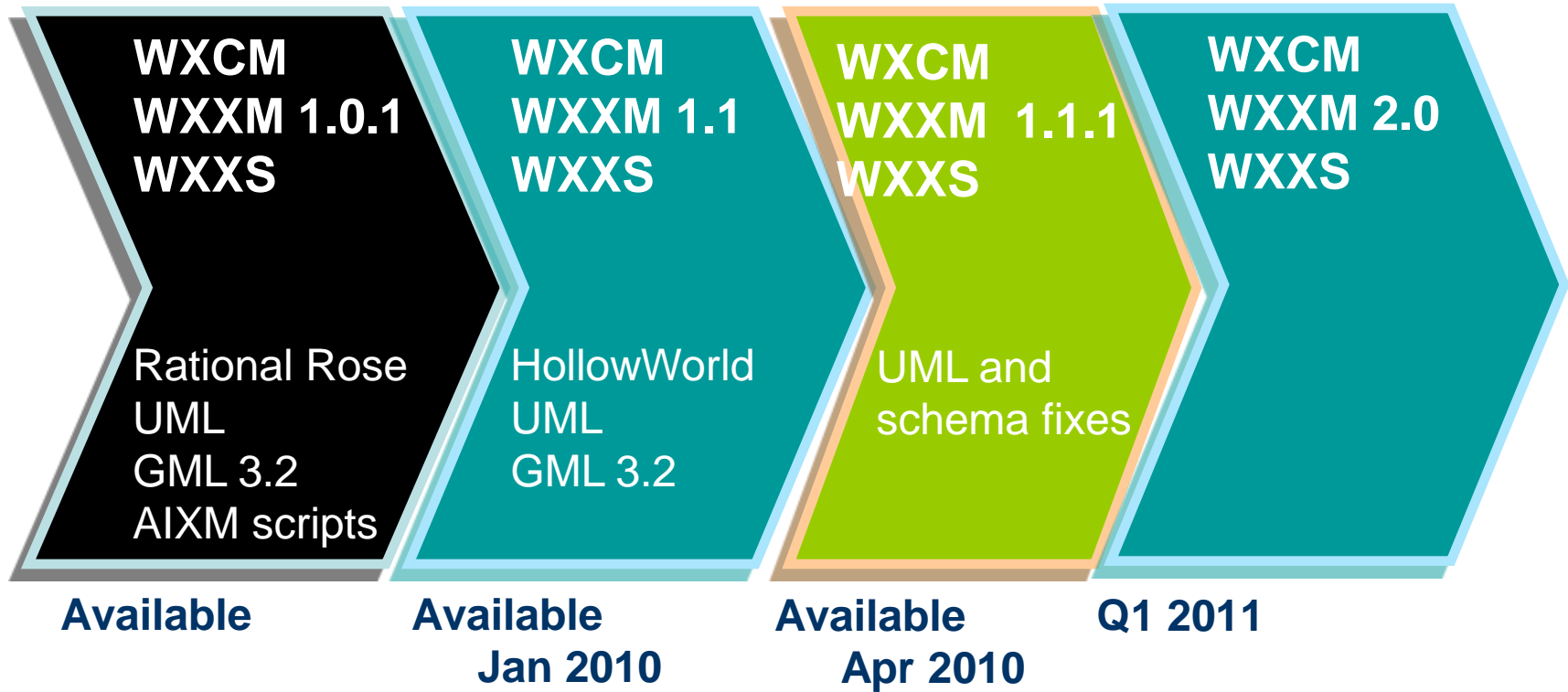# WXXM 2.0

Aaron Braeckel

Briefing to 3rd Workshop on OGC/GIS Standards in Meteorology
15 Nov 2010
National Center for Atmospheric Research
Boulder, CO

Schedule

WXCM WXXM 1.0.1 WXXS	WXCM WXXM 1.1 WXXS	WXCM WXXM 1.1.1 WXXS	WXCM WXXM 2.0 WXXS
Rational Rose UML GML 3.2 AIXM scripts	HollowWorld UML GML 3.2	UML and schema fixes	
Available	**Available Jan 2010**	**Available Apr 2010**	**Q1 2011**

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Background

WXXM 1.0:

Features
- UML model in Rational Rose
- XML Schemas generated from UML (Rational Rose scripts)
- ICAO Annex 3 Products (METAR, TAF, etc.)

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Background

WXXM Workshop, November 2008:

future versions of WXCM/WXXM/WXXS Weather Information Models and

"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)"

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Background

Goals of WXXM 1.1:

- Partition schema (WXXS) into general weather concepts and aviation-specific weather concepts
- Support an O&M-based observation and forecast model
- Align with U.K. Climate Science Modeling Language (CSML) and NetCDF Common Data Model (CDM) general weather data types
- Support the ability to use NetCDF-CF standard names and JMBL parameter names
- Refine time semantics
- Evaluate standards-based units of measure (applies to WXXM and AIXM)
- Enhance support for Ontologies

Background

WXXM 1.1 (January 2010):

Features
- UML model in Enterprise Architect (HollowWorld)
- XML Schemas generated from UML (FullMoon)
- Additional Products:
    - METAR
    - TAF
    - AIR/SIGMET
    - PIREP
    - AIREP
    - MDCR
    - Volcanic Ash Advisory*
    - G-AIRMET/G-SIGMET
    - CSML-like types (coverage types: PointSeries, Trajectory, etc.)
    - Gust front
    - …

Background

WXXM 1.1.1 (April 2010):

Features
- Fixed problems introduced by the Rational Rose -> Enterprise Architect conversion process
- Fixed cardinality issues
- Changed *wxxs* namespace to *avwx*
- WXXM 1.1 Primer

WXXM 2.0

WXXM 2.0 (Q4 2010):

Features
- Simplicity and consistency improvements
- Documentation improvements
- Additional products
- Respond to feedback from OWS-7, NNEW, and other users
- Various accumulated updates from the WXXM 1.1 process
- Start analysis of AIXM/WXXM joint topics
- Iteration on the FullMoon generation code/process. Contributions back to FullMoon

If available…
- Observations and Measurements 2.0/ISO 19156
- CSML 3.0 convergence

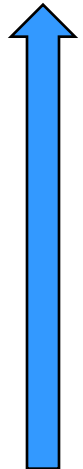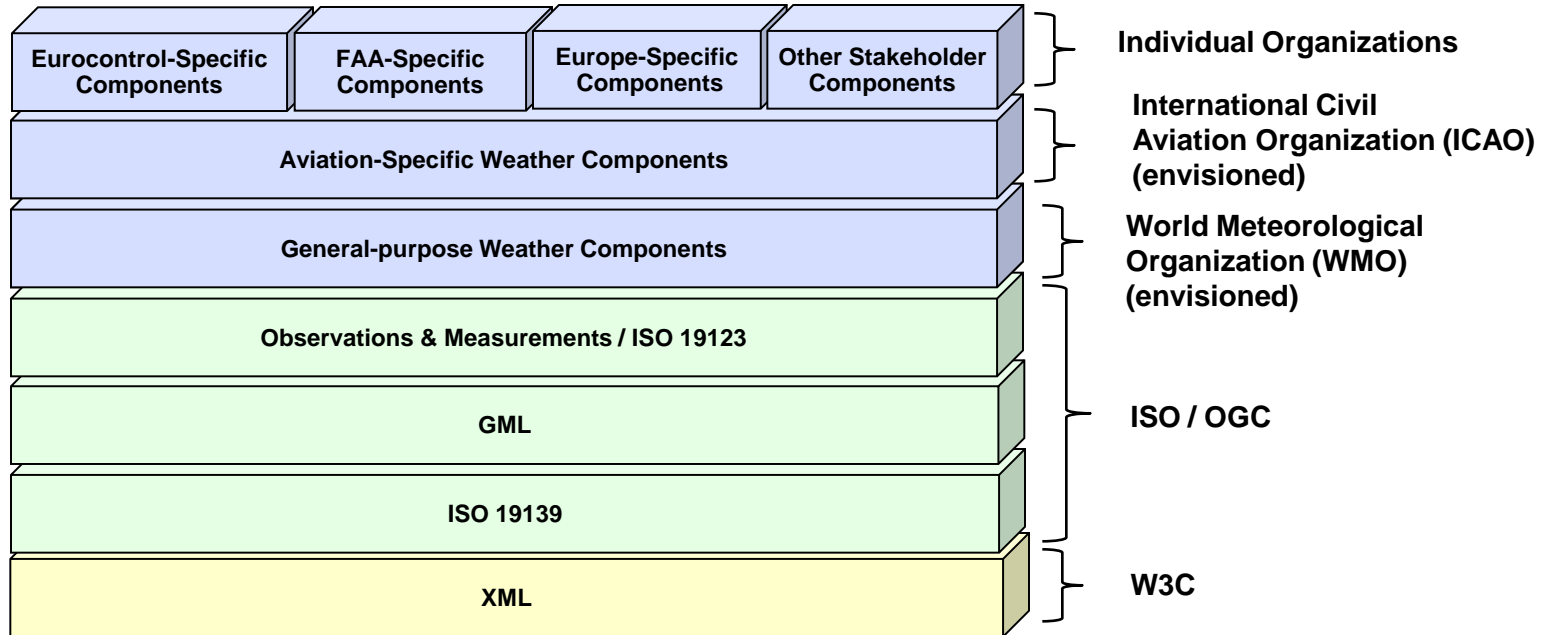Candidate for industry implementation and further standardization

Data Model

Layers:

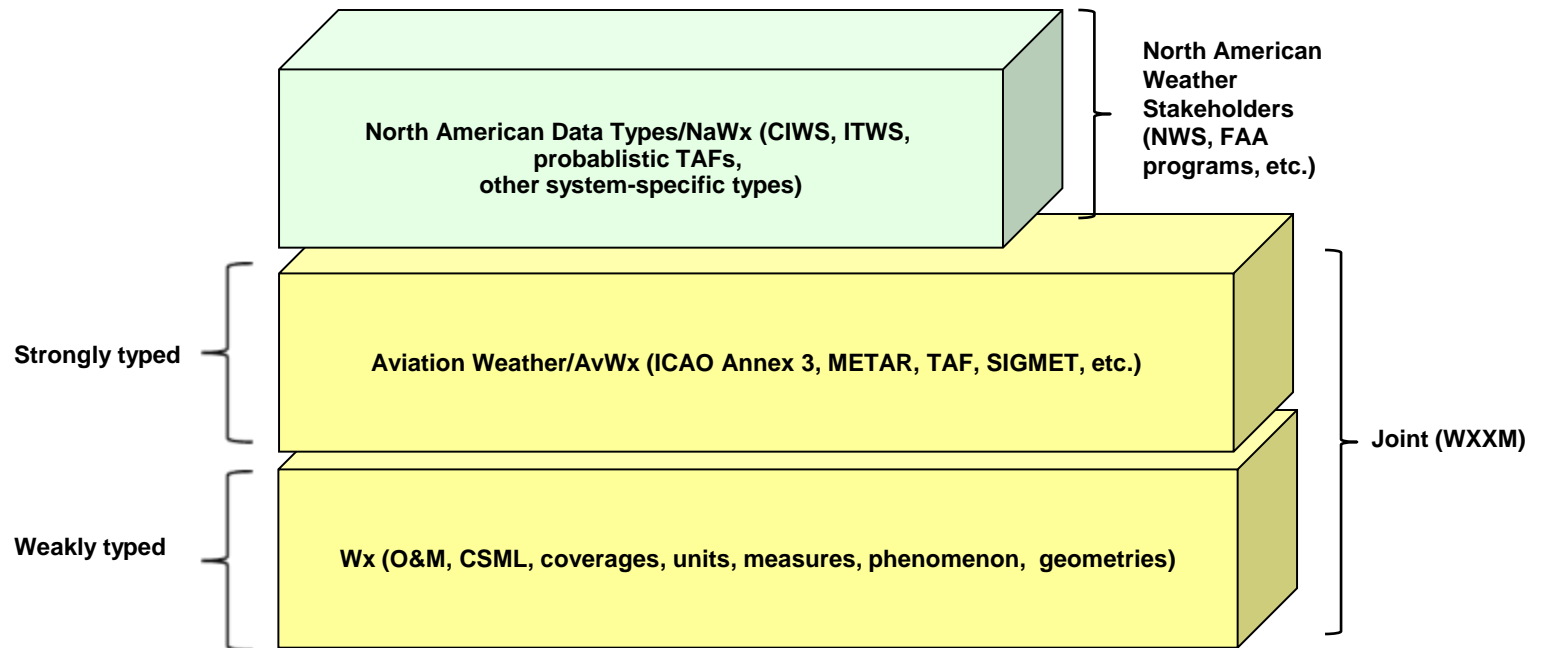**Data Model
Component Agility**

Standards Governance Body

Eurocontrol-Specific Components	FAA-Specific Components	Europe-Specific Components	Other Stakeholder Components

High (months)

Individual Organizations

Aviation-Specific Weather Components

International Civil Aviation Organization (ICAO) (envisioned)

General-purpose Weather Components

World Meteorological Organization (WMO) (envisioned)

Observations & Measurements / ISO 19123

GML

ISO / OGC

ISO 19139

XML

W3C

Low (years)

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Data Model

Current Schemas:

Typing

North American Data Types/NaWx (CIWS, ITWS,
probablistic TAFs,
other system-specific types)

North American Weather Stakeholders (NWS, FAA programs, etc.)

Strongly typed

Aviation Weather/AvWx (ICAO Annex 3, METAR, TAF, SIGMET, etc.)

Joint (WXXM)

Weakly typed

Wx (O&M, CSML, coverages, units, measures, phenomenon, geometries)

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Background

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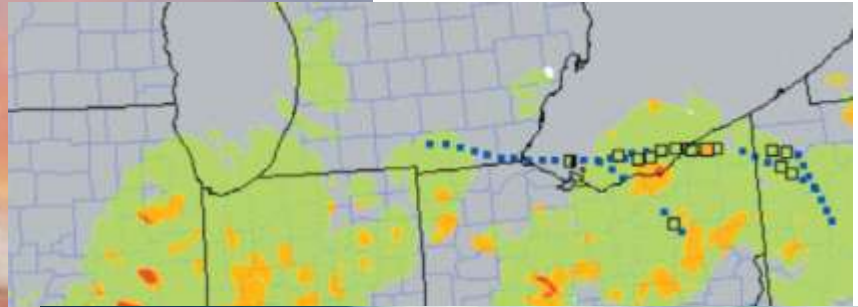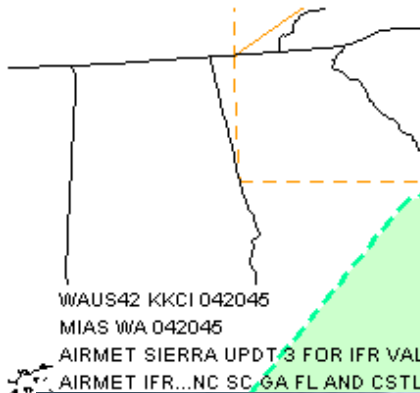
Grid
based on — SF_SamplingSolid
phenomenonTime — TM_Instant or None
coverage result — CV_DiscreteGridPointCoverage
grid dimension — three
external CRS — three (x-y-z)
alignment — -

Single time-snapshot of a gridded field.

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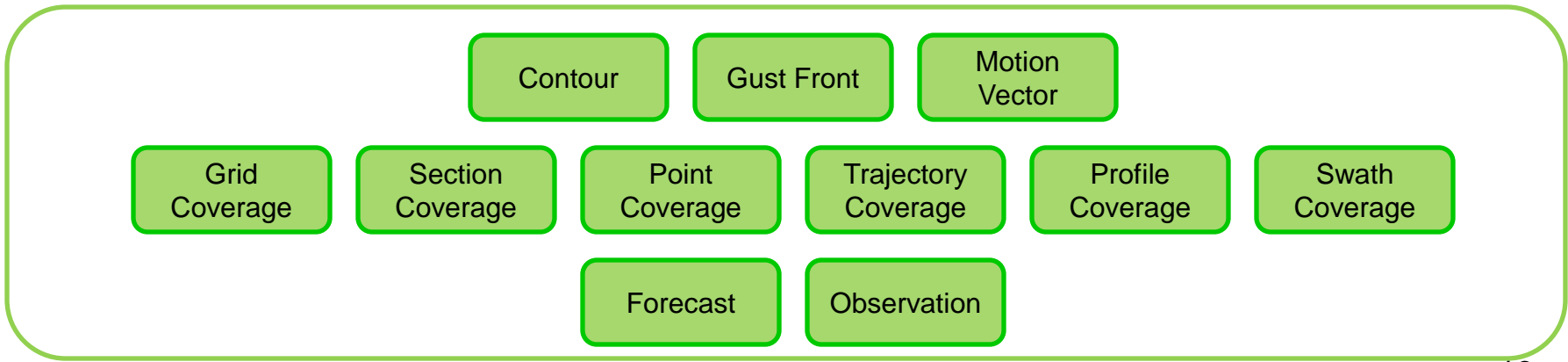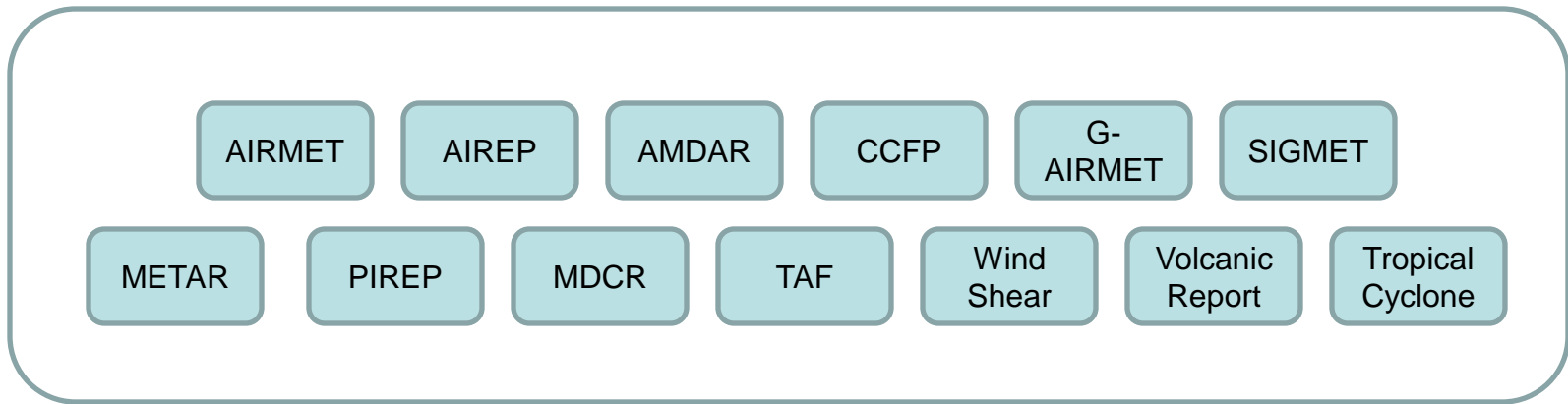external CRS — four (x-y-z-t)
alignment — -

Time-series of gridded parameter fields. E.g. Numerical weather prediction model

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WXXM 1.1 Products

WAUS42 KKCI 042045
MIAS WA 042045
AIRMET SIERRA UPDT 3 FOR IFR VAL
AIRMET IFR...NC SC GA FL AND CSTL

WXXM 1.1 Products

AIRMET   AIREP   AMDAR   CCFP   G-AIRMET   SIGMET

METAR   PIREP   MDCR   TAF   Wind Shear   Volcanic Report   Tropical Cyclone

Contour   Gust Front   Motion Vector

Grid Coverage   Section Coverage   Point Coverage   Trajectory Coverage   Profile Coverage   Swath Coverage

Forecast   Observation

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WXXM 2.0

O&M and Forecasts:

forecast sampling time?

valid time not represented

«FeatureType»
Observation

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

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

«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
Better aligned with forecast data

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Weather Model Convergence?

O&M 1.0

WXXM 1.0

CSML 1.0

Unidata CDM

O&M 1.0

WXXM 1.1

Aligned with

CSML 2.X

Aligned with

Unidata CDM

O&M 2.0

WXXM 2.X

O&M 2.0

CSML 3.X

WXXM Builds
on CSML 3.X

(XML encoding)

Aligned with

Unidata CDM

(Binary encoding)

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WXXM 2.0
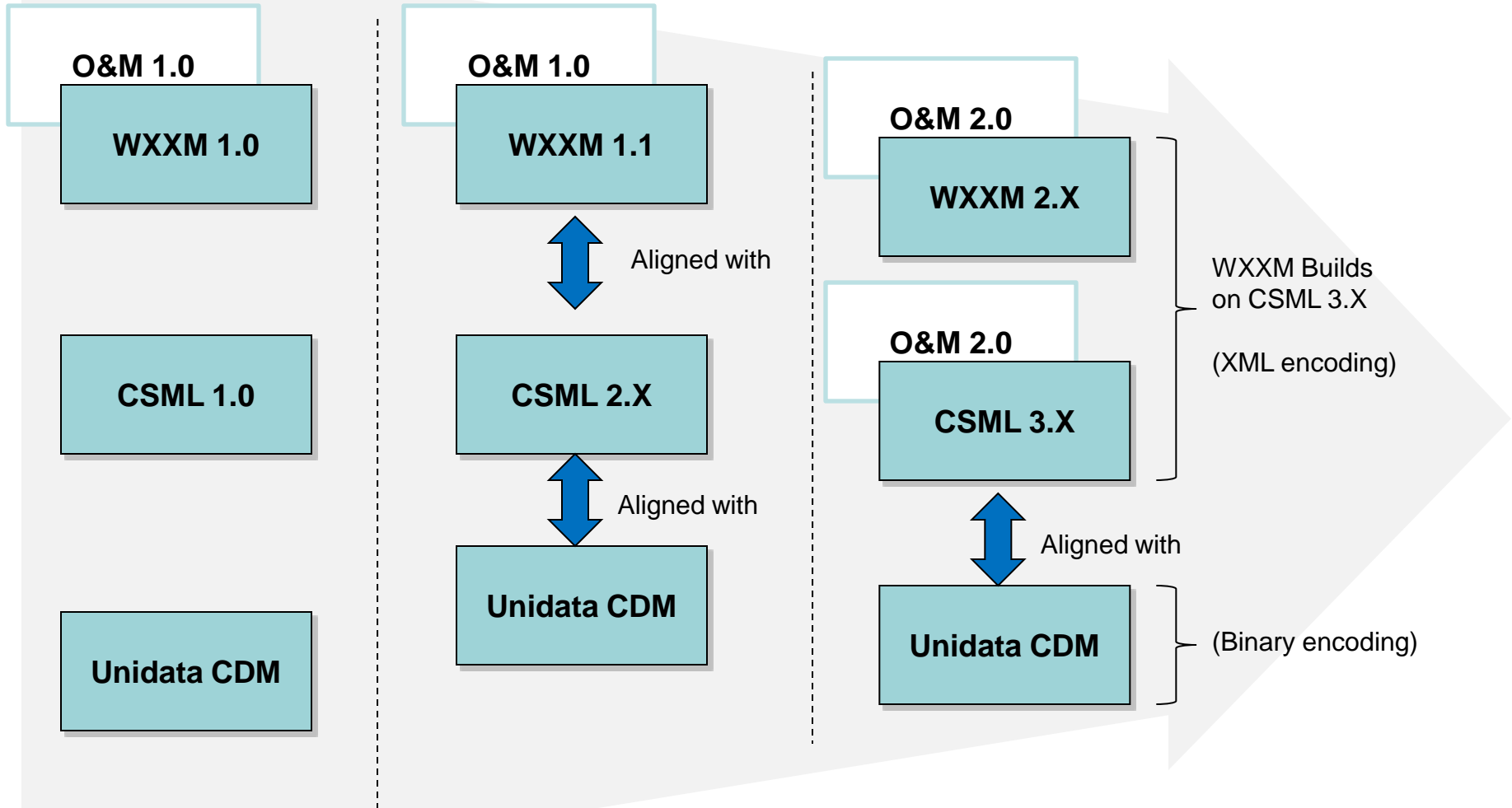
References:

WXXM Models and Schemas:
http://wiki.ucar.edu/display/NNEWD/WXXM

Eurocontrol OneSky site:
https://extranet.eurocontrol.int/

AIXM Web Site:
http://www.aixm.aero