Interoperability, Standards, and Metadata

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Agenda

- Interoperability
- Standards
- ISO TC 211
- Metadata?
  - Not just for catalogs
- An introduction to ISO 19115
- Metadata work in ISO TC211

Why Is Interoperability Important?

- No person (or organization) can advance independently
  - Man has survived and prospered through teamwork - interoperating
  - Think globally, act locally
  - Global economy - interoperating on a global scale
- Things are expensive
  - Duplication of effort is wasteful
  - Maximize ROI

Enhanced Interoperability improves: Communication, Efficiency, Quality

GIS has always required Interoperability

- Geographic analysis
  - Multiple sources, multiple organizations
  - Distributed within a community
  - Merging diverse information types

and continues to…

- Enterprise GIS
  - GIS evolving beyond isolated communities
  - GIS merging with broader IT infrastructures
- GIS Web Services
  - Enabled by distributed networks
  - Loosely coupled

Interoperability ...

from ISO TC 211

- the ability to **find** information and processing tools, when they are needed, no matter where they are physically located
- the ability to **understand and employ** the discovered information and tools, no matter what platform supports them, whether local or remote
- the ability to **participate in a healthy marketplace**, where **goods and services are responsive to the needs of consumers**

Varieties of Interoperability

- Technical
- Semantic
- Political/Human
- Legal
- Inter-disciplinary

Interoperability Enablers

- Infrastructure
  - Compatible Technology
- Authorization
- Copyright
- Business Agreements
  - MOUs
- Business Model
  - Pricing/commerce
- **Standards**
- Security
  - Privacy
- Information Assurance
  - Certification
  - Quality
- **Metadata**

Standards

As defined by ISO
http://www.iso.ch

- Documented agreements:
  - Technical specifications, precise criteria, rules, guidelines, definitions of characteristics
    - Ensuring materials, products, processes and services are fit for purpose
  - Reference documents used in public contracts or international trade
    - Indisputable reference clarifying the contractual relations between economic partners
- Promote competition, commerce and free trade

Standards and Specifications

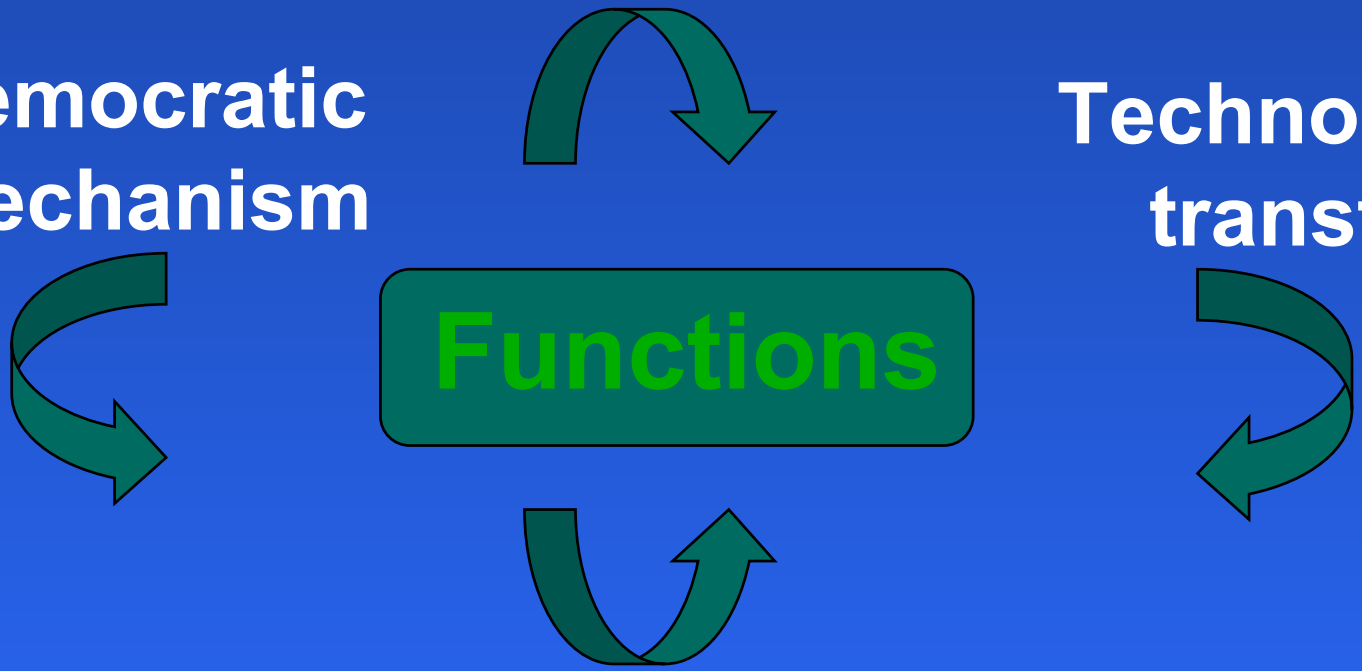
- Make things work – affect every aspect of life
- Widespread use of Standards (International)
  - Make things work around the world
  - Increase efficiency - globally
- Developing standards is a lot of work
  - Many organizations involved
  - Take time to develop
  - Complicated
  - 20% technical 80% political

Standards

Political compromise

Democratic mechanism

Technology transfer



Consensus technical solutions

From H.Tom – *Standards for Enabling International Interoperability*

Participation in Standards

- **Organizationally**
  - International Standards
  - Regional Standards
  - National Standards
  - Information Community Standards
    - NATO ICAO, IHO…
- **Operationally**
  - Platform
  - GIS standards
  - IT/industry standards

ESRI Actively Participates in Interoperability & Standards Organizations

- **ISO** – International Organization for Standardization
- **OGC** – Open GIS Consortium
- **ANSI/INCITS** – American National Standards Institute/International Committee fo Information Technology Standards
- **OASIS** – Organization for the Advancement of Structured Information Standards
- **IHO** – International Hydrographic Organization
- **WS-I** – Web Services Interoperability Organization
- **OMA** – Open Mobile Alliance (formerly LIF)
- **WLIA** – Wireless Location Industry Association
- **FGDC** – Federal Geographic Data Committee
- **GSDI** – Global Spatial Data Infrastructure
- **CEN** – Committee for European Normalization
- **DGIWG** – Digital Geographic Information Working Group
- **EPSG** – European Petroleum Survey Group
- **ACSM** – American Congress on Surveying and Mapping
- **ASPRS** – American Society of Photogrammetry and Remote Sensing
- **STIA** – Spatial Technologies Industry Association

Standards Organizations

	Cross Community					Geographic					Information Communities					
	ISO	W3C	CEN	ANSI*	WS-I	OGC	GSDI	STIA	ACSM	ASPRS	DGIWG	IHO	FGDC	EPSG	OMA	WLIA
Standard Development SGML ISO TC211 Spatial Schema	X		X	X							X	X	X			
Specification Development Data Models Web Services	X	X	X	X	X	X			x	x	X	X	x	x	x	
Authority	X	X	X	X		x			x	x		X			x	
Coordination			X	X	X		X	X	X	X			X	X	X	X
Lobbying							X	X	X				x			X
Consulting								X						X	X	X

International Organization for Standardization

- ISO from Greek ISOS meaning “equal”
- Founded in 1947
- 146 member nations
  - 1 member per country (represented through national standards organization – ANSI, DIN, etc)
  - 13700 standards, 3000 technical bodies, 30000 experts
- NGO – unlike UN
  - Delegates not national governments
  - Roots in private sector and industry associations
- Able to bridge the gap
  - Consensus solutions meeting requirements of business and broader needs of society

Hallmark of ISO Brand

- Equal footing
  - Every ISO member institution has right to take part
  - 1 nation –1 vote regardless of size or economic strength
- Voluntary
  - ISO has no legal authority
  - Adopted by nations – health, safety, etc
- Market driven
  - Developed by experts from industry, technical, business, government, academic
- Consensus
  - Ensures widespread applicability
  - Remain current

Benefits of ISO Standards

- Business/Trade
  - Wide acceptance of products and services
  - Free to compete in broader market
  - Remove technical trade barriers
  - Support political trade agreements
- Government
  - Provides technical and scientific underpinnings for health, safety, environmental legislation
- Consumers
  - Provides assurance about quality, safety, & reliability
  - Contribute to quality of life

The ISO Process

- All work performed in technical committees (TC)
- Formal Process
  - Refined over 50 years
  - Stages and timelines fully defined
- Consensus based
  - Drafts considered until consensus reached through voting process by P-members

Preliminary Stage

Proposal Stage

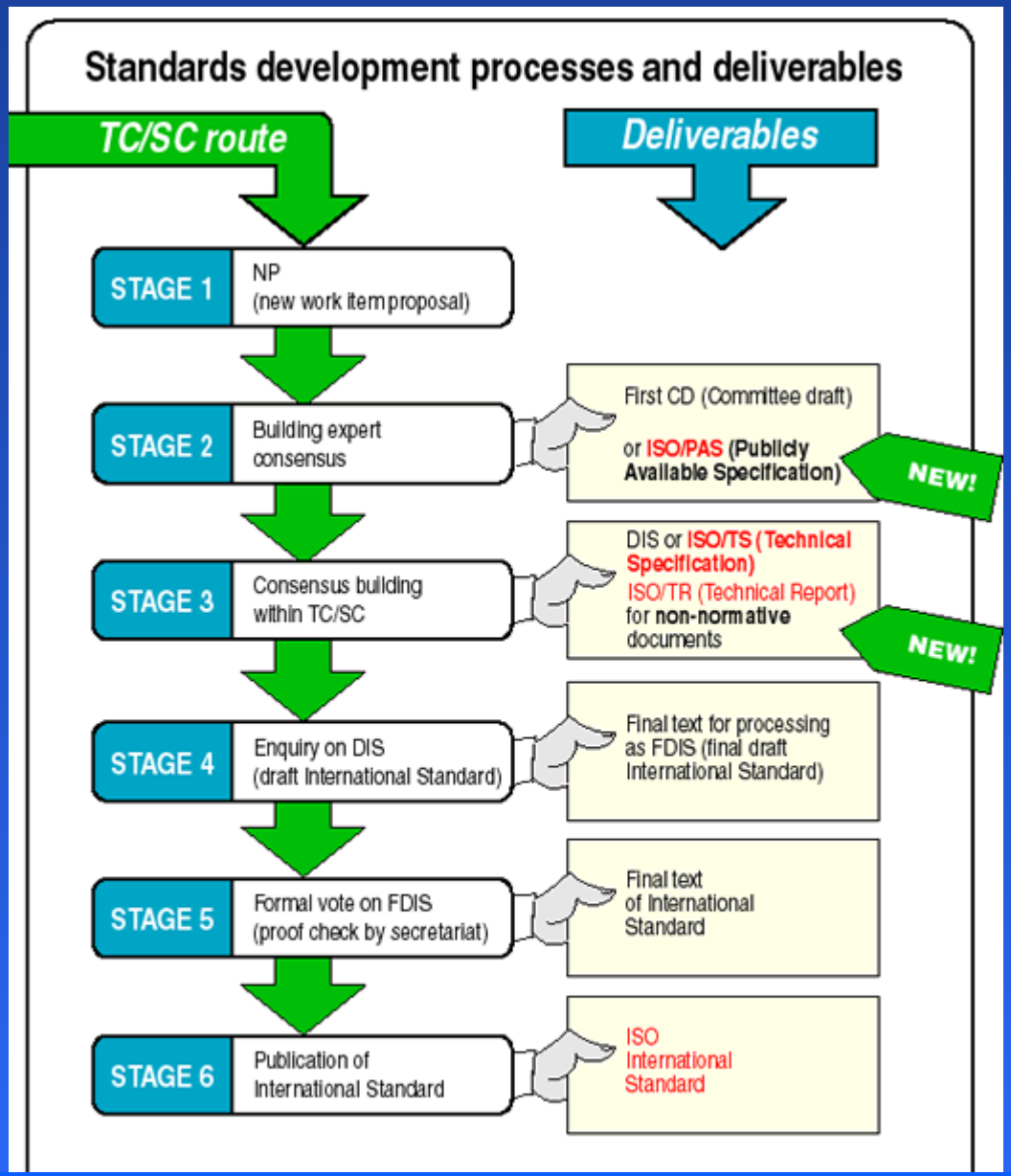
Preparatory Stage

Committee Stage

Enquiry Stage

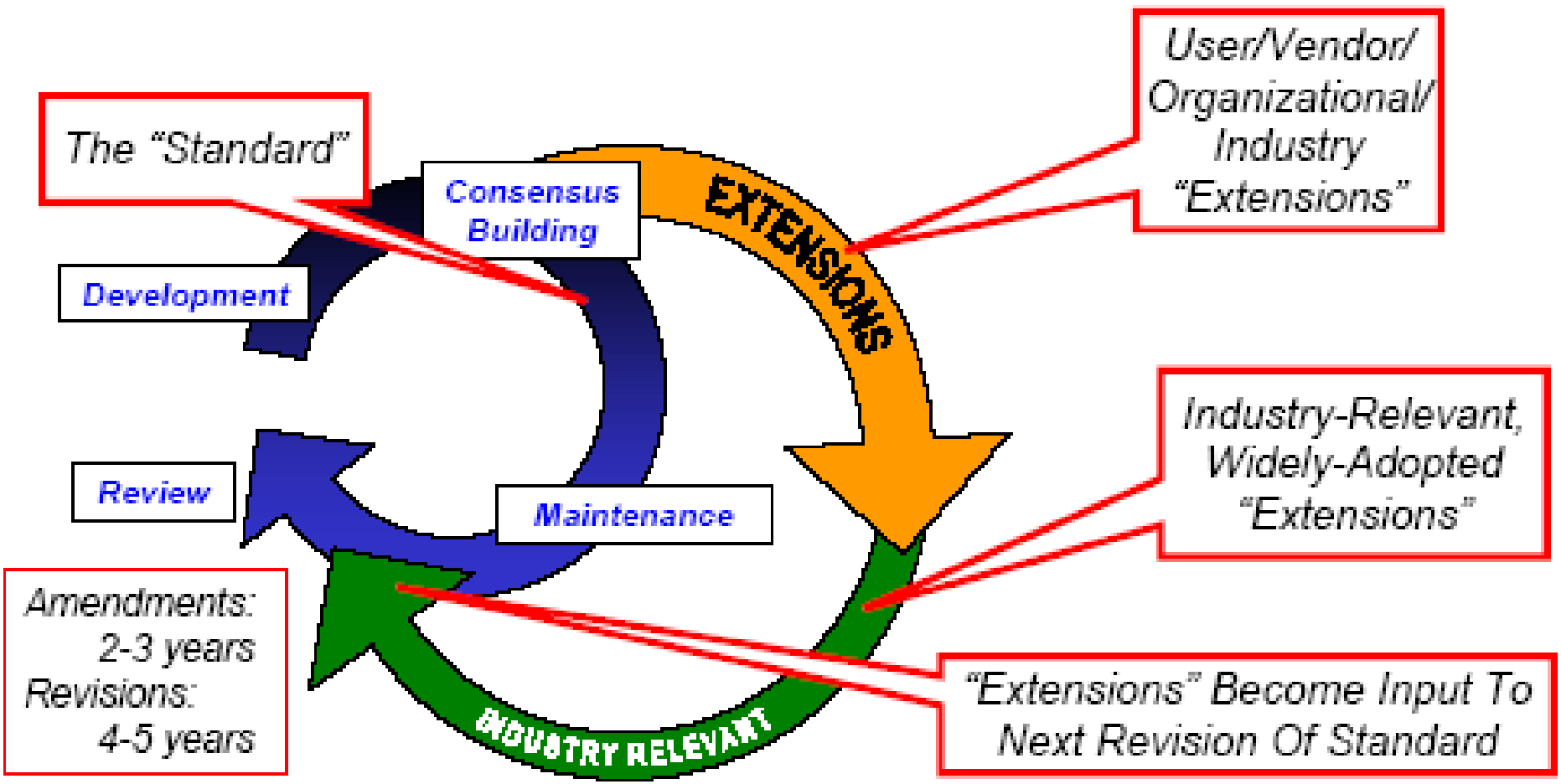
Approval Stage

Publication Stage



ISO Development Stages

Standards Development Cycle



Standardized Profiles

Standards may be simplified/tailored

"...set of one or more base standards or sub-sets of base standards…that are necessary for accomplishing a particular function."

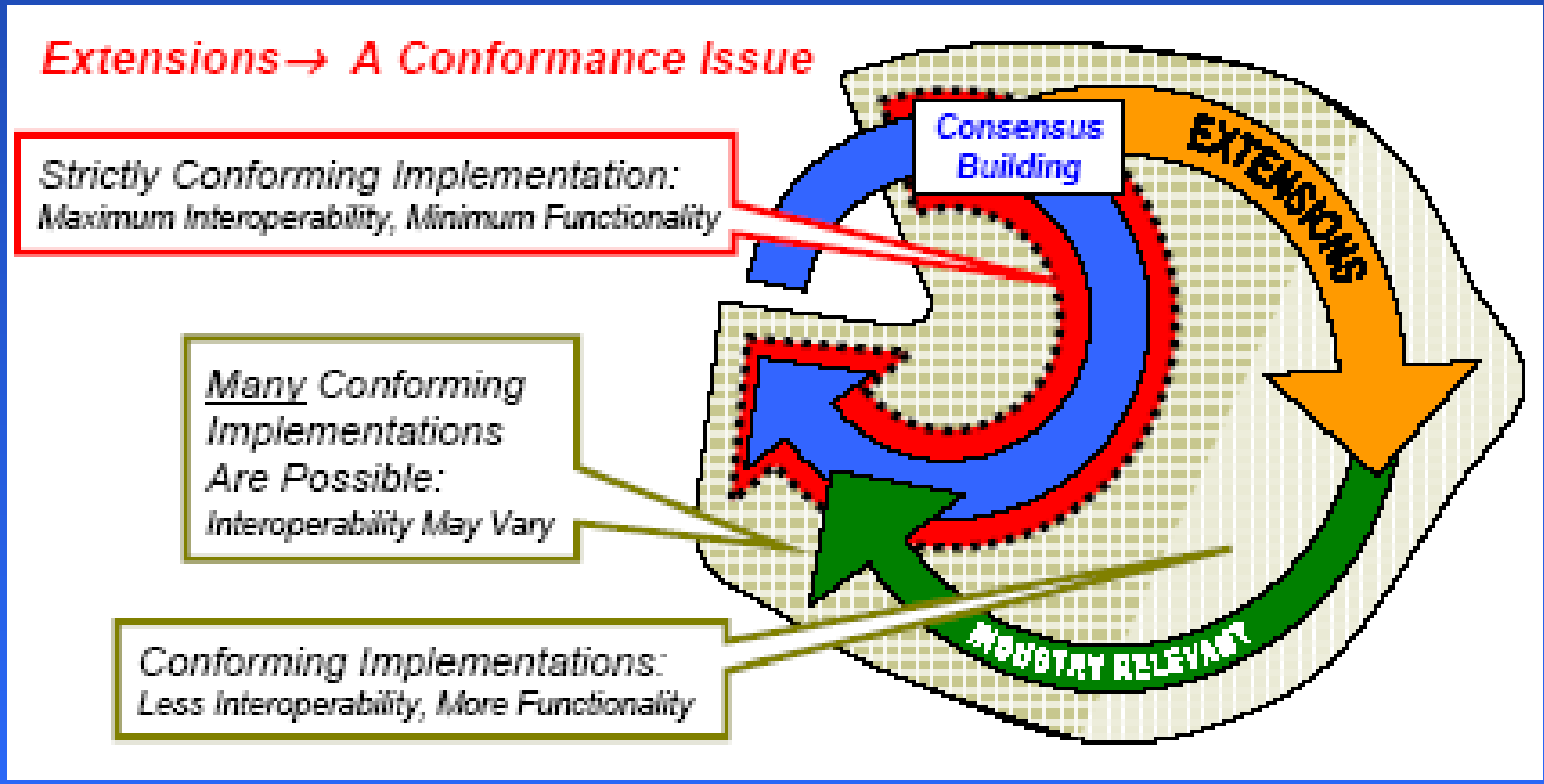
Conformance to profile = conformance with base standard(s) (Conformance Level 1, Strict Conformance)

- Registered Profiles
  - Internationally Registered (ISP)
  - Nationally Registered
- Published Profiles
  - Formally within Community
  - Informally within Organization

Profiles with extensions

- Standards balance needs of interoperability with needs that exceed requirements of the standard
  - Higher interoperability = lower functionality
  - Higher functionality = lower interoperability
- Extensions lower interoperability outside the community
- Extensions are “out of scope” with respect to base standard
- ISO 19106 - Conformance level 2 – ”conforming”

Extensions and conformance



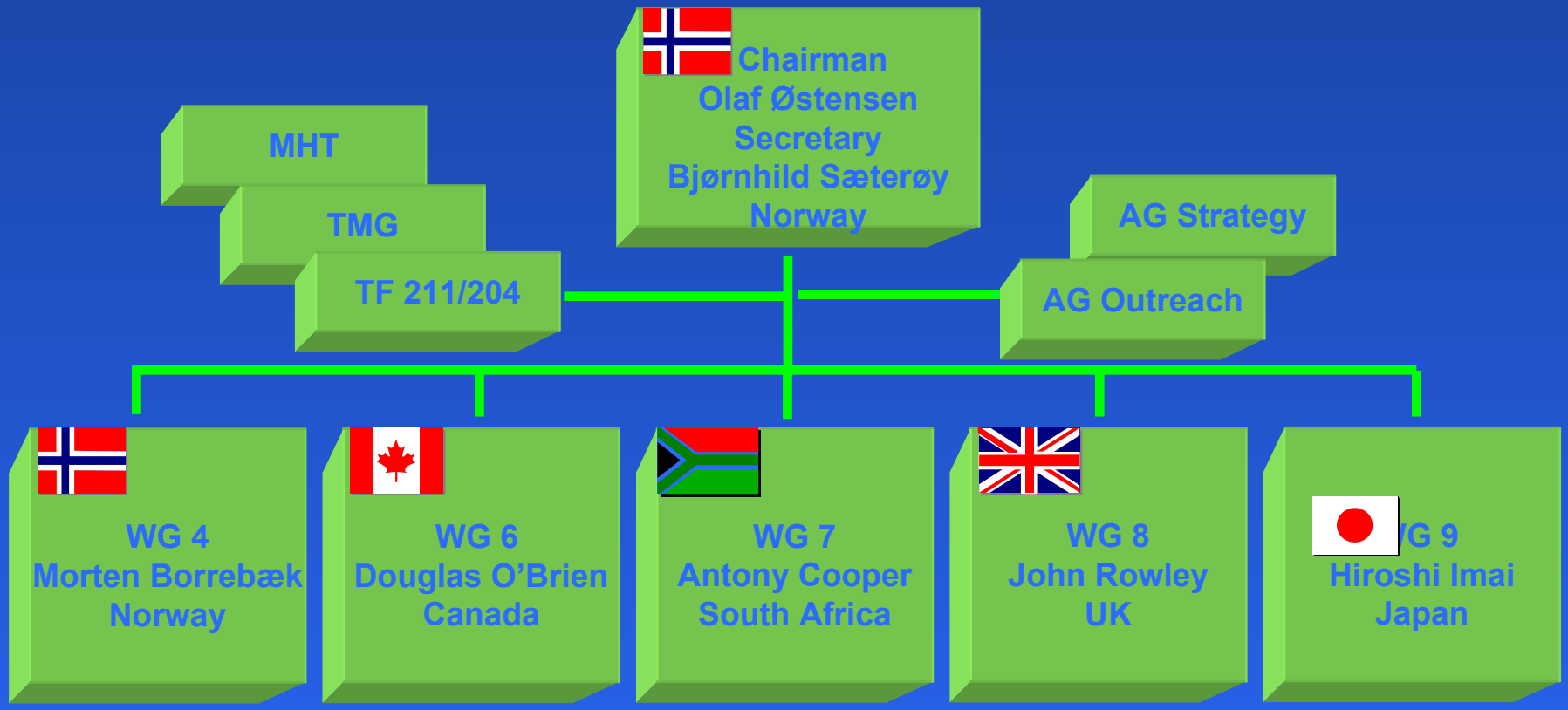
International Organization for Standardization Technical Committee 211

ISO/TC 211 Geographic information/Geomatics

filling the broad range of geographic information requirements

ESRI actively participates through ANSI-INCITS-L1

ISO / TC 211 - Geographic information



Geospatial services | **Imagery** | **Information communities** | **Location based services** | **Information management**

Countries + 50 | Liaison organizations + 25 | Standards committees + 12

Standards

Access, technology

Content (data)

Organization

Education

- ISO [illegible] Standard representation of latitude, lo[illegible] for geographic point locations
- I[illegible]odel
- ISO [illegible]eted
- ISO/TS [illegible]l sc[illegible]na language
- ISO 19104 - Te[illegible]
- ISO 19105 - Con[illegible]nc
- ISO 19106 - Profiles
- ISO 19107 - Spatial schema
- ISO 19108 - Temporal schema
- ISO 19109 - Rules for application schema
- ISO 19110 - Feature cataloguing methodology
- ISO 19111 - Spatial referencing by coordinates
- ISO 19112 - Spatial referencing by geographic identifiers
- ISO 19113 - Quality principles
- ISO 19114 - Quality evaluation procedures
- ISO 19115 - Metadata
- ISO 19116 - Positioning services
- ISO 19117 – Portrayal
- ISO 19118 - Encoding
- ISO 19119 - Services
- ISO/TR 19120 - Functional standards + new rev
- ISO/TR 19121 Imagery and gridded data
- ISO/TR 19122 - Qualifications and certification of personnel
- ISO 19123 - Schema for coverage geometry and functions
- ISO/RS 19124 - Imagery and gridded data components
- ISO 19125 - Simple feature access – Part 1-3
- ISO 19126 - Profile - FACC Data Dictionary
- ISO 19127 - Geodetic codes and parameters
- ISO 19128 - Web Map Server Interface
- ISO 19129 - Imagery, gridded and coverage data framework
- ISO 19130 - Sensor and data model for imagery and gridded data
- [illegible]SO 19131 - Data product specification
- [illegible]0132 - Location based services possible standards
- [illegible] Location based services tracking and navigation
- [illegible] [illegible]modal location based services [illegible]for routing and navigation
- ISO 19135 [illegible]r registration of [illegible]a information items
- ISO 19136 – Geograp[illegible] La[illegible]ge (GML)
- ISO 19137 - Generally us[illegible]o[illegible]e spatial schema and of similar important other schem[illegible]
- ISO 19138 - Data Quality Measu[illegible]
- ISO 19139 - Metadata - Implementation [illegible]
- ISO 19140 - Technical amendment to the ISO [illegible] Geographic information series of standards for harmonization and enhancements

Completed Standards
The Building Blocks

- ISO 19101:2002 - Reference model
- ISO 19105:2000 - Conformance and testing
- ISO 19106:2004 - Profiles
- ISO 19107:2003 - Spatial schema
- ISO 19108:2003 - Temporal schema
- ISO 19111:2003 - Spatial referencing by coordinates
- ISO 19112:2003 - Spatial referencing by geographic identifiers
- ISO 19113:2002 - Quality principles
- ISO 19114:2003 - Quality evaluation procedures
- ISO 19115:2003 - Metadata
- ISO 19116:2004 - Positioning Services
- ISO 19125:2004 - Simple feature access – Part 1-2
- **And several technical reports**

Draft International Standards

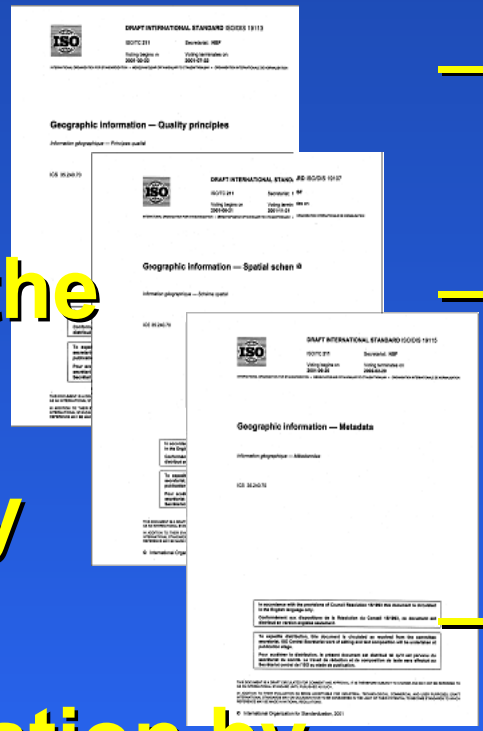
- ISO/DIS 19104 - Terminology
- ISO/DIS 19109 - Rules for application schema
- ISO/FDIS 19110 - Feature cataloguing methodology
- ISO/DIS 19117 - Portrayal
- ISO/DIS 19118 - Encoding
- ISO/DIS 19119 - Services
- ISO/DIS 19123 - Schema for coverage geometry and functions
- ISO/DIS 19128 - Web Map server interface
- ISO/DIS 19133 - Location based services tracking and navigation
- ISO/DIS 19135 - Procedures for registration of items of geographic information
- ISO/PDTS 19139 - Metadata – XML Schema implementation

The Foundation

- Framework/standards infrastructure
  - basic architecture
    - ISO 19101
  - service architecture
    - ISO 19119, etc
- Locate, understand
  - Metadata
    - ISO 19113, 14, 15
- Basic structure
  - Spatial, temporal schemas, CRS definition
    - ISO 19107-8, 9, 11
- Access
  - Simple feature access, ISO 19125
  - Web map services, ISO 19128
- Data content descriptions
  - ISO 19103, 19109, 19110, etc

Geographic Information Standards

- ISO 19100 suite of standards
  - Maturing
  - Providing the basics
  - Adopted by nations
  - Implementation by industry

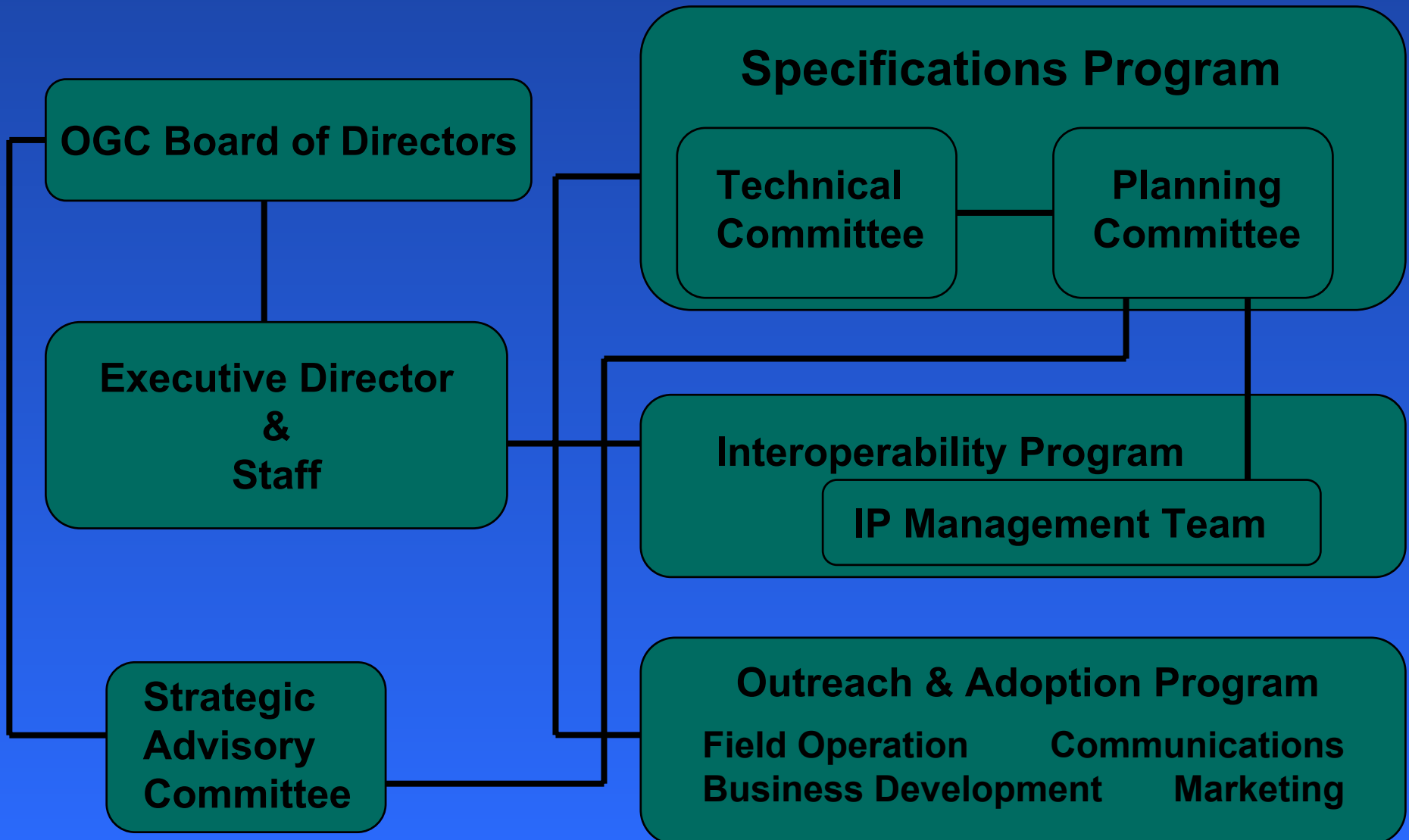


- ISO TC 211
  - Organizing for the future
  - Addressing broader community issues
  - Maintaining leadership role

an international industry consortium of 250+ companies, government agencies and universities participating in a consensus process to develop publicly available geoprocessing specifications

- Mission
  - **Deliver spatial interface specifications that are openly available for global use**

Open Geospatial Consortium (OGC)



From H.Tom – *Standards for Enabling International Interoperability*

Adopted OGC Specifications

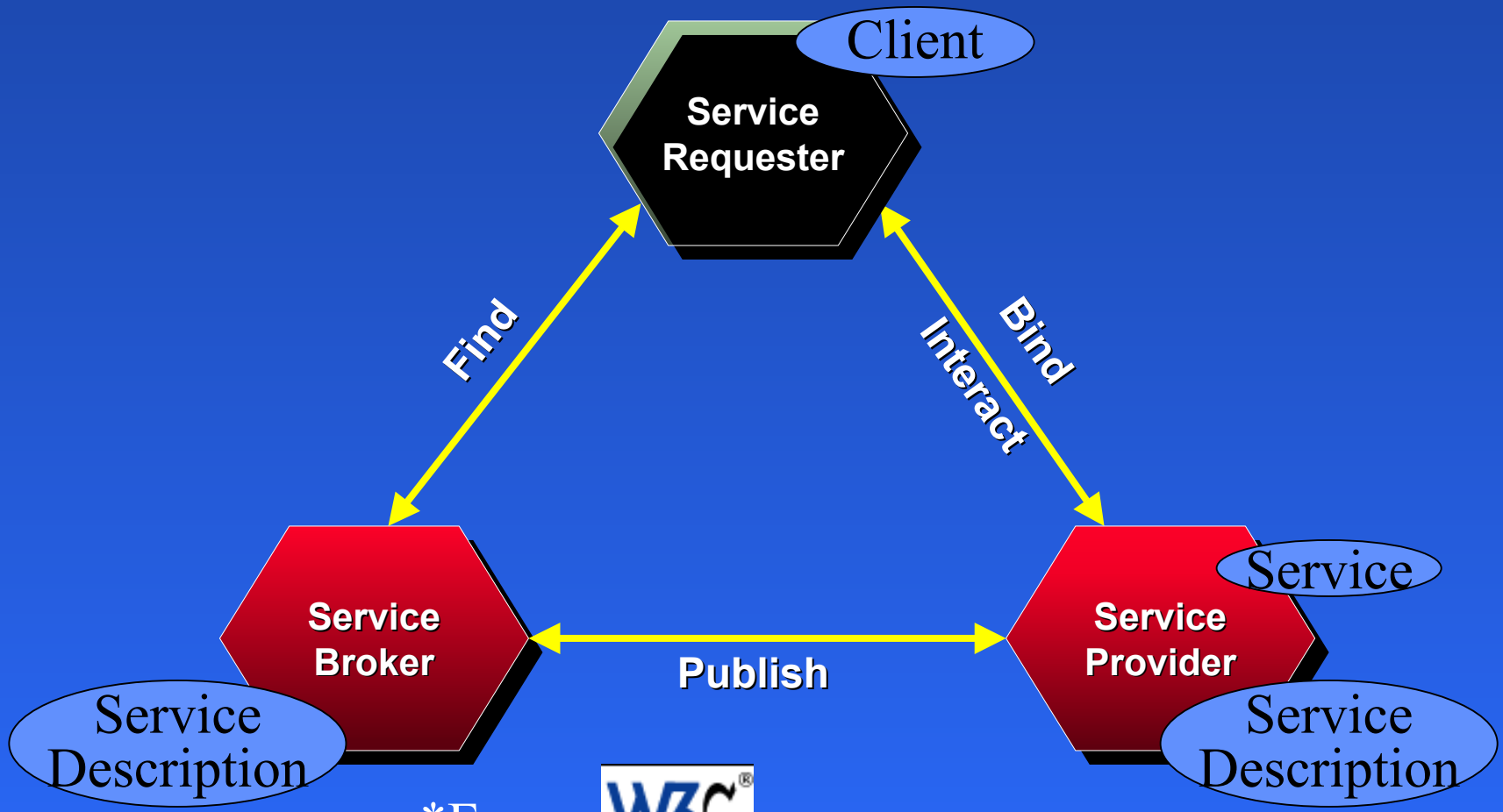
- Catalog Interface (CAT)
- Coordinate Transformation Services (CT)
- Filter Encoding (Filter)
- Geography Markup Language (GML 3.0)
- Grid Coverages (GC)
- Location Services (OpenLS)
- Simple Features – CORBA (SFC)
- Simple Features – SQL (SFS)
- Simple Features – OLE/COM (SFO)
- Styled Layer Descriptor (SLD)
- Web Coverage Service (WCS)
- Web Feature Service (WFS)
- Web Map Context Documents (WMC)
- Web Map Service (WMS)

Information Technology Standards

Leading the web to its full potential

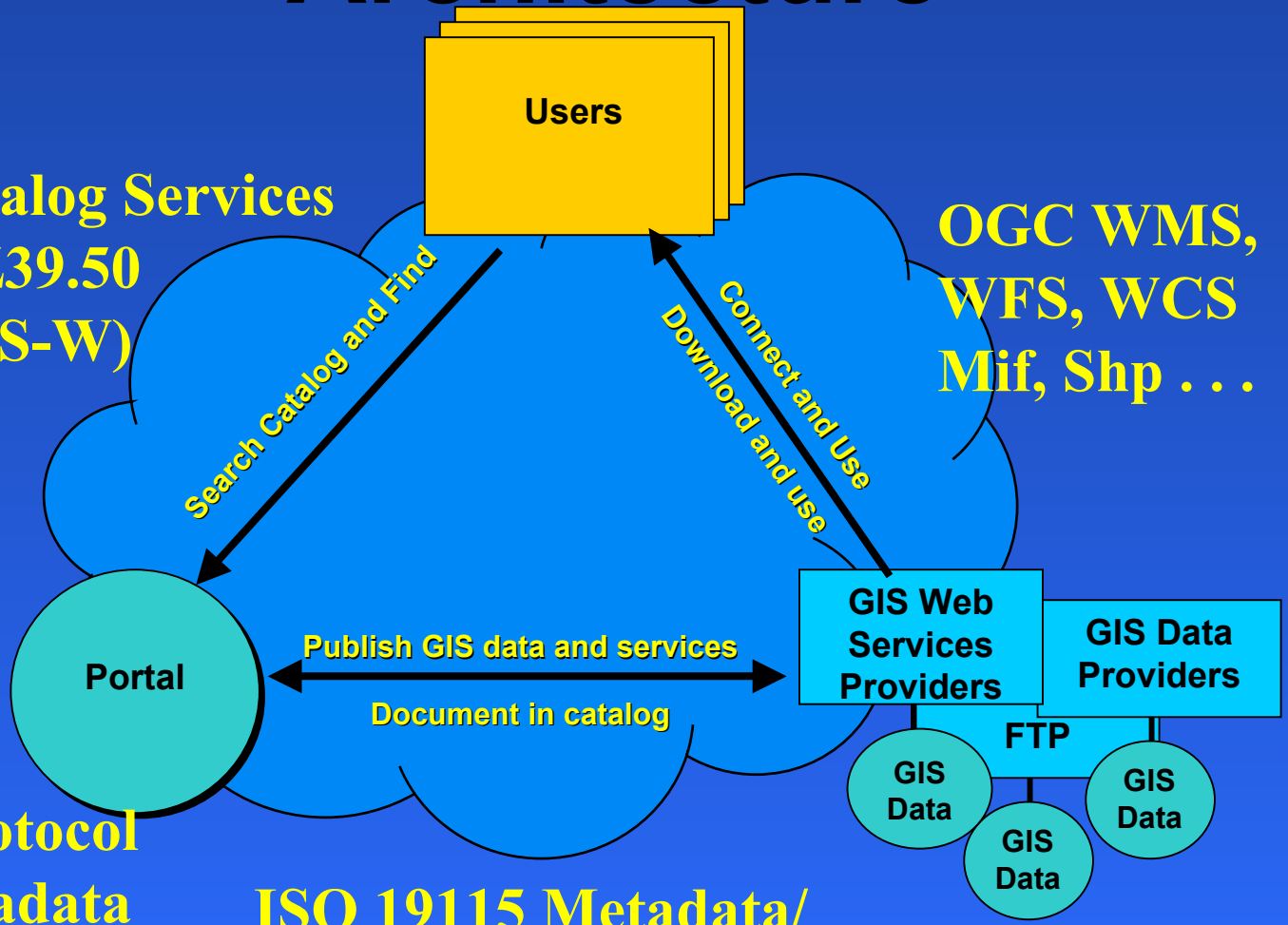
- XML - **Extensible Markup Language**
  - **Profile of SGML** (ISO 8879)
- WSDL - **Web Services Description Language**
  - **An XML language for describing Web services**
- SOAP - **Simple Object Access Protocol**
  - **A lightweight protocol for exchanging information**

W3C Service Oriented Architecture*



*From W3C Web Service Architecture, 14 Nov. 2002

ESRI's Metadata Portal Architecture



OGC Catalog Services (Z39.50 CS-W)

OGC WMS, WFS, WCS Mif, Shp . . .

OAI Protocol for Metadata Harvesting

ISO 19115 Metadata/
ISO 19139 Metadata
XML Schema Implementation

Portal Standards

- ISO 19115: 2003 Geographic Information -- Metadata
  - ISO 19139 Metadata XML Schema Implementation
- OAI-PMH Open Archives Initiative Protocol for Metadata Harvesting 2.0
- OpenGIS® Catalog Services Implementation Specification (CAT 2.0)
  - Z39.50 Protocol Bindings - ISO 239.50: 1998 Information and documentation – Information retrieval (Z39.50) – Application service definition and protocol specification
  - Http Protocol Bindings – Catalog Services-Web
- OpenGIS® Web Map Service Implementation Specification (WMS) 1.3

Metadata

- Data about Data
- Documentation that describes information (data) so it can be understood
- Insures the right data for the right purpose
  - is used correctly

Geospatial data has a long history using Metadata

Paper Maps

Identification

Symbols

Date

Sources

Producer

Navigation notices

Accuracy

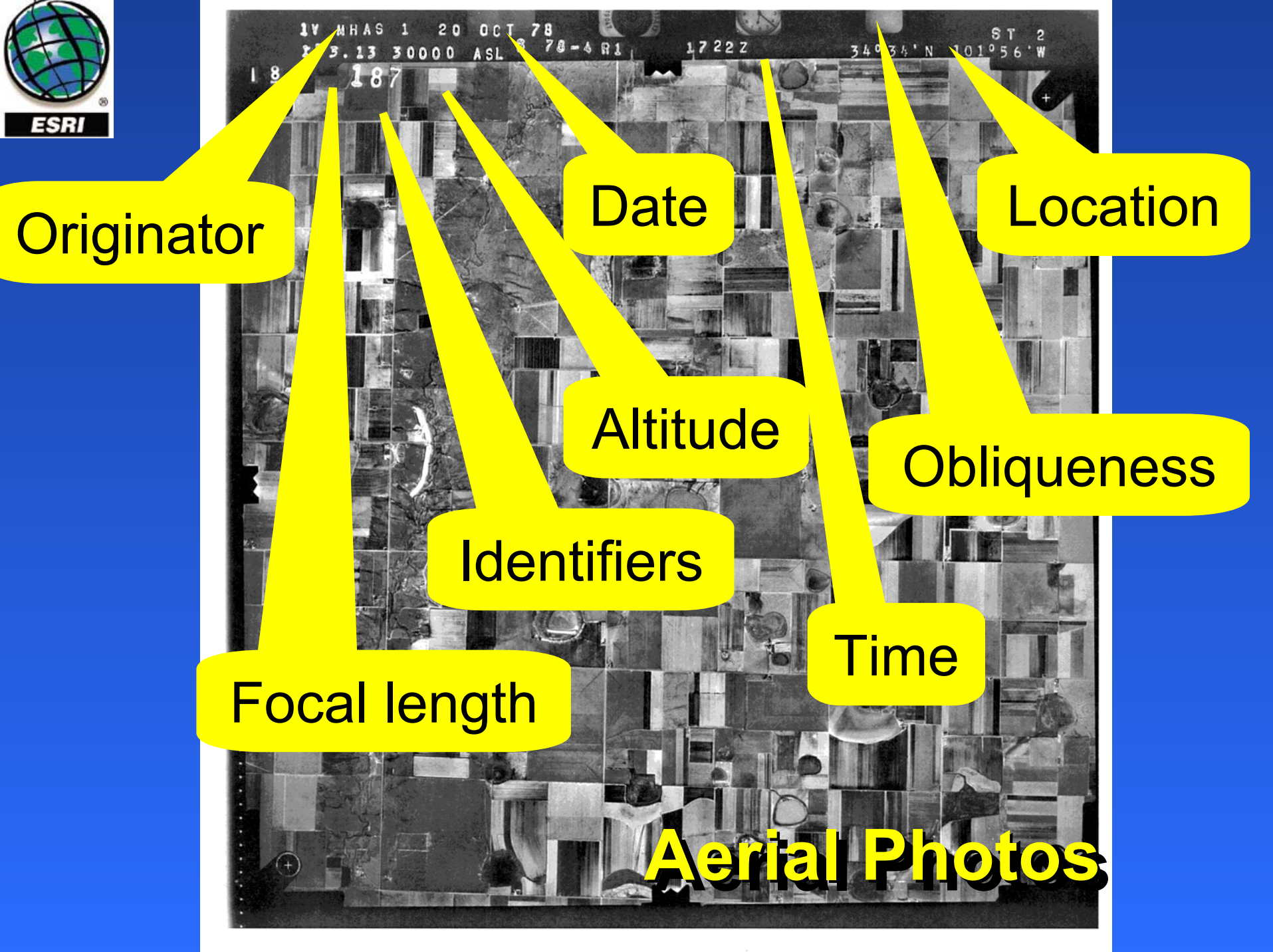
Reference system

Scale

Title

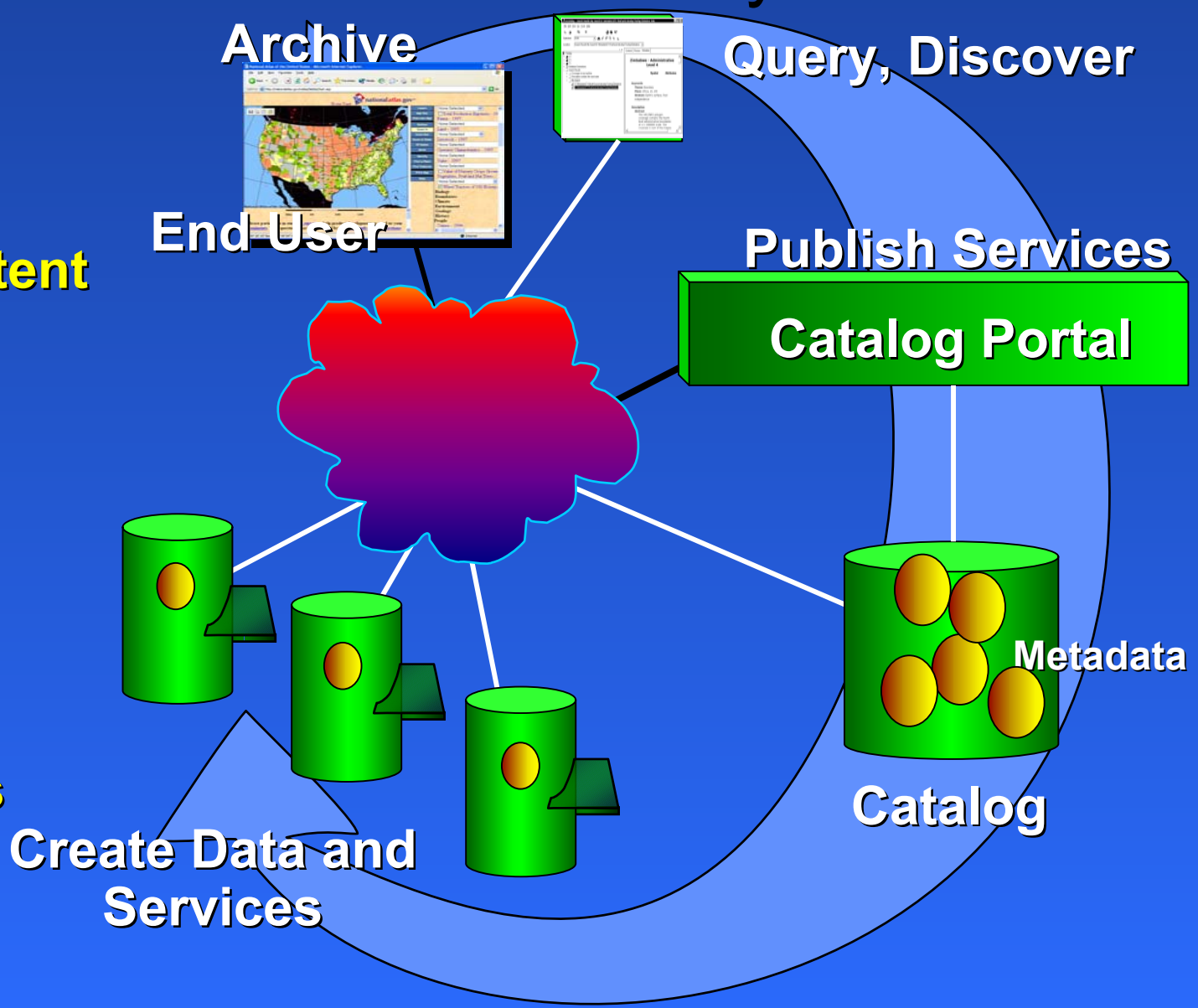
Location

ESRI


Originator
Focal length
Identifiers
Altitude
Date
Time
Obliqueness
Location
Aerial Photos

Metadata - Supporting Geographic Data and Services Life Cycle

1. Create Content
2. Catalog
3. Publish
4. Discover
5. Use/Access
6. Archive



Metadata Environment

Application

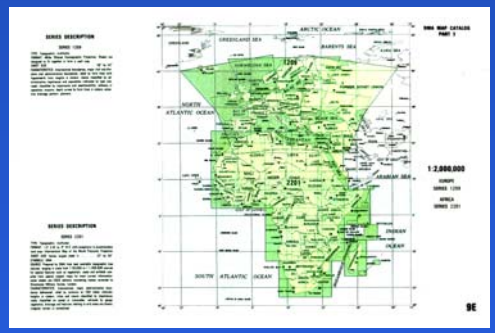
Environment

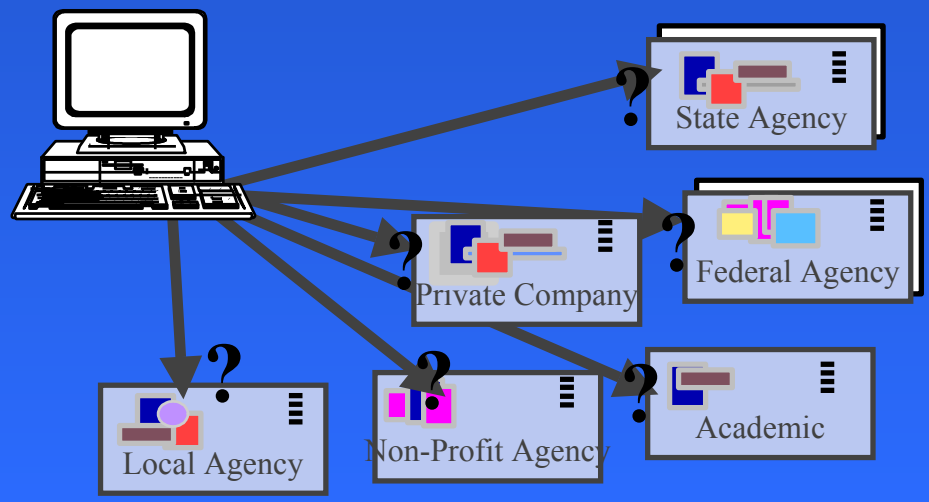
	Catalog	Processing Support	Historical Record	Understand Data
Locate	X		X	X
Evaluate	X		X	X
Extract	X	X		
Employ		X		X

Catalog Environment

Locate **Evaluate** **Extract**

- Product Catalog
  - Printed
  - On-line
- Portals
- Clearinghouse
  - Searching
  - Browsing
- Data Warehouse
  - Management

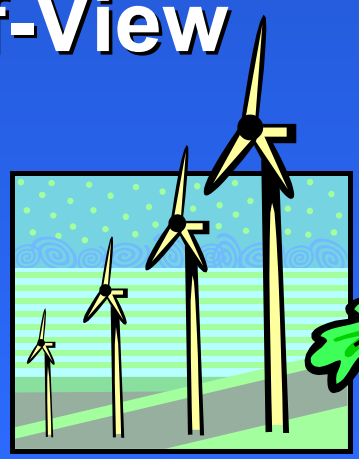




User Environment

Locate Evaluate Employ

- Understand the Model
  - How features are represented
  - Connectivity
- Understand the Content
  - Why features are included or excluded
- Understand the Point-of-View
  - Business/Commercial
  - Environmental/Scientific
  - Military/Defense/Intel



Processing Environment

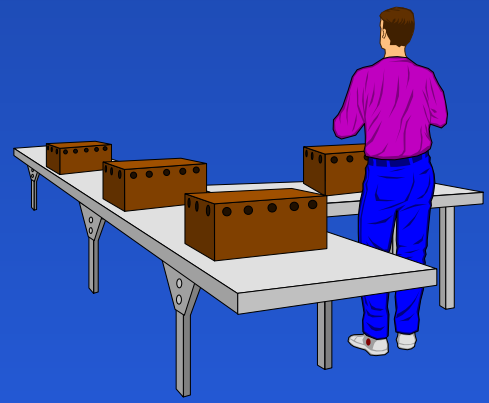
Extract Employ

- Support user Decisions
  - Identify multiple datasets within an application
  - Know the good and bad areas
  - Merging data (which is the better data?)
    - Currentness
    - Quality
- Support Computer Processing
  - Application software functions
  - Capabilities, access
  - Guide software through the data

Historical records

Locate Evaluate

- Production Management
  - Planning - setting priorities
  - Coordinating production
  - Storage/Archival
- Legal Records
  - Proper use
  - Document assumptions



Metadata perspectives

- **Why is metadata more important now?**
  - Expansion in the use of Geographic Information
    - Proliferation of data
    - Non-geographers using geospatial data
    - The producer is not the user
  - Geospatial data is imperfect
    - A model, a "point of view"
    - Assumptions, limitations, approximations, simplifications
  - Geospatial data is expensive
    - Reuse
    - Data management
- **Why should it be standardized?**
  - Provide an understanding of data – around the Globe and across information communities

ISO 19115:2003

INTERNATIONAL STANDARD

ISO 19115

First edition
2003-05-01

Geographic information — Metadata

Information géographique — Métadonnées

Reference number
ISO 19115:2003(E)

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ISO 19115:2003

Scope

- ...the schema required for **describing** geographic information and services.
- ...information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of **digital** geographic data.
- ...applicable to the cataloguing of datasets, clearinghouse activities, and the full description of datasets for a wide range of geographic applications.
- …applicable to geographic datasets, dataset series, and individual geographic features and attributes
- ...may be used for other forms of geographic data such as map, charts, textual documents

19115:2003 Geographic Information – Metadata

- Defines *metadata elements*;
- Provides a *schema* (UML);
- Establishes a common set of metadata terminology, definitions (data dictionary);
- Provides extension procedures

ISO metadata foundation

Regional metadata standards

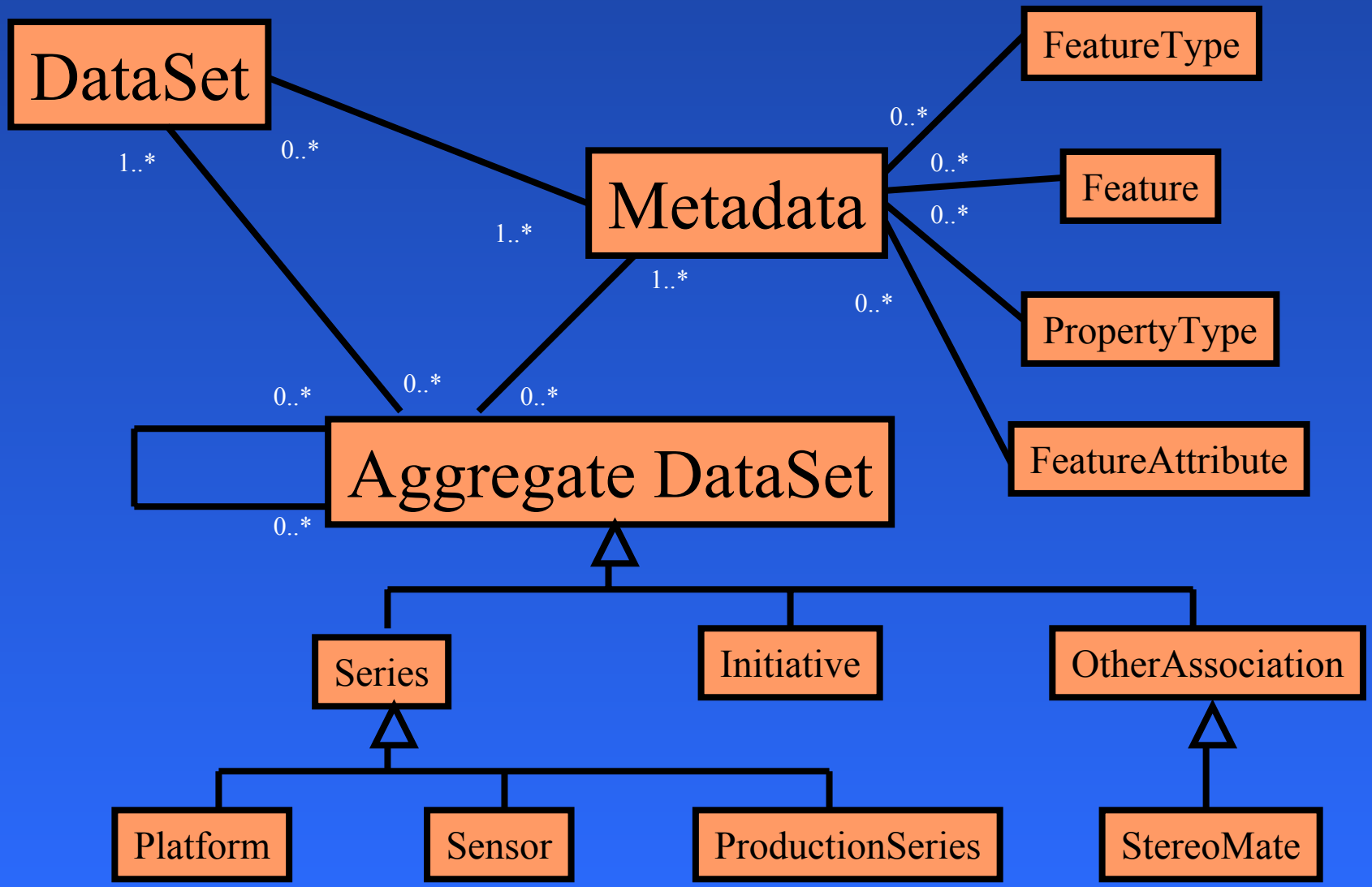
- ***ANZLIC Working Group on Metadata: Core Metadata Elements Guidelines Draft 7*****,** Australia and New Zealand Land Information Council, November 1995, Sydney.
- ***the Canadian Directory Information Describing Digital Geo-referenced Data Sets*****,** Canadian General Standards Board, July 1994, Ottawa.
- ***Standard for Geographic Information - Metadata****,* European Committee for Standardisation (CEN), September 1996, Brussels.
- ***Content Standard for Geospatial Metadata*** **Federal Geographic Data Committee,** June 8, 1994, Washington DC

Other influential documents

- ***Digital Geographic Information Exchange Standard (Digest), Version 1.2*****.** Digital Geographic Information Working Group, January 1994,
- ***IHO Transfer Standard for Digital Hydrographic Data****,* International Hydrographic Bureau, October 1995, Monaco
- ***Spatial Data Transfer Standard (SDTS),*** US Department of Commerce, August 1992, Gaithersburg, MD
- ***Application Profile for the Government Information Locator Service (GILS),*** US Department of Commerce, December 1994, Gaithersburg, MD
- ***Cartographic materials: A manual of interpretation for AACR2****,* Anglo-American Committee on Cataloguing of Cartographic materials, 1982, Chicago
- ***USMARC Format for Bibliographic Data****,* US Library of Congress, 1988, Washington, DC

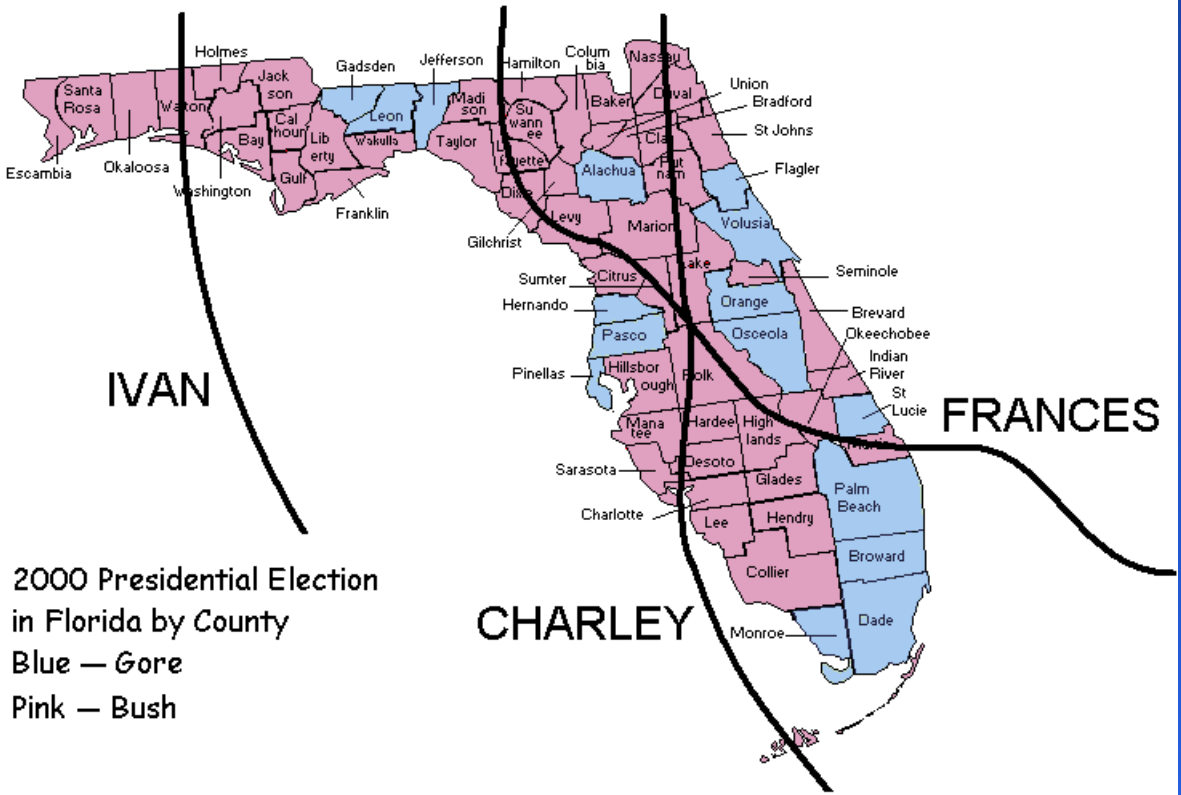
ISO 19115:2003

Metadata applications



I thought it was an interesting coincidence that a state with questionable presidential election results would be pummeled by hurricanes just before the next election. Then I thought it was an interesting coincidence that the storms spared Miami, who voted for Gore in 2000. Just out of curiosity, I overlaid two maps: one of the tracks of the hurricanes of 2004, and one of the election results of 2000.

This is no longer an interesting coincidence. It is an unmistakable message from God. I hope everyone is listening.



2000 Presidential Election
in Florida by County
Blue — Gore
Pink — Bush

ANY QUESTIONS?

Note: After leaving Florida, Charley hit Georgia and Frances hit Georgia and South Carolina. Both voted for Bush in 2000.

The path of Ivan is projected as of Sept 14. Alabama, Mississippi and Louisiana all voted for Bush. If you have ANY doubt who this message is coming from, watch to see if Ivan veers West to hit those states as well.

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Metadata UML Packages

Identification Information

Reference System Information

Distribution Information

Locate

Data Quality Information

19108, 11, 12

Content Information

Evaluate

19113,14

19110, 21, 23, 24

Extract

Application Schema Information

Metadata Extension Information

Constraint Information

19107

19117

19119

Employ

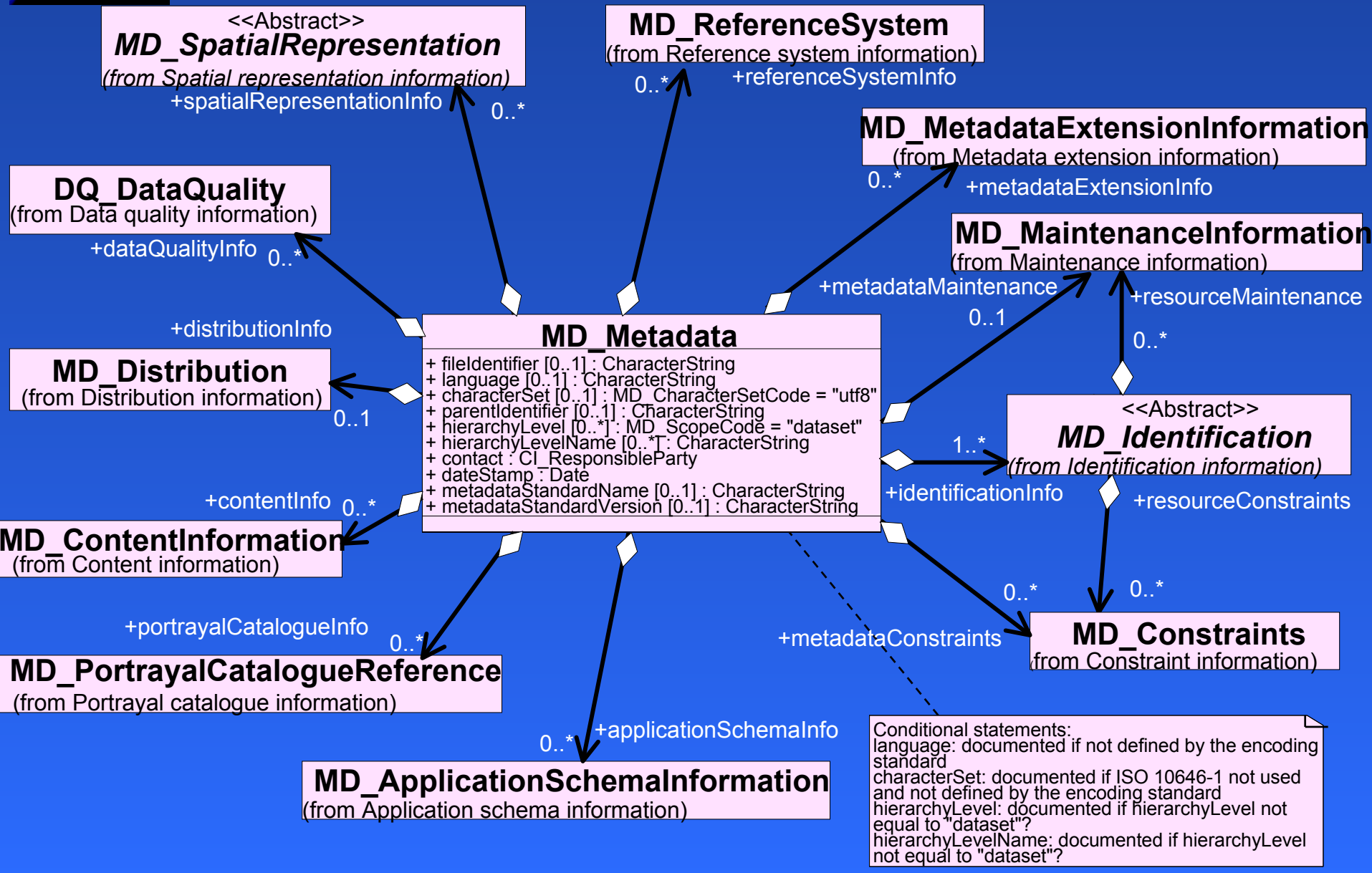
Spatial Representation Information

Portrayal Catalogue Information

Maintenance Information

ISO 19115:2003 Annex A

Metadata schema UML models



ISO 19115:2003 Annex B
Metadata data dictionary

	Name/Role Name	Short Name	Definition	Obligation/ Condition	Maximum occurrence	Data type	Domain
29	MD_Identification	ident	basic information required to uniquely identify a resource	Use obligation from referencing object	Use maximum occurrence for referencing object	Aggregated Class (MD_Metadata) <<Abstract>>	Lines 30-41
30	citation	idCitation	citation data for the resource	M	1	Class	CI_Citation <<DataType>> (B3.2)
31	abstract	idAbs	brief narratiave summary	M	1	CharacterString	Free text
32	purpose	idPurp	summary of the intentions with which the resource was developed	O	1	CharacterString	Free text
33	credit	idCredit	recognition of those who contributed to the resource	O	1	CharacterString	Free text
34	statusCode	idStatCode	status of resource	O	N	Class	MD_ProgressCode <<CodeList>> (B.6.26)

Recommended core metadata for geographic datasets

- ✓ **Dataset title**
- ✓ **Dataset reference date**
- ✓ **Dataset responsible party**
- ✓ **Geographic location of the dataset (by four coordinates or by geographic identifiers)**
- ✓ **Dataset language**
- ✓ **Dataset character set**
- ✓ **Dataset topic category**
- – Spatial Resolution
- ✓ **Abstract describing the dataset**
- – Distribution format
- – Additional extent information (vertical and temporal)
- – Spatial representation type
- – Reference system
- – Lineage statement
- – On-line resource
- – Metadata file identifier
- – Metadata standard name
- – Metadata standard version
- ✓ **Metadata language**
- ✓ **Metadata character set**
- ✓ **Metadata point of contact**
- ✓ **Metadata time stamp**

✓ **Mandatory**

ISO 19115:2003

- Designed:
  - to support geographic information;
  - to work with wider information technology standards and practices;
  - to serve the global community, in a multi-national, multi-language environment;
  - based on a foundation of national, regional, and special information community standards and experiences
- Developed through a rigorous, consensus ISO process
- Provides a foundation for national, regional, and global interoperability

Semantic Interoperability

On-going Metadata Work

- ISO/TS 19139 *Geographic Information – Metadata* – **XML Schema Specification**
- ISO 19115-2 *Geographic Information – Metadata* – Part 2 **Extensions for Imagery and Gridded Data**

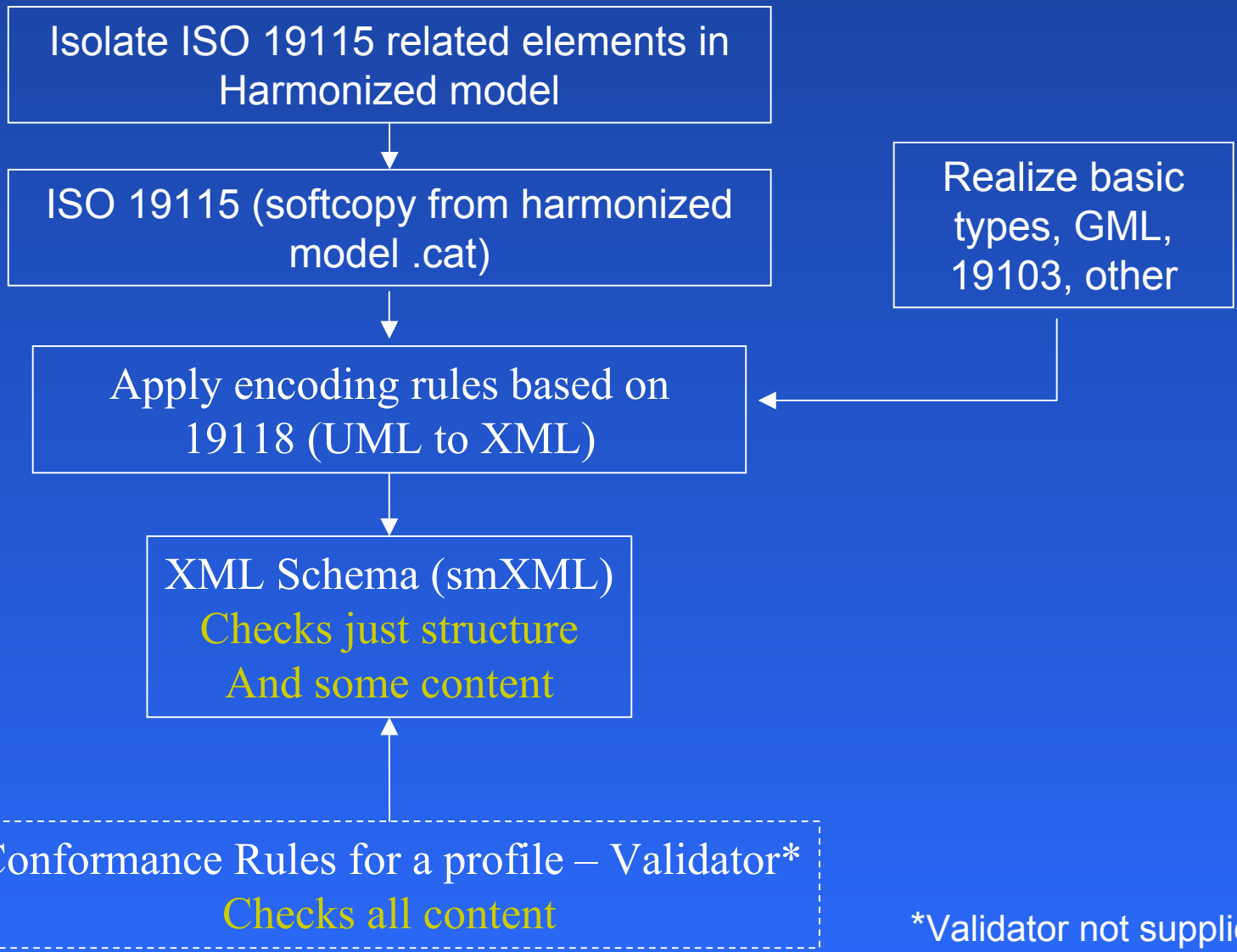
ISO 19139

Geographic Information - Metadata XML Schema Implementation

- Defines spatial metadata XML (smXML) encoding
  - an XML Schema implementation derived from ISO 19115-Geographic information – Metadata
- XML Schema
  - More rigorous validation of compliance
  - More exact representation of UML
- Based on Comprehensive Profile ISO 19115
- Separate from ISO 19115
  - More easily evolve with changes in technology
  - Quickly establish implementation of ISO 19115

Technical Interoperability

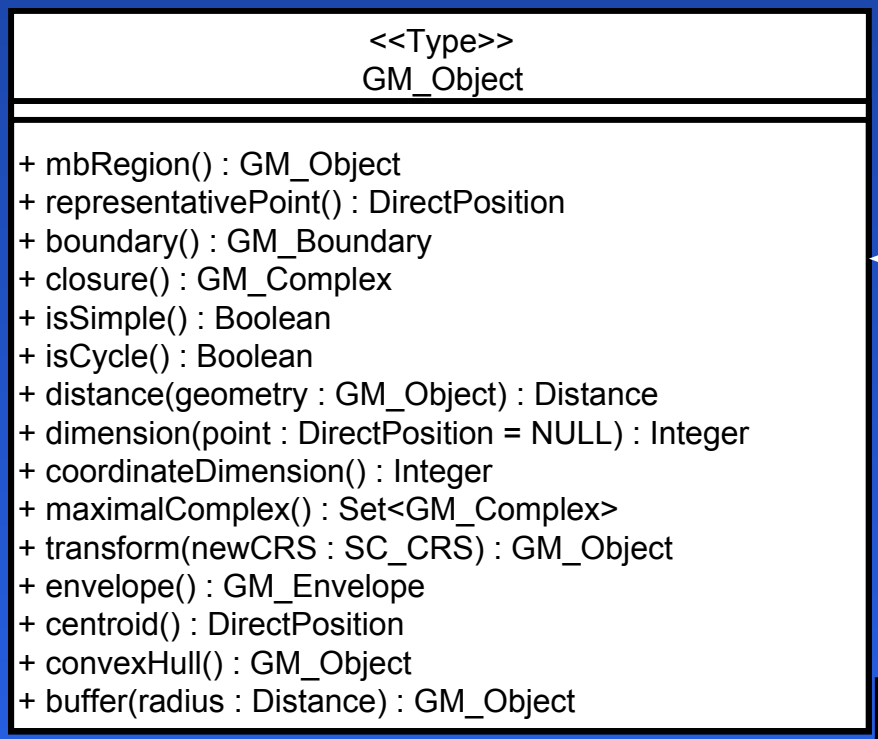
Build Process



*Validator not supplied in document

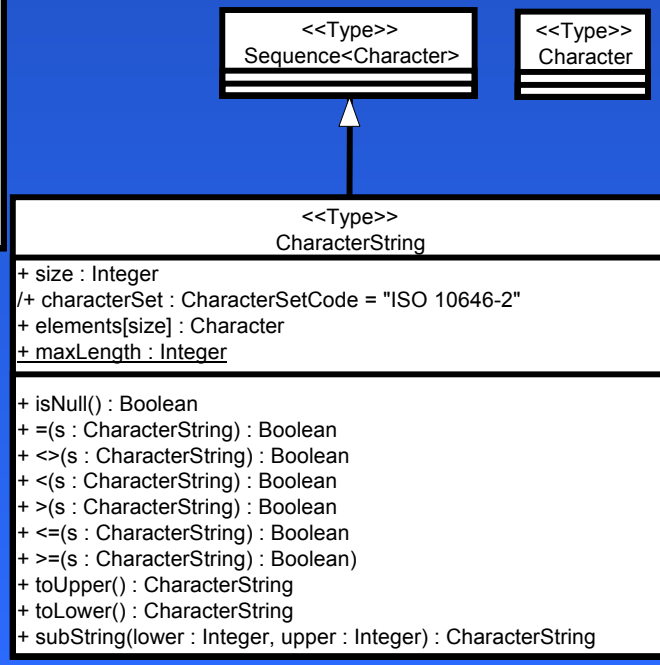
Realization of existing XML Schema

In ISO 19115 harmonized UML model from ISO 19107



From ISO 19136

In harmonized UML model from ISO 19103



From XML Schema

ISO 19139 Specification

- Implementation UML profile process
- Identification of additional 19100 entities
  - 19103, 7, 8, 9, 18
- smXML encoding rules
- Other (19100) encoding rules
  - scXML spatial common XML
  - ssXML spatial schema XML
  - stXML spatial temporal XML
  - asXML application schema XML

http://www.isotc211.org/scXML
http://www.isotc211.org/ssXML
http://www.isotc211.org/stXML
http://www.isotc211.org/asXML

- smXML types to enforce domain restrictions
- smXML (XML schema) → http://www.isotc211.org/smXML
- Referenced XML schema
- UML to XML schema process
  - Rational Rose scripts
  - XSLT XML to XSD
- Implementation examples

```
<?xml   version="1.0“ encoding=„UTF-8“?>
<xs:schema targetNamespace="http://www.isotc211.org/smXML"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:smXML="http://www.isotc211.org/smXML"
xmlns:scXML="http://www.isotc211.org/scXML" version="0.10">
<!-- ================== Classes  ================== -->
<xs:complexType name="CI_ResponsibleParty_Type">
```

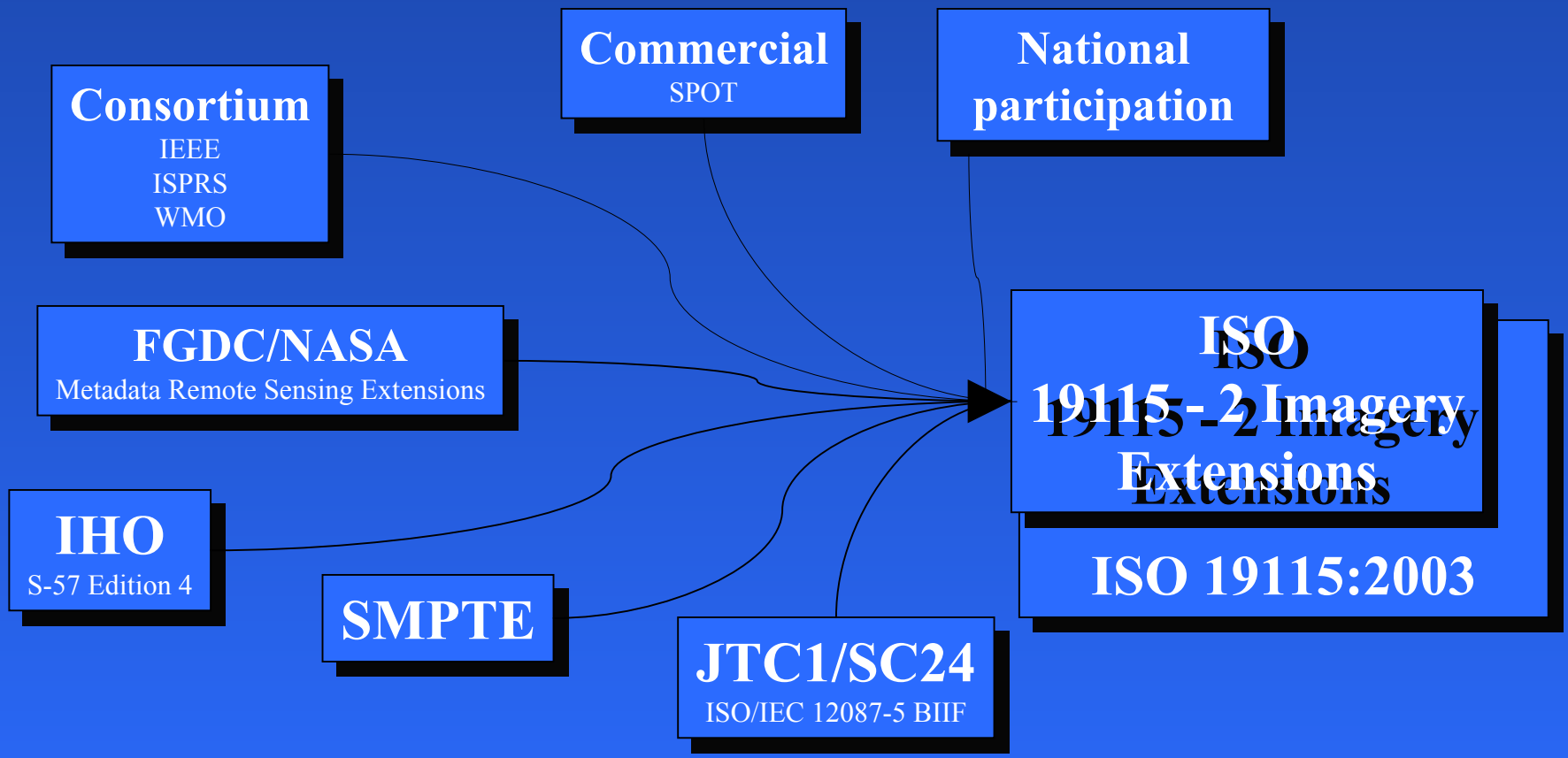
ISO 19139
Schedule

- Working Draft2: 2003-09
- Working Draft3: 2004-03
- **Preliminary Draft TS: 2004-06**
- Draft TS: 2005-01
- Technical Specification: 2005-03

ISO 19115-2 *Geographic Information – Metadata* – Part 2 Extensions for Imagery and Gridded Data

- Scope
  - This International Standard **extends** ISO 19115:2003 Geographic Information – Metadata by **defining the schema and additional metadata** required for imagery and gridded data

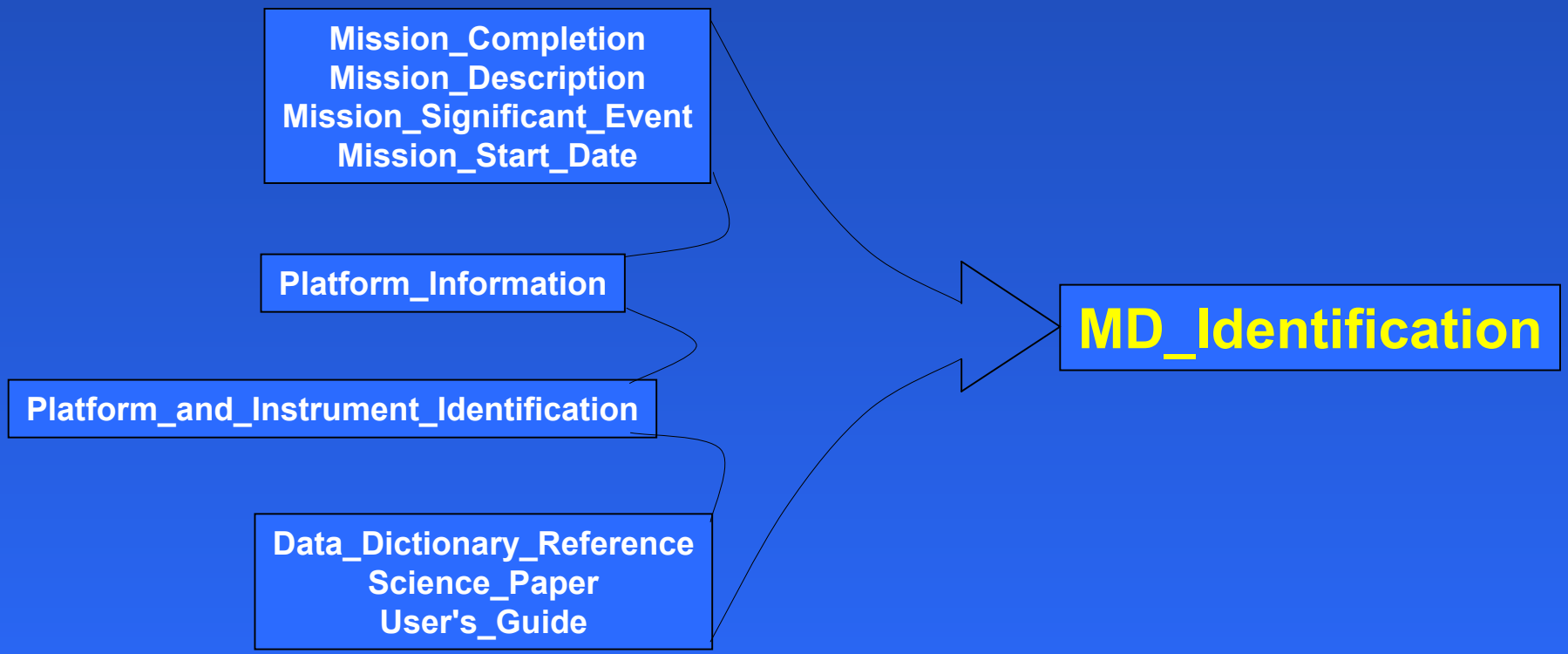
Liaison Organizations and Related Work



Please join in

Proposed Extensions
Identification Information

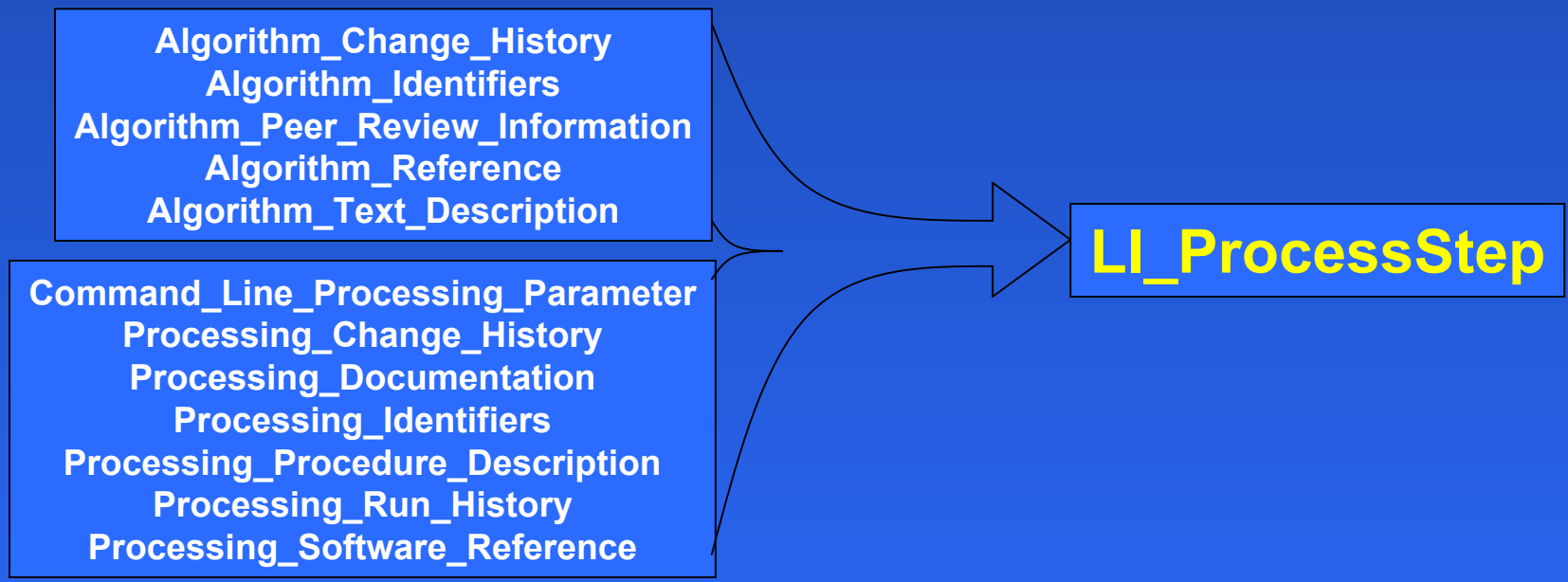
New Imagery Elements and Existing Classes



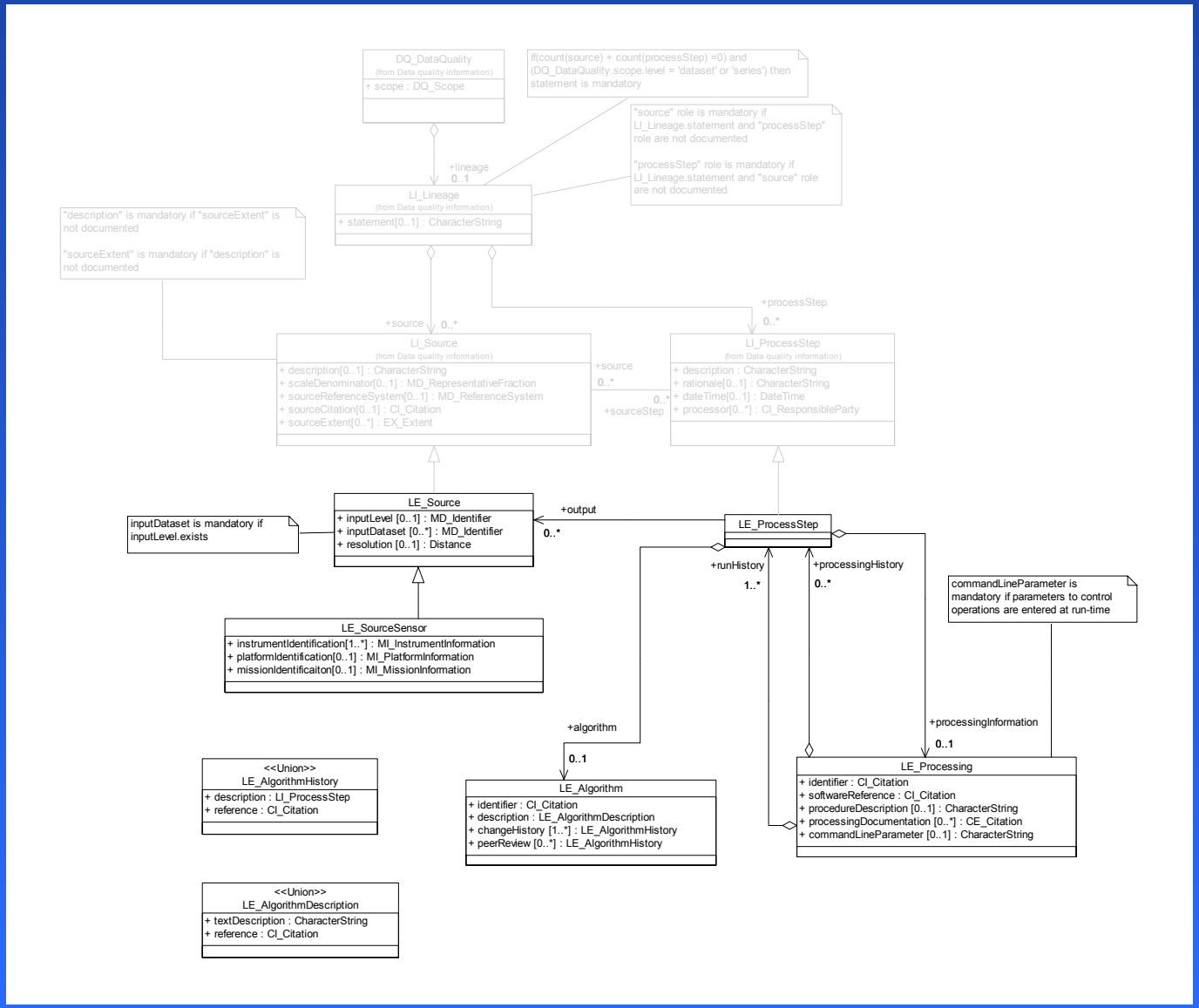
Proposed Extension

Data Quality – Lineage

New Imagery Elements and Existing Classes



Extended UML



Extended data dictionary

	Name	Short Name	Definition	Obligation	Max Occurrence	Data Type	Domain
	LE_Algorithm	Algorithm	details of the methodology by which geographic information was derived from the instrument readings	Use	Use maximum occurrence from referencing object	Aggregated Class (LE_ProcessStep)	
	identifier	algId	information identifying the algorithm and version or date	M	1	Class	<<DataType>>CI_Citation
	description	algDesc	information describing the algorithm used to generate the data	M	1	Class	<<Union>>LE_AlgorithmDescription

ISO 19115-2
Schedule

- Working Draft: 2003-09
- Working Draft2: 2004-09
- Committee Draft: 2005-03
- Draft International Standard: 2005-09
- Final DIS: 2006-05
- IS: 2006-08

Summary
Interoperability, Standards, & Metadata

- Many flavors of interoperability
- Standards – a key factor enabling interoperability
  - Agreement between provider and user
  - Wide acceptance of products and services – quality of life
  - Consensus technical solutions
  - ISO TC 211 – establishing the building blocks - implemented by industry
- Metadata – another key factor enabling interoperability
  - Data about data
  - The right data for the right purpose
- Essential for all aspects of spatial data handling
  - Locate
  - Evaluate
  - Extract
  - Employ
- Metadata in the ISO 19115 standard
  - Semantic interoperability
  - Provides a common understanding
  - Expanded networks
  - Global Interoperability
- ISO TC 211 is taking the next steps
  - Expanding for imagery
  - Implementation specification
    - Technical interoperability

Thank you

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