

THREDDS

Technical Task Force Workshop

NCAR's ATD Atrium, FL1 - Boulder (CO) - May 2002

THREDDS Vs Metadata and OpenGIS & ISO TC211

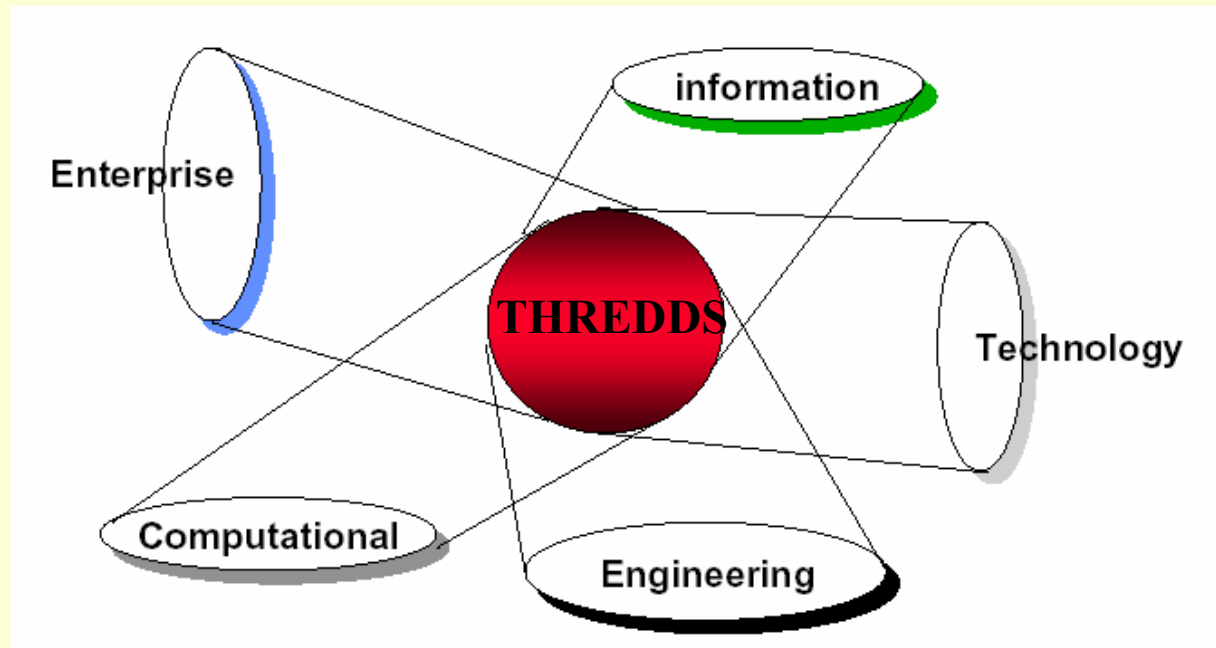
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THREDDS System

- Open Distributed Processing (ODP) System
- Architectural Framework of the Reference Model for Open Distributed Processing (RM - ODP)
 - International standard of **ISO/IEC** and **ITU-T** (formerly CCITT)
 - ISO 10746-1,2,3,4
 - ITU-T X901-4
- Separation of concerns:
 - 5 viewpoints



Five Viewpoints

1. Enterprise viewpoint:
 - articulates a “business model” that should be understandable by all stakeholders; focuses on purpose, operational objectives, policies, enterprise objects, etc.
2. Information viewpoint:
 - focuses on information content and system behaviour (i.e. data models, semantics, schemas)
3. Computational viewpoint:
 - captures component and interface details without regard to distribution
4. Engineering viewpoint:
 - exposes the distributed nature of the system and provides standard definitions to describe engineering constraints
5. Technology viewpoint:
 - describes where to apply the technologies/products of choice and allows for conformance testing against the architectural specification



THREDDS Metadata

- Metadata is essential in the context of:
 - Information Viewpoint
 - Information Interoperability
 - Computational Viewpoint
 - Computational Interoperability

Metadata related to the Information Viewpoint

- Describes the following information aspects
 - Information Structure
 - Information Content
 - Information Encoding
- Information Communities are characterised by different Metadata
 - Especially for the Content and Encoding

■ THREDDS Information Community



THREDDS Information Communities

- THREDDS may encompass several Information Communities
- Two convenient main kinds of Information Communities
 - Digital Library Community
 - Geo-information Community

Digital Library
Community

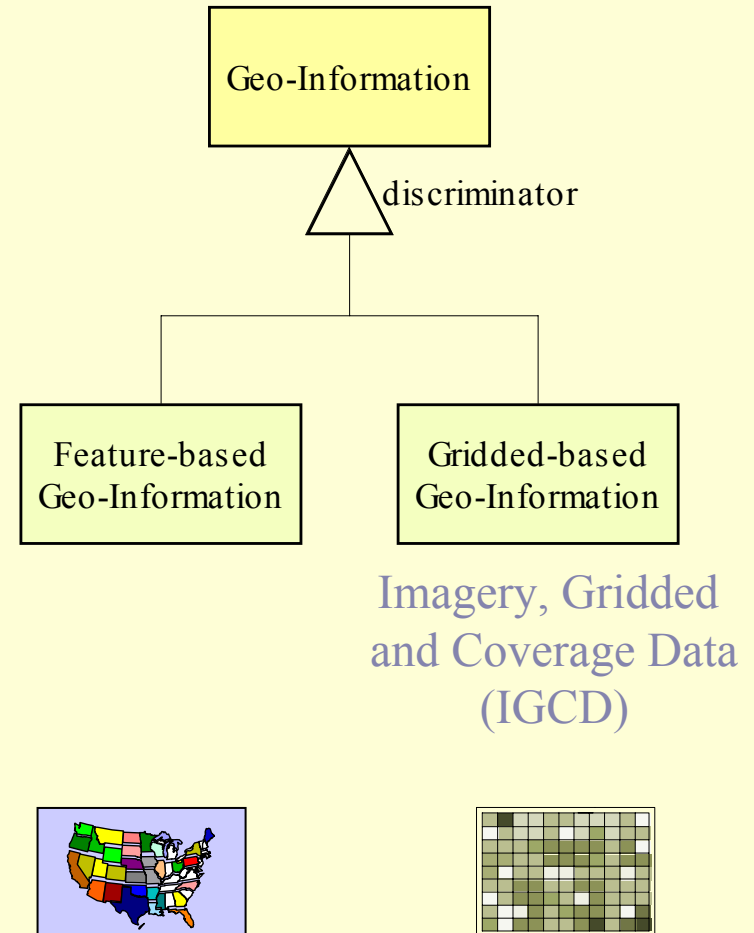
Geo-Information
Community



Geo-Information Community Metadata

Two main kinds of Geo-Information

- **Feature-based Geo-Information**
 - Structure Metadata
 - Content Metadata
 - Encoding Metadata
- **Gridded-based Geo-Information (IGDC)**
 - Structure Metadata
 - Content Metadata
 - Encoding Metadata



Geo-Information Community Metadata

■ Structure Metadata

- Geometry aspects

- *OpenGIS Topic 1 (Feature Geometry)* Feature-Based
- *ISO 19123 (IGCD)* Gridded-Based
- *OpenGIS topic 6 (Coverage)* Gridded-Based
- *OpenGIS topic 7 (Earth Image)* Gridded-Based

- Space and Time aspects

- *ISO 19107 (Spatial Schema)* Feature-Based
- *ISO 19108 (Temporal Schema)* Feature-Based Gridded-Based
- *OpenGIS topic 4 (Stored Functions)* Gridded-Based



Geo-Information Community

■ Content Metadata

- Content Description aspects

- *ISO 19115*

Feature-Based Gridded-Based

- *FGDC Extensions for Remote Sensing Metadata*

Gridded-Based

- Quality aspects

- *ISO 19113, 19114*

Feature-Based Gridded-Based

- *OpenGIS topic 9 (Quality)*

Feature-Based Gridded-Based

- *Extensions for IGCD*

Gridded-Based

- Spatial Referencing aspects

- *ISO 19111*

Feature-Based Gridded-Based



Geo-Information Community

■ Encoding Metadata

● Encoding Rules

- *ISO 19118 (XML encoding rules)* Feature-Based Gridded-Based
- *OpenGIS GML Ver. 2.1, 3.0* Feature-Based Gridded-Based
(*Geography Markup Language*) encoding rules
- *OpenGIS SensorXML* Gridded-Based
(*Sensor Model Language*) encoding rules
- *ESML encoding rules* Gridded-Based
- *IMML* Gridded-Based
(*Imagery Metadata Markup Language*) encoding rules
-



DL Information Community Metadata

■ Structure Metadata

- *Dublin Core Metadata Initiative (DCMI) Element Sets Modelling*
- *ADL Structure Modelling*

■ Content Metadata

- *Dublin Core Metadata Initiative (DCMI) element sets:*
 - *Content, Intellectual Property and Instantiation*
- *ADL Content Metadata;*

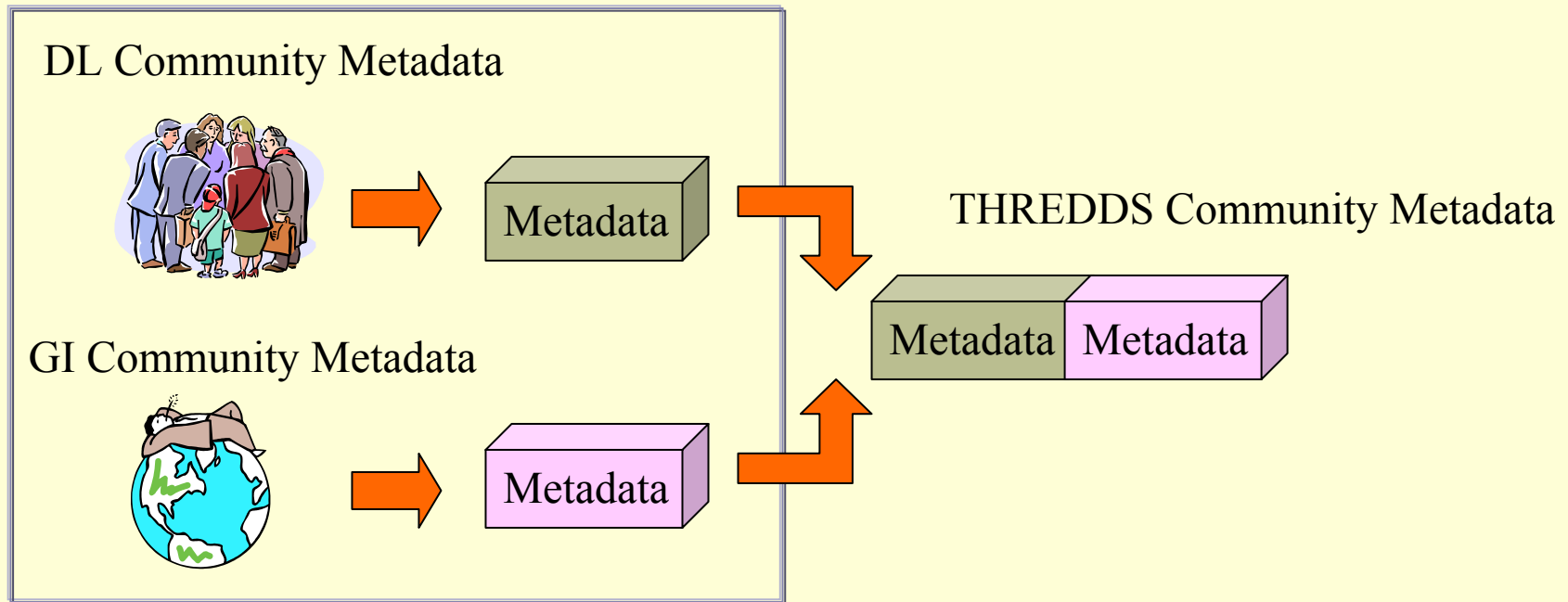
■ Encoding Metadata

- *Dublin Core elements Encoding rules for:*
 - *RDF/XML;*
 - *HTML 4.0/5.0;*
 - *DCSV (Dublin Core Structured Value)/XML;*
 - *MS Office file header encoding;*
 - *ISO 19118/XML;*
 - *GML 3.0;*
 - *...*



THREDDS Information Community Metadata

- An Aggregation approach?

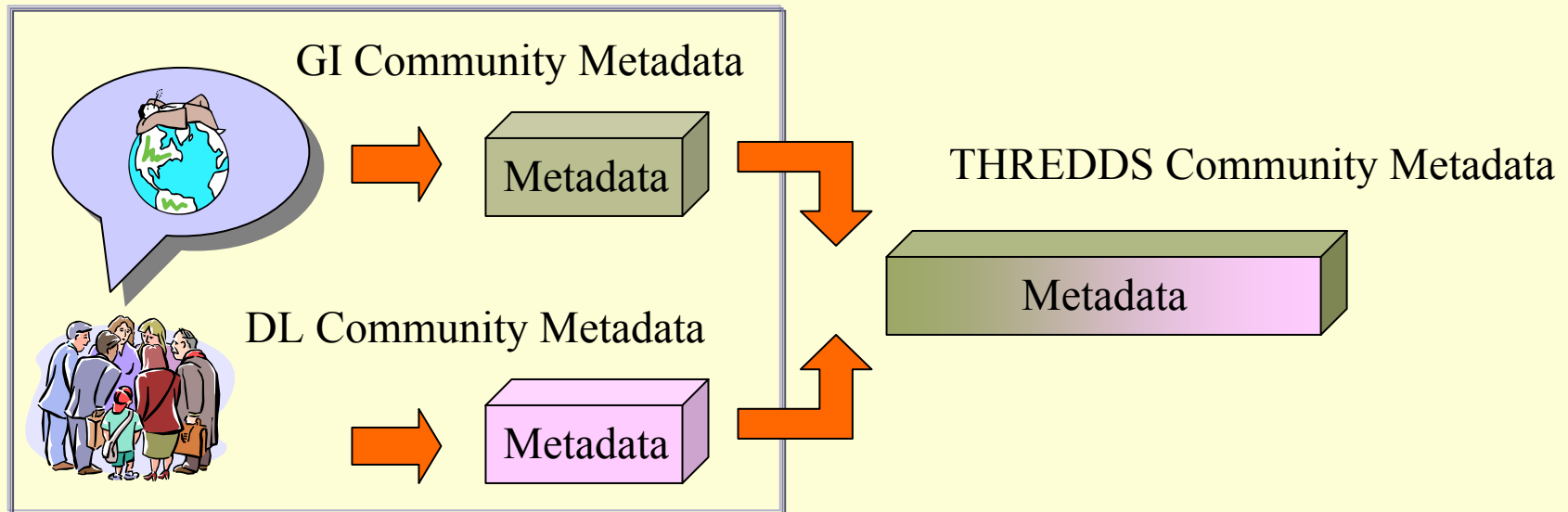


- The DL and the GI Metadata contents are both present and separate



THREDDS Information Community Metadata

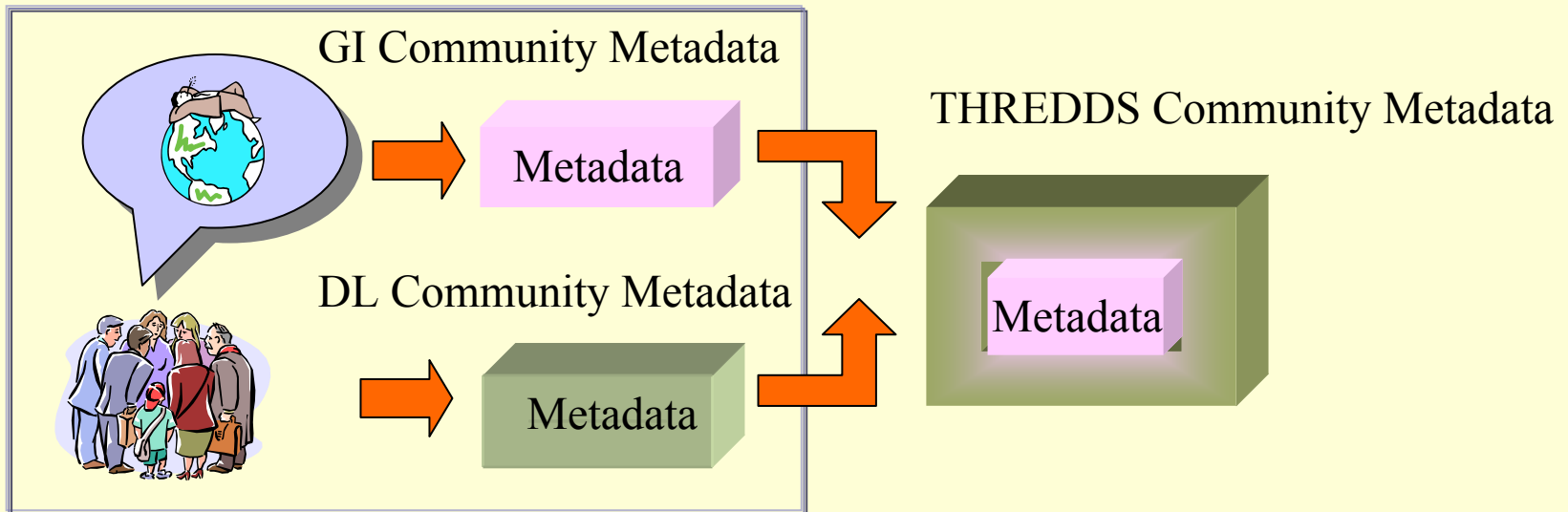
- An Extension approach?



- The DL Metadata content is extended by the GI Metadata content (e.g. through pointers)

THREDDS Information Community Metadata

■ An Abstraction Approach?



- The DL metadata content presents a high level abstraction of the GI metadata content, which is present and accessible

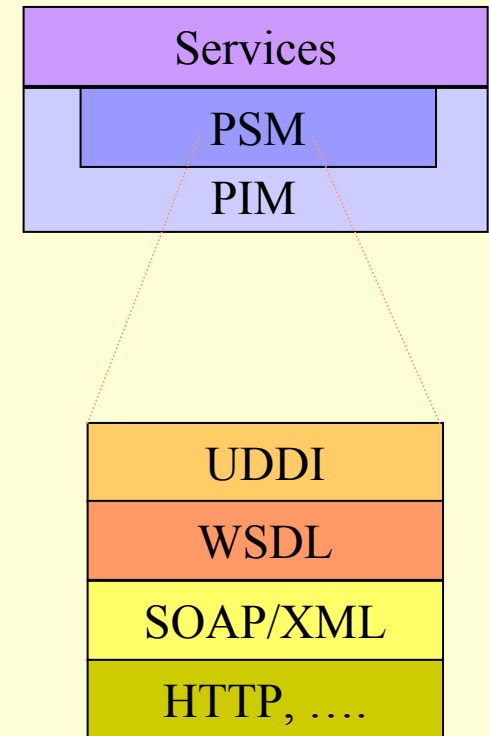
Metadata related to the Computational Viewpoint

- Helps to deal with the THREDDS System Distribution needs:
 - Heterogeneous Systems Computational Interoperability
 - Openness;
 - Integration;
 - Flexibility;
 - Modularity;
 - Federation;
 - Manageability;
 - Security;
 - Transparency.
 - Specific Information Community application services
 - Digital Library Community
 - Resource harvesting
 - Resource discovery
 - Geo-Information Community
 - Registry Services (e.g. Catalogue Service)
 - Geo-services



Computational Interoperability Support: Metadata

- **OMG MDA (Model Driven Architecture™) approach**
 - A broad ranging standard to enable interoperability of all current and future middleware technologies:
 - XML/SOAP, EJB/J2EE, CORBA/IDL and .NET
 - The architecture considers:
 - A platform independent model (PIM)
 - Examples of possible Metamodel:
 - XMI (XML Metadata Interchange),
 - MOF (Meta Object Facility),
 - CWM (Common Warehouse Metamodel)
 - One or more platform specific models (PSM)
- **Web Service Model**
 - Metadata content
 - WSDL (Web Service Description Language)
 - SOAP Header content
 - XML Schema (XSD)
 -



Geo-Information Community Services: Metadata

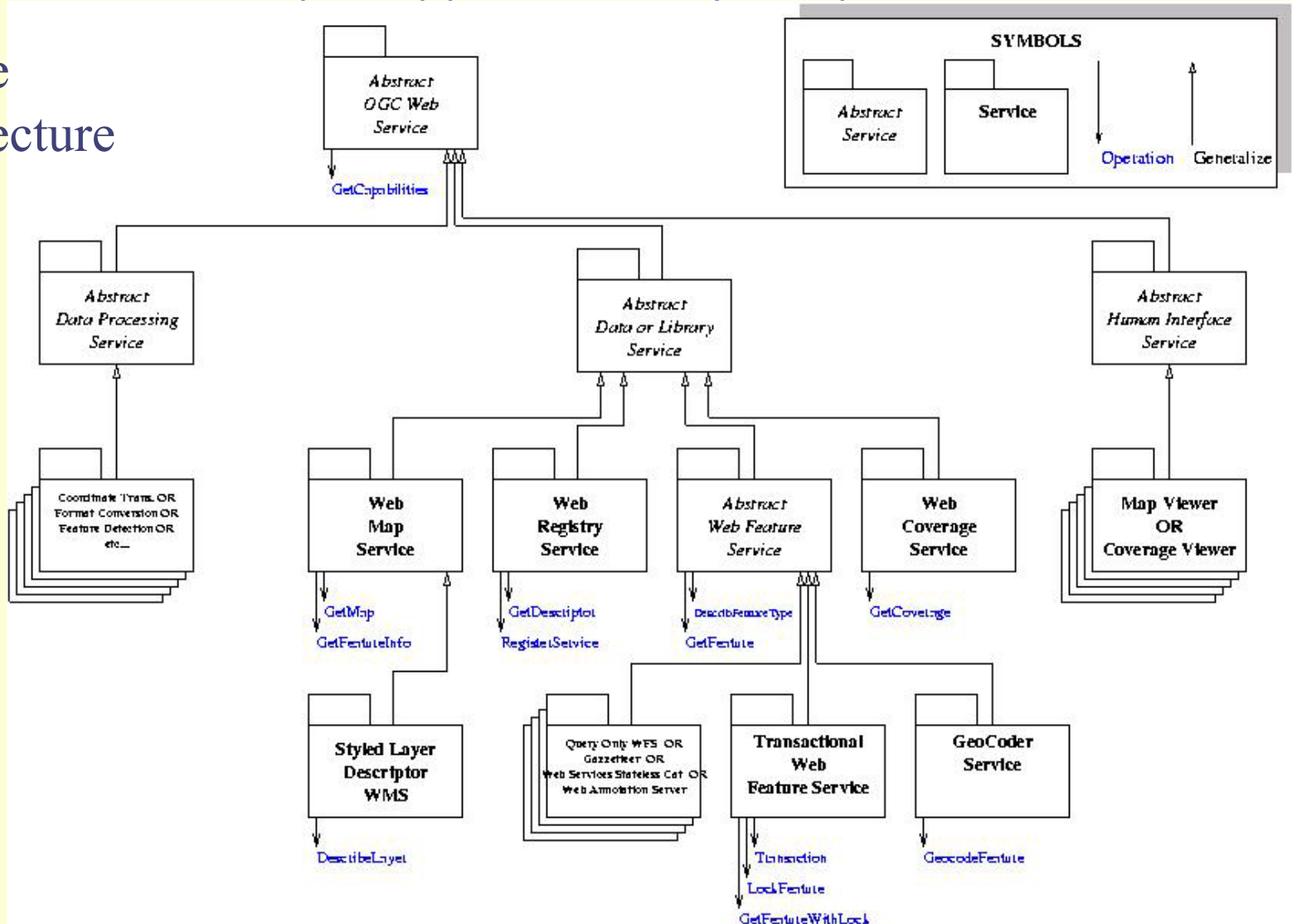
- General Geo-Information service interface model
 - *ISO 19119*
- Data Services
 - Web Feature Service
 - Web Coverage Service
 - Web Sensor Service
 - Web Map Service
 - *ISO 19128*
 - *OpenGIS® Web Map Server Interfaces Implementation Specification*
 - Web Registry Service
 - *OpenGIS topic 13 (Catalogue Service);*
- Data Processing Services
 - Image Coordinate Transformation Service
 - *OpenGIS topic 16;*
- Human Interface Services
 - Portrayal Service
 - *ISO 19117*



OpenGIS Initiatives: OWS

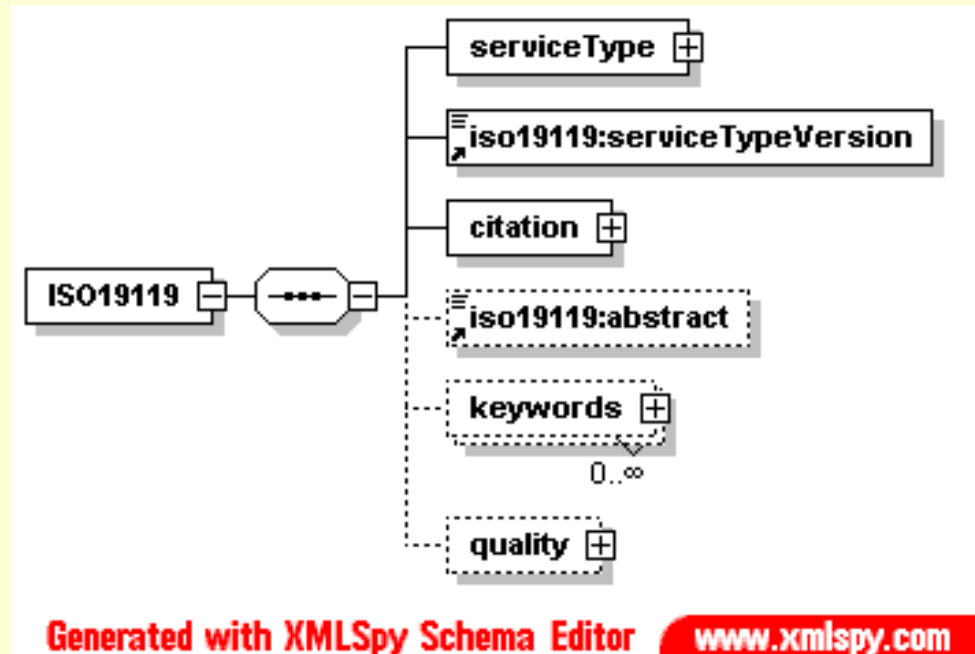
- Web Services Technology & GI Services
- OGC Web Services (OWS) (under development)

Service Architecture



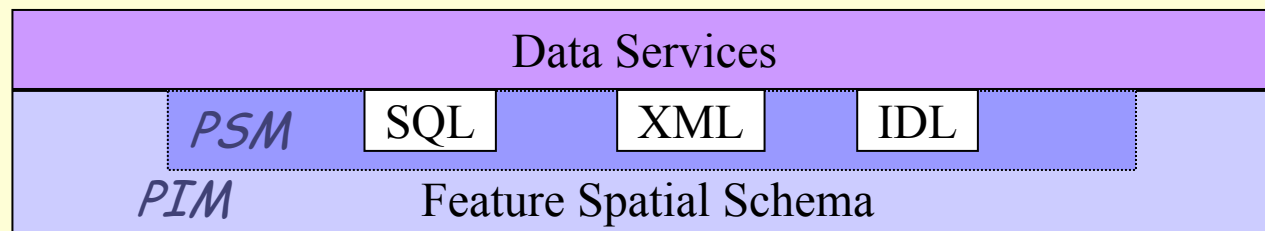
OpenGIS Initiatives: OWS

- OWS Service Metadata Specification
 - WSDL extension
 - Compliant with ISO 19119



OpenGIS Initiatives: GAIA

- OMG MDA approach & GI data services
 - GAIA (Geoinformation Access Interchange and API) (to be approved)
- GAIA PIM
 - the OpenGIS topic 1 (ISO DIS 19107 Spatial Schema);
 - Formalised in UML
- One GAIA PSM that covers the following implementation:
 - SQL 1999
 - ISO 13249-3, Information technology— Database languages— SQL Multimedia and Application Packages— Part 3: Spatial
 - *ISO 19125-1, Geographic information — Simple feature access— Part1: Common architecture*
 - *ISO 19125-2, Geographic information — Simple feature access— Part2: SQL option*
 - XML
 - IDL



Conclusions

- Metadata is essential for the THREDDS system
 - Information viewpoint
 - Computational Viewpoint
- Several important specifications from GI international Standardisation Initiatives
 - ISO 19100 serie of standards
 - OpenGIS Consortium
- Issues
 - Several specifications and Interesting initiatives are under development
 - Especially for Gridded-based Geo-Information
 - The real consensus of the international GI Community is not yet clear
- Other important contributions from
 - OMG (e.g. MDA, MOF, XMI)
 - W3C (e.g. XML Schema, WSDL, RDF)

