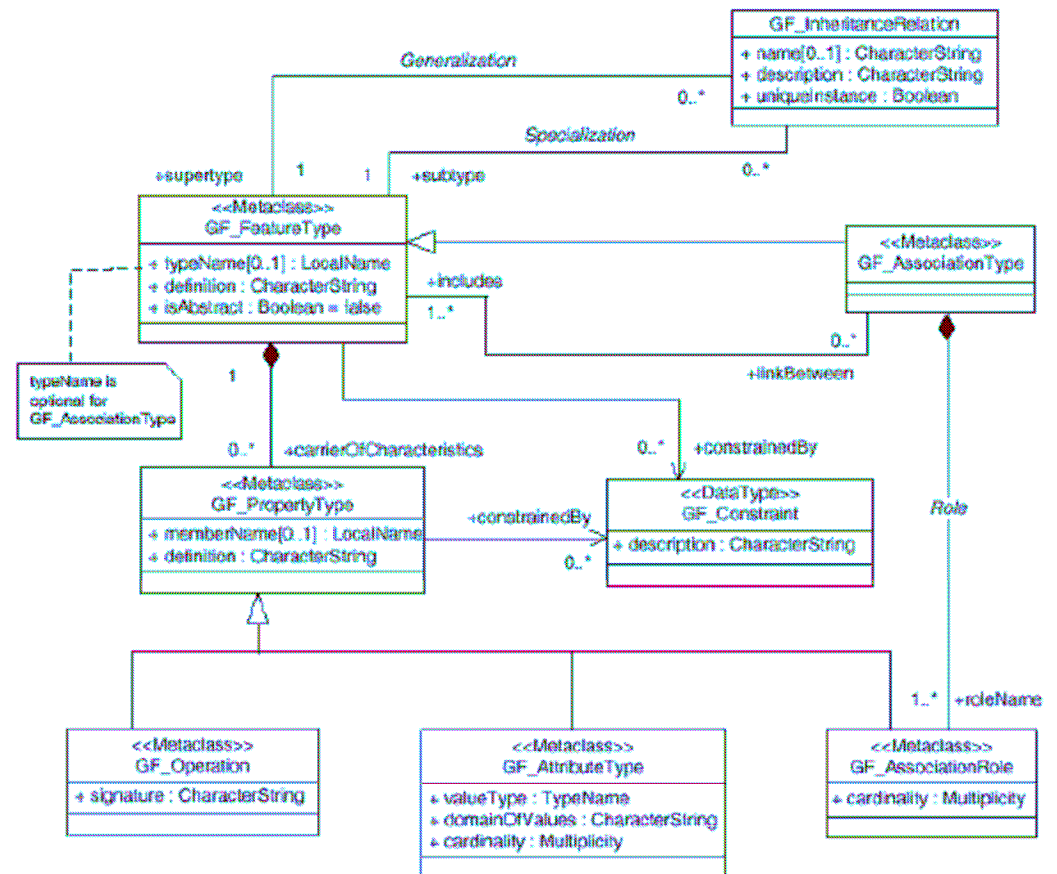
(A) INSPIRE Principles	(B) Terminology	(C) Reference model
(D) Rules for application Schemas and feature catalogues	(E) Spatial and temporal aspects	(F) Multi-lingual text and cultural adaptability
(G) Coordinate referencing and units model	(H) Object referencing modelling	(I) Data translation model/guidelines
(J) Portrayal model	(K) Identifier Management	(L) Registers and registries
(M) Metadata	(N) Maintenance	(O) Quality
(P) Data Transfer	(Q) Consistency between data	(R) Multiple representations
(S) Data capturing	(T) Conformance	

Data Harmonisation: Generic Conceptual Model

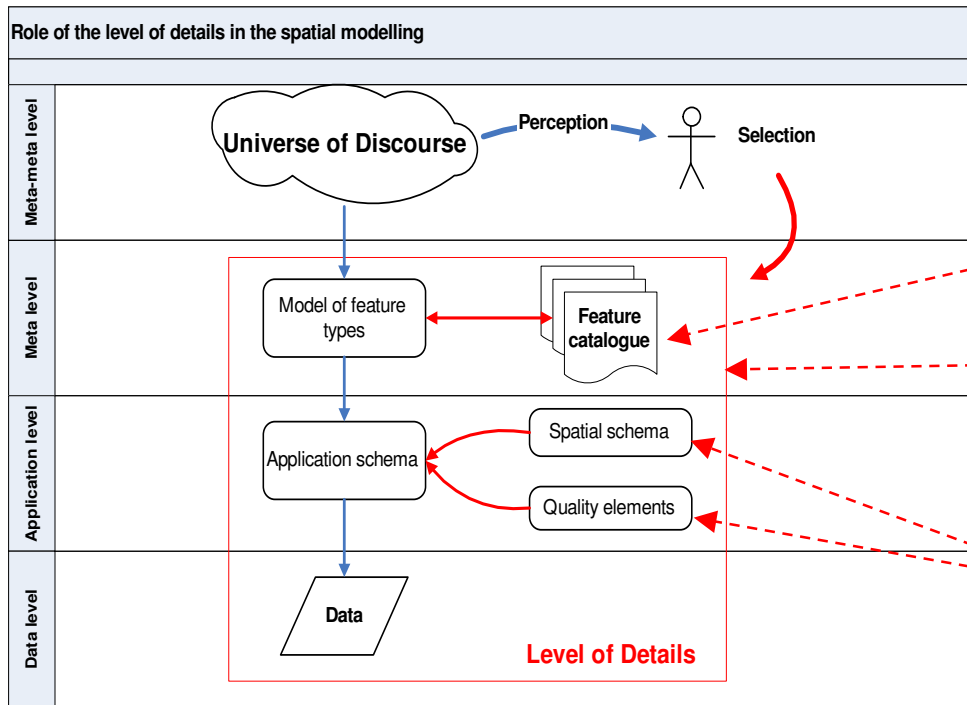
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- Formalisation of data harmonisation
- Basis for data specification of the 34 data themes listed in the annexes of the Directive according to ISO 19131
- Concepts established in the GCM shall not be modelled as part of application schemas of the data themes
- Concepts of general utility shall be channelled (back) to the GCM,



Data Harmonisation: Application Schema Development 1



User driven modelling

- Selection rules defined
 - To give a complete and precise description of the universe of discourse
 - According to the required granularity
- Data collection and representation methods should be selected considering the intended use

Expressed by the compliance with the specifications of the theme

- verification against the corresponding INSPIRE application schema through the same set of constraints
- comparison of the specification elements with the metrics of implementation (data quality elements according to ISO 19131)

Multiple LoD

- Spatial object types (features) should follow generalisation-specification hierarchies and other formalised relationships (partonomy)

- Information coming from different sources has to be combined in a consistent way
- Themes with strong inter-relation have to be grouped and specified together
- Specific rules should be developed and formalised as constraints
- Reuse of feature concepts
 - maintenance and free accessibility of feature concept dictionary as a register (operational component) of the infrastructure
 - Interlinked and agreed cross-domain vocabularies
- Use of data matching tools (data mining, ontologies) and transformations (conflation, matching geometries, generalisation)

- Different legacy
 - Mutual agreement on position of the spatial objects, their classification, representation and the applicable data matching algorithms
- International boundaries
 - Different borderlines because of disputes, data accuracy and errors of coordinate transformation
 - Different level of details, diverging classification
 - INSPIRE requires mutual agreement; data matching can be used as last resort
 - Fixed frame of state boundaries may serve for anchoring other datasets from both side
 - Specific attention to the segmentation at generalisation (triple boundary points, intersections with linear spatial objects, natural and artificial landmarks)

- INSPIRE is a legal-technical instrument for accessing spatial data for environmental purposes in a coherent way
- Main added value of SDI: information/data presented in a consistent way
- Consistency is required within a dataset, between different LoDs and legacy, between various thematic data, and along/across the international boundaries
- Coherent information integration may require appropriate on-the-fly spatial data transformation services and/or data harmonisation

- Fixing the objectives to be achieved as technical specifications the INSPIRE Directive leaves the decision for the Members States how to arrive at the targeted interoperability
- In addition to the obligatory elements set in the Implementing Rules best practices of implementation have to be promoted (implementation of multiple-representation databases and generalisation services)
- The legal enforcement puts the operational European SDI in a reasonable perspective (2019) for all the 34 data themes listed in the annexes of the Directive

Thanks for your interest!

To learn more please visit

<http://www.ec-gis.org/inspire>

Late questions please send to

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