Implementation of WMO Information System in Japan Meteorological Agency

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Topics of the talk

- WIS and activities in JMA
- What we expect for interoperability activity
  - OGC Met Ocean DWG and WMO/CBS IPET-MDI in mind
WMO Information System (WIS)

- **Sustain & improve GTS [part A]**
  - Legacy store-forward protocols, routing tables
  - Domain-specific data formats
  - Reliability precedes over flexibility and volume

- **Add new features [part B]**
  - Flexible and/or cost-effective communication
    - Data discovery, access, & retrieval (DAR)
  - Serve more diverse communities
  - Enhanced interoperability
GTS/WIS centers and standards

- **WMO Codes**
- **GTS Protocols**

**Operation-critical data**
- Data creation
- Metadata creation

**Non-operation critical or high volume data**
- Data creation
- Metadata creation

**NMC NC/DCPC**
- Data Push

**RTH/WMC GISC/DCPC**
- Data Push

**Relayed Push**
- Push/Pull
- Catalog Search

**Protocol?**
- Format?
- Protocol?
- Metadata Profile?
Three key factors of interoperability activity:

- New Standard
- New User Communities
- Traditional Practices
JMA activities for WIS

- **DAR Catalogue**
  - Further developing WMO profile of ISO 19115
  - SRU considered primary search protocol

- **Communication protocols**
  - OAI-PMH for metadata
  - Atom syndication for data

- **Data formats**
  - HTML5 Microdata
  - Data format interoperability

}\{ Blog-based Technologies
JMA has long experience

- As RTH of GTS: WMO No. 9 Volume C1
- Non-GTS data:
  General information catalogue (since 1997) now online and searchable: visit http://www.jma.go.jp/jma/kishou/177jmh/catalogue.html if you can read Japanese language :-)

Now working to establish WIS DAR standard and implementation
Further Development of WMO Metadata Profile

- WMO Core Profile to ISO 19115 Metadata
  - Ver. 1.1 endorsed by CBS-XIV (March 2009)
- Almost identical to ISO 19115 Core Profile
  - Some code tables added
  - No extra structure
  - No element additionally mandated
What is profile intended by ISO?

- Entire 19115 is too huge
  - 409 elements
- Core 19115 is too small
  - 22 elements
  - only 7 mandatory
- Users are supposed to select elements to suit application
  - that is profile
Metadata profiles in Japan

- **Generic GIS**
  - Japan Metadata Profile v2.0
    - by Geographical Survey Institute
    - [http://zgate.gsi.go.jp/ch/jmp20/cle_met_right.html](http://zgate.gsi.go.jp/ch/jmp20/cle_met_right.html)
    - (in Japanese)
  - Profile to ISO 19115 Core Profile
  - Conceptually parallel to INSPIRE

- **Oceanography**
  - Marine Metadata Profile
    - by Japan Coast Guard
    - (in Japanese)
  - Profile to JMP 2.0
Situation of metadata structure

**Standard:**
ISO 19115

**Tradition:**
WMO-9 Vol C1

**New User:**
hopefully emerging

since it's a new service
Proposal for DAR Metadata

- Discussion in IPET-MDI etc.
  - by JMA, CMA, and DWD

- Goal: practical guidance on Volume C1 to 19115 conversion
  - could be VolC1-type Profile
  - VolC1 Profile ⊃ WMO Core ⊳ ISO Core
  - or just a guideline is okay
  - more experience with new users/data will tell us better standard structure
Observation station mapping
Observation station mapping

- Very useful
- Is it DAR or service linked from DAR?
Metadata Search Protocols

- **ISO 23950 (aka ANSI Z39.50)**
  - old, binary, and non-HTTP
  - anybody here wants "raw" Z39.50?

- **SRU (Search by URL)**
  - HTTP-based simple protocol, intended to be gateway to Z39.50
  - minimal requirement for WIS centres

- **OGC CSW**
  - concept similar to SRU

Further work/experience/guideline desired
Situation of metadata search

Standards:
Z39.50/SRU/CSW

New User:
Natl CH, GEOSS, ...

Tradition:
?

since it's a new service
Protocol to synchronize metadata

- **GTS Practice**
  - METNO bulletin tells change of Volume C1
  - (of course) not for ISO 19115

- **OAI-PMH**
  - standard of Open Archive Initiative
  - used in SIMDAT project
  - Tokyo-Beijing synchronization test working

- Any other activity?
Situation of metadata distribution

**Standard:**
OAI-PMH

**New User:**
WIS Centres

**Tradition:**
METNO

*but it's not for ISO metadata*
Data transfer protocols

- Discussion was active since the onset of “Future WIS” concept
- Number of protocols have been proposed
  - Push
    - GTS store-and-forward
    - GTS-FTP, LDM, …
  - Middle: subscription
  - Pull
    - OPeNDAP
    - Pandora (REST used in JMA)
    - OGC WCS/WMS series
Situation for data transfer protocol

New Users: (diverse)

Tradition: GTS bulletin/FTP

Standards

we support diversity

there's no "one-size-fits-all" solution but some are more promising

if existing one doesn't work for you...
Push vs pull controversy

- **Management – pull**
  - in case of retry/backup/ad hoc setup recipient knows better what is needed

- **Popularity – pull**
  - everybody use the web
  - off-the-shelf httpd-CGI implementations
  - abundant knowledge on security

- **Delay – push**
  - polling is needed for pull protocols
  - average delay = $\frac{1}{2} \times (\text{poll interval}) \times (\# \text{ hops})$
JMA's blog-based proposal

- **HTTP-GET** for data distribution
- **Atom syndication** (aka RSS) for update notification
  - text data can be bundled
  - widespread use of GeoRSS as substitute of metadata catalog
- **Atom publishing** for time-critical message
  - REST: simpler than SOAP
Blog data server in work

- Apache HTTPd + Roller
- Atom Syndication
- HTML5 Microdata
  - Both human- and machine-readable data
Microdata display of SYNOP

► HTML code (extract)

```html
<section item="vevent int.wmo.synop">
  <ul>
    <li>coordinates:
      <span itemprop="vevent int.wmo.vevent.geo">+42.55;+9.48</span></li>
    <li>air temperature (degree Celsius):
      <span itemprop="int.wmo.prop.temperature">11.0</span></li>
    <li>pressure (hPa):
      <span itemprop="int.wmo.prop.pressure">1017</span></li>
  </ul>
</section>
```

► Rendering

- coordinates: +42.55; +9.48
- air temperature (degree Celsius): 11.0
- pressure (hPa): 1017
Data formats (1) aviation OPMET

- **Tradition**
  - METAR, TAF, SIGMET, …
  - AFTN limitations character set & message size

- **Users: aviation community**
  - seeking more quality and additional info
  - future of AFTN environment?

- **Standard**
  - XML
    - work in progress at CBS IPET-MDI
Data formats (2) grid data

- **Tradition: GRIB**

- **Many users:**
  - academia: CF-NetCDF
  - space science: HDF
  - GIS: GeoTIFF, ArcInfo, ERDAS, …

- **Possible way forward**
  - forced unification won't work
  - conversion
    - spec: comparison of data forms
    - terminology: common/ISO data models
Situation for data interoperability

Abstract Modeling

helps conversion efforts through common terminology & concepts

Alternative Standards

Tradition: GRIB/BUFR/TAC

New Users

so many...

strong ties

reluctant to use it
Future: web services & conversion

Standardised conversion will help:

- **WMS/WCS**
  - parameter `FORMAT=`
  - mapserver uses GDAL

- **Pandora (used in JMA)**
  - request header `Accept:` or filename suffix

- **OpeNDAP**
  - server: format-by-format implementations
  - client does not care about source data structure
Summary

- JMA in WIS: RTH on IMTN and prospective GISC
- Three keys of interoperability
  - traditional practice
  - new user community
  - standard
- Interoperability is desired for
  - metadata format & search protocol
  - data transfer protocol
  - data format

We have proposals & are open to discussion