Open Geographical Consortium

Java interfaces as OGC standards

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Making location count.

What is the OGC?

- Not-for-profit
- International industry consortium
- Founded 1994, currently 340+ members
- **Open Standards development by consensus process**

OGC Mission

To lead in the development, promotion and harmonization of open spatial standards …

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OGC Program

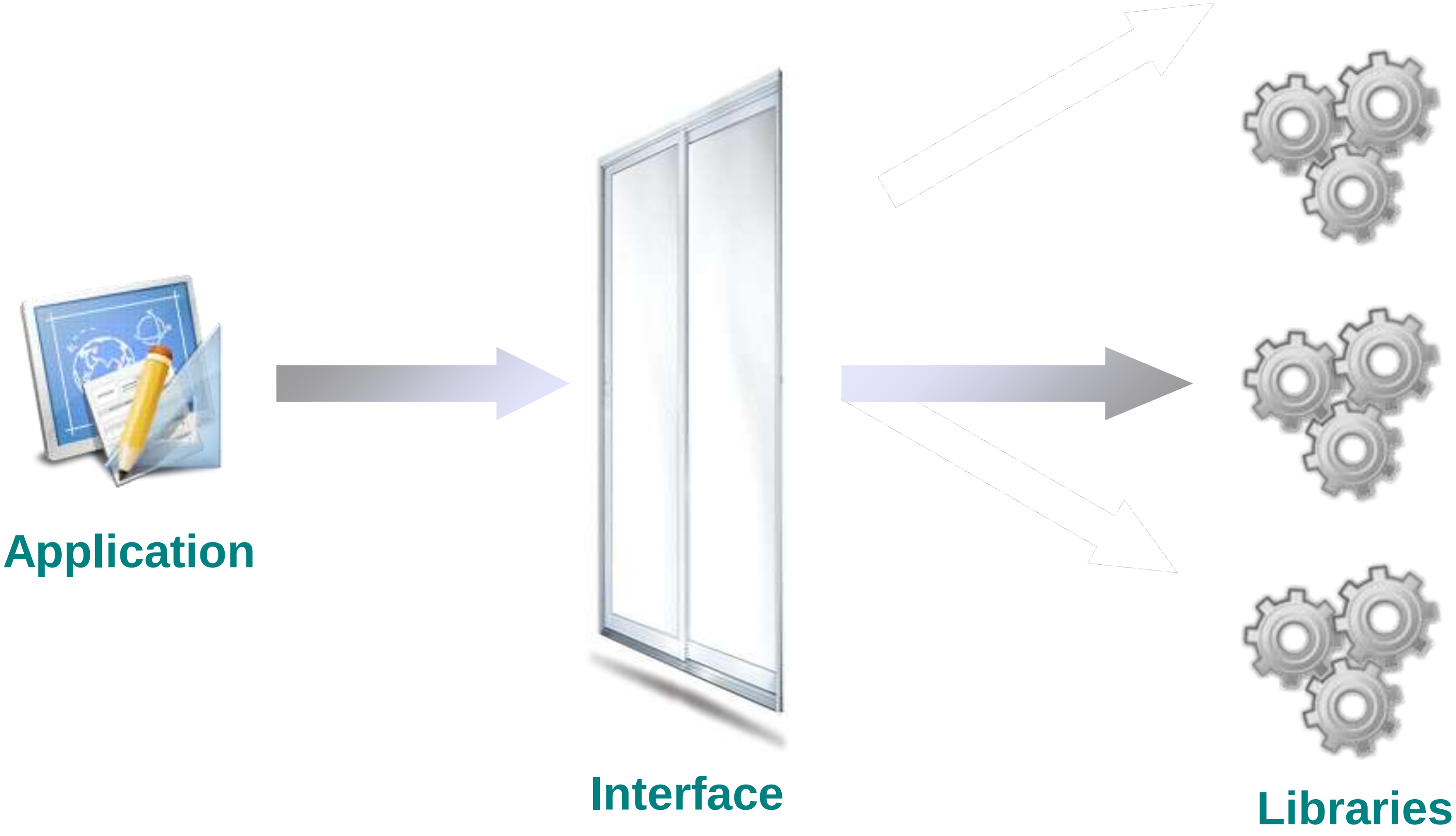
Interoperability Program – a global, innovative hands-on rapid prototyping and testing program designed to accelerate interface development and validation and to bring interoperability to the market.

Specification Development Program – Consensus standards process similar to other Industry consortia (World Wide Web Consortium, OMA, OASIS, JCP etc.).

Outreach and Community Adoption Program – education and training, encourage take up of OGC specifications, business development, communications programs

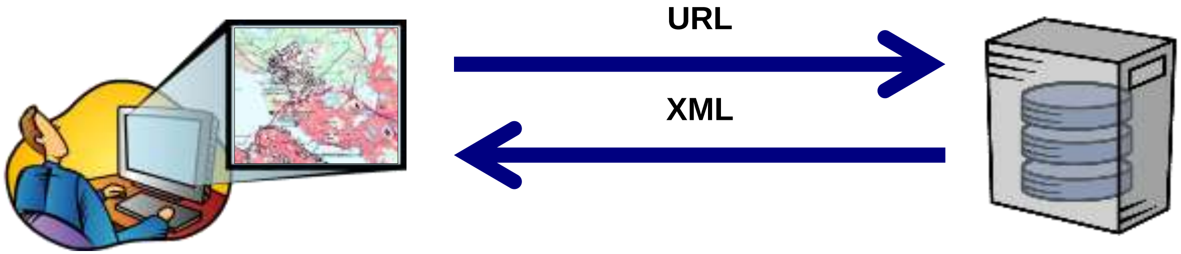
What is GeoAPI?

- OGC/ISO specifications as programmatic interfaces
- Analogous to JDBC, but for geospatial applications



Why GeoAPI

Isn't OGC Web Services sufficient?



- Similar to JDBC:
  - SQL existence doesn't means that low-level API is not needed.
  - JDBC interfaces complete SQL, and they proven to be quite useful.
- Easily switch from one toolkit to another (demo)
- Mix components from different toolkits (demo)
- Reduce the learning curve

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How GeoAPI is designed

- Sources are UML in OGC/ISO specifications
- Adapted to meet expectations of Java developers
  (departures documented in the GeoAPI specification)

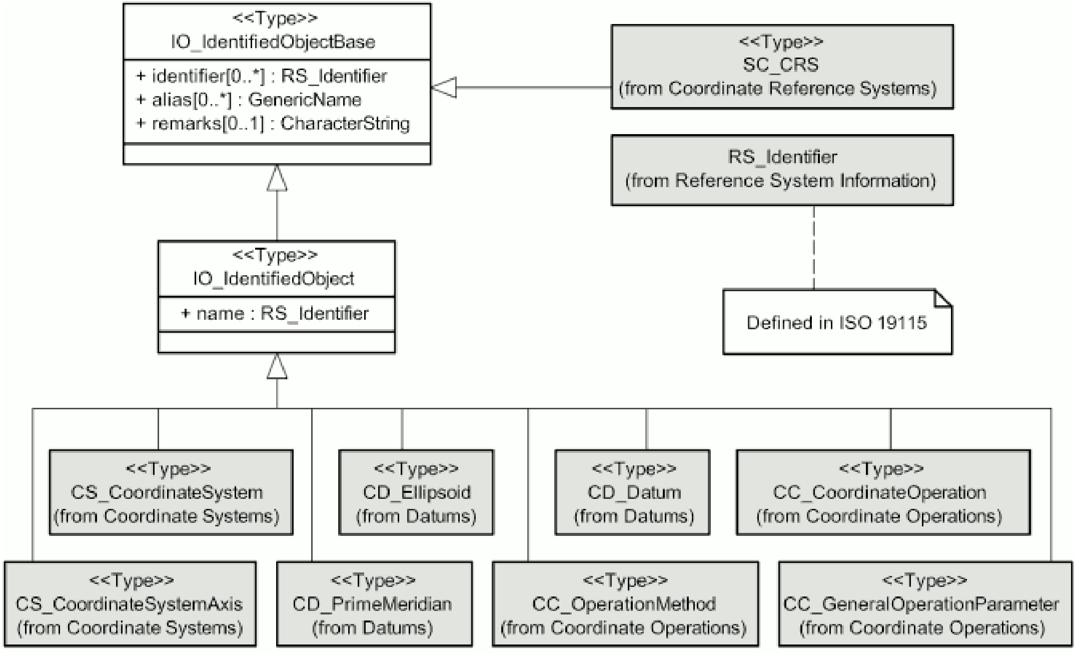

Figure 5 — IO_IdentifiedObject package

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Why Java interfaces derived from OGC UML

- Give to developers a model designed by OGC/ISO experts
  - Help to anticipate problems that developers may encounter only years later. Often the OGC/ISO experts have already debated such problems.
- Developers can implement only the interfaces they need
  - Nevertheless, the full set of interfaces is still useable as “hook” for future developments.
- Implementors can refer users to existing documentation
  - Less documentation effort for implementors
  - Model more likely to be familiar to users

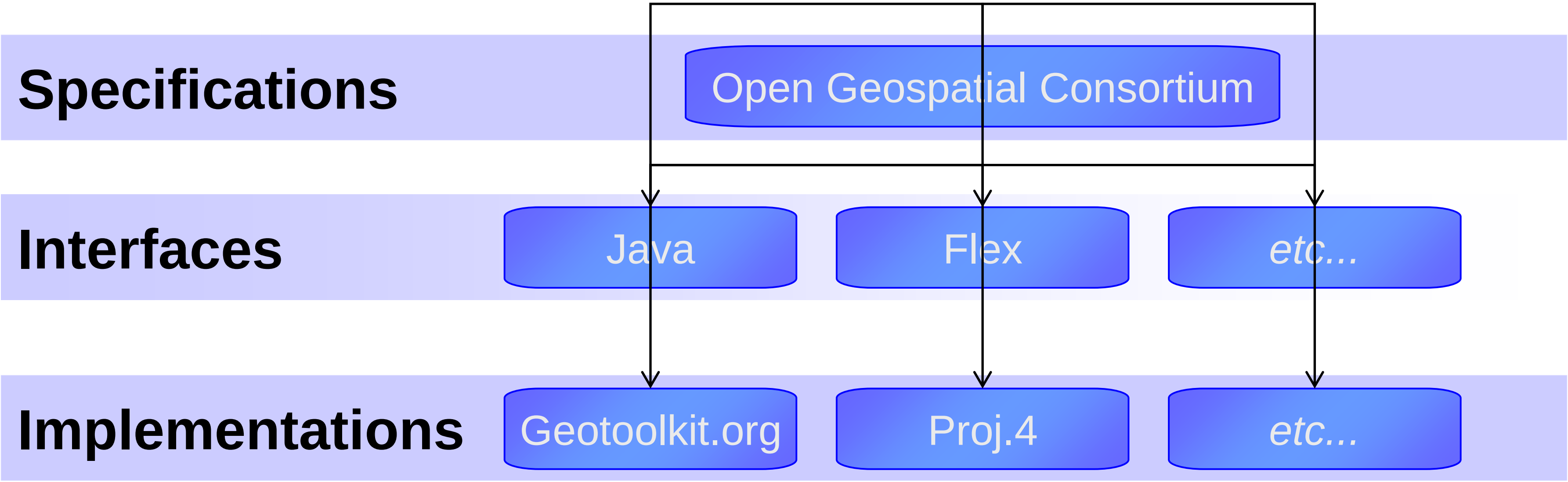
Interface example

```
/**
 * Abstract coordinate reference system, defined by a
 * coordinate system and a datum.
 *
 * @since 2.0
 */
@UML(identifier="SC_CRS", specification=ISO_19111)
public interface CoordinateReferenceSystem extends ReferenceSystem {
    /**
     * Returns the coordinate system.
     */
    @UML(identifier="usesCS", specification=ISO_19111, obligation=MANDATORY)
    CoordinateSystem getCoordinateSystem();

    /**
     * Returns the datum.
     */
    @UML(identifier="usesDatum", specification=ISO_19111, obligation=MANDATORY)
    Datum getDatum();
}
```

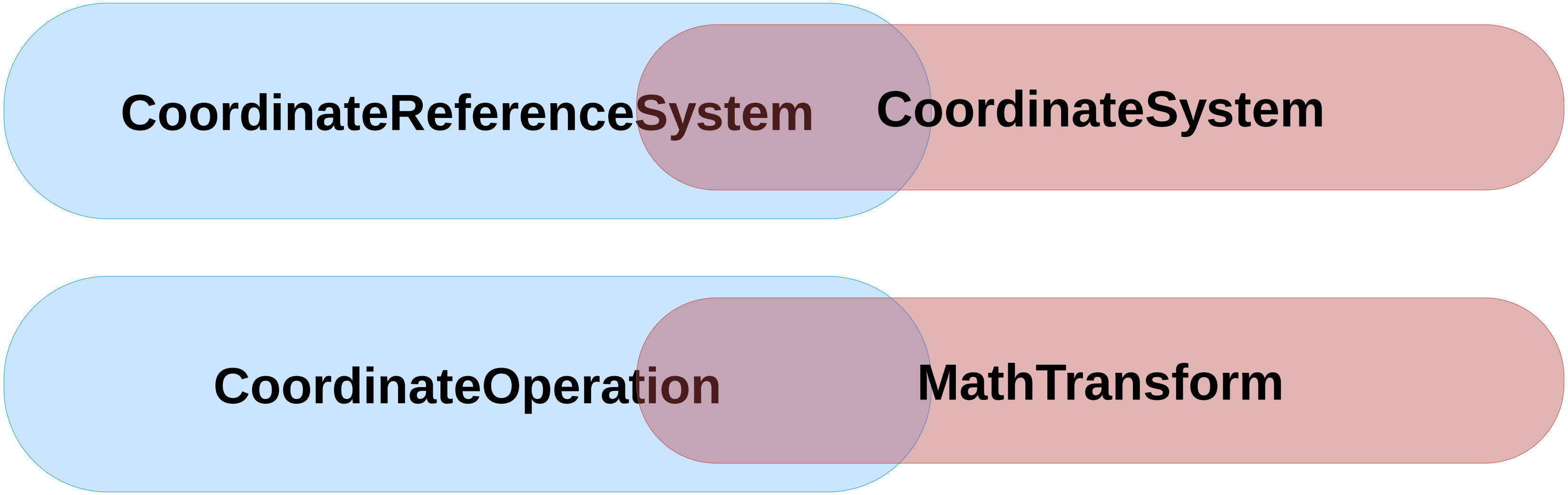
Where interfaces stand

- Between OGC/ISO specifications and implementations
- Java language for now, but other languages are possible
- Many implementations for the same set of interfaces



Implementation flexibility

- Comparable to JDBC
  - – PostgreSQL, Oracle or MS-Access databases don't have to be implemented in a “JDBC way”
- Concepts can be merged for simplicity
  - – Demonstrated by Proj.4 wrapper and examples



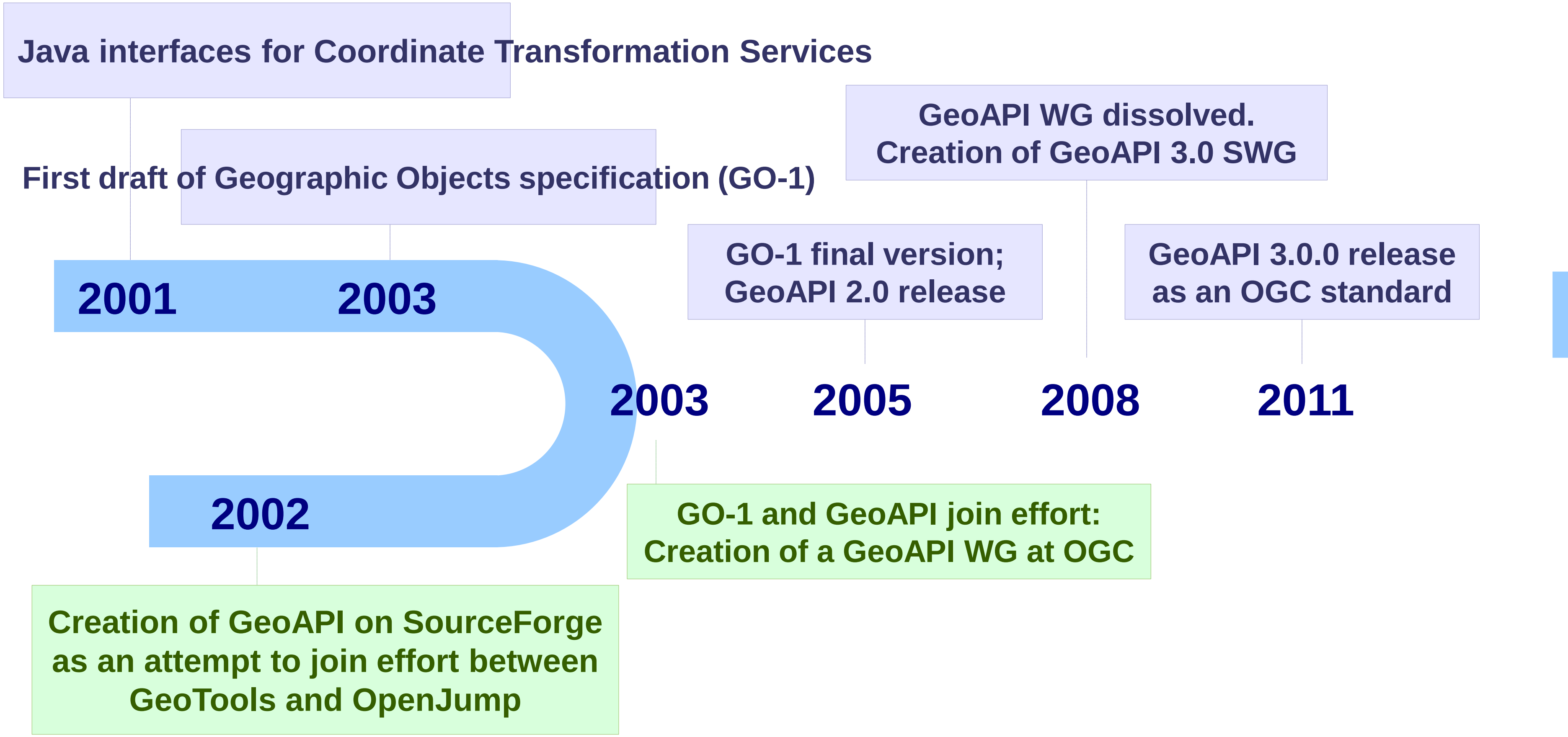
CoordinateReferenceSystem

CoordinateSystem

CoordinateOperation

MathTransform

History



2001

Java interfaces for Coordinate Transformation Services

2002

Creation of GeoAPI on SourceForge as an attempt to join effort between GeoTools and OpenJump

2003

First draft of Geographic Objects specification (GO-1)

2003

GO-1 and GeoAPI join effort: Creation of a GeoAPI WG at OGC

2005

GO-1 final version; GeoAPI 2.0 release

2008

GeoAPI WG dissolved. Creation of GeoAPI 3.0 SWG

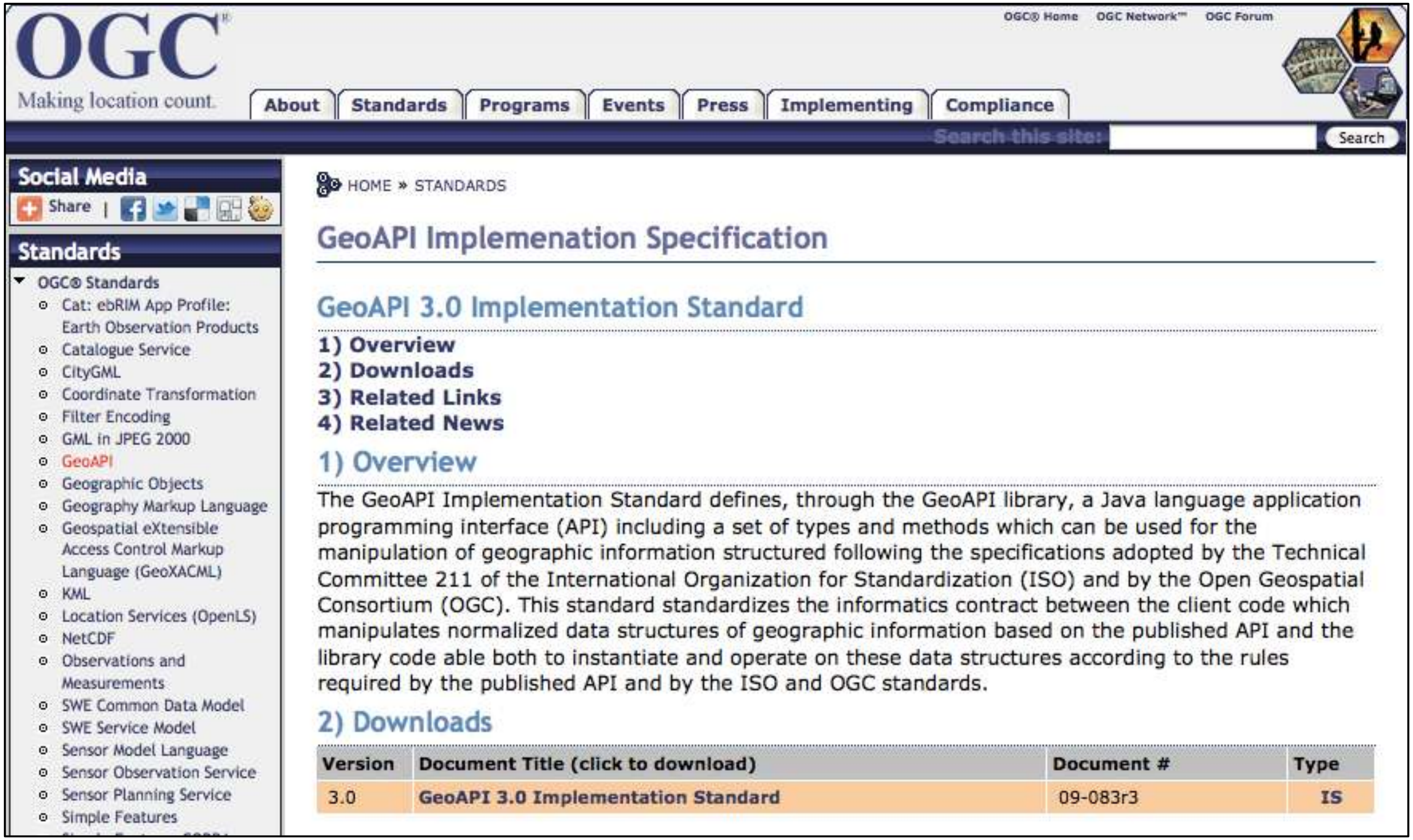
2011

GeoAPI 3.0.0 release as an OGC standard

WG:	Working Group
SWG:	Standard Working Group

Present

http://www.opengeospatial.org/standards/geoapi



- OGC® Standards
  - Cat: ebRIM App Profile: Earth Observation Products
  - Catalogue Service
  - CityGML
  - Coordinate Transformation
  - Filter Encoding
  - GML in JPEG 2000
  - GeoAPI
  - Geographic Objects
  - Geography Markup Language
  - Geospatial eXtensible Access Control Markup Language (GeoXACML)
  - KML
  - Location Services (OpenLS)
  - NetCDF
  - Observations and Measurements
  - SWE Common Data Model
  - SWE Service Model
  - Sensor Model Language
  - Sensor Observation Service
  - Sensor Planning Service
  - Simple Features

HOME » STANDARDS

GeoAPI Implemenation Specification

GeoAPI 3.0 Implementation Standard

1) Overview
2) Downloads
3) Related Links
4) Related News

1) Overview

The GeoAPI Implementation Standard defines, through the GeoAPI library, a Java language application programming interface (API) including a set of types and methods which can be used for the manipulation of geographic information structured following the specifications adopted by the Technical Committee 211 of the International Organization for Standardization (ISO) and by the Open Geospatial Consortium (OGC). This standard standardizes the informatics contract between the client code which manipulates normalized data structures of geographic information based on the published API and the library code able both to instantiate and operate on these data structures according to the rules required by the published API and by the ISO and OGC standards.

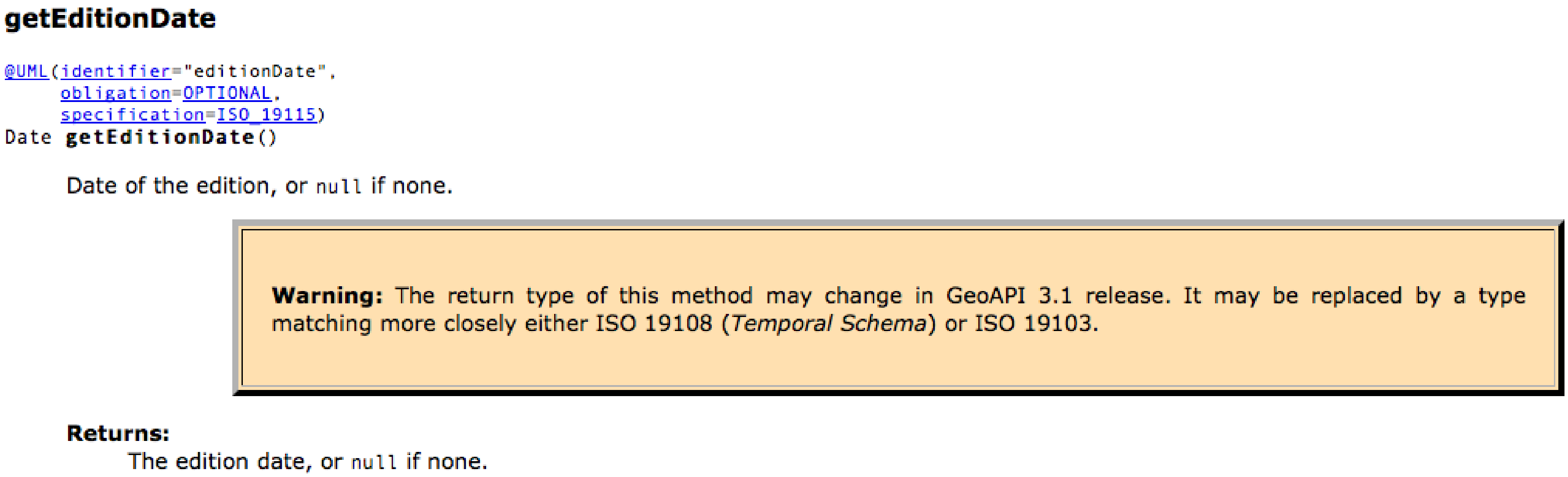
2) Downloads

Version	Document Title (click to download)	Document #	Type
3.0	GeoAPI 3.0 Implementation Standard	09-083r3	IS

OGC standard working group

- Technical discussions on the SourceForge mailing list
- Procedural (votes, *etc.*) discussions on the OGC mailing list
  - Any OGC member can join
  - Decisions are done according the OGC rules
  - Only OGC staff can deploy to Maven Central

Evolution



getEditionDate

```
@UML(identifier="editionDate",
     obligation=OPTIONAL,
     specification=ISO_19115)
Date getEditionDate()
```

Date of the edition, or `null` if none.

> **Warning:** The return type of this method may change in GeoAPI 3.1 release. It may be replaced by a type matching more closely either ISO 19108 (*Temporal Schema*) or ISO 19103.

Returns:
The edition date, or `null` if none.

All impacted API :

Metadata.getDateStamp()
Citation.getEditionDate()
CitationDate.getDate()
Element.getDates()
Event.getTime()
ProcessStep.getDate()
RequestedDate.getLatestAcceptableDate()
RequestedDate.getRequestedDateOfCollection()

Requirement.getExpiryDate()
MaintenanceInformation.getDateOfNextUpdate()
StandardOrderProcess.getPlannedAvailableDateTime()
Usage.getUsageDate()
Datum.getRealizationEpoch()
TemporalDatum.getRealizationEpoch()
TemporalDatum.getOrigin()
DatumFactory.createTemporalDatum(Map, Date)

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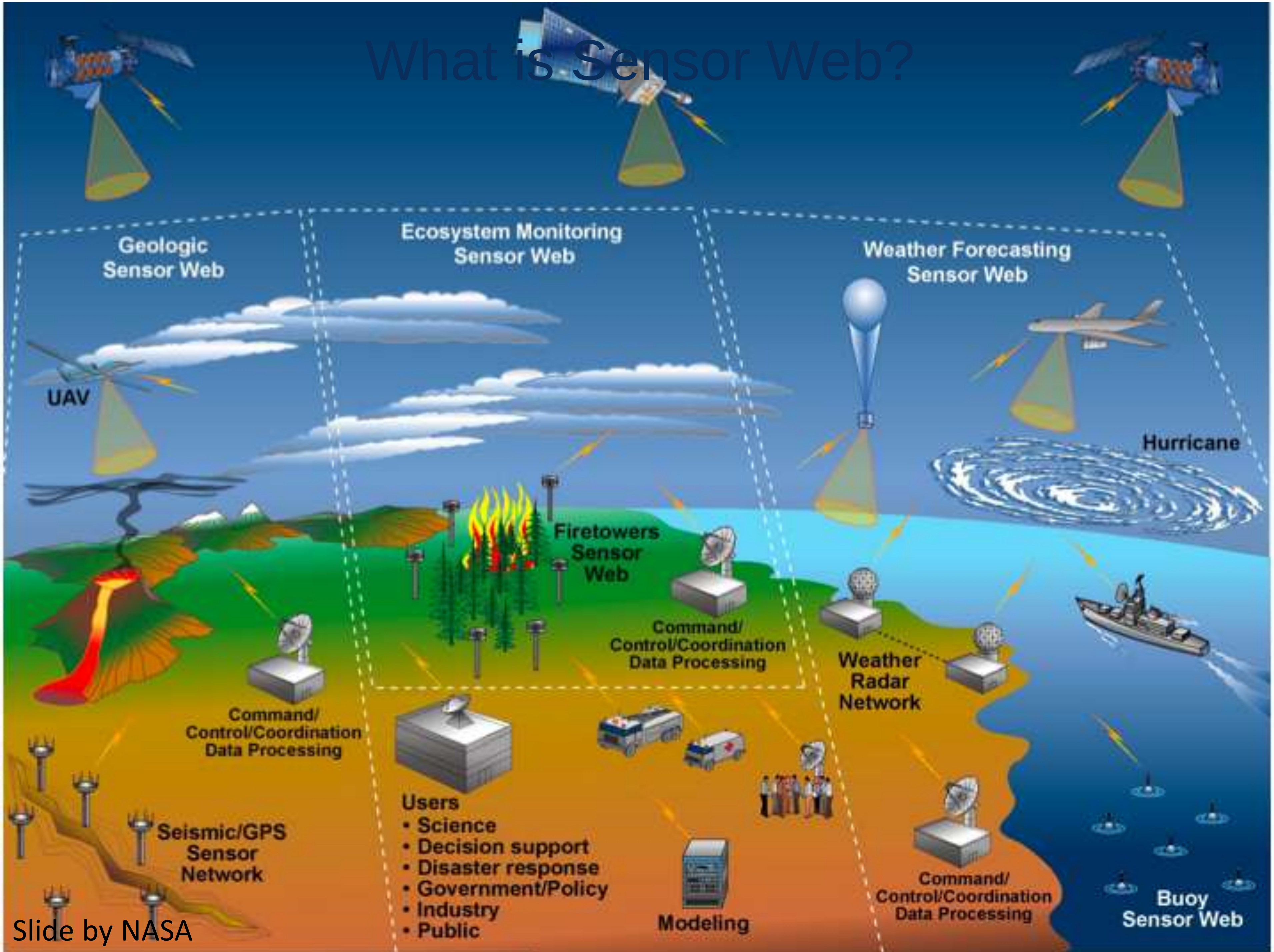
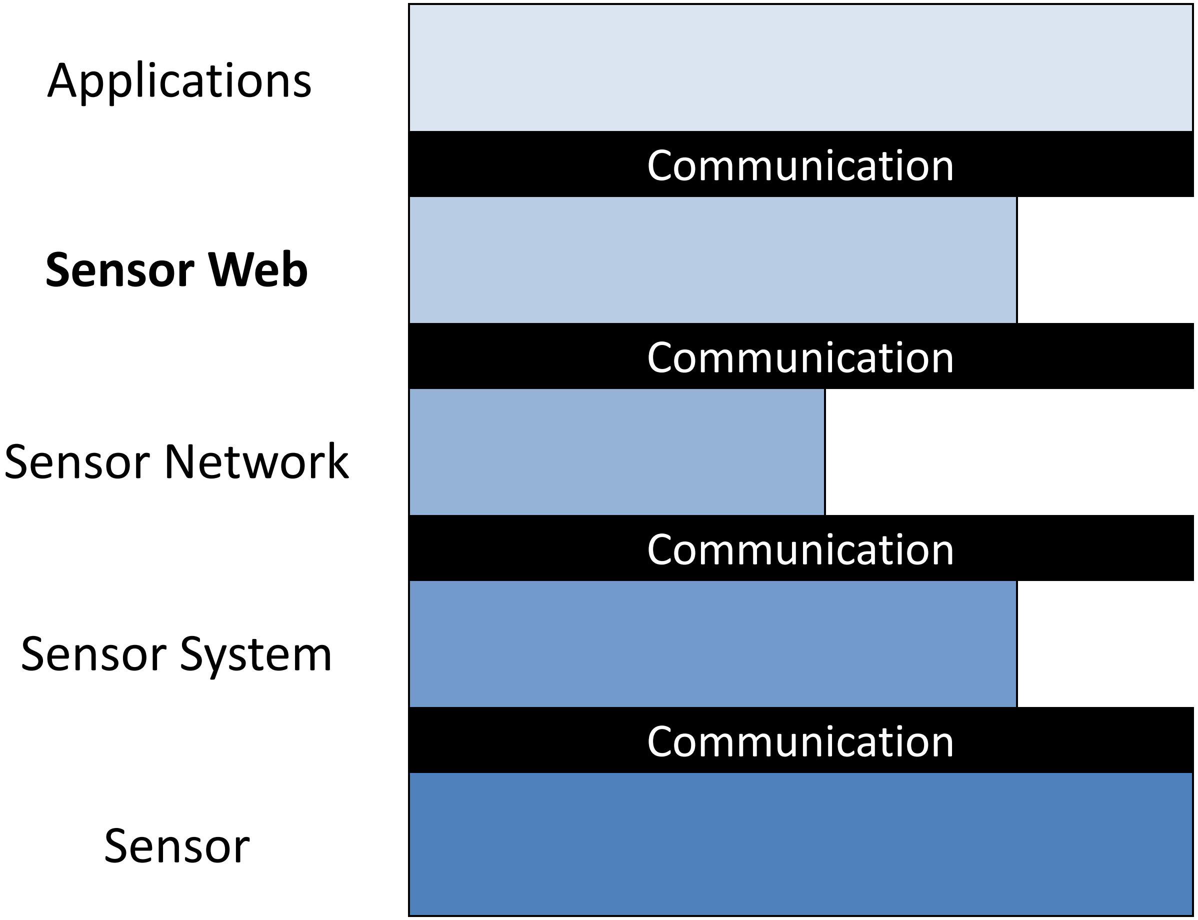
What is Sensor Web?


Geologic Sensor Web
Ecosystem Monitoring Sensor Web
Weather Forecasting Sensor Web
UAV
Hurricane
Firetowers Sensor Web
Command/ Control/Coordination Data Processing
Command/ Control/Coordination Data Processing
Weather Radar Network
Command/ Control/Coordination Data Processing
Users
• Science
• Decision support
• Disaster response
• Government/Policy
• Industry
• Public
Seismic/GPS Sensor Network
Modeling
Buoy Sensor Web

Slide by NASA

Scientific View: Sensor Web



Applications

Communication

Sensor Web

Communication

Sensor Network

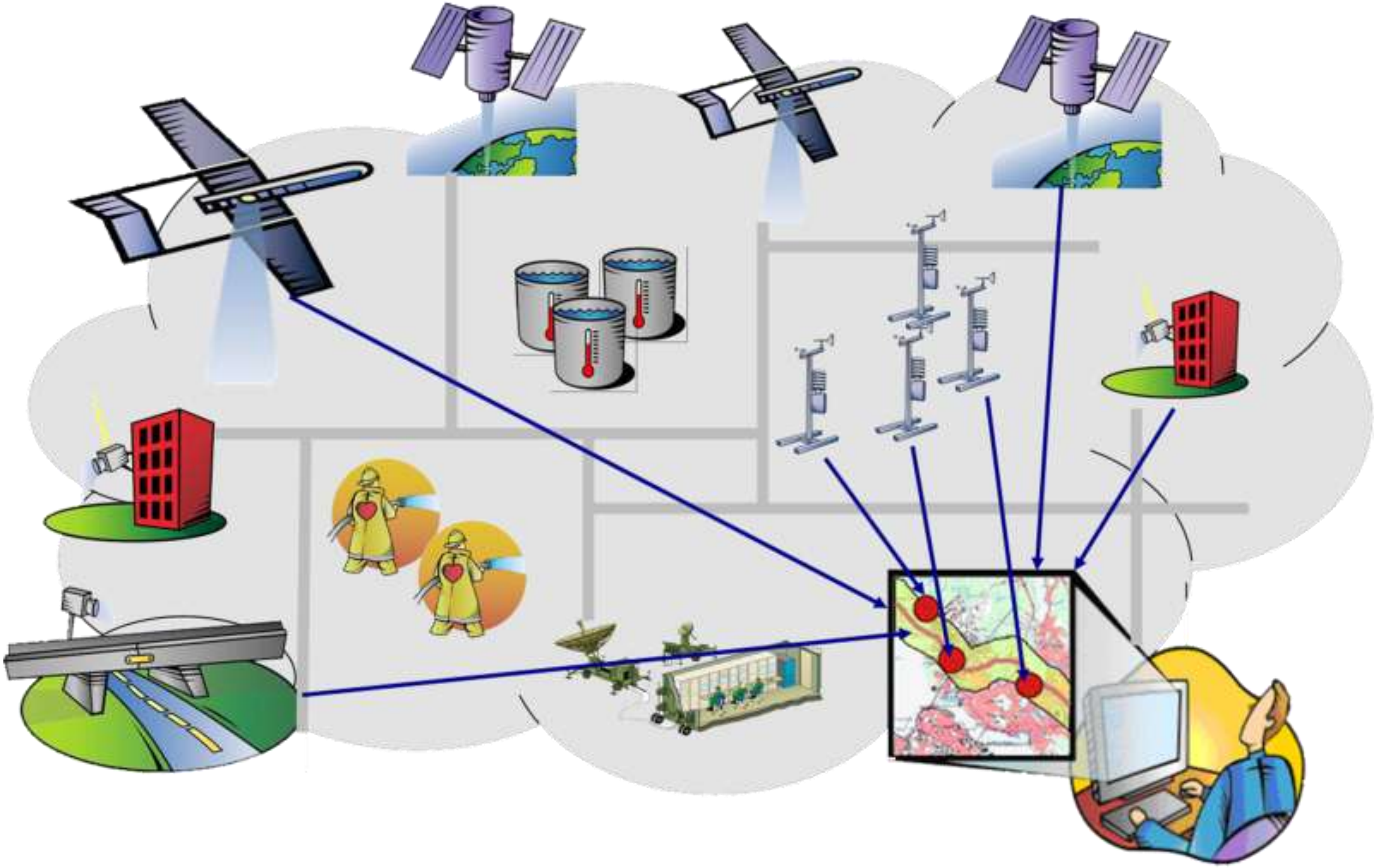
Communication

Sensor System

Communication

Sensor

OGC: Sensor Web



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Sensor Web Intent

- Quickly discover sensors and sensor data (secure or public) that can meet my needs – location, observables, quality, ability to task
- Obtain sensor information in a standard encoding that is understandable by me and my software
- Readily access sensor observations in a common manner, and in a form specific to my needs

Sensor Web Intent II

- Task sensors, when possible, to meet my specific needs
- Subscribe to and receive alerts when a sensor measures a particular phenomenon

Sensor Web Vision I

- Sensors will be web accessible
- Sensors and sensor data will be discoverable
- Sensors will be self-describing to humans and software (using a standard encoding)
- Most sensor observations will be easily accessible in real time over the web

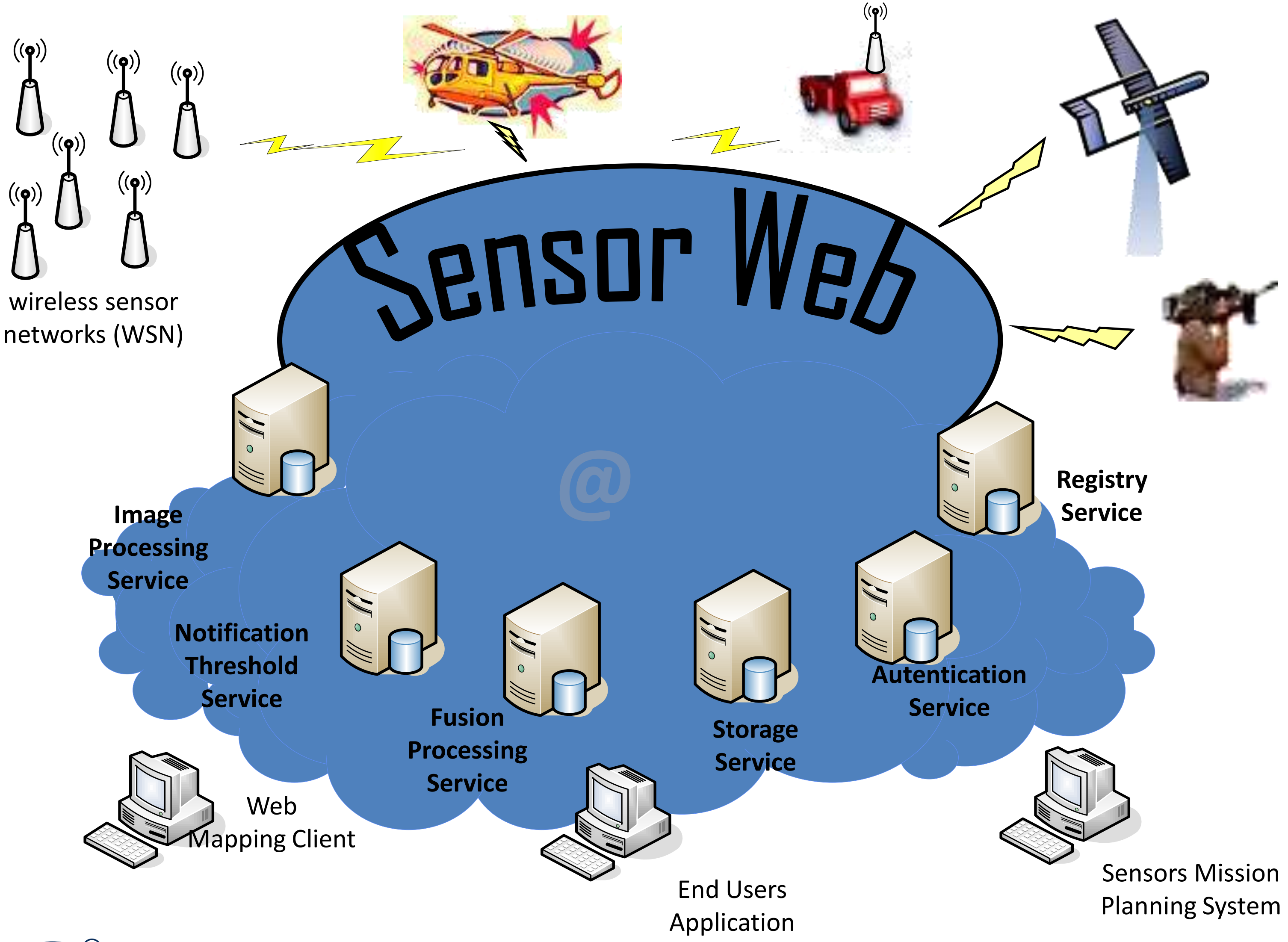
Sensor Web Vision II

- Standardized web services will exist for accessing sensor information and sensor observations
- Sensor systems will be capable of real-time mining of observations to find phenomena of immediate interest
- Sensor systems will be capable of issuing alerts based on observations, as well as be able to respond to alerts issued by other sensors

Sensor Web Vision III

- Software will be capable of on-demand geolocation and processing of observations from a newly-discovered sensor without *a priori* knowledge of that sensor system
- Sensors, simulations, and models will be capable of being configured and tasked through standard, common web interfaces
- Sensors and sensor nets will be able to act on their own (i.e. be autonomous)

Sensor Web Vision



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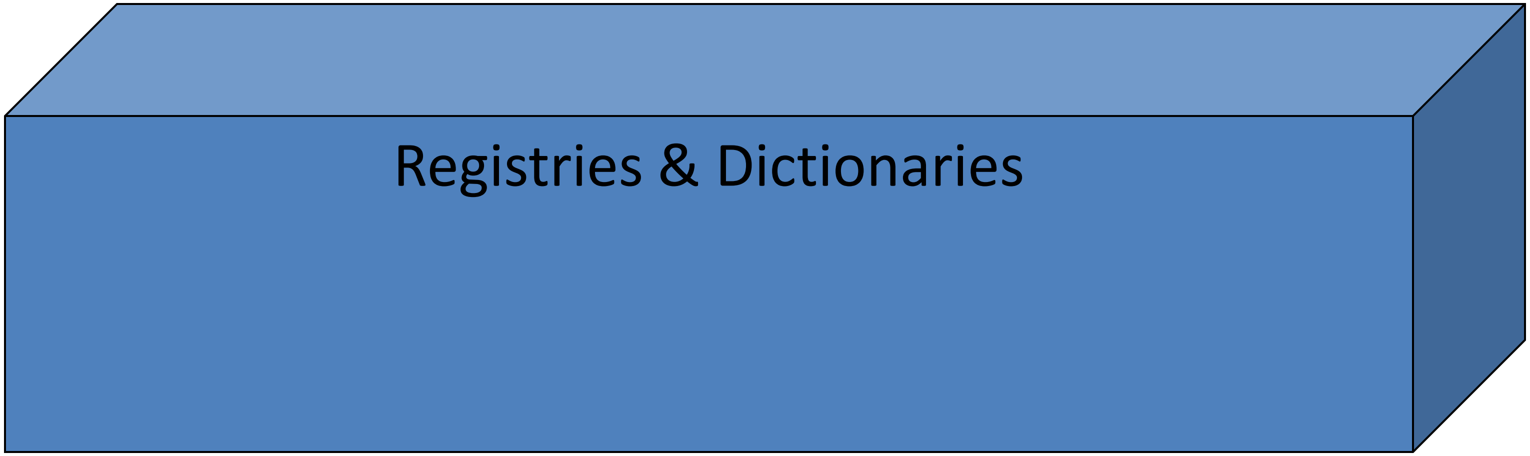
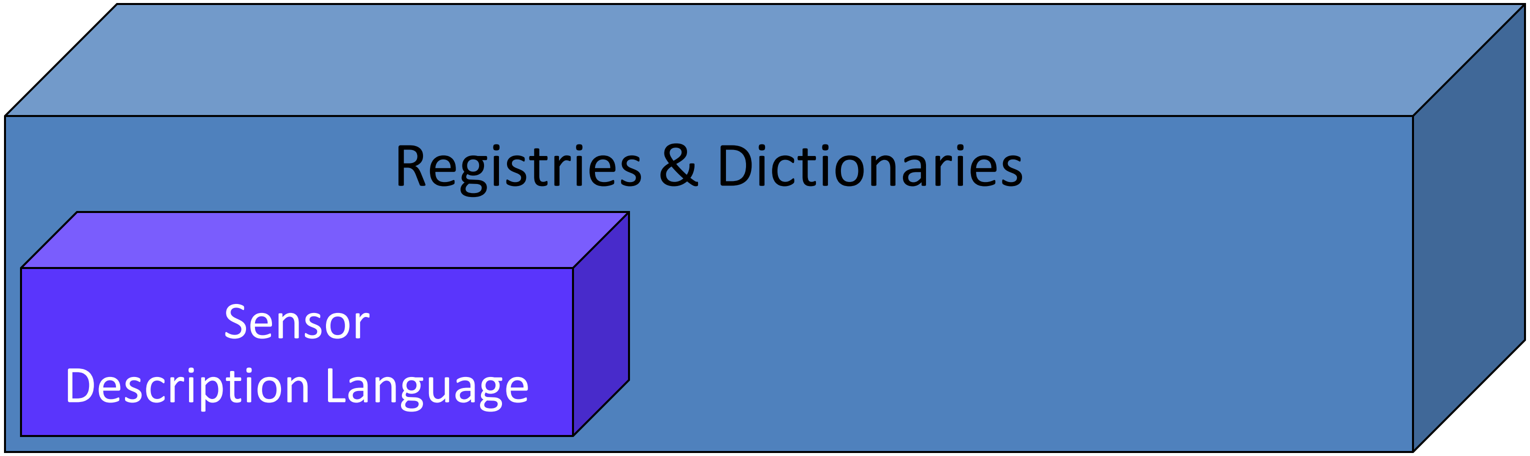
Sensor Web: Building Blocks

- Quickly discover sensors and sensor data (secure or public) that can meet my needs – location, observables, quality, ability to task



Sensor Web: Building Blocks

- Obtain sensor information in a standard encoding that is understandable by me and my software



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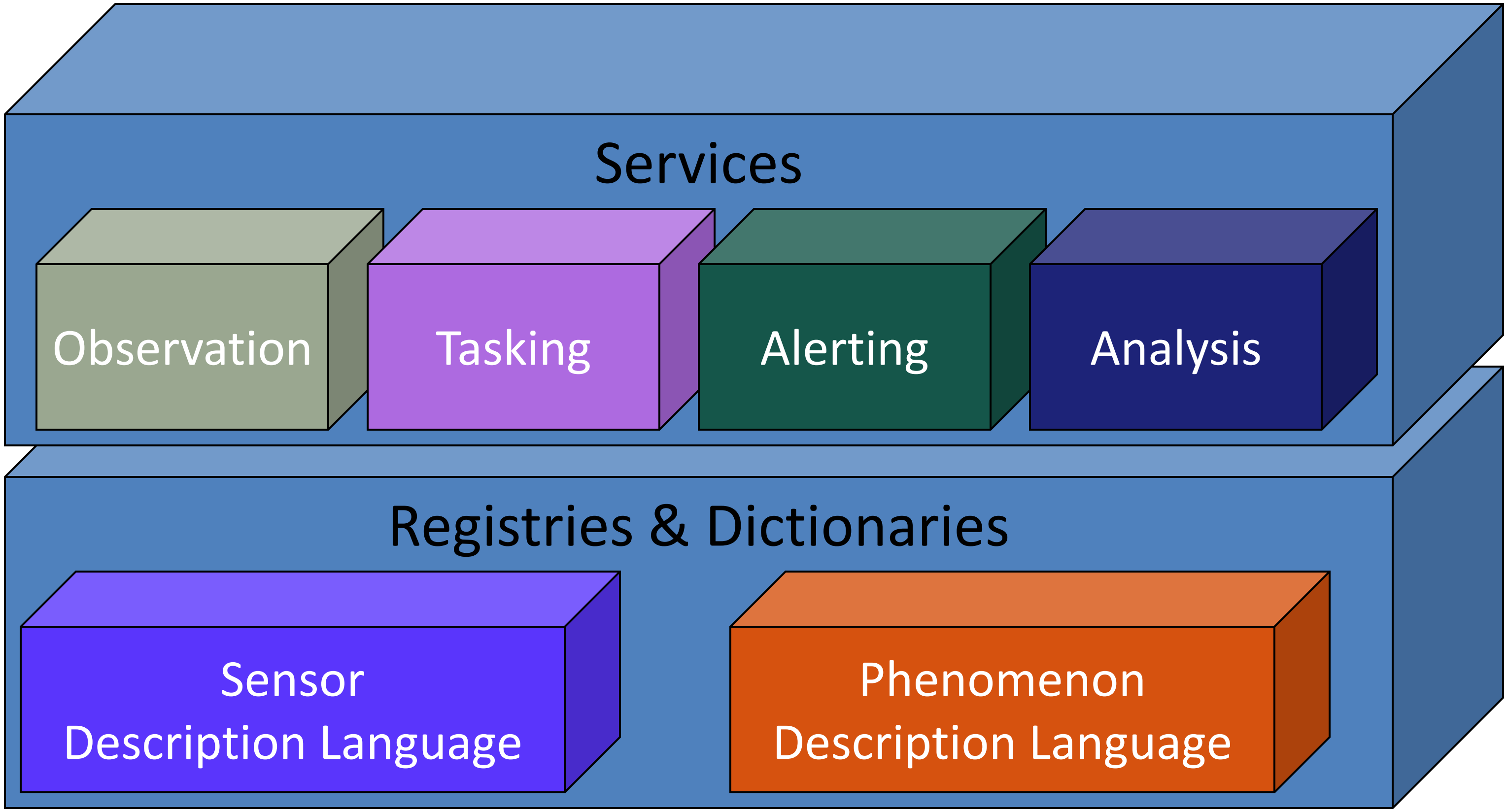
Sensor Web: Building Blocks


Services
Observation
Tasking
Alerting
Analysis
Registries & Dictionaries
Sensor Description Language
Phenomenon Description Language

What is KML?

- KML is a file format used to display geographic data in an Earth browser, such as
  - Google Earth,
  - Google Maps
  - Google Maps for mobile
  - etc.
- Who uses KML
  - Casual Users
  - Scientists
    - E.g. mapping Earthquakes
  - Non-Profits
    - Humanitarian missions like UN in Dafur
  - Students and Educators

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www.opengeospatial.org