Meteorology and Oceanography DWG Progress Report

EGOWS, ECMWF

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2010-06-02

Since last Egows

Organisational aspects
WMO-OGC MoU
Extension to Oceanography

Work done or in progress
Modelling
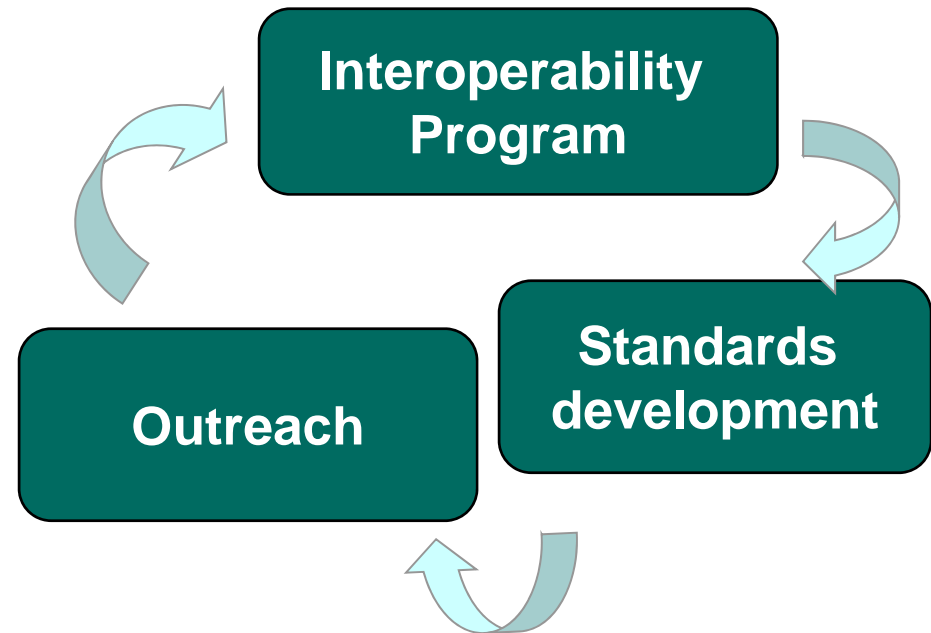WMS time issues
Interoperability experiment
SLD/SE
+…

Meetings
to work
to communicate

Interoperability Program

Standards development

Outreach

WMO-OGC MoU, Signed Nov 2009

- Four named WMO Secretariat staff have access to OGC Portal

  - Shi Peiliang, Pierre Kerhervé, José Arimatea de Sousa Brito, David Thomas

- A group composed of 8 WMO Experts, and 8 OGC experts to help communication and coordination

- 2 each from **Meteorology,** Oceanography, Hydrology, Climatology

- WMO have 8 Commissions: CBS, JCOMM, CHy, CCl, CAeM, CAgM, CIMO, CAS

- Remaining three people: - ask for nominations from Presidents of CCl, JCOMM, CHy

- Propose that main objectives of current plan are:

  - Develop Best Practice or Profile for WMS and WMTS

  - Develop Conceptual models suitable

  - Promotion of OGC web standards such as WMS, WFS and WCS and related standards

  - Develop Best Practice or Profile for Catalogue infrastructure

  - Develop awareness and promote of O&M, SWE and related standards within WMO WIGOS community

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WMO Experts

One expert representing CCl to liaise beween CCl and Met Ocean/Hydrology OGC DWGs

One expert representing CHy to liaise beween CHy and Met Ocean/Hydrology OGC DWGs

One expert representing JCOMM to liaise between JCOMM and Met Ocean/Hydrology OGC DWGs

Four experts representing CBS or CIMO to liaise with the Met Ocean/Hydrology OGC DWGs to:

- Develop proposals related to conceptual models suitable for WMO IPET-MDI (Chair or core member of IPET-MDI)

- Develop proposals for best practices or profile for Catalogue infrastructure (Chair or core member of ET-WISC)

- Develop awareness of O&M, SWE & related standards in WMO WIGOS & CIMO communities (WIGOS expert from CIMO)

- Consider the use of WMS, WMTS,WFS, WCS and related standards for the development/implementation of the WIS (Chair or core member of ET-CTS)

One expert to liaise with the 7 experts above, to follow-up the progress in the programme in Exhibit A of the MoU and to submit a report (at least each year) on this progress to WMO CBS Management Group (Chair or core member of ET-GDDP).

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Since Boston TC (June 2009)

- The Meteorology Domain working group became Meteorology **and Oceanography** Domain Working group

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Works :
First steps on WMS

06/08-09/01: Open Survey set up on OGC Twiki

- http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetQuestionnaire

- Survey announced by email on the OGC MDWG email list

- Survey presented at the EGOWS 2009 meeting

- On September 1st, there were 15 contributions :
  - 1 from an international organisation (EUMETSAT)
  - 6 from National Meteorological Services (DWD, Met Office, FMI, KNMI, Meteo-France)
  - 2 from a Regional Meteorological services (Servei Meteorològic de Catalunya (SMC), MeteoGalicia)
  - 4 from National environment Agencies or data centres
  - 1 from university department
  - 1 from private company
- A few more responses since September

Synthesis => issues

- A synthesis is available at :
  http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetQuestionnaireSynthesis

- 10 Main Issues
  1. Time handling (12 times)
  2. Bounding Box, Anti-Meridian, poles & Southern Hemisphere, Projections (6 times)
  3. Vertical coordinates (5 times)
  4. Metadata, search and filtering (4 times)
  5. Performance (4 times)
  6. Asynchronous and dynamic delivery (3 times)
  7. Styling (3 times)
  8. Security (2 times)
  9. Integration with other systems, such as WCS, GRIB, OpenDap (2 times)
  10. Cross section description (1 time)

Process to « interoperate around interoperability » 1-within the met ocean community

- Based on :
  - this synthesis,
  - the MDWG email list exchanges
  - the EGOWS 2009 conclusions
  - The 1st GIS/OGC standards applied to meteorology workshop working groups reports,

  the twiki defines an open space to prepare the work on many issues

- For instance :
  * Time handling :

  http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetTimeDefinition

  * Weather exchange Models:

  http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetWeatherExchangeModels

  But also

  * Getcapabilities metadata:

  http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetGetCapabilitiesLayering

  * Controlled vocabulary :

  http://external.opengis.org/twiki_public/bin/view/MeteoDWG/MetOntologies

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Performance!

- Performance and efficiency have to be <u>a global permanent concern</u>:

    - Meteorology has a permanent high rate of update of data
    - Meteorology and oceanography involve large amounts of data
    - Telecoms are often a bottleneck for our customers

- Requirements, goals,metrics could be agreed in terms of frames per second for animation, seconds delay permitted for query retrieval or display …

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Performance Requirements
ECMWF WG report

- No "one-size fits all" solutions.

- Two ends of the spectrum:
  - Small amount of users (forecasters) with access to large data, high interactivity
  - Large amount of users (mass), access to pre-processed data.

- Mass market (Web access)

- Decision makers

- Traders

- Researchers/scientists

- Operational forecasters

Is security an issue for MetOceanDWG?

- Security is not specific to MetOceanDWG

- Needs could be explicited towards the Security Domain Working Group in charge of these matters : authentification, authorization, controlled access to data and metadata…
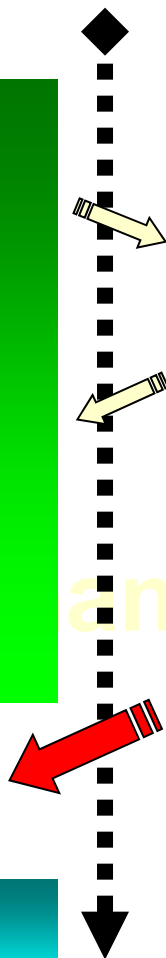
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MetOcean DWG 1ˢᵗ steps

WMS

1. **Time handling**

2. **Bounding Box, Anti-Meridian, poles and Southern Hemisphere, Projections**

3. **Vertical coordinates**

4. **Metadata, search and filtering**

5. **Asynchronous and dynamic delivery**

6. **Styling**

7. **Integration with other systems, such as WCS, GRIB, OpenDap**

8. **Cross section description (wait WMS 1.4?)**

WCS, WFS

Models

WMS issues working process
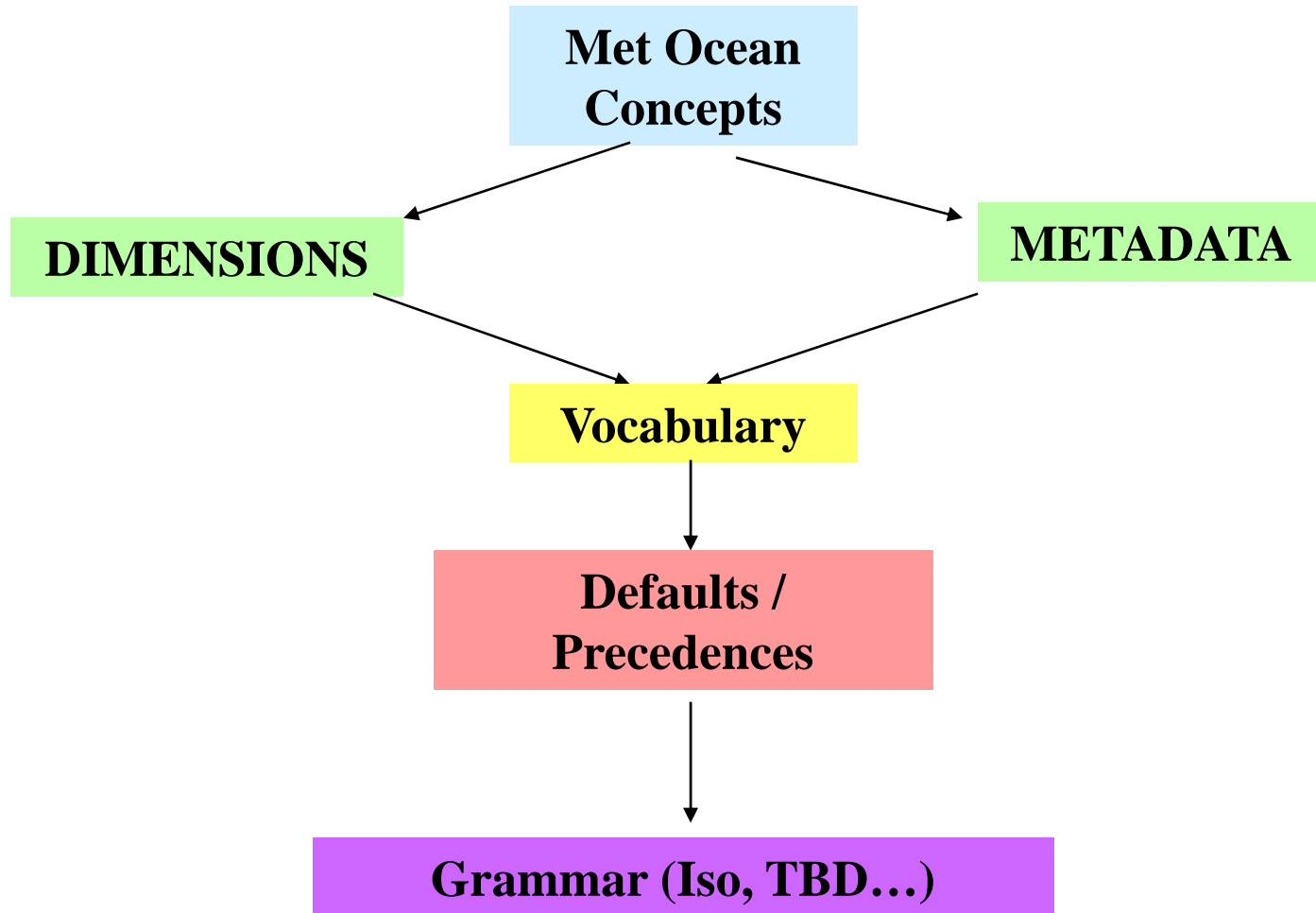
# Basic Issue - Time has 1, 2 or 2.5 dimensions

- TIME= parameter in OGC requests is not sufficient

- Two basic time approaches in MetOcean domain
  - Observations - time just 1D - here TIME dimension is enough
  - Forecasts, 3 parameters defining 2 dimensions with some incomplete combinations:
    - **Analysis initialization base time** – here-in-after referred as "RUN" Proposed DIM_name : RUN_START_TIME
    - **Forecast offset** – here-in-after referred as "OFFSET"
    - Proposed DIM_name : FORECAST_OFFSET
    - **Validity** (or forecast) time   TIME = RUN + OFFSET

- Forecast/validity may have different semantics:
  - Fixed time validity (not an issue),
  - Validity time ranges - 3h, 6h, accumulation = relative time from analysis initialization base time

- Focus on WMS but same applies to WCS, WFS, …

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Multidimensional time

- Only a subset of product RUNxOFFSET is available:
  - Number of OFFSETs in particular RUN may vary
  - Higher OFFSETs in the same RUN may have coarser step
- For one *Constant Validity Time* multiple different forecasts are available
- Rapid updates (even hourly or tens of minutes)
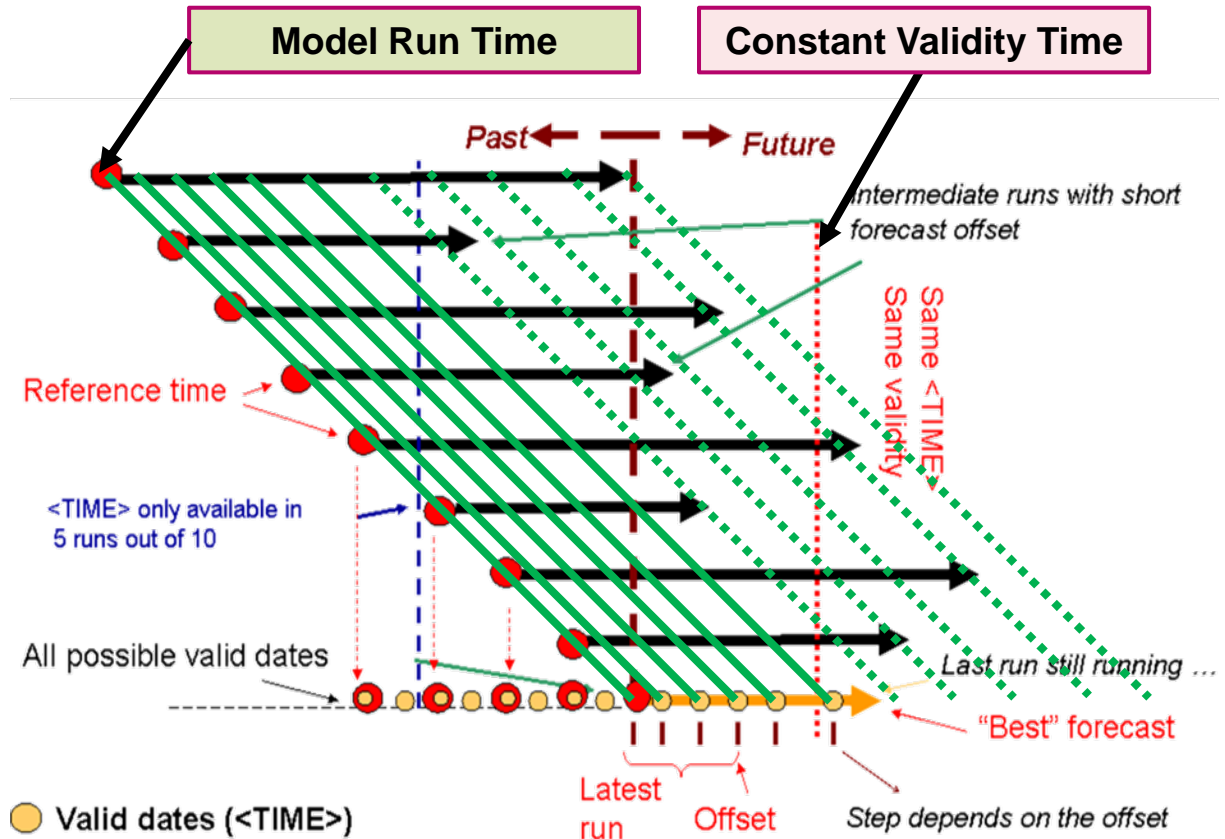
Range available validities depends on the module run time because validity and run time axes are not orthogonal.

http://external.opengeospatial.org/twiki_public/bin/view/MetOceanDWG/MetTimeDefinition

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Multidimensional time

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Picture courtesy of John Caron, UCAR

A1. Single layer for all runs

- WMS Layer represents particular parameter (e.g. Temperature, Pressure, …) while RUNs, OFFSETs (and TIMEs) are listed in GetCapabilities as WMS dimensions

- Pros
  - Convenience - client can control what he gets.
  - If only TIME is supplied as argument, WMS can return Best Run estimate.
  - Closest to current meteorological practice in terms of common retrieval semantics which are used in the forecasting process:
    RUN & OFFSET   TIME   RUN & TIME

- Cons
  - Some of combinations of RUN & OFFSET are not available and will return and exception.
  - Many RUN & TIME combinations are not available.

- **May require WMS extension to describe WMS dimensions dependencies (e.g. DescribeLayerDimensions request).**

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A2. Separate runs into layers or services (described by

- Model RUN is represented as *separate layer* OR as a dedicated *service end-point*.

- Available forecast validity TIMEs are listed in GetCapabilities.

Pros

– All RUNs are properly enumerating their forecast validity offsets and there are no invalid RUN&TIME combinations

Cons

– Layers or service end-points appear & **disappear** within the time, clients can't remember them.

– Large number of Capabilities documents

– Best Run semantics requires dedicated "Best Run Layer" or Best service end-point

– Implies rapid update of CSW

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A3. Separate runs into layer hierarchy

bProposed by Michael Weis and Joseph Matula

- Using WMS layer tree to "group" same parameters:
  - Parent layer provides Best Run selection with TIME dimension
  - Child layers represent different RUNs listing corresponding available forecast TIMEs

Pros

  - All RUNs are properly enumerating their forecast validity offsets and there are no invalid RUN&TIME combinations.
  - Best Run semantics is built-in.
  - No need for service catalogue.

Cons

  - "Unusual" approach making it more difficult to "read" for machines (despite easy for humans).
  - Larger Capabilities document.
  - Layers appear & disappear within the time, client can't remember them

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Other common issues

- Clients have to refresh Capabilities documents BUT what is the ideal period?.

- Latest run is usually the Best, BUT not always.

- **Best Forecast** for certain validity time is not always from the Best Run (older model run may describe weather in certain region or time range better).

- Handling CSW updates if layers/services appear/disappear in time.

- RUN does not become available at once, but within tens of minutes or hours as model computes forecast - partial data availability is sometime desired.

- We have much more dimensions (different vertical coordinates - levels, ensemble model members, …) - more detailed description of dimensions will be necessary anyway.

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Summary of approaches we revised

- **A1** - is based on existing WCS work, but to be fully correct it requires more detailed description of dimensions (dependencies). It allows unification all access semantics (TIME, RUN&TIME, Best Run, Best Forecast).

- **A2** - based again on some existing works (treating different model runs as different service end-points). Increases complexity of requests due to external catalogue use.

- **A3** - theoretical, but creative approach. In principal similar to A2 just avoiding the need of catalogues.

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A need to practice : The Interoperability Experiment
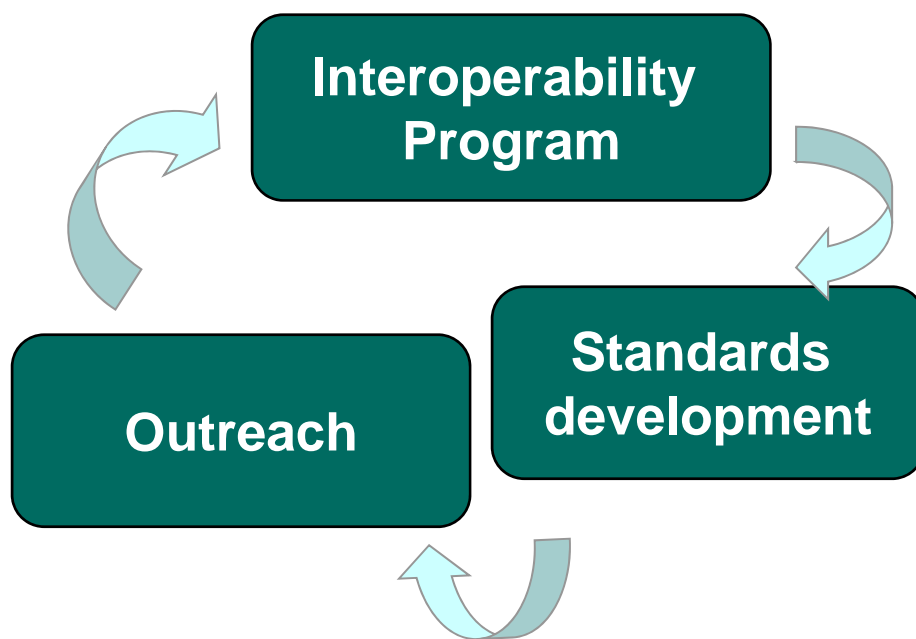
MetOcean DWG 1st steps

WMS

1. **Time handling**

2. **Bounding Box, Anti-Meridian, poles and Southern Hemisphere, Projections**

3. **Vertical coordinates**

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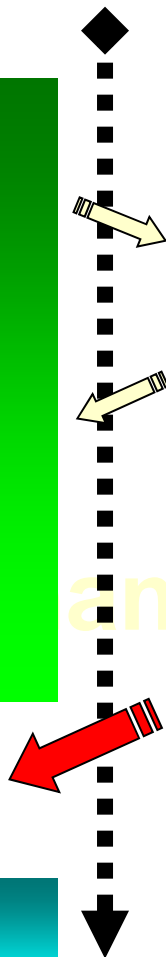
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WCS, WFS

Models
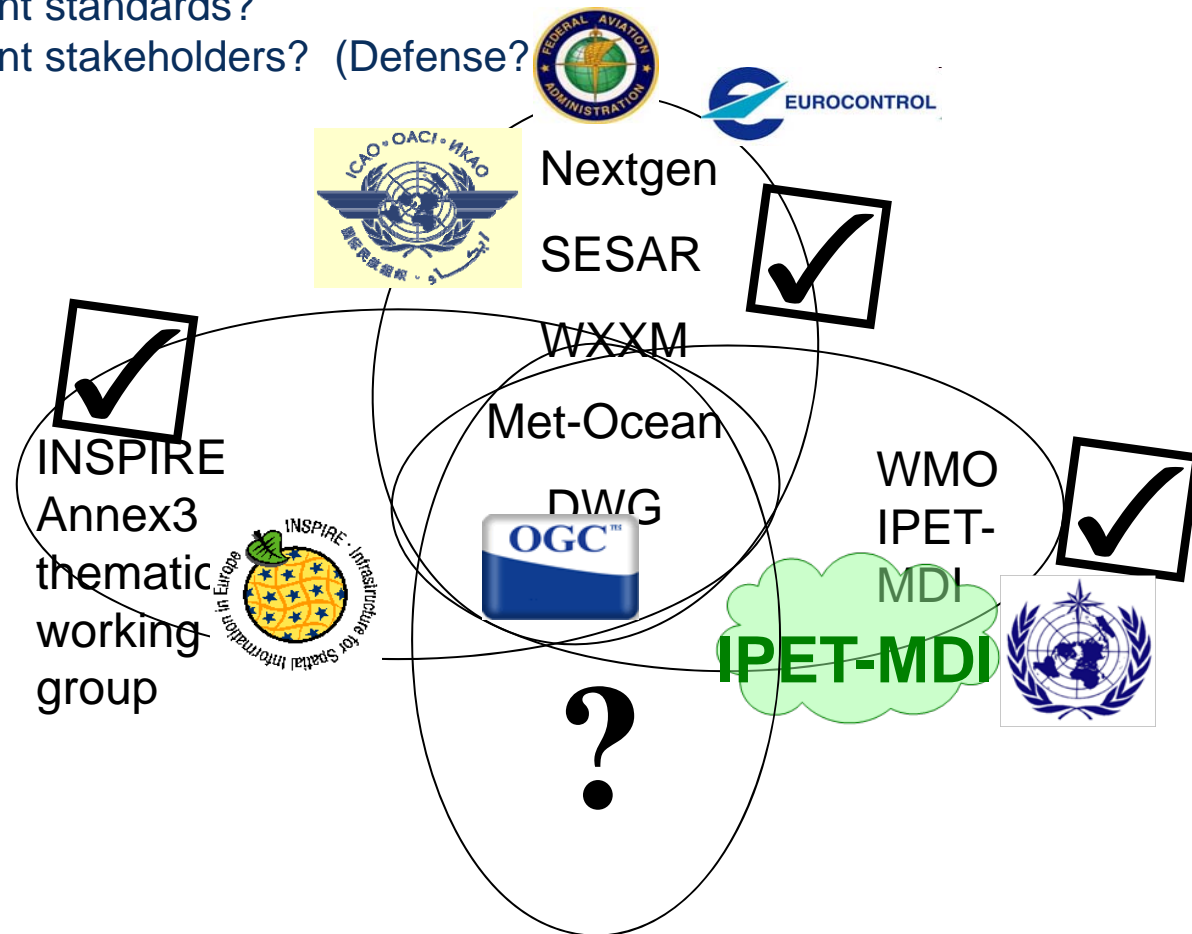
Use INSPIRE methodology

=>

1st define Use cases

Agreement on the 2nd GIS/OGC use in meteorology workshop proposals : scope

- Scope definition process
  - Standards Landscape analysis
    - Did we forget important standards?
    - Did we forget important stakeholders? (Defense?)
  - Use cases to consider

Nextgen

SESAR

WXXM

Met-Ocean

DWG

INSPIRE Annex3 thematic working group

WMO IPET-MDI

IPET-MDI

?

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Other standards or Stakeholders?

- Metadata for Climate Models (METAFOR)
- WOML (FMI Meteorological objects)
- ncML-GML

- Existing OGC-works-linked Conceptual models (Observations…)?

- Oceanography ?
  – E2EDM

- Defense
  – JMBL?
  – DIGIWG?

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Agreement on the 2nd GIS/OGC use in meteorology workshop proposals : roadmap

- Roadmap for the next year
  - 1st aim to have a consistent proposal for Autumn 2010

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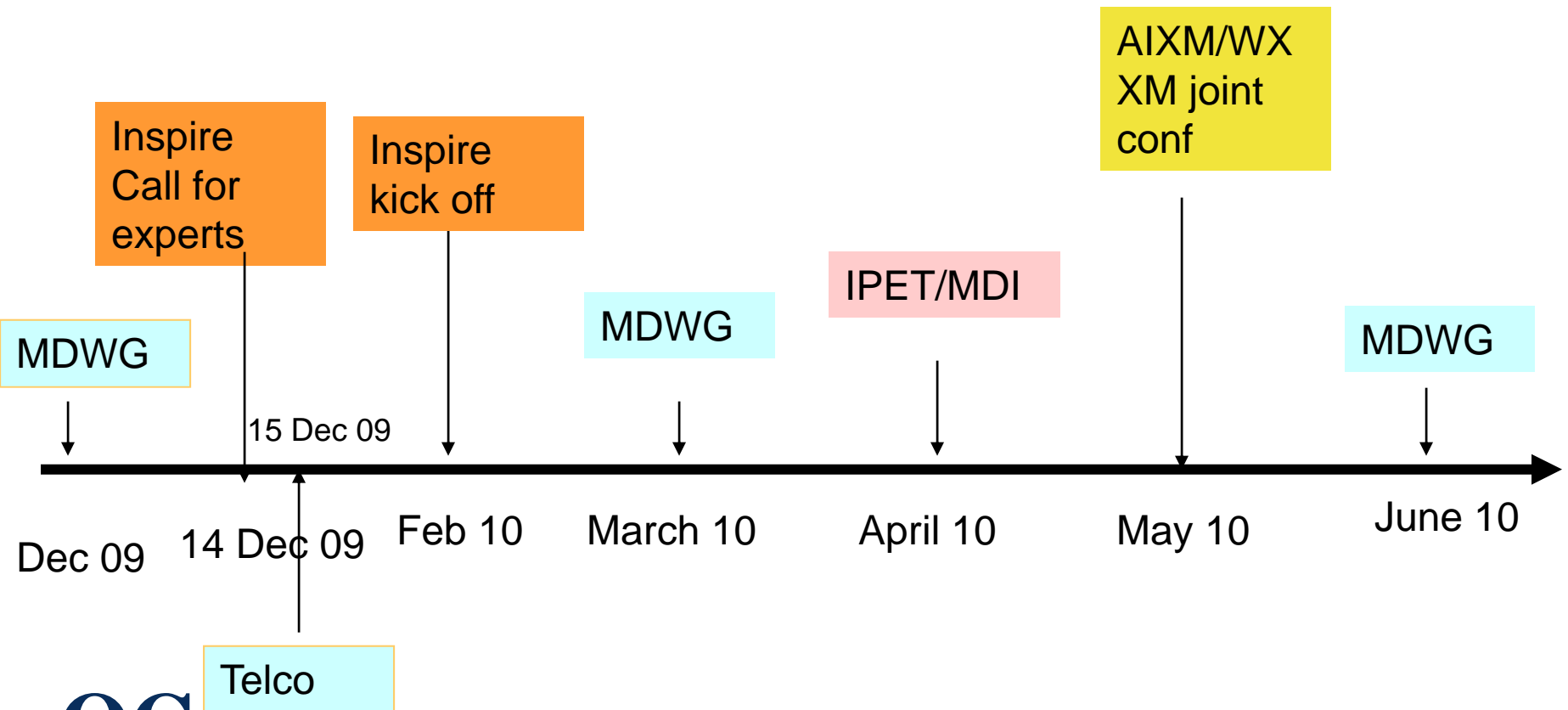
Use cases

- Available on the twiki
- Used as a first base for the INSPIRE Experts kickoff meeting in May 2010

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Met Ocean DWG Telecons

- Teleconferences on Technical Issues :
  - WMS – Mondays, 16:00 UTC
  - Conceptual Modelling – Tuesday 16:00 UTC
  - IE –Thurdays 15 UTC

See OGC Agenda or Twiki

- Twiki: http://external.opengis.org/twiki_public/bin/view/MetOceanDWG
- Mailing list: meteo.dwg-requests@lists.opengeospatial.org

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A lot of meetings…..

- – 4 OGC Technical comittees (June 2009, Sept. 2009, Dec 2009, March 2010)
- – Telecons
- – Email exchanges….

- WMO-OGC:
  - – 1 OGC-WMO meeting to define how to implement the MoU (Feb 2010)

- Connected Workshops
  - – 1 ECMWF Meteorological Operational Systems meeting
  - – 1 OGC/GIS use in meteorology workshop in Meteo-France
  - – INSPIRE experts kickoff meeting
  - – EGU, …

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The OGC Technical Comitees

A Matrix organisation based on Standards Working Groups (SWG) and Domain Working Groups (DWG)

Met DWG Sessions where we present the progress and plans, and where anyone can make any presentation of interest for the community

Standards WG sessions (WMS, WCS, SLD/SE,…) where we communicate on the specificities of the met comunity

A session can gather 4 to 80 people.

During the closing plenary, each working group presents a report and submits motions

If no objection to unanimous consent…« the motion passes »

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Roadmap

Met Ocean DWG 2010 Meeting Opportunities

- **1- 4 Jun 2010: ECMWF - Reading: 21st EGOWS meeting European working Group on Operational meteorological WorkStations**

- **14 - 18 Jun 2010: NOAA, Washington: OGC TC/PC**

- **20 - 24 Sept 2010: Météo-France, Toulouse: OGC TC/PC**

- **15 -17 Nov 2010: Third Workshop on the Use of OGC/GIS standards in Meteorology, Exeter, UK**
  - This follows the workshops in Reading 2008 and Toulouse 2009, organised by ECMWF, Météo-France and the UK Met Office.
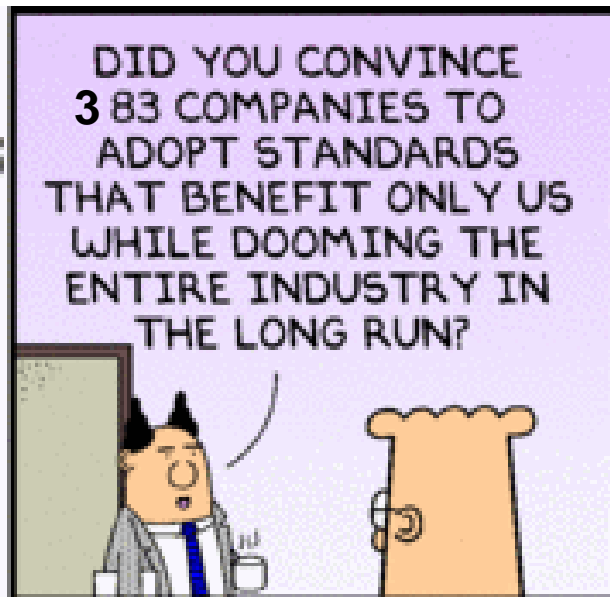
- **28 Nov - 3 Dec 2010: Sydney, Australia: OGC TC/PC**