ICAO Annex 3 XML Representations IWXXM 1.0 RC1

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Feb 2013

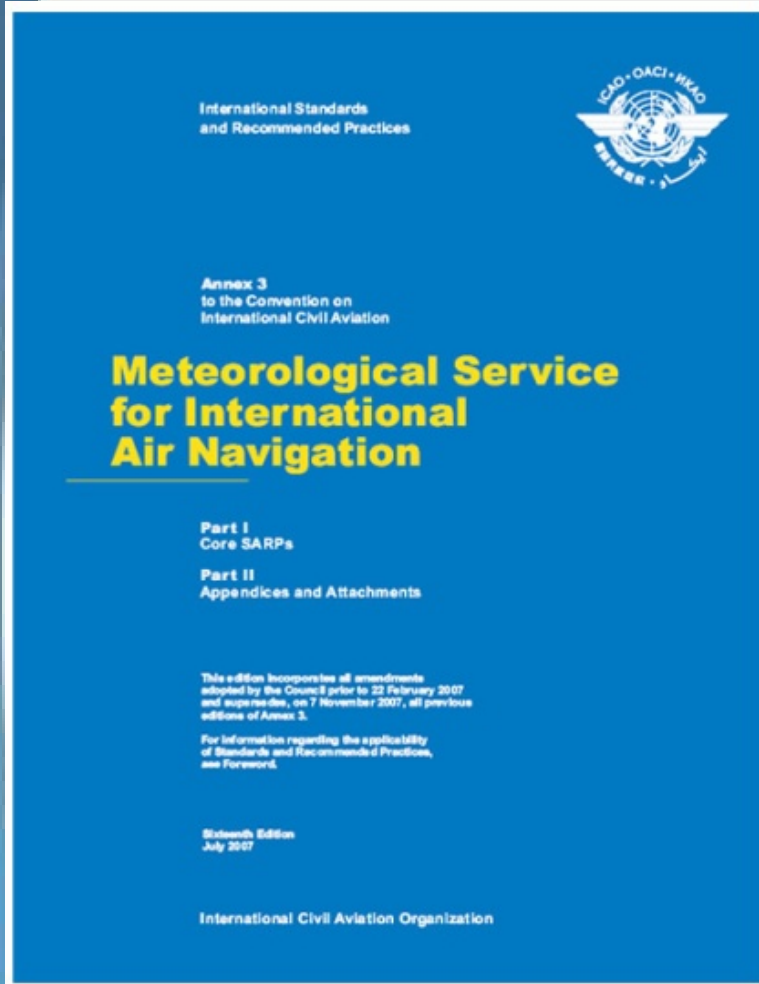National Center for Atmospheric Research

ICAO Annex 3

ICAO

- **International Civil Aviation Authority**

- Set aviation weather requirements

WMO

- **World Meteorological Organization**

- Develop and maintain appropriate code forms to meet requirements

ICAO Annex 3

Amendment 76 – Nov 2013

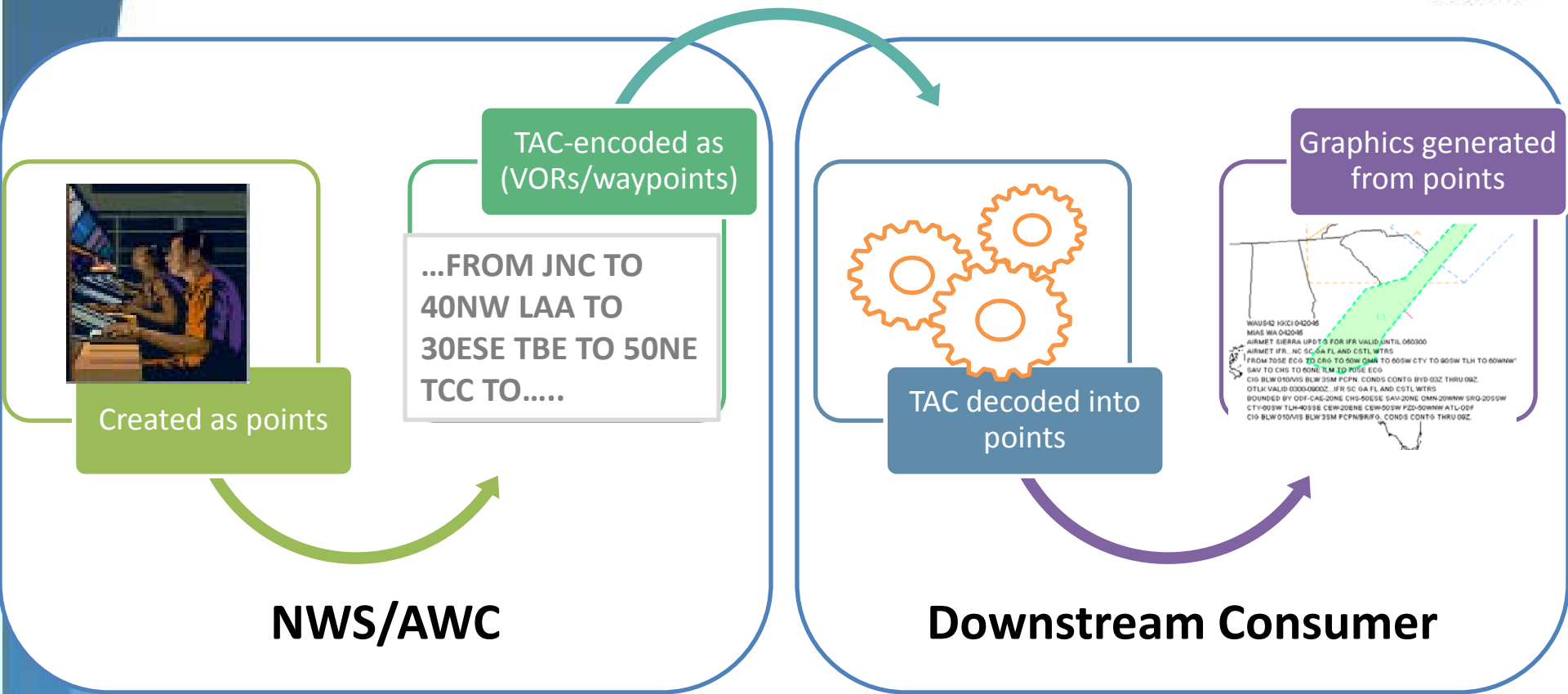"*States in a position to do so* should exchange METAR, SPECI, SIGMET and TAF in a digital form" (XML/GML)

Amendment 77 – Nov 2016

"METAR, SPECI, SIGMET and TAF should be exchanged in a digital form"

Example AIRMET Flow

Created as points

TAC-encoded as (VORs/waypoints)

...FROM JNC TO 40NW LAA TO 30ESE TBE TO 50NE TCC TO.....

TAC decoded into points

Graphics generated from points

NWS/AWC

Downstream Consumer

Human-readable -> **Machine-readable** = DIFFICULT

Machine-readable -> Human-readable = STRAIGHTFORWARD

Model Packages

ICAO Weather Information Exchange Model (IWXXM)
METAR, SPECI, TAF, and SIGMET representations

Simple Aviation Features (SAF)
Simplified features from the aviation domain, such as aerodrome and runway (relationship to AIXM)

Meteorological Community Exchange Model (METCE)
WMO logical data model, specifically Observations and Measurements (O&M) specializations

MET Basic Types (Met-basic)
Measures, CodeLists and other meteorological basic types

Observable Property Model (OPM)
Qualifications and constraints on observed properties

Sampling Features

In meteorology, we define a sampling regime that enables us to observe, measure or simulate the real-world. Sampling Features (from ISO 19156 'Observations and measurements') provide a way to characterise this sampling regime and the relationship to the real-world.
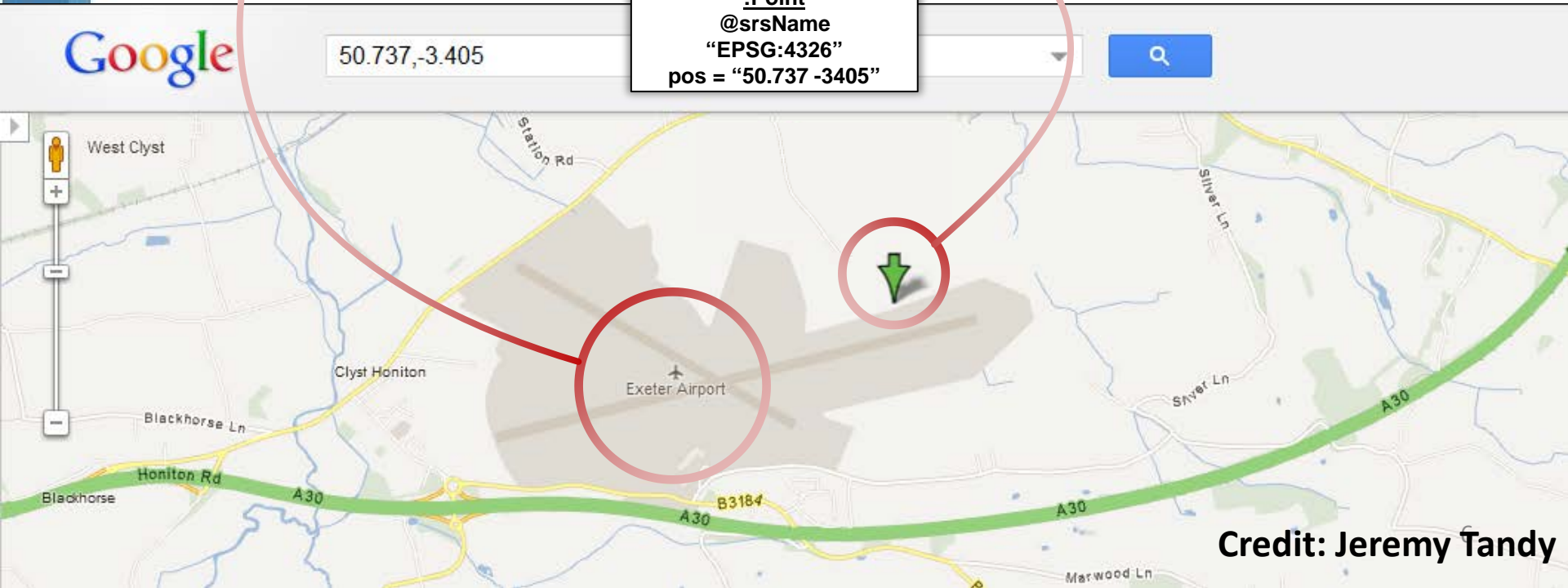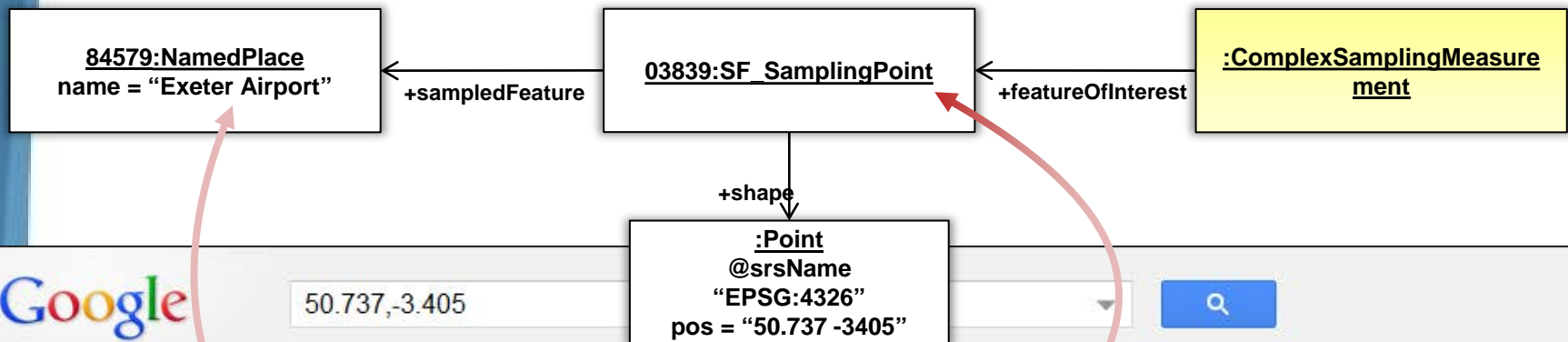
Credit: Jeremy Tandy

Simple Aviation Features (SAF)

SAF

XSD

SCH

METCE   **OPM**   **Met-basic**

**ISO** *Geographic Information / Geomatics*

Simplified representations of aviation features (runway, aerodrome, flight information region, air traffic services unit)

... simplified, referenceable versions of existing AIXM constructs

...developed in a cross-domain manner with AIXM and FIXM developers (aeronautical information and flight information groups)

... based on conceptual modelling framework from ISO 19100 series

IWXXM

IWXXM   **SAF**

METCE   **OPM**   **Met-basic**

ISO *Geographic Information / Geomatics*
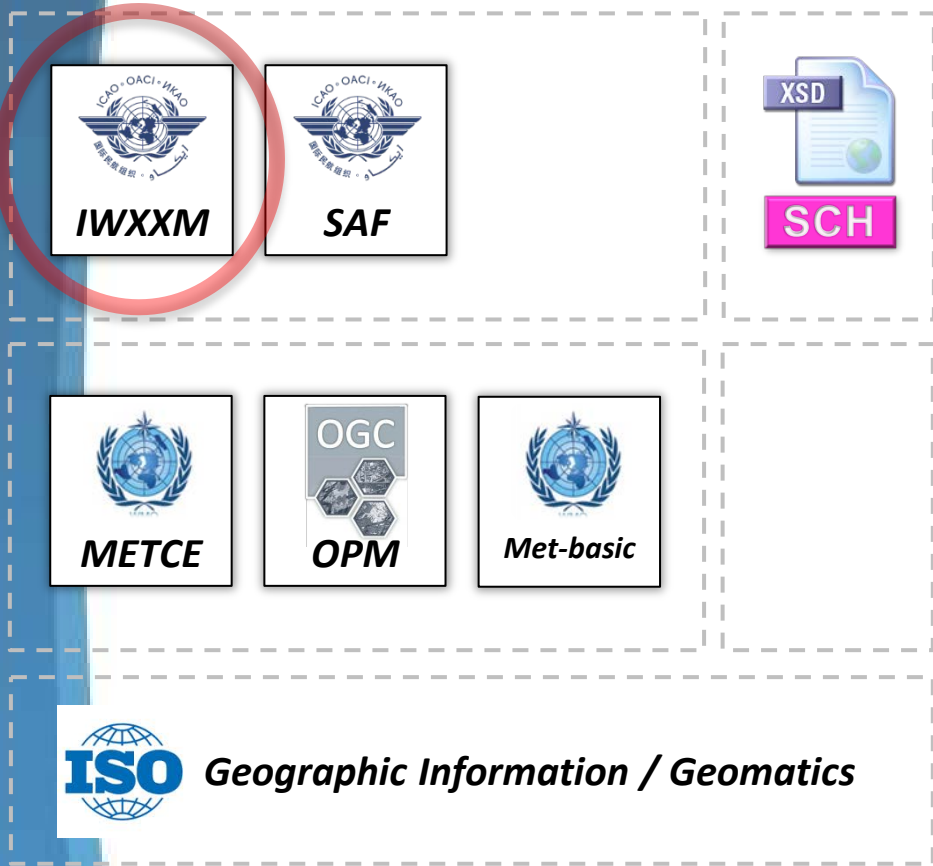
Encoding of the ICAO Annex 3 reports (METAR, SPECI, TAF, SIGMET) using ISO, OGC, and WMO models
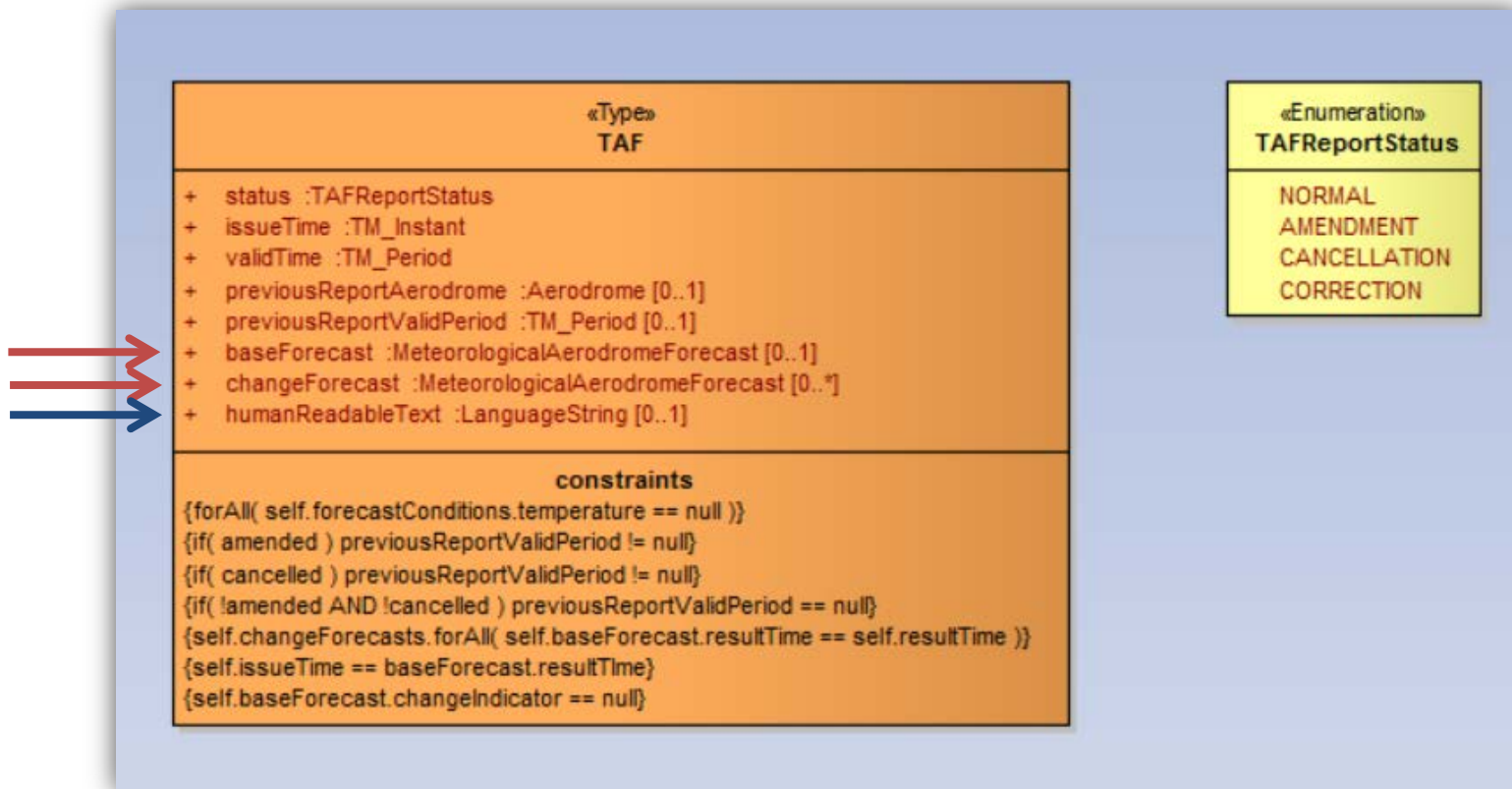
… based on conceptual modelling framework from ISO 19100 series

… uses METCE, OPM, Met-basic and SAF

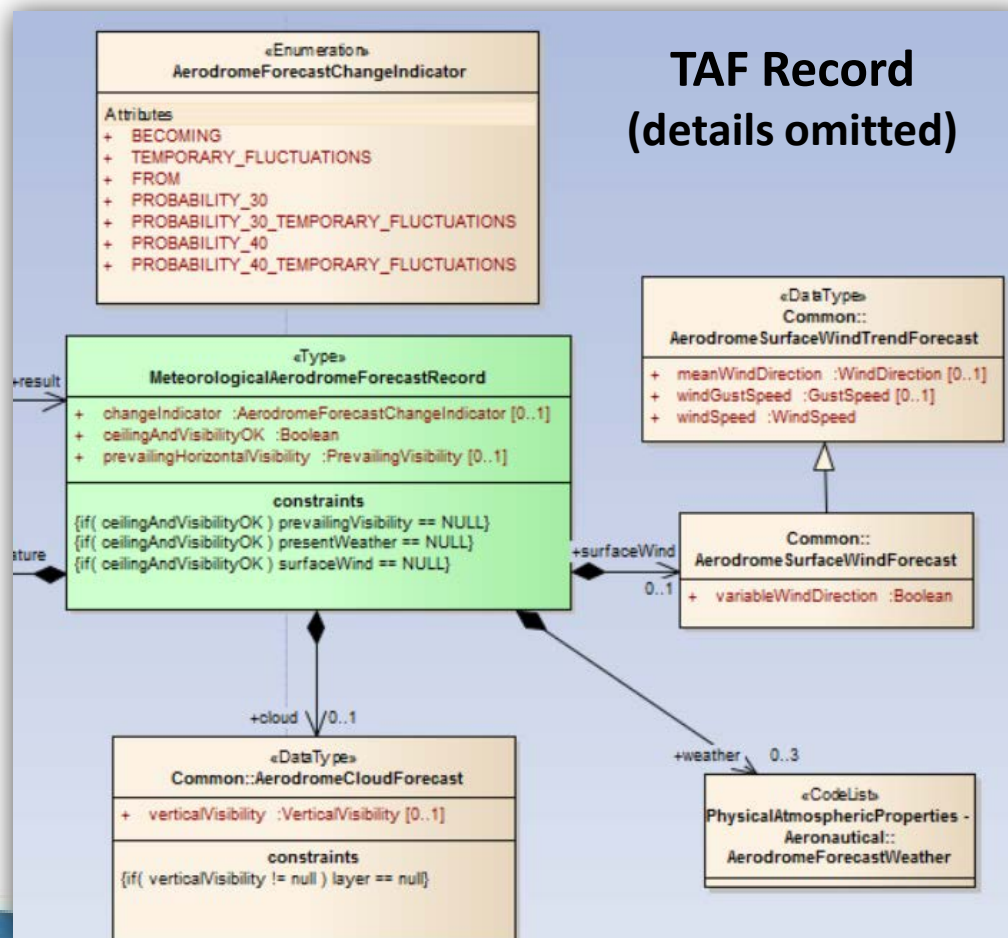# IWXXM Reports

METAR, SPECI, TAF, SIGMET

Reports contain one or more observations and forecasts

IWXXM Observation and Forecast

Observation results

Observation results in IWXXM are called Records

ICAO Dictionaries/Registers

Discussions on ICAO-managed aeronautical information (aerodrome, runway, FIR, etc.) registers underway

Different representations:
- Human-readable (HTML)
- Semantic (RDF/SKOS)
- Machine-readable (XML and others)

Annex 3 Differences

A number of state differences to Annex 3 have been filed with ICAO

For testing and validation of the model, US extensions have been encoded in a US extension to IWXXM
  No XML Schema has yet been generated, work in
  progress

Filed state differences that are a subset of Annex 3 may require changes to IWXXM schemas
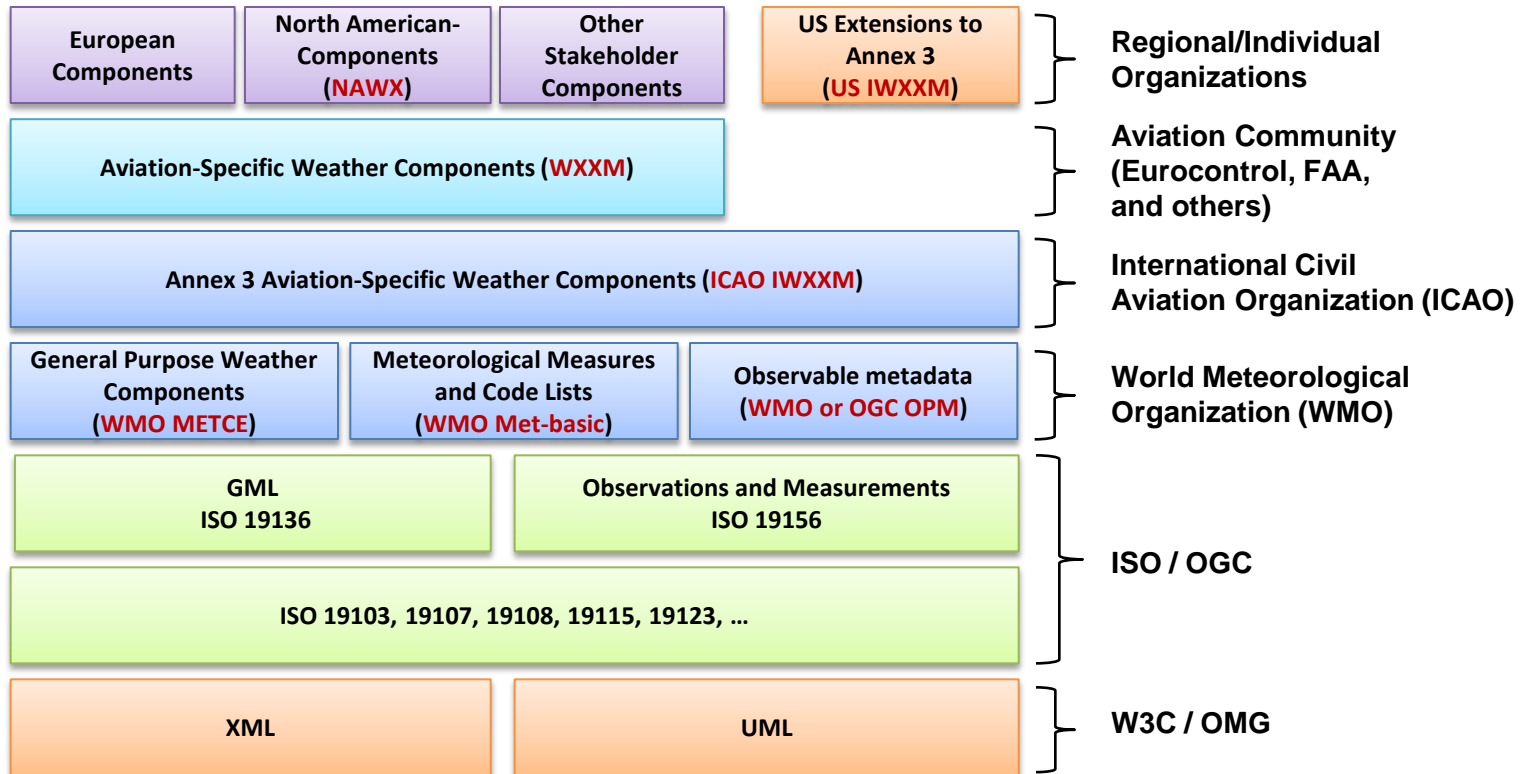
Standards Relationship

Efficient XML Study

METAR form	Bytes per report
TAC without headers (avg over 24 hours)	67 bytes
Uncompressed WXXM/XML (avg over 24 hours)	~2700 bytes (40x)
EXI comp... (avg for 2...	
EXI comp... (a single...	
GZIP com... (avg for 2...	

Tips:

- Use appropriate floating point precision
- Don't include raw TAC text (WXXM)

Takeaways:
- EXI-compressed XML can range from half the size per report of TAC (for 24 hour package) to 5x (for a single message package)
- GZIP compression is easy and worthwhile

Caveats: WXXM 1.1, 80-90% decoded TAC information

AvXML 1.0 standard development schedule

[7th Dec 2013] *1.0RC1 release*

[1st Feb 2013] *1.0RC1 review closed*

[1-8 Feb 2013] *1.0RC1 feedback clarification*

[Feb-Mar 2013] *Amendments incorporated for 1.0RC2*

[Mar 2013] *1.0RC2 published for review*

[Spring 2013] *WXXM 2.0 release incorporating IWXXM*

[July 2013] *AvXML 1.0 published*

[Nov 2013] *"States in a position to do so" may exchange AvXML 1.0*

Active Discussions

❖ Strong and weak typing

❖ Complexity

❖ XML Schema 1.0 and XML Schema 1.1 with open content model and rules

❖ Product-centrism (TAC) and data-centrism (XML)

❖ State differences (those countries that don't meet minimum ICAO standards)

❖ …and others…

Components of 1.0 RC1

IWXXM 1.0RC1 is published for review at the WMO wiki:

http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=METCE-1.0RC1

1.0 RC1 includes:

Release notes

Conceptual model (UML)

Enterprise Architect Project File (EAP)

XMI format

HTML documentation package (requires local deployment)

XML Schemas

Published online

Compressed file bundle

Java bindings for XML Schemas

Simple tutorial describing METAR and VA SIGMET XML instances

Further information on AvXML

FAQ page:

http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=METCE-1.0RC1-FAQ

Moderated public review comments:

CBS-TT-AvXML Google Group

Note that comments on AvXML 1.0RC1 should be submitted to the Google group using a subject line beginning with the text "[1.0RC1-feedback]"

Temporary HTML hosting

http://www.ral.ucar.edu/staff/braeckel/avxml/1.0RC1/

Tools

UML

Enterprise Architect (UML) – free reader

Reads .EAP files and .XMI files

http://www.sparxsystems.com/products/ea/downloads.html

Your web browser

Reads .HTML files

XML

Any text editor/viewer

Oxygen XML Editor - *http://www.oxygenxml.com/*

XML Spy - *http://www.altova.com/xml-editor/*

Any questions?

Please provide your feedback and comments to the [CBS-TT-AvXML Google Group](#)

comments on AvXML 1.0RC2 should be submitted to the Google group using a subject line beginning with the text "[1.0RC2-feedback]"

Thank you