

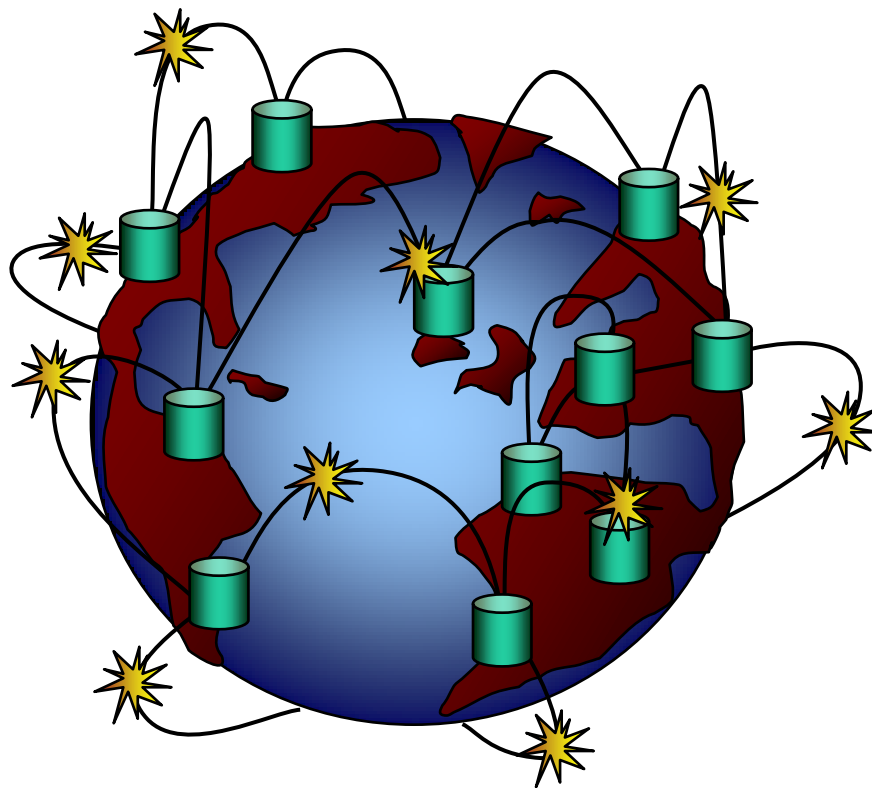


# **Communicating Geospatial Information across Communities and Technologies**

Presentation to IHO Marine Spatial Data Infrastructure Forum

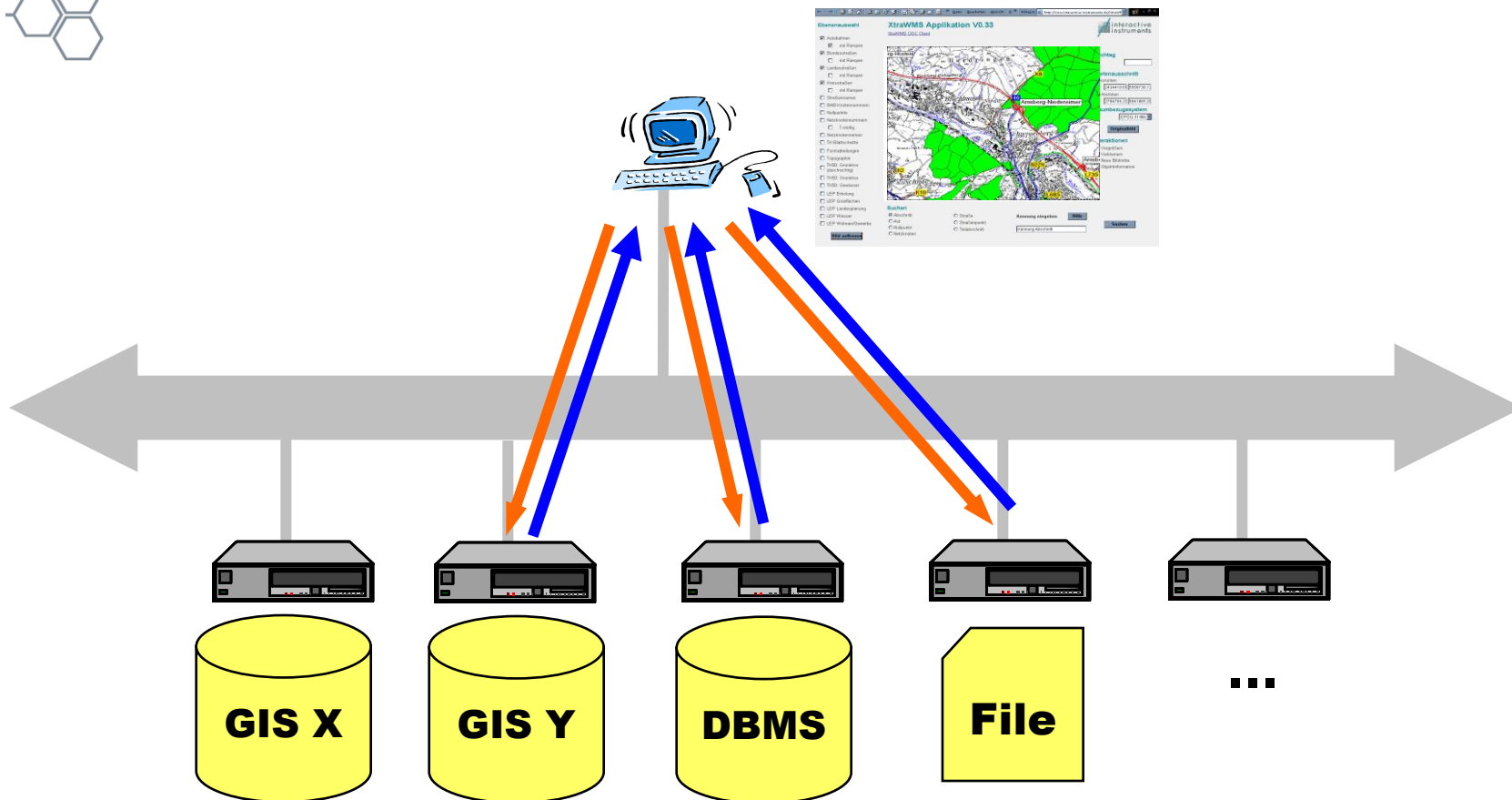
George Percivall  
OGC Chief Engineer  
4 February 2014

# The Geoweb – a global community



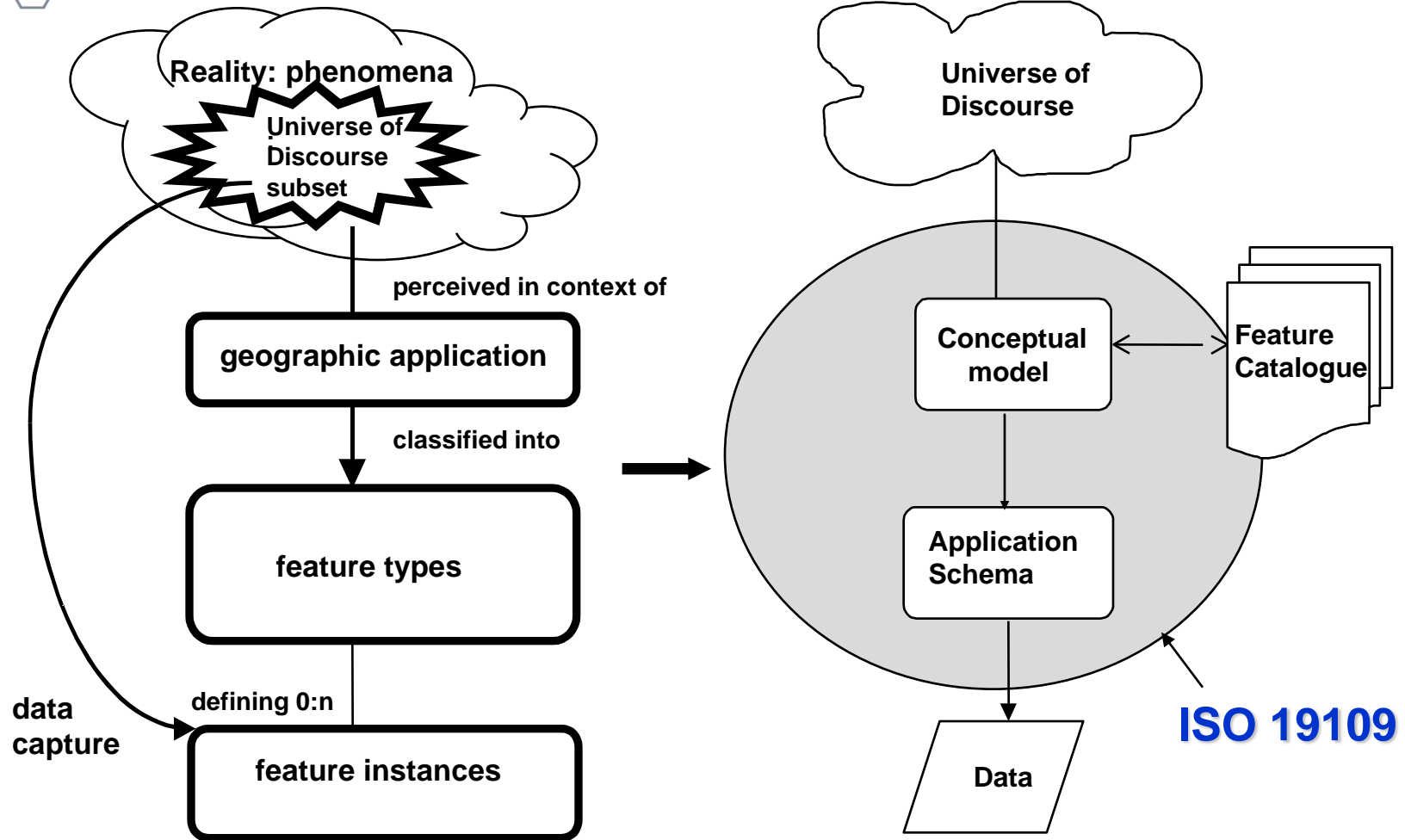
**Composed of many collaborating organizations... authoring  
and publishing geospatial content and services**

# Communicating geospatial information across communities and technologies



- Exchange of geospatial information requires conceptual information modeling implemented consistent across technologies and vendors.
- OGC and ISO Standards define this process

# From 'reality' to geographic data



# OGC Geography Markup Language (GML)

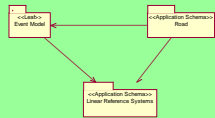


- XML-based language for encoding geographic information to be stored and transported over the Internet
- GML serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet.
- GML defines both the geometry and properties of objects that comprise geographic information.
- GML "Application Schemas" support data interoperability within a community of interest.
  - Development of GML Application Schemas supported by ISO TC 211 (ISO 191XX) and OGC standards and tools..

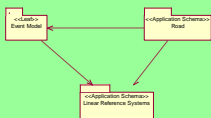
# GML Application Schemas



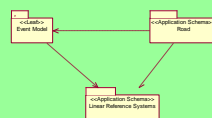
**Cadastre,  
Land Use**



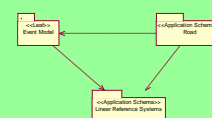
**Traffic  
And  
Transport**



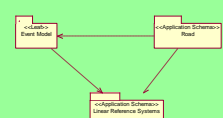
**Telecom**



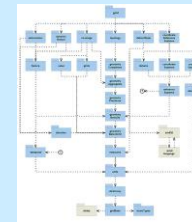
**Environ-  
ment**



**...**



**GML Schemas**



**XML Technologies / W3C**

# GML Schemas

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- Base schemas, general syntax, feature model, metadata mechanisms
- Basic geometry (0d, 1d, 2d)
- Additional geometric primitives (0d, 1d, 2d, 3d)
- Geometric composites
- Geometric aggregates
- Coordinate reference systems
- Topology
- Temporal information and dynamic features
- Definitions and dictionaries
- Units, measures and values
- Directions
- Observations
- Coverages
- Default styling

# GML Application Activities

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## Profiles

- GML Point Profile
- GML Simple Features Profile
- GML GeoShape for use in IETF
- GML in JPEG2000
- GeoRSS: GML Serialization

## Programs building GML App Schemas

- US NSDI
- GEOINT
- INSPIRE
- IHO S-100

## Application Schemas

- CityGML
- WaterML
- GeoSciML
- Climate Science ML (CSML)
- CleanSeaNet
- NcML/GML (NetCDF and GML)
- TDWG Biodiversity GML
- MarineXML
- Ground Water Modeling Language

More GML Application Schemas

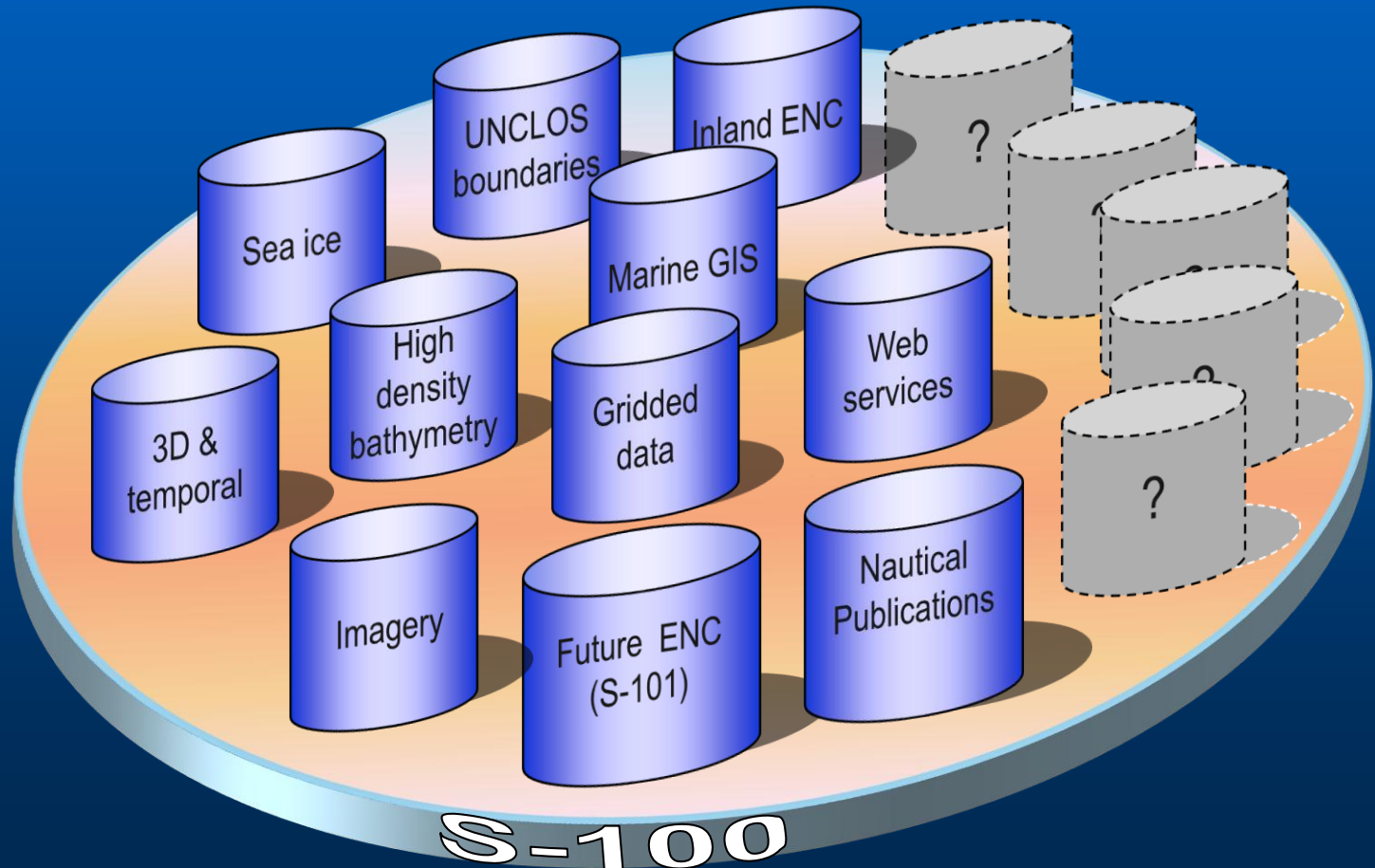
<http://www.ogcnetwork.net/node/210>

[http://en.wikipedia.org/wiki/GML\\_Application\\_Schemas](http://en.wikipedia.org/wiki/GML_Application_Schemas)



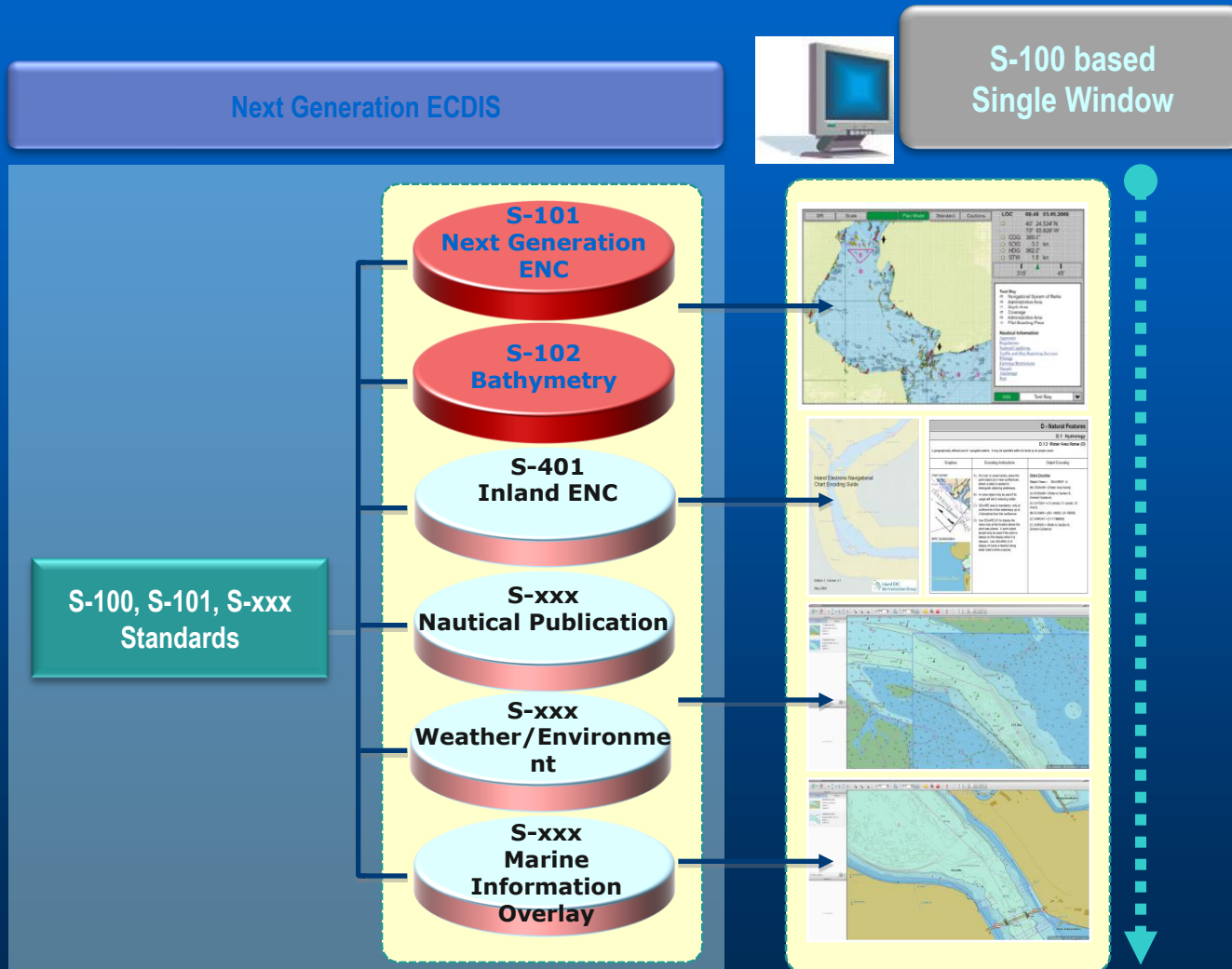
# IHO S-100 Basics

S-100 - IHO Universal Hydrographic Data Model - provides a contemporary hydrographic geospatial data standard that can support a wide variety of digital data sources, products and services



# Transition to an S-100 ECDIS

## Electronic Chart Display and Information System



# Support for Application Schema Development



"Simple Ain't Easy."

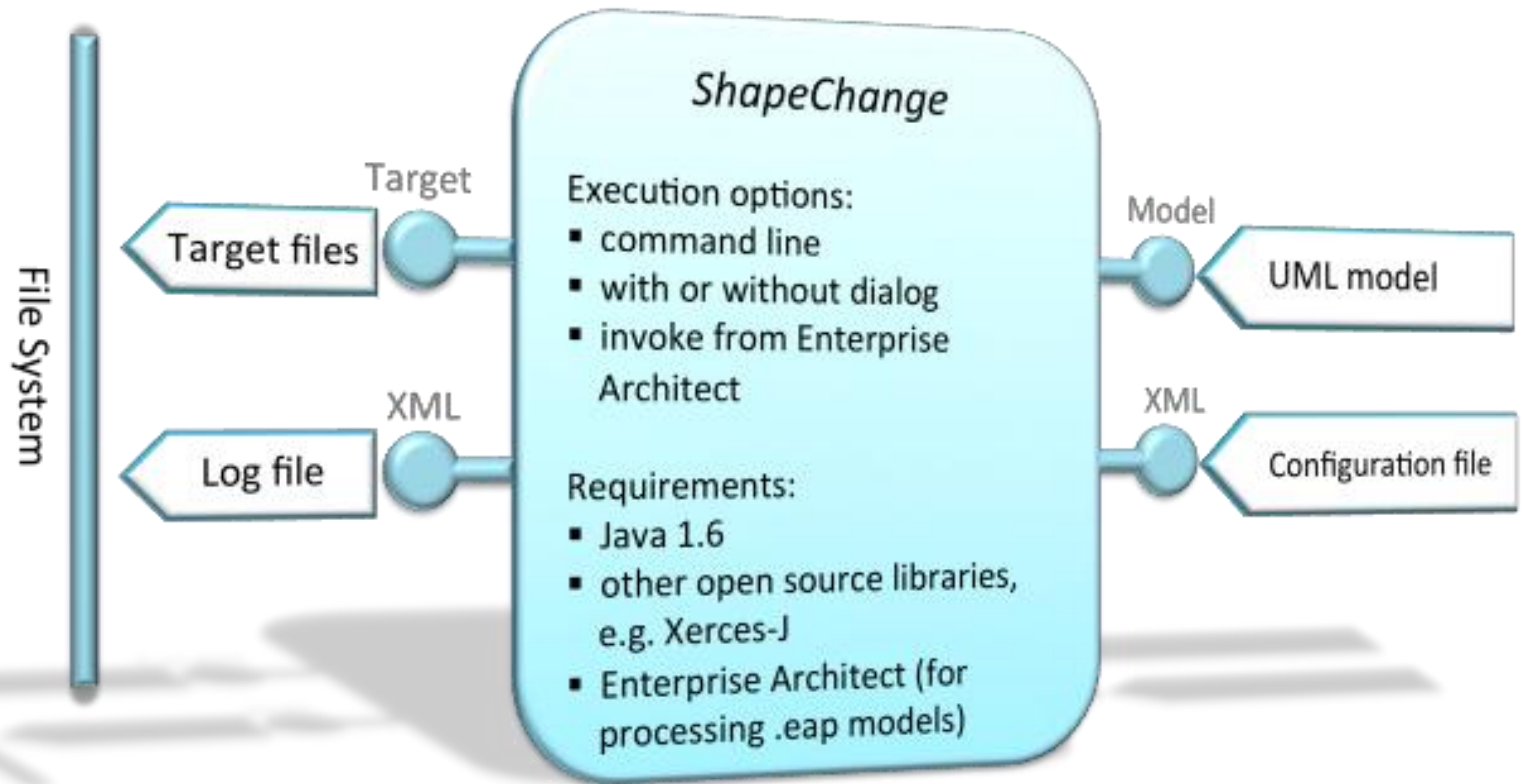
» Thelonious Monk

- Process
  - Process has been refined in several organizations
  - Approaches, lessons learned and guidelines available
- Tools
  - To map from UML or other modelling languages to GML, JSON, KML
  - Open source and proprietary tools are available

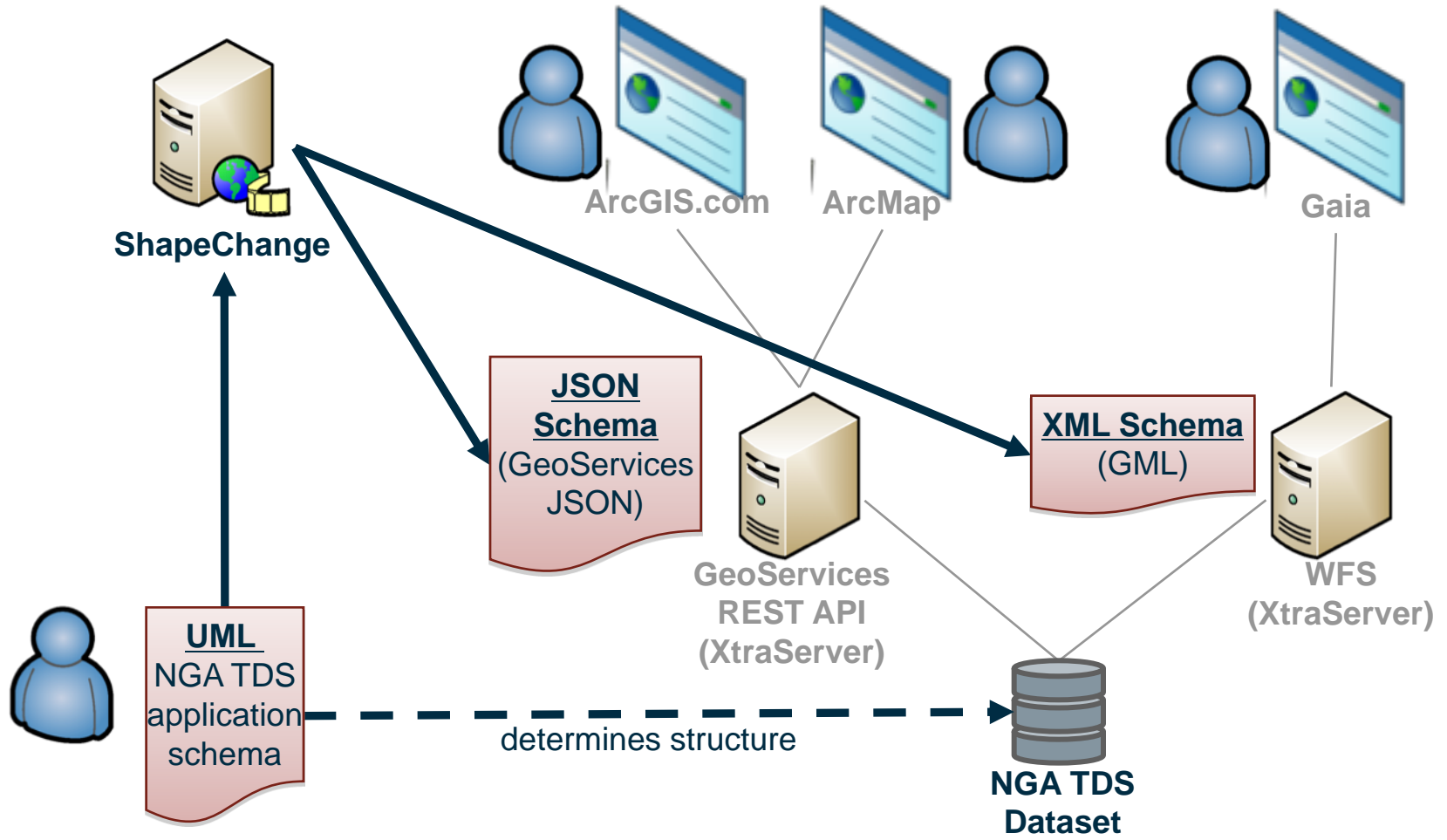
# Schema Automation using ShapeChange



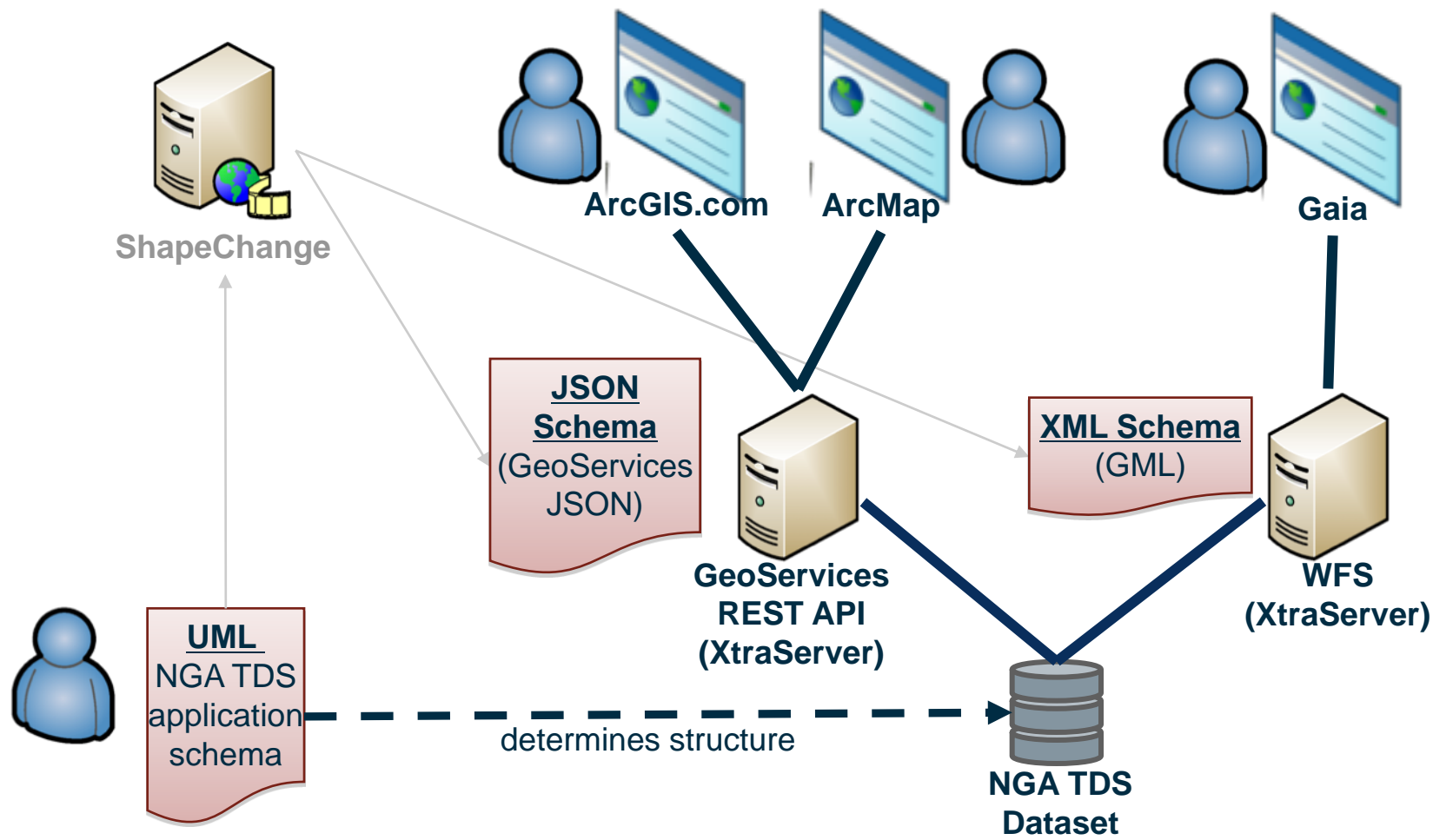
ShapeChange converts conceptual schemas in UML to GML application schemas and other targets



# UML to (GML, JSON, KML, etc.)



# Communicating geospatial information across communities and technologies



# OGC Interoperability Program



**This is not just about research but rather about hands-on engineering efforts to determine the ability of standards to solve real interoperability problems and assess if they're mature enough for deployment in operational environments.**

**Lots of OGC IP videos on OGC's YouTube Channel**

<http://www.youtube.com/user/ogcvideo/videos>



# Ingredients for Success





# OGC Interoperability Program



Global, innovative, hands-on rapid prototyping and testing program designed to unite users and industry in accelerating interface development and validation, and the delivery of interoperability to the market

## Proven Process

- Accelerate development, testing, acceptance and refinement of standards & best practices

## Effective Process

- Align industry in advancing standards in state-of-practice IT systems

## Repeatable Process

- Over 40 initiatives successfully conducted using proven policies and procedures

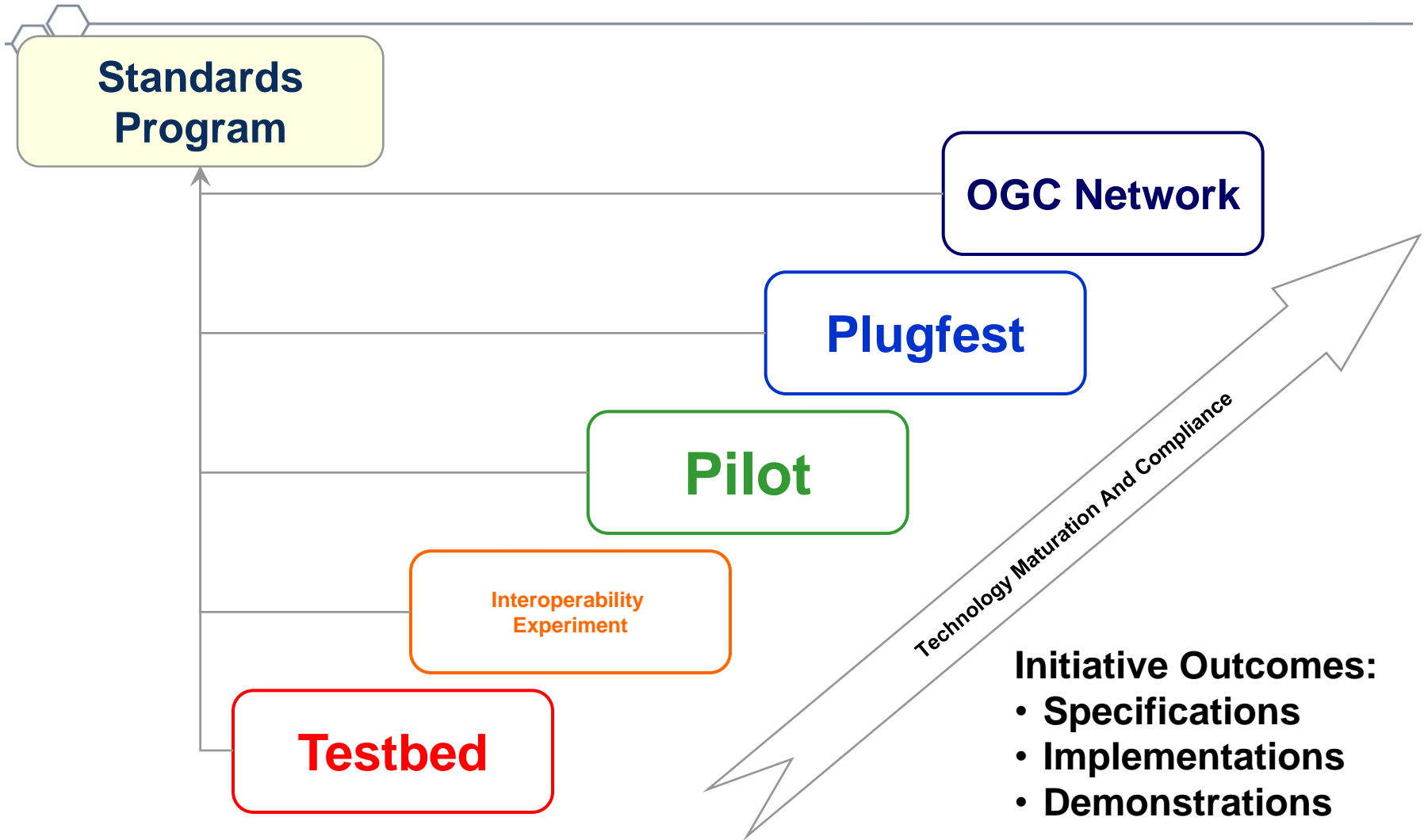
## Competitive Process

- Regularly yielding a high-level of industry participation and cooperation

## Cost effective Process

- For sharing expertise and cost while gaining early marketplace insight and advantage

# OGC-IP Technology Maturation Strategy



## Types of Interoperability Program Initiatives

# Benefits of Involvement



## For Participants

### *Business potentials*



Early insights and skill building



Early visibility



Early market deployment



Direct influence



Broaden market reach

## For Sponsors

### *Significant efficiencies*



*Ability to Determine Market Interest*



*Accelerated process - workable interface specifications in 4-6 months*



*Vendors test, validate and demonstrate interface integrity – Rapid time to market*



Leverage of other sponsor' funding to solve common/similar problems

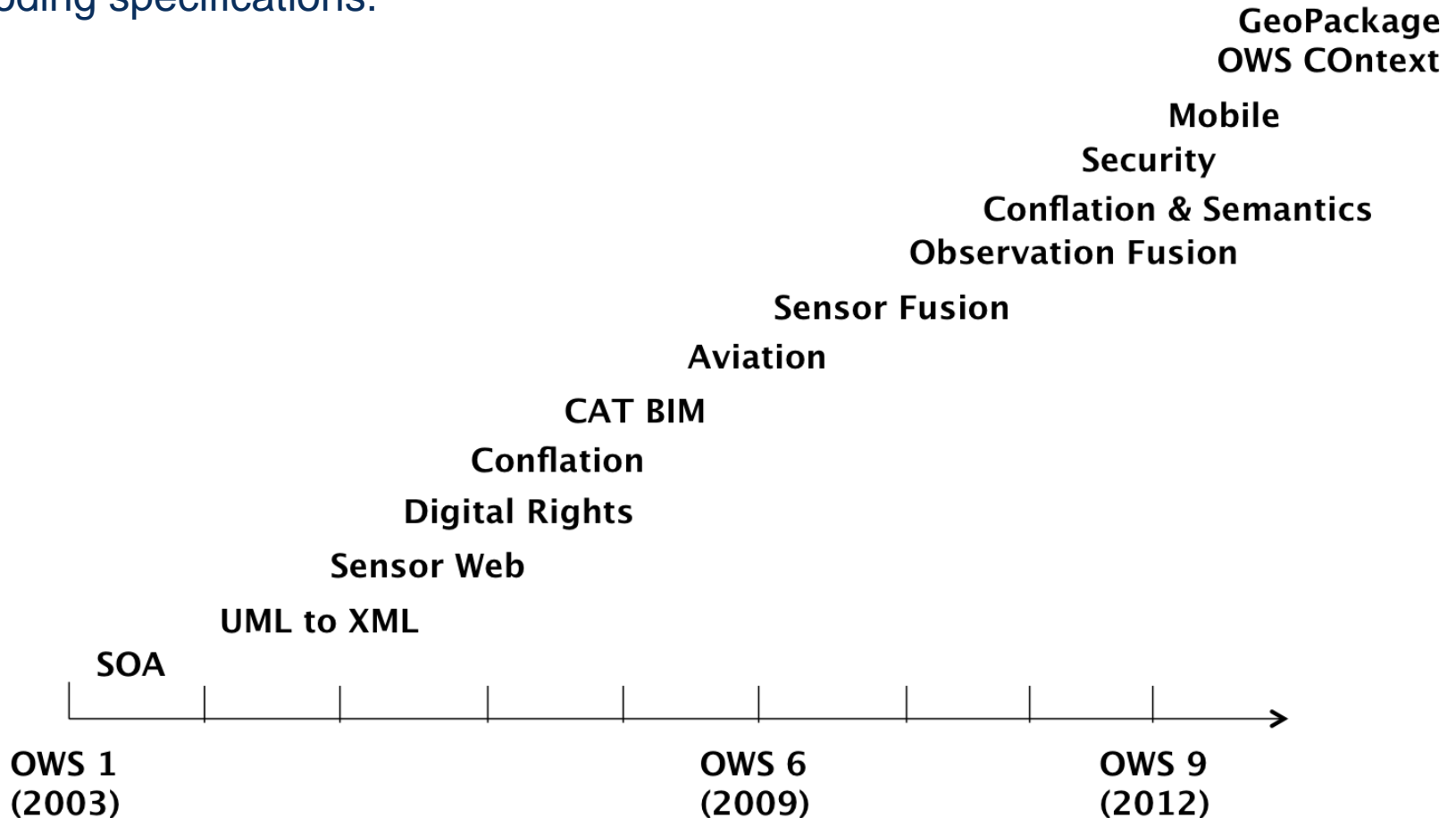


Significant ROI 2-3.5 overall (and as high as 25 for individual sponsors)

# OGC Testbed Projects



OGC Testbeds provide an environment for collaborative, fast-paced, multi-vendor rapid prototyping efforts to define, design, develop, and test candidate interface and encoding specifications.





## **1. Technical Documents**

(draft standards, best practices, change requests, etc.)

## **2. Prototype Implementations**

(services, clients, tools, running code)

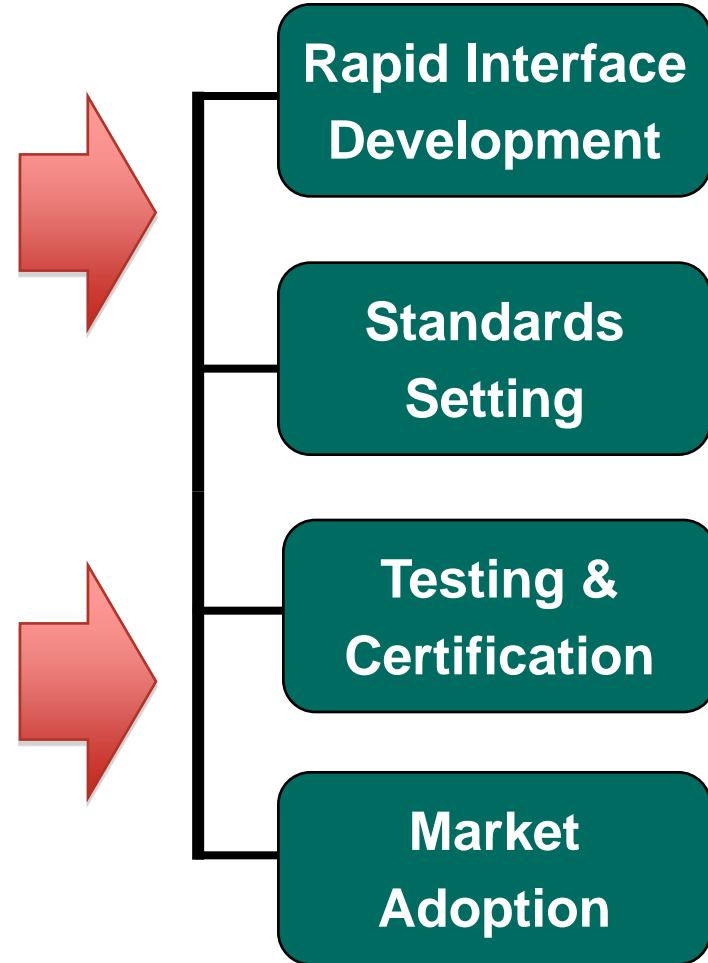
## **3. Demonstrations**

(showing users why it matters, in their terms)

# OGC's Approach for Advancing Interoperability



- **Interoperability Program (IP)** - a global, innovative, hands-on rapid prototyping and testing program designed to unite users and industry in accelerating interface development and validation, and the delivery of interoperability to the market
- **Standards Development Program** - Consensus standards process similar to other Industry consortia (World Wide Web Consortium, OMA etc.).
- **Compliance Testing and Certification Program** - allows organizations that implement an OGC standard to test their implementations with the mandatory elements of that standard
- **Communications and Outreach Program** - education and training, encourage take up of OGC specifications, business development, communications programs



# Major OGC Standards

<http://www.opengeospatial.org/standards>

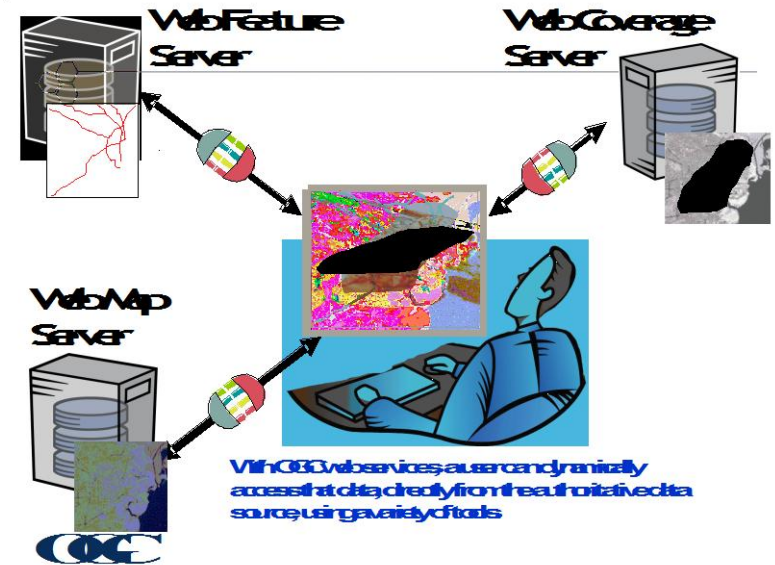


## Some examples

- **Web Map Servers (WMS)**
- **Web Feature Servers (WFS)**
- **Web Coverage Servers (WCS)**

## As well as the:

- **KML (formerly Keyhole Markup Language)**
- **Web Map Context (WMC)**
- **Geography Markup Language (GML)**

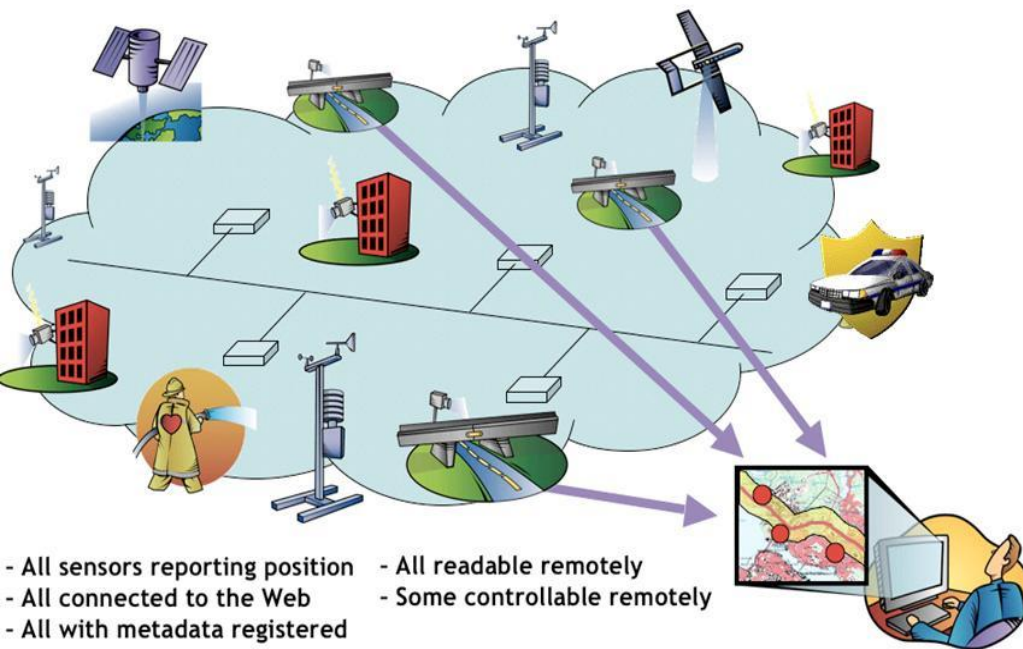


Just as `http://` is the dial tone of the World Wide Web, and `html / xml` are the standard encodings, the geospatial web is enabled by OGC standards.

# OGC Sensor Web Enablement Standards



Enables discovery and tasking of sensor assets, and the access and application of sensor observations for enhanced situational awareness



- ✓ Sensor Model Language (SensorML)
- ✓ Observations & Measurements (O&M)
- ✓ Sensor Planning Service (SPS)
- ✓ Sensor Observation Service (SOS)
- ✓ Catalogue Service

--Complementary Standards--

- ✓ IEEE 1451 smart sensor standard
- ✓ OASIS (alert) standards



# OGC Activities Driven by Community Needs



## Education & Research



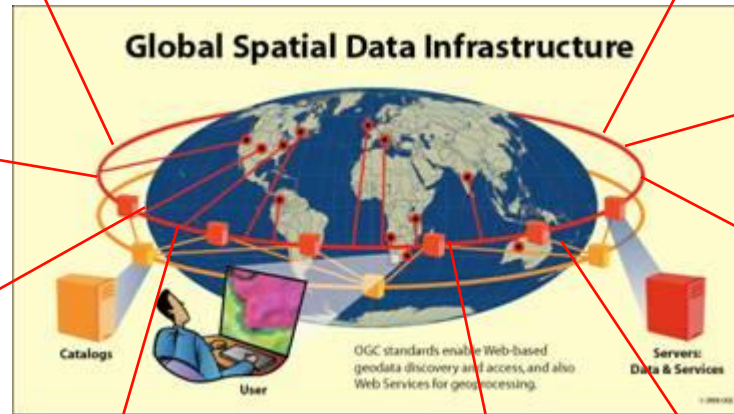
## Sustainable Development



## Defence



## Health



## E -Government



## Emergency Services, Disaster Management



## Energy



## Consumer Services, Real Time Information



## Geosciences: land, sea, air information



# Deepwater Horizon – Gulf of Mexico, April 2010



# Oil Industry Response to Deepwater Horizon



- Oil and Gas Producers (OGP) formed a 3-year Joint Industry Project (JIP) funded by oil industry members.
- Oil Spill Response JIP managed by IPIECA for OGP based on its long-standing experience with Oil Spill Response
- OSR JIP composed of several Work Programs (WPs)
  - WP1 - In-Water Surveillance
  - WP2 - Surface Surveillance
  - WP3 - Modelling & Prediction
  - WP4 - Metocean Databases
  - WP5 - GIS/Mapping and Common Operating Picture



# OSR JIP WP5

## GIS/Mapping and Common Operating Picture

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- Produce a Recommended Practice for GIS/Mapping
  - Support of Oil Spill response using of GIS technology
  - Geo-information in a “Common Operating Picture” for management of the response
- OGP and IPIECA choose OGC to lead an open process to develop a recommended practice based on open standards
- The OGC Interoperability Program
  - An essential part of OGC’s fast, effective, inclusive user-driven process to develop, evolve, test, demonstrate and promote OGC Standards.



# OGC Concept Development

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- Initiative to assess emerging technologies & architectures to support interoperability initiatives and open standards.
- Process
  - 1. Request for Information (RFI)
    - Wide request for input on relevant technologies and open standards
    - RFI contains draft Recommended Practice
  - 2. Engineering Workshops
    - Workshop to discuss and advance the concepts in the RFI
    - Workshop participants selected from the RFI Responses
  - 3. Reference Architecture and Feasibility Report
    - Engineering Report of open standards and architecture views
    - Describe implementations indicating feasibility and maturity

# Oil Spill Response COP: Draft Recommendation in the RFI



- Oil Spill Response Enterprise Viewpoint
  - Deepwater Horizon
  - COP Definition, Users and Scenarios
- Geospatial Information Viewpoint
  - Base map and reference information
  - Drill and incident specific information
- Delivering Geo Information Viewpoint
  - Web services
  - Schemas and encodings
  - Disconnected users
  - Records retention



# Common Operating Picture

Type of Equipment	Equipment purchased to Date/Year	Amount of equipment left in good service
Booms, Skimmers (in metres)	6,500	7,410
Booms, Offshore (in metres)	2,300	4,200
Skimmers, Offshore and Shoreline units	0	153 (on-site)
Aerial Dispenser Spraying Capacity	1	<ul style="list-style-type: none"> <li>1 x Hercules aerial</li> <li>2 x Aerial Dispenser Systems for Hercules</li> <li>1 x UNCS aerial spraying capacity</li> <li>1 x UNCAF aircraft (if stock available)</li> </ul>
Dispensers	0	
Vessel mounted dispersant spraying capacity	2	11
Fluorimeters (for monitoring the effectiveness of dispersant spraying)	2	1

Oil Containment & Recovery Data



Location and Status of Response Assets



Procurement Status



Spend & Payment Tracking



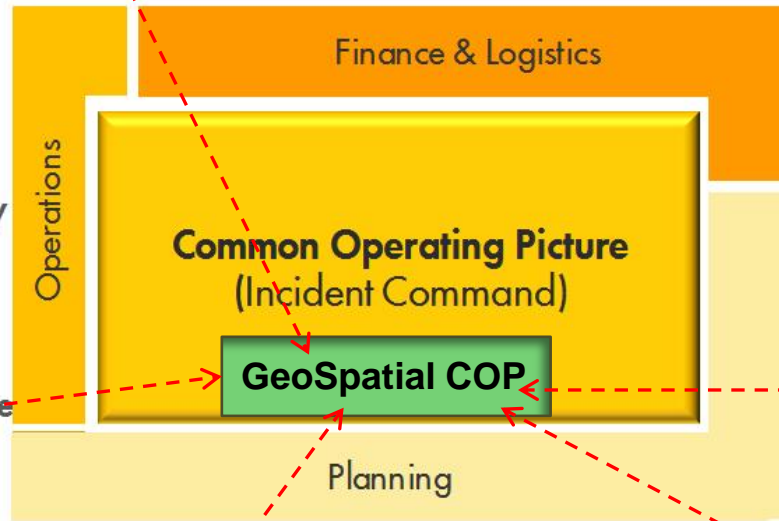
Claims and Recovery



Resource ETA & Capability



Aerial Surveillance & Control



Response Objectives and Tactics



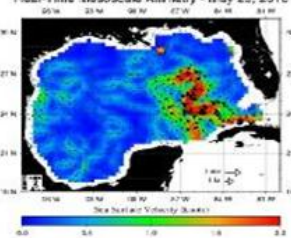
Spill Trajectory Modelling



ROV Data & Imagery



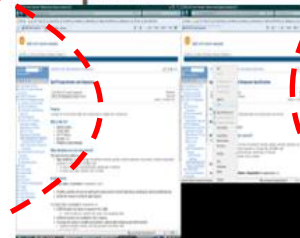
Satellite Imagery with Coordinates



Map Overlays & Video Feed



Situation Status Reports



Sensitive Areas Protection Plan



# Scenarios for use of COP



- **Command Section**
  - COP used in daily command briefings during a response.
  - Adapted to meet the particular needs of a response due to the physical environment and political environment.
- **Planning Section**
  - COP used to communicate plans to other teams on response.
- **Operations Section**
  - COP to communicate to the actual field crews completing the tasks.
- **Legal Team Use**
  - COP provides historical response data used in long-term litigation



# Organization of Geospatial Information



- Base map and reference information
  - this information typically exists in some form prior to the occurrence of a spill incident, and may be gathered and updated routinely as newer information becomes available. Base map and reference information may not be pertinent to a specific incident.
- Incident-specific information
  - this includes all of the relevant information that is generated following a spill incident, and pertains specifically to that incident.

# Base map and reference information

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- Administrative Boundaries & References Information
- Bathymetry & Hydrography
- Topography
- Imagery & Remote Sensing
- Natural Resources, Habitats, & Managed Areas
- Navigation & Marine Infrastructure
- Public Safety & Terrestrial Infrastructure
- Oil and Gas Infrastructure
- Response Planning
- Restoration
- Weather, Oceanography & Natural Hazards

# Drill and incident specific information

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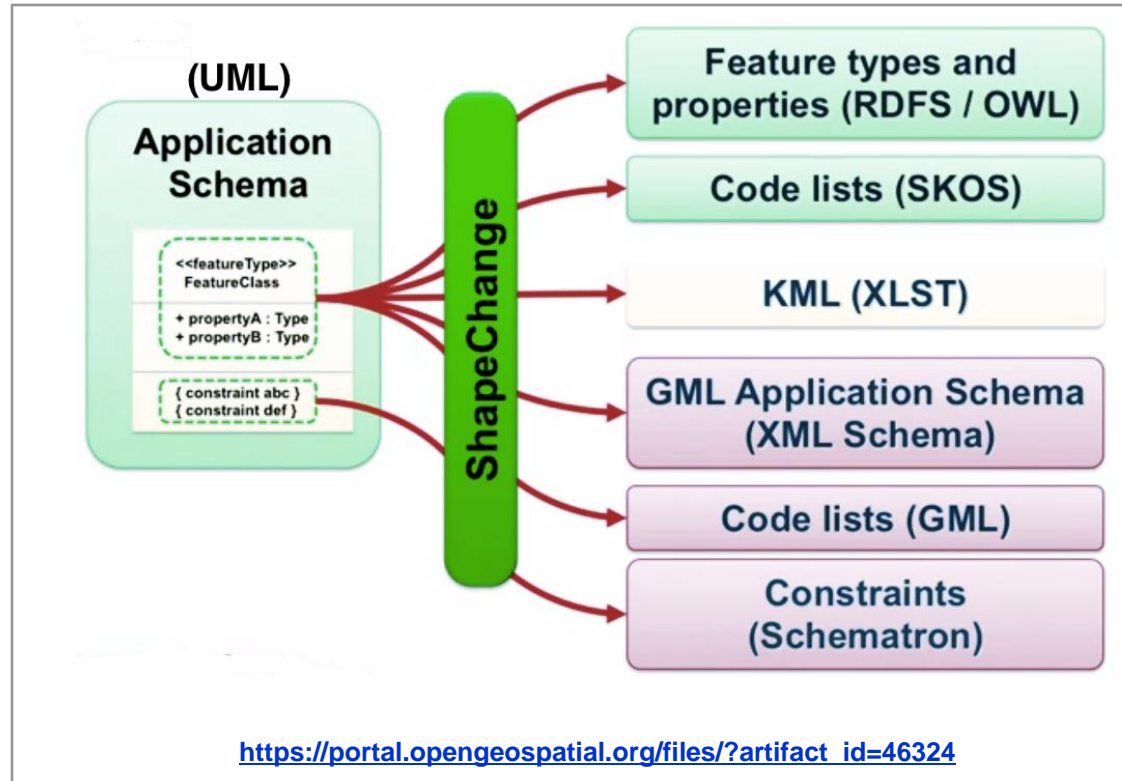
- Abstract, Spill Summary & Reporting
- Damage Assessment
- Oil Spill Response Operations
- Operator Services & Support

# Geospatial Data Application Schemas



- UML frequently used to specify conceptual schemas for geographic information using ISO 19000 series
- Encoding rules support conversions of such schemas to implementation schemas, e.g. to GML application schemas

- Potential Oil Spill Applications Schemas
  - OGP Seabed Survey Data Model (SSDM)
  - Consider environmental data model development
  - Define a focus group with the needed expertise



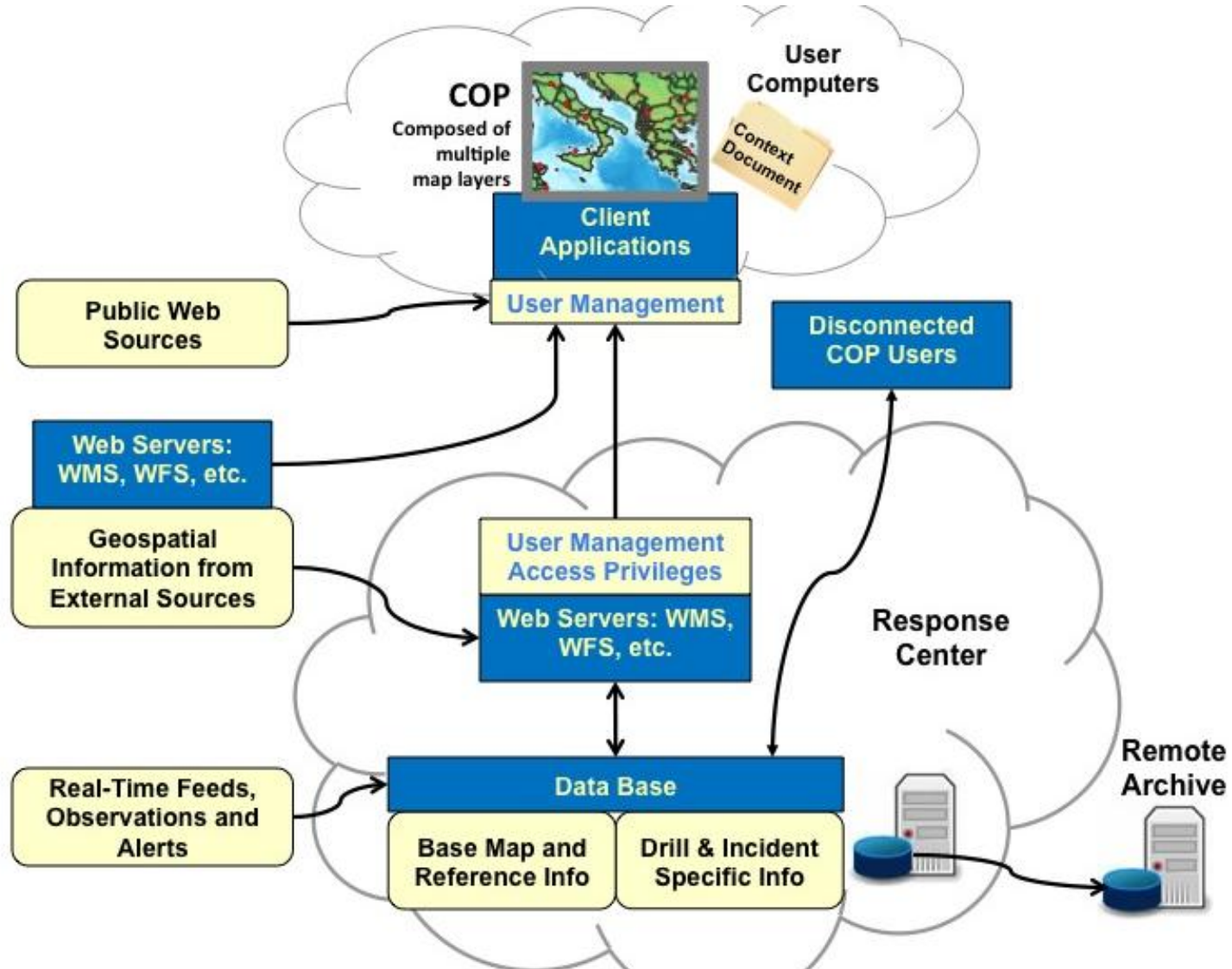
# Web service delivery to users

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- Context sharing
  - OGC Context Document
- Web mapping services
  - OGC WMS, WMTS
- Portrayal and symbols
  - OGC SLD, SE
- Access to features and coverages
  - OGC WFS, WCS
- Catalog/registry services
  - OGC CSW
- User identity and management services

# OSR COP delivery architecture



# Delivering Geospatial Information



- Interoperability architecture
- Web service delivery to users
- Schemas, metadata and encodings
- Real-time feeds and Alerts
- Disconnected user operations
- Records retention and provenance

# OGP-IPIECA Oil Spill Response COP



- **Schedule**

- Request for Information:

- Responses by 30 Oct.
- Still open to input

- Engineering Workshops

- December in UK
- January in USA

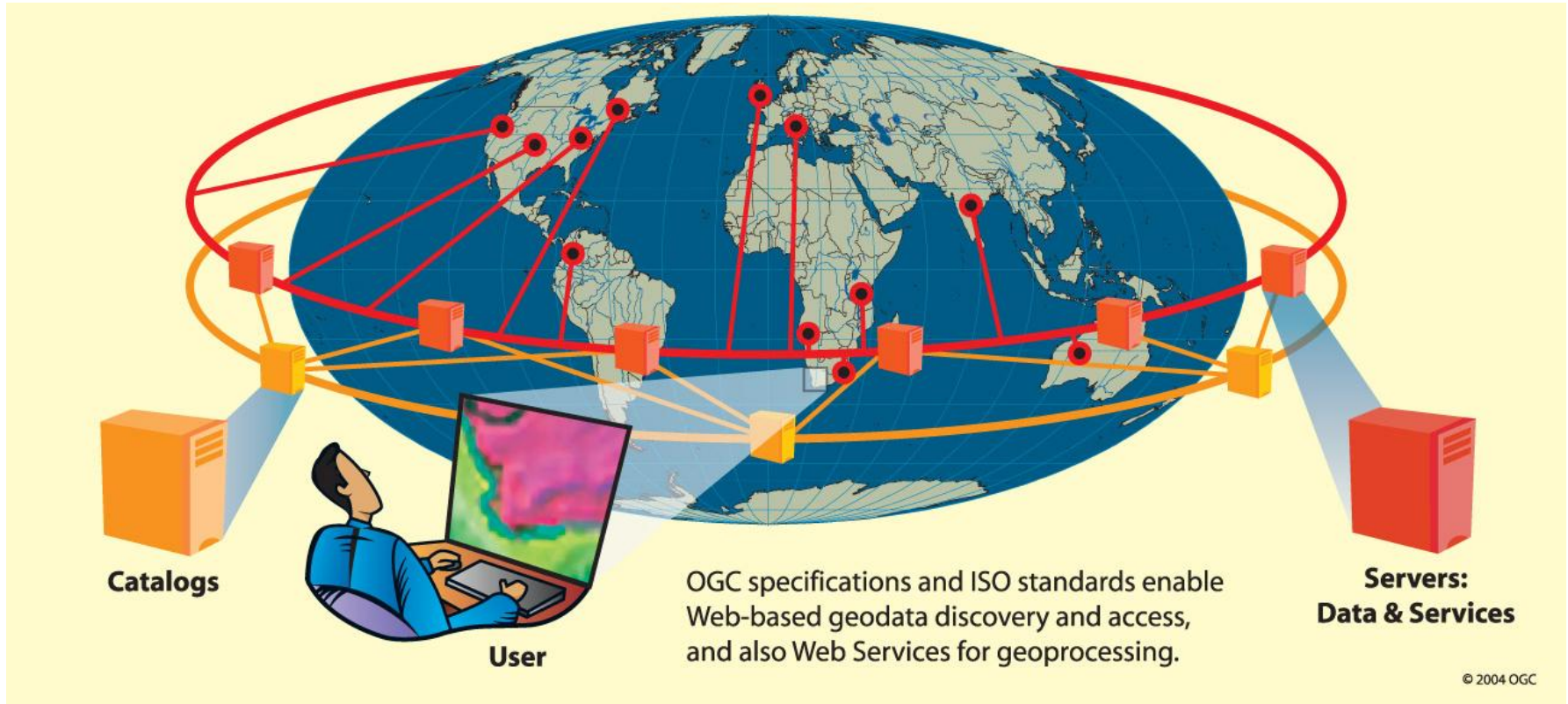
- Reference Architecture and Feasibility Report, early 2014

## Responses to RFI

- ASA Science
- Astrium
- EMSA
- ERM
- Esri
- Finland SYKE
- GeoCentro
- Jacobs Univ.
- **IHO** 
- MDA
- MWCC
- NOAA ERMA
- NAPSG
- Oceaneering
- Primal Innovation Tech
- SINTEF
- Terradue
- Witt Obriens
- 34 North



# The OGC vision is a vision of a global geospatial and IT community



**Composed of many collaborating organizations... authoring and publishing open standards for geospatial interoperability**

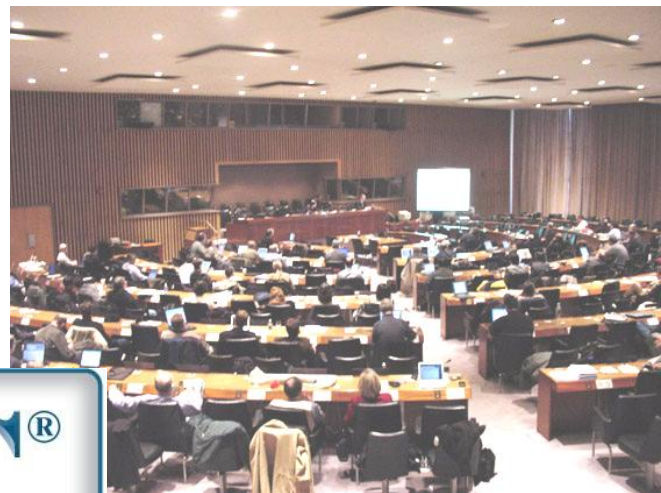
# Thank You



**George Percivall**

[gpercivall@opengeospatial.org](mailto:gpercivall@opengeospatial.org)

+1 301 560-6439



<http://www.opengeospatial.org/>