Enabling Information Sharing thru Common Services

WXXM 2.0 and Beyond
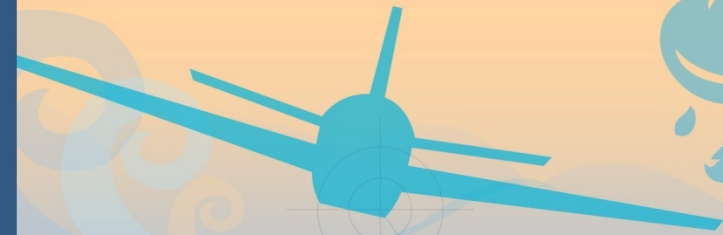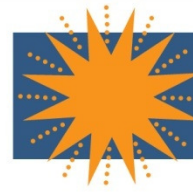
Federal Aviation Administration

Air Transportation Information Exchange Conference - (featuring AIXM, WXXM and FIXM)

August 30, 2011 - September 1, 2011
NOAA Science Center & Auditorium
Silver Spring, Maryland

Presented To: Air Transportation Information Exchange Conference

Presented By: Aaron Braeckel

Date: Aug 30, 2011

Introduction

WXXM History

2.0 Technical Progress

After 2.0

Standardization

Data Models

Data Model Component Agility

Standards Governance Body

High (months)

Eurocontrol-Specific Components	North American-Specific Components (NAWX)	Europe-Specific Components	Other Stakeholder Components
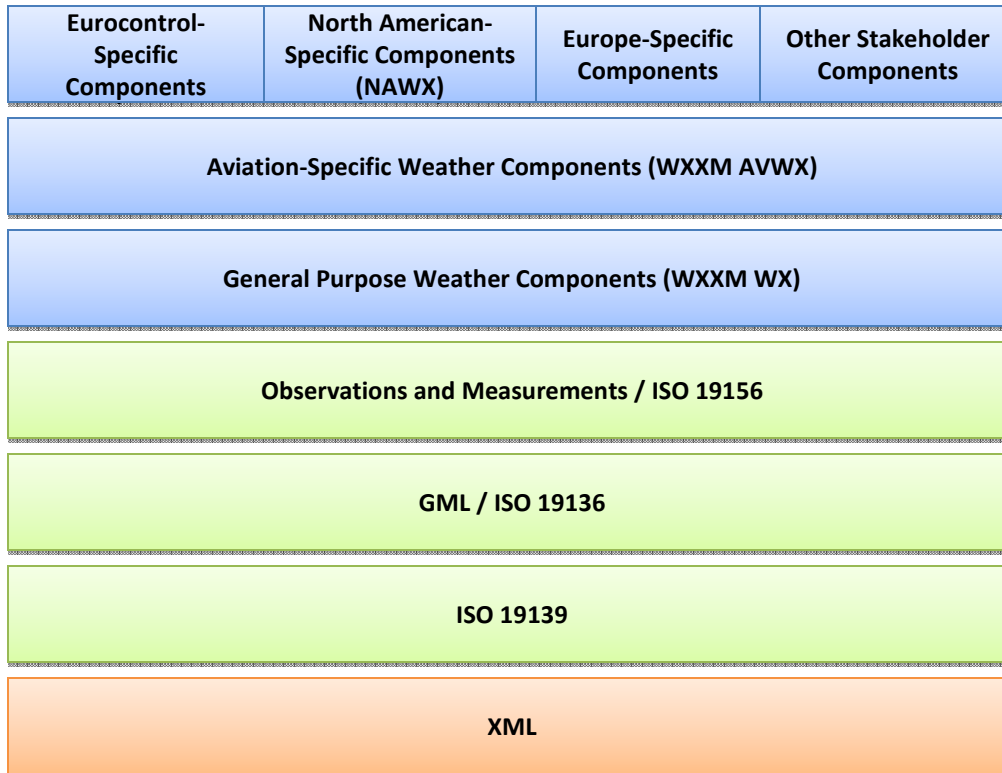
Individual Organizations

Aviation-Specific Weather Components (WXXM AVWX)

International Civil Aviation Organization (ICAO) (envisioned)

General Purpose Weather Components (WXXM WX)

World Meteorological Organization (WMO) (envisioned)
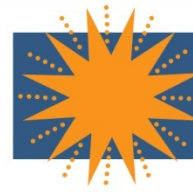
Observations and Measurements / ISO 19156

GML / ISO 19136

ISO 19139

ISO / OGC

Low (years)

XML

W3C

History

WXXM 1.0
- Eurocontrol

- Rational Rose
- Observations & Measurements 1.0

WXXM 1.1.0
- Eurocontrol, FAA, others

- Enterprise Architect
- HollowWorld/FullMoon
- Expanded products
- CSML v2-like coverage representations

WXXM 1.1.1
- Eurocontrol/FAA

- UML model and schema fixes

WXXM 2.0
- Eurocontrol/FAA

- Fixes
- ICAO Annex 3 Improvements
- Observations & Measurements 2.0
- Improved documentation
- Namespace change

WXXM 1.0

Released Mid-2008

- Rational Rose
- ICAO Annex 3 Products
- Primarily UML

EUROCONTROL

Federal Aviation
Administration

Nov 2010 Workshop

Goal:

> *Explore possible collaboration between U.S. and Eurocontrol on common weather model*

Attendees:

Eurocontrol

FAA

NCAR

MIT Lincoln Labs
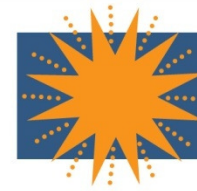
NOAA/ESRL

Mileridge Ltd

US NWS

Result:

"FAA and EUROCONTROL agree on the following to conjointly develop future versions of WXCM/WXXM/WXXS Weather Information Models and Schemas"

"The basis for the Models and Schema will be ISO/OGC Standards and Best Practices

ISO 191## series

GML 3.2

OGC Observation and Measurement Model (O&M)"

WXXM 1.1

Released Jan 2010

- UML in Enterprise Architect and HollowWorld
- XML Schemas generated using FullMoon
- Additional Products
- CSML-like Coverage model
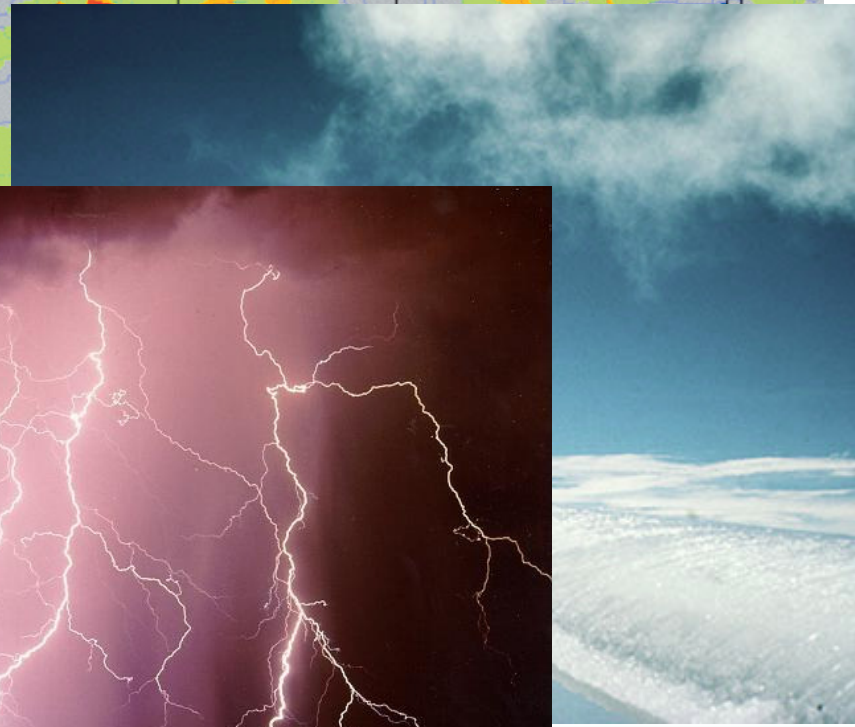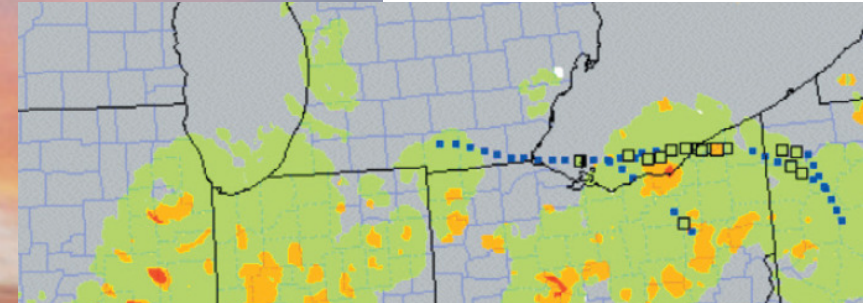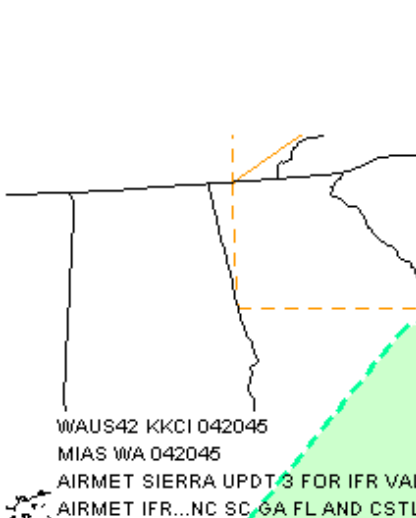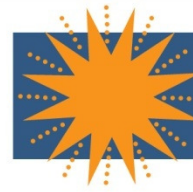- Numerous other changes and additions

EUROCONTROL

Federal Aviation Administration

WXXM 1.1 Products

CSML/Coverage Types

Point

based on	SF_SamplingPoint
phenomenonTime	TM_Instant
coverage result	CV_DiscretePointCoverage

A single observation at a point. E.g. Raingauge measurement

PointSeries

based on	SF_SamplingPoint
phenomenonTime	TM_Period
coverage result	CVT_DiscreteTimeInstantCoverage

A time-series of single datum observations at a fixed location. E.g. Tidegauge, buoy, weather station
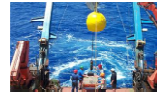
Trajectory

based on	SF_SamplingCurve	
phenomenonTime	TM_Period	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	one
	external CRS	four (x-y-z-t)
	alignment	-

An observation along a discrete path in time and space e.g. aerosol measurements along an aircraft's flight path

Section

based on	SF_SamplingSurface	
phenomenonTime	TM_Instant or TM_Period	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	two
	external CRS	four (x-y-z-t)
	alignment	z- axis (at least)

Series of profiles from a trajectory in time and space. E.g. marine CTD measurements along a ship's track

Profile

based on	SF_SamplingCurve	
phenomenonTime	TM_Instant	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	one
	external CRS	four (x-y-z-t)
	alignment	z-axis

An observation of some parameter along a vertical line in space. E.g. Wind sounding or radiosonde.
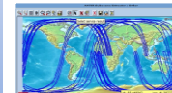
ProfileSeries

based on	SF_SamplingCurve	
phenomenonTime	TM_Period	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	two
	external CRS	four (x-y-z-t)
	alignment	z-, t-axes

Time-series of profiles on fixed vertical levels at a fixed location. E.g. vertical radar timeseries

Swath

based on	SF_SamplingSurface	
phenomenonTime	TM_Instant or TM_Period	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	two
	external CRS	three (x-y-t)
	alignment	-

*Two-dimensional grid of data along a satellite ground-path E.g. AVHRR satellite imagery*

ScanningRadar

based on	SF_SamplingCurve	
phenomenonTime	TM_Instant	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	two
	external CRS	two (azimuth-range)
	alignment	

*Backscatter profiles along a look direction at fixed elevation but rotating in azimuth. E.g. Weather radar*

Grid

based on	SF_SamplingSolid	
phenomenonTime	TM_Instant or None	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	three
	external CRS	three (x-y-z)
	alignment	

Single time-snapshot of a gridded field.
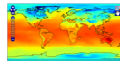
GridSeries

based on	SF_SamplingSolid	
phenomenonTime	TM_Period	
coverage result	CV_DiscreteGridPointCoverage	
	grid dimension	four
	external CRS	four (x-y-z-t)
	alignment	-
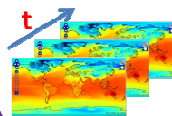
Time-series of gridded parameter fields. E.g. Numerical weather prediction model
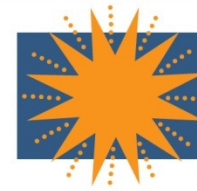
t

WXXM 1.1 Products

METAR/SPECI ICAO Annex 3	**AMDAR/MDCR**	**Point** CSML	**GridSeries** CSML
TAF ICAO Annex 3	**Volcanic Ash Advisory** ICAO Annex 3	**PointSeries** CSML	**Section** CSML
AIRMET ICAO Annex 3	**G-AIRMET**	**Profile** CSML	**Swath** CSML
SIGMET ICAO Annex 3	**Gust Front**	**ProfileSeries** CSML	**ScanningRadar** CSML
PIREP FMH 12	**AIREP** AFMAN Manual	**Grid** CSML	**Trajectory** CSML
Contour	**CCFP**	**MotionVector**	

WXXM 1.1.1

Released Apr 2010

- Fixed problems introduced by new schema generation approach
- Fixed cardinality issues
- Changed wxxs namespace to avwx
- WXXM 1.1 Primer

WXXM 2.0

Currently in progress

- Feedback on desired information, fixes, and capabilities
- Newer versions of building blocks: O&M 2, GML coverages, CSML 3
- Documentation improvements
- "Bullet-proofing"

O&M 2/ISO 19156

Air Transportation Information
Exchange Conference - (featuring
AIXM, WXXM and FIXM)

**O&M 2 validTime differs
from MET terminology**

forecast
sampling time?

«FeatureType»
Observation

+ metadata: MD_Metadata [0..1
+ samplingTime: TM_Object
+ resultTime: TM_Object [0..1
+ parameter: Any [0..*
+ resultQuality: DQ_Element [0..1

valid time not
represented

constraints
{observedProperty must be member or component
of member of featureOfInterest}
{procedure must be suitable for observedProperty}
{result type must be suitable for observedProperty}

O&M 1.0/WXXM 1.1

«FeatureType»
Observation Core::OM_Observation

+ phenomenonTime: TM_Object
  resultTime: TM_Instant
+ validTime: TM_Period [0..1]
+ resultQuality: DQ_Element [0..*]
+ parameter: NamedValue [0..*]

0..*
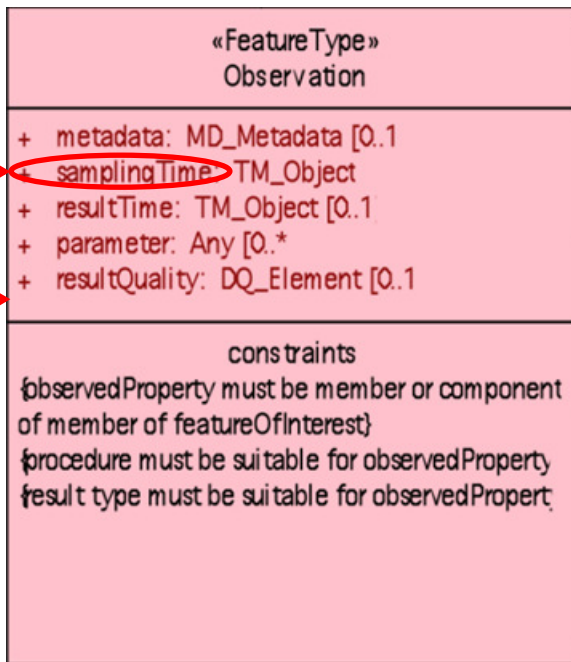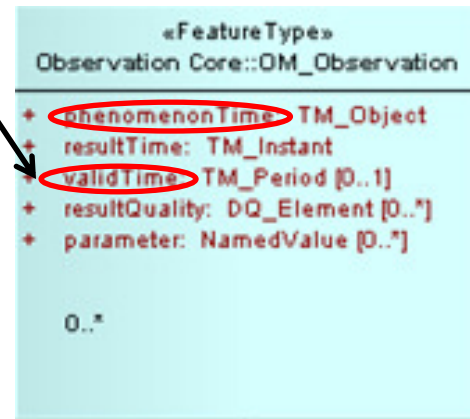
O&M 2.0/WXXM 2.0
**Better aligned with
forecast data**

EUROCONTROL   Federal Aviation
Administration

GML Coverages and CSML

Apr 2010
- WXXM 1.1.1 released

Oct 2010
- GML

May 2011
- Initia... ...ailable
- Incor...

WXXM 2.0 incorporation possible, depending…

2011?
- GML 3.3 release, including necessary updates to GML Coverages

EUROCONTROL   Federal Aviation Administration
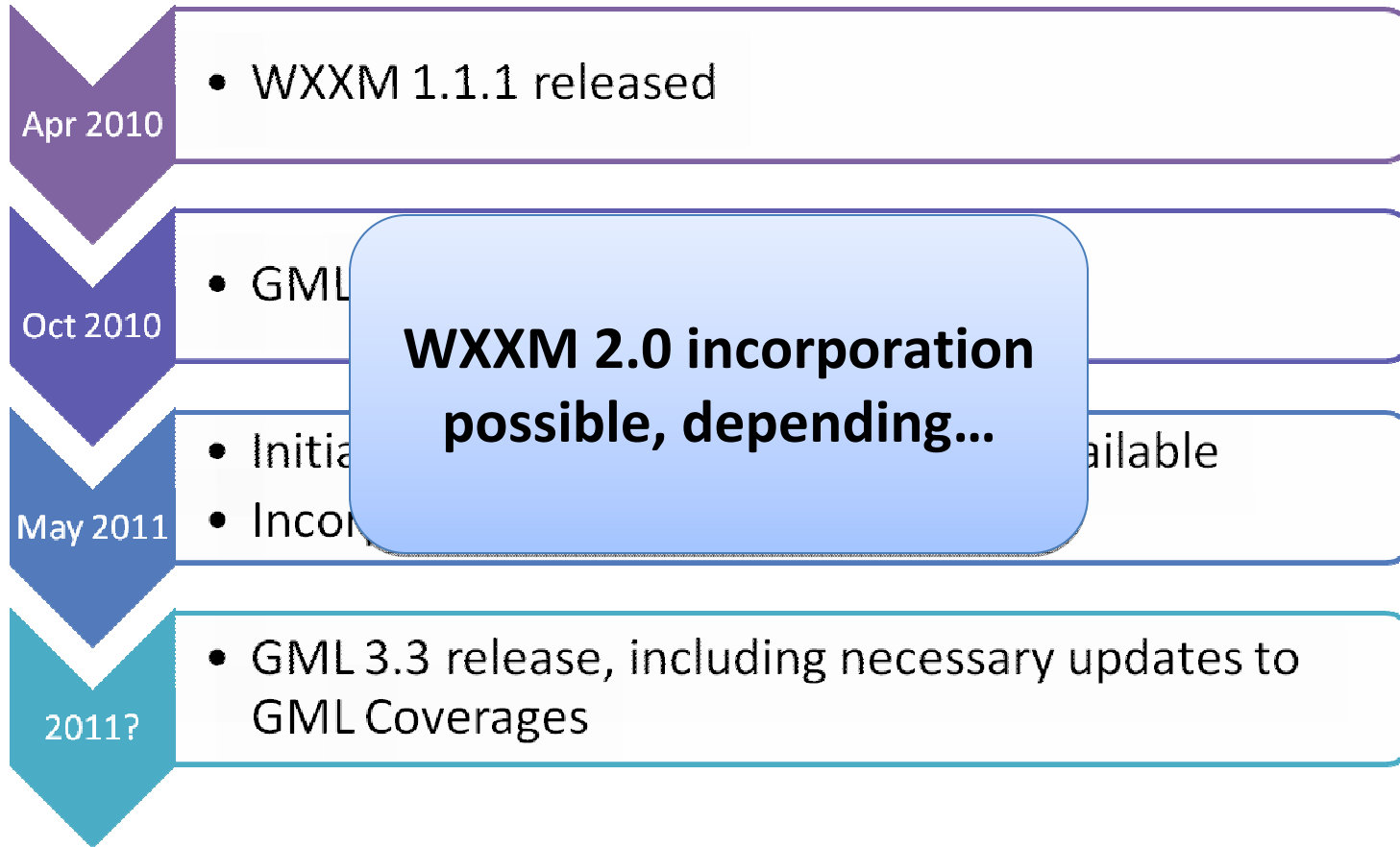
Extensions Capability

Allow for extensions to WXXM:

- Pending additions

- Domain-specific extensions

- Regional extensions

```xml
<om:result>
  <avwx:AerodromeWx gml:id="id10">
    <avwx:airPressure uom="mBar">900</avwx:airPressure>
    <avwx:airTemperature uom="C">30</avwx:airTemperature>
    <avwx:dewpointTemperature uom="C">20</avwx:dewpointTemperature>
    <avwx:verticalVisibility uom="NM">2</avwx:verticalVisibility>
    <avwx:windDirection uom="deg">30</avwx:windDirection>
    <avwx:extensions>
      <myns:RegionalExtensions>
        ...
      </myns:RegionalExtensions>
    </avwx:extensions>

  </avwx:AerodromeWx>
</om:result>
```
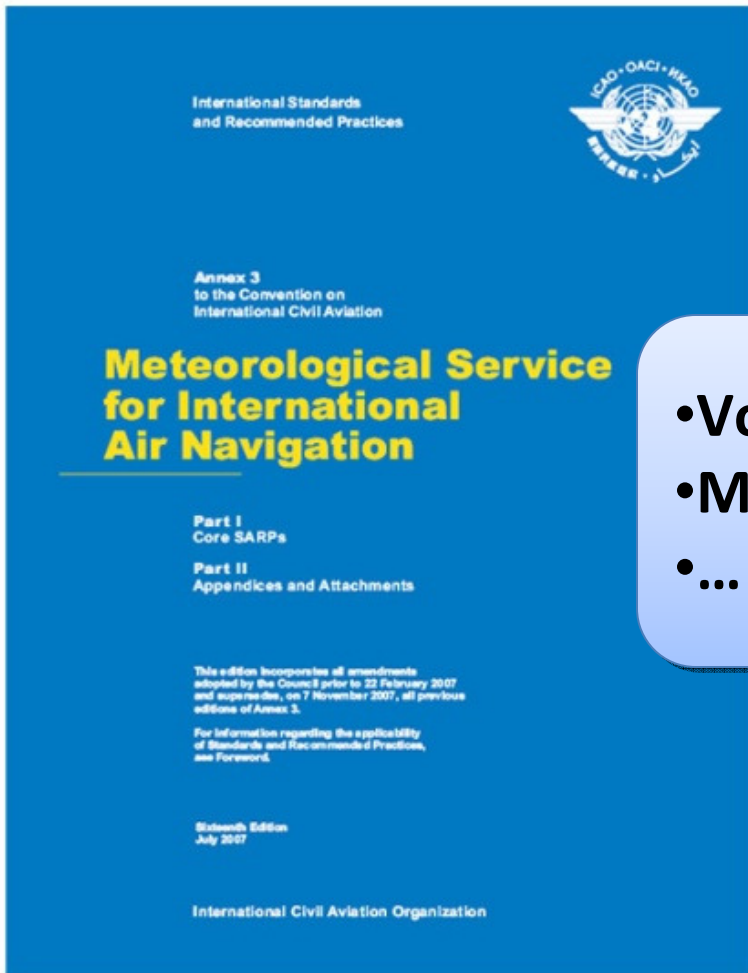
ICAO Annex 3

International Standards and Recommended Practices

Annex 3
to the Convention on
International Civil Aviation

Meteorological Service for International Air Navigation

Part I
Core SARPs

Part II
Appendices and Attachments

This edition incorporates all amendments adopted by the Council prior to 22 February 2007 and supersedes, on 7 November 2007, all previous editions of Annex 3.

For information regarding the applicability of Standards and Recommended Practices, see Foreword.
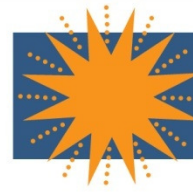
Sixteenth Edition
July 2007

International Civil Aviation Organization

- •Volcanic Ash improvements
- •METARSpeci -> SPECI
- •...
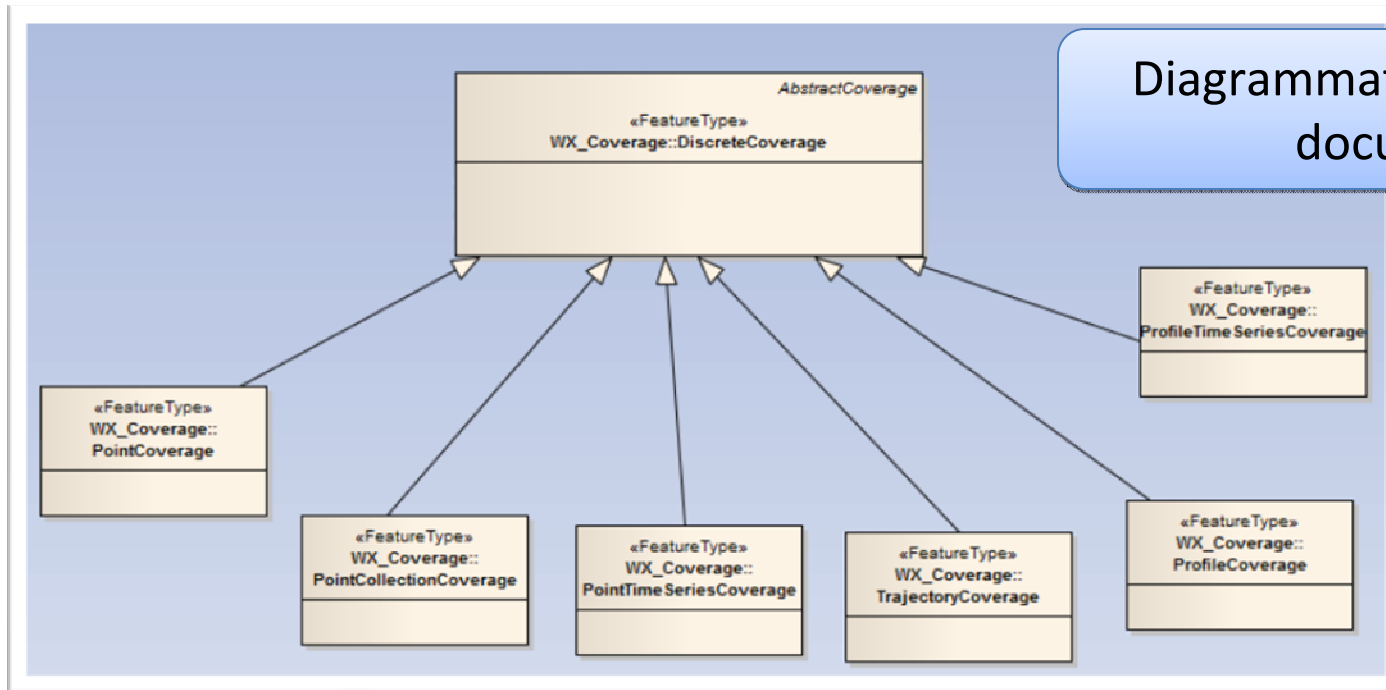
Documentation

Diagrammatic (conceptual) documentation

```
<element name="SurfaceReport" substitutionGroup="avwx:AbstractReport" type="avwx:SurfaceReportType">
    <annotation>
        <documentation>A report of  observations made from the surface of the earth or water bodies</documentation>
    </annotation>
</element>
```

Class-level documentation

Future Work

Units of Measure

OGC MetOceans model

Additional commonality between AIXM/WXXM/FIXM

GML 3.3/4.0

CSML Alignment
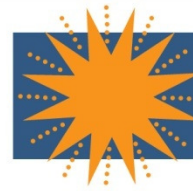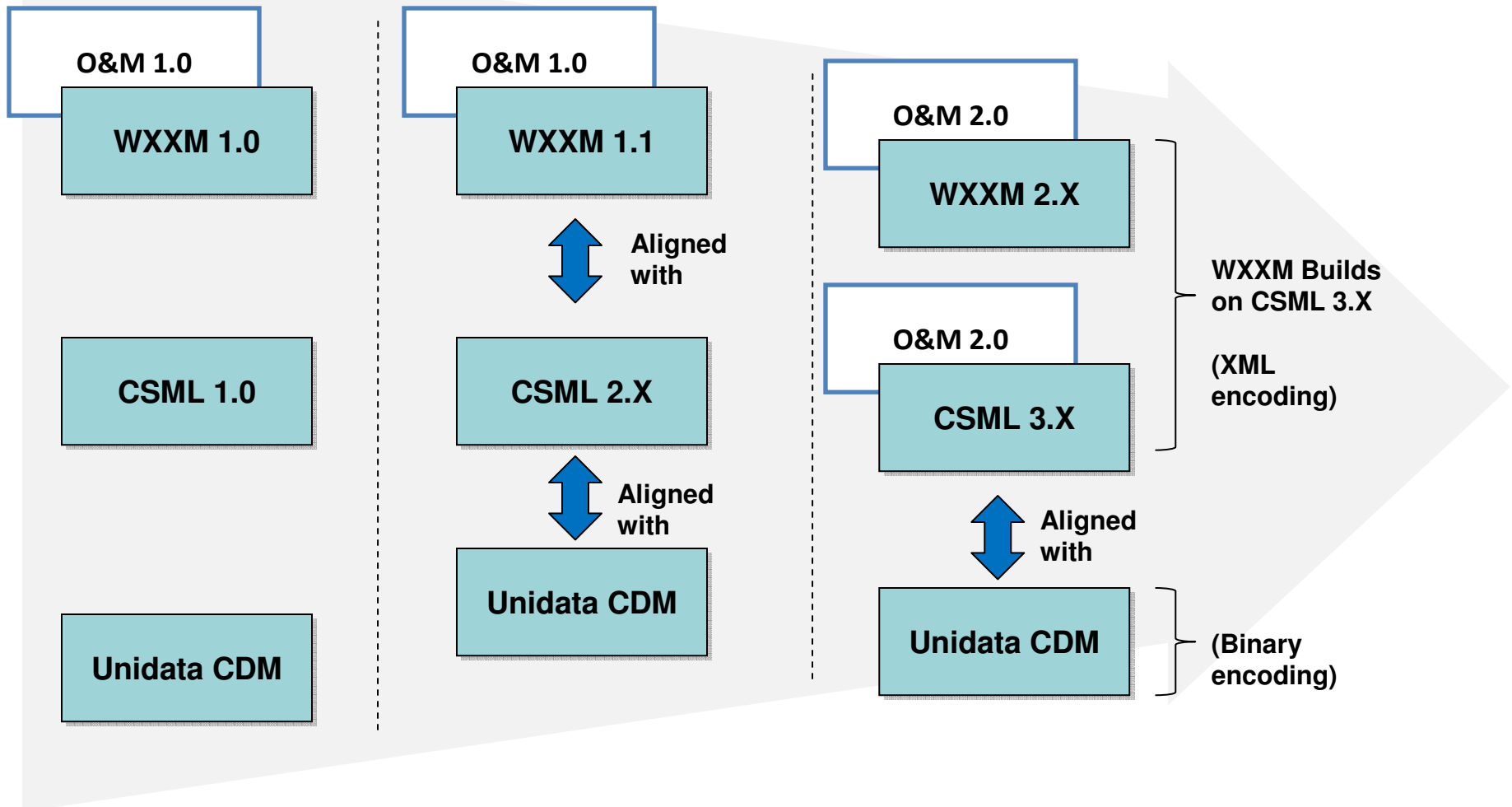
Model Alignment

Conclusion

Finish WXXM 2.0 Model and Schema Changes (Q4 2011) → Public Release (Jan 2012) → WXXM 2.1

More Information / Contacts

http://www.wxxm.aero

https://wiki.ucar.edu/display/NNEWD/WXXM