Open standards for sustainable disaster risk reduction

Steven Ramage
Head of Ordnance Survey International,
Member of the OGC Global Advisory Council
The number of natural disasters has increased over the past 30 years in every region of the world.

World Development Report, World Bank

http://tinyurl.com/mq3gdw8
In the outcome document “The future we want” Governments and organisations urged to commit to disaster risk reduction to enhance the resilience of cities and communities to disasters.

Regarding geospatial standards we must consider mechanisms to assist Member States:
• Create a baseline or mechanism for data sharing;
• Adopt existing standards and implement them in national legal and policy frameworks;
• Include IHO, ISO, OGC and others.
UN-GGIM and international standards

“It is important to think about data standards, sharing and accessibility. Today’s supply chain means integrating traditional and non-traditional types of information.”
WU, Hongbo

“We must consider economic requirements.”
LI, Pengde

“Successful response starts with a map.”
McCONNELL, James

“Collaboration amongst agencies is critical.”
UNE, Hiroshi

“We use open standards to enable systems interoperability.”
DEAKIN, Rob
UN-GGIM and international standards

Save lives
- Drive activities that underpin emergency response and humanitarian assistance;
- Support evidence-based decision making and policy development;
- Share and provide access to accurate, current, high-quality, authoritative data.

Save time
Save money
UN-GGIM and international standards

New York, 13-15 August 2012
Second session of the UN Committee of Experts on Global Geospatial Information Management

2/103
Inventory of issues to be addressed by the UN-GGIM Committee of Experts

Concept proposed

(d) Suggestion by Technical Committee 211 (geomatics and geographic information) of the International Organization for Standardization (ISO/TC211) to put forward, jointly with the Open Geospatial Consortium (OGC) and the International Hydrographic Organization (IHO), a paper related to standard-setting issues in the international community …
UN-GGIM and international standards

Draft report submitted

Second High Level Forum on Global Geospatial Information Management

Qatar National Convention Centre, Doha, Qatar, 4-6 February 2013

Full report

Third Session of UN-GGIM Committee of Experts

Cambridge, UK, 24-27 July 2013
Committee of Experts on
Global Geospatial Information Management

Third session
Cambridge, United Kingdom of Great Britain and Northern Ireland
24-26 July 2013

Item 8 of the provisional agenda

Establishment and implementation of standards for the global geospatial information community

The UN-GGIM inventory of issues

and

geographic information standardization

Background Document Prepared jointly by the International Organization for Standardization (ISO/TC211), the Open Geospatial Consortium (OGC) and the International Hydrographic Organization (IHO)

http://tinyurl.com/mmfxjh5

The Secretariat acknowledges with thanks the contributions of Gilles Bessero, Jean Brodeur, Serena Coetzee, Olaf Østensen, Anthony Pharaoh and Carl Reed
UN-GGIM inventory of issues

a) Developing a national, regional and global strategic framework for geospatial information;
b) Establishing institutional arrangements and legal and common frameworks;
c) Building capability and capacity, especially in developing countries;
d) Assuring the quality of geospatial information;
e) Promoting data sharing, accessibility and dissemination;
f) Embracing trends in information technology;
g) Promoting geospatial advocacy and awareness;
h) Working in partnership with civil society and the private sector;
i) Linking geospatial information to statistics.
### Existing standards and inventory of issues

<table>
<thead>
<tr>
<th>UN-GGIM issue</th>
<th>Number of standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Developing a national, regional and global strategic framework for geospatial information</td>
<td>ISO: 6</td>
</tr>
<tr>
<td>(b) Establishing institutional arrangements and legal and common frameworks</td>
<td>ISO: 5</td>
</tr>
<tr>
<td>(c) Building capability and capacity, especially in developing countries</td>
<td>ISO: 5</td>
</tr>
<tr>
<td>(d) Assuring the quality of geospatial information</td>
<td>ISO: 7</td>
</tr>
<tr>
<td>(e) Promoting data sharing, accessibility and dissemination</td>
<td>ISO: 63</td>
</tr>
<tr>
<td>(f) Embracing trends in information technology</td>
<td>ISO: 20</td>
</tr>
<tr>
<td>(g) Promoting geospatial advocacy and awareness</td>
<td>ISO: -</td>
</tr>
<tr>
<td>(h) Working in partnership with civil society and the private sector</td>
<td>ISO: -</td>
</tr>
<tr>
<td>(i) Linking geospatial information to statistics</td>
<td>ISO: 7</td>
</tr>
</tbody>
</table>
International Hydrographic Organization (IHO)

- Intergovernmental consultative and technical organization established in 1921
- To support safety of navigation and the protection of the marine environment
- One of the IHO objectives:
  - To bring about the greatest possible uniformity in nautical charts and documents (i.e. standardization)

www.iho.int
For disaster response lack of data has major impact: resolution and density of data for good tsunami inundation modelling far exceeds capabilities of existing data in most coastal areas of world.

Governments should establish holistic bathymetric data gathering programmes that serve all requirements concurrently - not just improvement of nautical charts.

“Regarding data interoperability and standardisation the principal issue in the maritime domain is lack of data.”

Robert Ward, President, International Hydrographic Organization (IHO)

Image courtesy of NOAA
UN-GGIM and international standards: IHO

IHO S-10x standards depend on several ISO19100 series standards
UN-GGIM and international standards: ISO

- World's largest developer of standards founded in 1946
  - Network of national standards institutes from 163 countries
  - 19,500 standards published
- Recognized by the UN, particularly agencies involved in the harmonization of regulations and public policies, and that provide assistance and support to developing countries
- Technical Committees (TCs)
  - Range from *food safety* to *computers* to *healthcare*
  - ISO/TC 211, *Geographic information/geomatics*

[www.iso.org][1] [www.isotc211.org][2]
Components of Spatial Data Infrastructure (SDI)
Components of Spatial Data Infrastructure (SDI)

ISO/TR 19122 - Qualifications and certification of personnel

ISO 19101 – Reference model
ISO 19104 – Terminology
ISO 19105 – Conformance and testing
ISO 19106 – Profiles
ISO/TR 19120 – Functional standards
ISO 19135 – Procedures for registration of geographic information items
## Components of Spatial Data Infrastructure (SDI)

<table>
<thead>
<tr>
<th>Standards</th>
<th>Access, technology</th>
<th>Content (data)</th>
<th>Organization</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 19107 - Spatial schema</td>
<td>ISO/TR 19121 - Imagery and gridded data</td>
<td>ISO 19123 - Schema for coverage geometry and functions</td>
<td>ISO 19107 - Spatial schema</td>
<td>ISO 19107 - Spatial schema</td>
</tr>
<tr>
<td>ISO 19108 - Temporal schema</td>
<td>ISO 19126 - Profile - FACC Data Dictionary</td>
<td>ISO 19127 - Geodetic codes and parameters</td>
<td>ISO 19108 - Temporal schema</td>
<td>ISO 19108 - Temporal schema</td>
</tr>
<tr>
<td>ISO 19109 - Rules for application schema</td>
<td>ISO 19124 - Imagery and gridded data</td>
<td>ISO 19129 - Imagery, gridded and coverage data framework</td>
<td>ISO 19109 - Rules for application schema</td>
<td>ISO 19109 - Rules for application schema</td>
</tr>
<tr>
<td>ISO 19110 - Feature cataloguing methodology</td>
<td>ISO 19126 - Profile - FACC Data Dictionary</td>
<td>ISO 19130 - Sensor and data model for imagery and gridded data</td>
<td>ISO 19110 - Feature cataloguing methodology</td>
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</tr>
<tr>
<td>ISO 19111 - Spatial referencing by coordinates</td>
<td>ISO 19127 - Geodetic codes and parameters</td>
<td>ISO 19131 - Data product specification</td>
<td>ISO 19111 - Spatial referencing by coordinates</td>
<td>ISO 19131 - Data product specification</td>
</tr>
<tr>
<td>ISO 19112 - Spatial referencing by geographic identifiers</td>
<td>ISO 19129 - Imagery, gridded and coverage data framework</td>
<td>ISO 19137 - Generally used profiles of spatial schema and similar important other schemas</td>
<td>ISO 19112 - Spatial referencing by geographic identifiers</td>
<td>ISO 19137 - Generally used profiles of spatial schema and similar important other schemas</td>
</tr>
<tr>
<td>ISO 19113 - Quality principles</td>
<td>ISO 19130 - Sensor and data model for imagery and gridded data</td>
<td>ISO 19138 – Data quality measures</td>
<td>ISO 19113 - Quality principles</td>
<td>ISO 19138 – Data quality measures</td>
</tr>
</tbody>
</table>
Components of Spatial Data Infrastructure (SDI)

ISO 19116 - Positioning services
ISO 19117 – Portrayal
ISO 19118 – Encoding
ISO 19119 – Services
ISO 19125-1 - Simple feature access – common architecture
ISO 19125-2 – SFA – SQL option
ISO 19125-3 – SFA – COM/OLE
ISO 19128 - Web Map Server (WMS)
ISO 19132 - Location based services
ISO 19133 - Location based services tracking and navigation
ISO 19134 - Multimodal location based services for routing and navigation
ISO 19136 - Geography Markup Language (GML)
ISO 19139 - Metadata – Implementation specifications
UN-GGIM and international standards

ISO/TC 211, OGC and IHO have been cooperating since 1994, mainly under the liaison mechanism of ISO.

ISO/TC 211 and OGC also benefit from a range of people working actively in both organizations and have a Joint Advisory Group (JAG).
UN-GGIM and international standards: OGC

• Industry consortium, circa 500 member organisations
• 30+ geospatial standards, several also ISO standards
• Goal is to define, document and test implementation standards for use with geospatial content and services
  ➢ integration of geospatial content and services into applications

www.opengeospatial.org
The OGC's Role in Emergency Response and Disaster Management

Overview

Emergency Response and Disaster Management are different domains of activity with different information sharing requirements. They do, however, overlap and in both domains there is a need to rapidly discover, share, integrate and apply geospatial information. The standards work of the Open Geospatial Consortium (OGC) plays a key role in addressing this need. Speeding the flow of location information means more lives and property saved and less risk for first responders.
White Papers

A white paper is an OGC member approved publication released by the OGC to the Public that states a position on one or more technical considerations or other subjects that are germane to the work of the OGC, often including a high-level explanation of a standards based architecture or framework of a solution. A White Paper often explains the results or conclusions of research. A White Paper is not an official position of the OGC.

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Date</th>
<th>File Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGC Sensor Web Enablement: Overview and High Level Architecture (OGC 07-165r1)</td>
<td>Mike Botts, George Percivall, Carl Reed, John Davidson</td>
<td>2013-04-02</td>
<td></td>
</tr>
<tr>
<td>Architecture of an Access Management Federation for Spatial Data and Services in Germany (OGC 12-026)</td>
<td>Andreas Matheus</td>
<td>2012-04-18</td>
<td></td>
</tr>
<tr>
<td>Geospatial Business Intelligence (GeoBI) (OGC 09-044r3)</td>
<td>George Percivall and Raj Singh</td>
<td>2012-07-12</td>
<td></td>
</tr>
<tr>
<td>Open Source and Open Standards (OGC 11-110)</td>
<td>Arnulf Christl and Carl Reed</td>
<td>2011-08-11</td>
<td></td>
</tr>
<tr>
<td>OGC Standards and Cloud Computing (OGC 11-036)</td>
<td>Lance McKee, Carl Reed, Steven Ramage</td>
<td>2011-04-07</td>
<td></td>
</tr>
<tr>
<td>OGC Identifiers - the case for http URIs (10-124r1)</td>
<td>Simon Cox</td>
<td>2010-07-15</td>
<td></td>
</tr>
<tr>
<td>An Introduction to GeoRSS: A Standards Based Approach</td>
<td>Carl Reed (Editor), Raj Singh, Ron</td>
<td>2006-06-01</td>
<td></td>
</tr>
</tbody>
</table>
The PREVIEW Global Risk Data Platform

UNEP and UNISDR provide free and interoperable access to more than 60 global data sets on nine types of natural hazards, as well as related exposure and risk.
GEO (GEOSS) Global Drought Monitor

GEO Global Drought Monitor – An Integration of Continental / Regional Drought Monitors

North American Drought Monitor
February 29, 2012

GDMP – Global Drought Monitor Portal
EuroGEOSS Regional Drought Monitor

Observing system

- Monitoring network
- Data quality control
- Data retrieval system
- Data analysis – converting data into information

Information System

- Web site
- Agro meteorological bulletins
  - WMS
Tsunami Information Portal

Developed by DM Solutions in concert with Asian Institute of Technology, Chulalongkorn University and Laboratory of Applied Geomatics. Uses OGC WMS.
The German-Indonesian Tsunami Early Warning System (GITEWS)

Decision Support System (DSS) by DLR: Overview, Architecture and Schedule

Torsten Heinen; Ulrich Raape
German Remote Sensing Data Center (DFD)
German Aerospace Center (DLR)
Problem:
- Generation of Tsunamis near coastlines with small travel times
- Extremely short time window for tsunami detection, early warning and effective disaster response
- Occurs, for example in Indonesia and Japan

GITEWS Approach:
- Development and deployment of sophisticated sensor systems to provide sensor observations as early as possible
- Simulate tsunami scenarios (large scenario database)
- Provide decision support
Sensor-based Landslide Early Warning System (SLEWS)

Source: SLEWS, www.slews.de
NASA SensorWeb Vision

Manage complexity via simplicity using Internet methodology

1. Access via URI
2. Easy discovery
3. Easy upscale
4. Resource Oriented Architecture
5. Goal-oriented or theme based tasking
6. User/Event Driven

Software-driven Antenna Sensitivity Patterns - Software Tunes Reception to Targeted Satellite

Plug-and-Play Flight Software

Plug-and-Play Ground Software

INTERNET

Copyright © 2009, Open Geospatial Consortium Inc
exactEarth Satellite AIS (S-AIS)
80,000 vessels daily worldwide
Fukushima Radiation Monitoring

- Database construction project
- Integrate data from many sources: from CSV to Web Services
- Construct OGC standards-based service framework
- Use Sensor Web Enablement (SWE) standards, notably Sensor Observation Services
Fukushima Radiation Monitoring: project structure

- **Nuclear Regulation Authority (NRA), JAPAN**
  (started 2012.04 by merging related agencies)

- **Project Management**
- **Japan Atomic Energy Agency (JAEA)**
  - 2 Teams
- **Hokkaido University**
  - 2 Teams
- **Japan Map Center (Company)**
  - 1 Team

**Partners**

- Okayama-U,
  The Institute of Statistical Mathematics
AIST project role

Provide Database Federation Framework based on international standards.
1. Convert/Wrap “legacy” databases (CSV) into standard web services

Framework
• Easy to access/interoperate
• Easy to reuse
• Easy to combine with other data

Various Radiation Data
• Need to handle various sensors (including real-time sensors)

OGC Web Services (W*S)
OGC Sensor Web (SWE)
USE OGC SPECS

Enables useful knowledge to be obtained by federating data

Integrates various datasets into a single, comprehensive database

Can handle more data

Meteo

Solis

Quality Control

Can provide as easy-to-use Web Services

Integrated Database

Raw Data

Maps

Documents

Tools

Continuous Radiation Monitoring at NRA/JAEA

Nuclear Regulation Agency Data

(Legacy Databases)

Can handle more data

Fukushima Radiation Monitoring: project overview

Can provide as easy-to-use Web Services

Uses OGC SPECS

Enables useful knowledge to be obtained by federating data

Ministry of Environment

Ministry of Economy, Trade & Industry

Fukushima Prefecture

Radiation data from Other Public Sectors (Legacy Databases)

Ministry of Health, Labor & Welfare

Common Schema Definition

More Variety

UE OGC SPECS

Enables useful knowledge to be obtained by federating data
Collaboration tools

Sahana is a Free and Open Source web based Disaster Management collaboration tool that addresses coordination problems. Sahana uses OGC standards to serve, access and display geographic data.

Sahana also works with the OGC's Open GeoSMS standard. Open GeoSMS is compatible with other OGC standards, such as those for sensor webs and earth imaging, and it is also compatible with standards such as the OASIS Common Alerting Protocol (CAP) standard.
OGC Open GeoSMS

An open standard based on the international Short Message System (SMS) for sharing location information between multiple mobile platforms.

Existing OGC standard – now submitted to ITU-T Study Group.
WFS for Data Supply Works

Time spent doing data supply Before / After
Same Issues, but…

- Christchurch City holds **Authoritative Data**, e.g. …
  - WasteWater
  - Building Status
- Construction partners **manually** submit data in variety of formats
- Time and **money wasted** on data loading and management
- WFS has **no capability to receive** updates through interoperable web services
What they needed:

- Transactional Interoperability between recovery partners:
  - CERA, CCC, SCIRT
  - ESRI, Intergraph
  - OGC Standards (NZGO SDI Cookbook)
    - Practical, short-term solution (can’t wait)
  - Focus on issues with existing (OGC) standards interfaces, notably WFS-T
  - Immediate results that will accelerate recovery & reconstruction efforts
Solution: WFS-T Plugfest

- Short Duration
- Collaborative
- Hands-on
- Independent Facilitation & WFS-T Architect
- “Just Make it Work”

Image: http://www.ispcs.org
# Technology Agnostic

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCC</td>
<td>Intergraph GeoMedia Pro&lt;br&gt;Intergraph GeoMedia WebMap</td>
</tr>
<tr>
<td>SCIRT</td>
<td>ESRI ArcGIS Server&lt;br&gt;ESRI ArcGIS Desktop&lt;br&gt;Safe Software – FME&lt;br&gt;WFS ‘Pump script’</td>
</tr>
<tr>
<td>CERA</td>
<td>Benoli Silverfish&lt;br&gt;ESRI GeoDatabase&lt;br&gt;WFS ‘Pump script’</td>
</tr>
<tr>
<td>InsureCorp*</td>
<td>Pitney Bowes Software MapInfo Professional</td>
</tr>
</tbody>
</table>

* fictitious name to protect any commercial interests
Before:
- Data submitted to CCC on paper, email, disk
- Significant effort & resource strain for data entry
- Doesn’t Scale

After:
- “Set and forget”
- Significant time & resources savings
- Submitters choose their own technology
OGC Business Value Committee (BVC)

The goals of the BVC are:
1. Determine the value of using open standards;
2. Assess the business reasons for developing standards;
3. Provide an independent forum for discussion.

business.value@lists.opengeospatial.org
UN-GGIM and international standards

With thanks to the following persons:
Robert Bessaro, President, IHO
Olaf Ostensen, Chair, ISO/TC211
Mark Reichardt, President, OGC
Maurits van der Vlugt, Mercury Project Solutions
Richard Murcott, LINZ

Steven Ramage, Head of Ordnance Survey International
Member of the OGC Global Advisory Council and
Chair of the OGC Business Value Committee
steven.ramage@ordnancesurvey.co.uk