WXXM 2.0
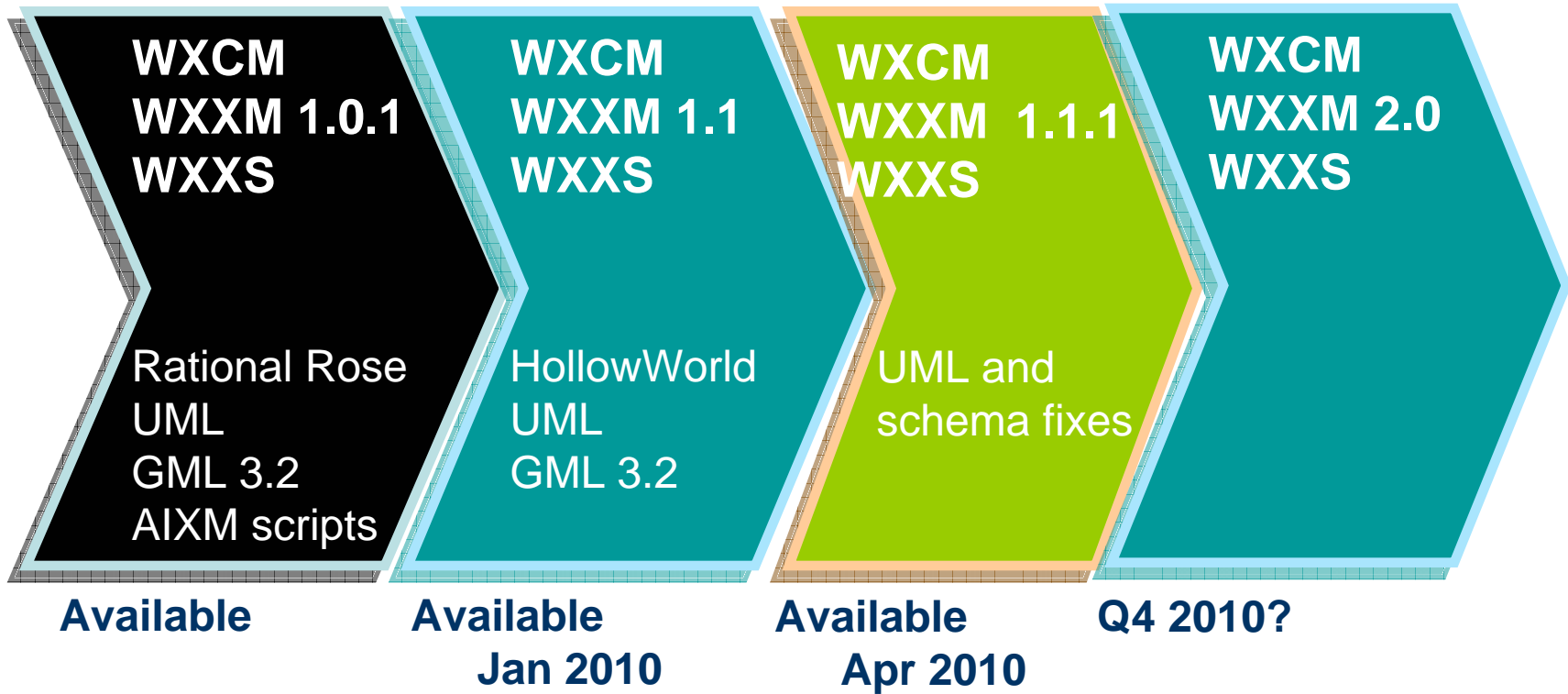
Aaron Braeckel

Briefing to WXXM/AIXM Conference
04 May 2010
National Center for Atmospheric Research
Boulder, CO

Schedule

WXCM
WXXM 1.0.1
WXXS

Rational Rose
UML
GML 3.2
AIXM scripts

Available

WXCM
WXXM 1.1
WXXS

HollowWorld
UML
GML 3.2

Available
Jan 2010

WXCM
WXXM 1.1.1
WXXS

UML and
schema fixes

Available
Apr 2010

WXCM
WXXM 2.0
WXXS

Q4 2010?

Background

WXXM 1.0:

Editors
- Eurocontrol

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

Background

WXXM Workshop, November 2008:

Goal

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

Attendees/Organizers

Dennis Hart (Eurocontrol)
David Hodgson (Mileridge – supporting Eurocontrol)
Silas Jones (Mileridge – supporting Eurocontrol)
Oliver Newell (MIT/LL)
Kajal Claypool (MIT/LL)
Aaron Braeckel (NCAR)
Chris MacDermaid (NOAA/ESRL)
Tim Hopkins (NWS)
John Chattel (NWS)
Stowe Davidson (NWS)
Eric Wise (DOD – AFWA)
Rich Deininger (Tectura/Boeing)
Andrew Wolfe (British Atmospheric Data Centre)
Jason Tuell (NWS)
Dave Pace (FAA)
Tom Ryan (FAA)

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Background

WXXM Workshop, November 2008:

"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)"

Background

WXXM Workshop, November 2008:

"Version 1.0.1 of the WXCM/WXXM/WXXS, developed by EUROCONTROL, will be used as the basis for future conjoint versions."
"The WXXM/WXXS will, whenever possible, be aligned with the Climate Science Modeling Language (CSML) Best Practice when not conflicting with the current O&M."

"FAA will officially lead the migration of version 1.0.1 of the models to version 1.1, which will include mature building blocks for the Agreed Design Changes and the foreseen alignment with CSML."

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Background

WXXM 1.1 (January 2010):

Editors
- Eurocontrol
- FAA/NNEW

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
    - …

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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	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	

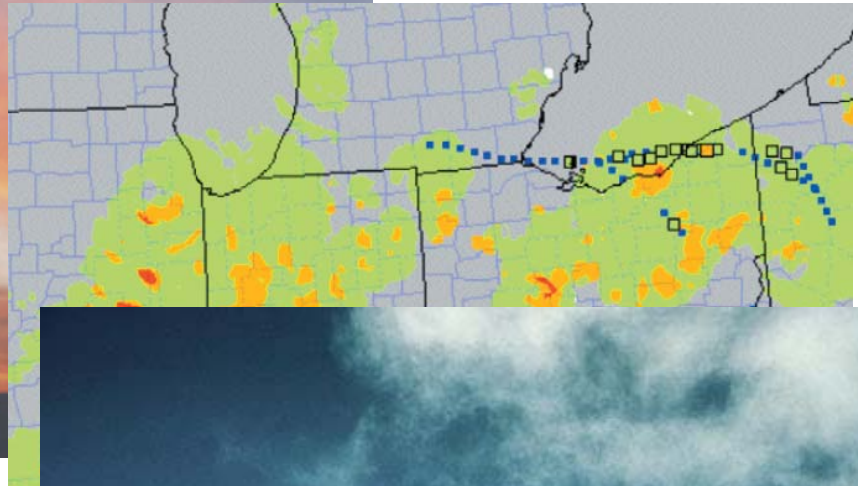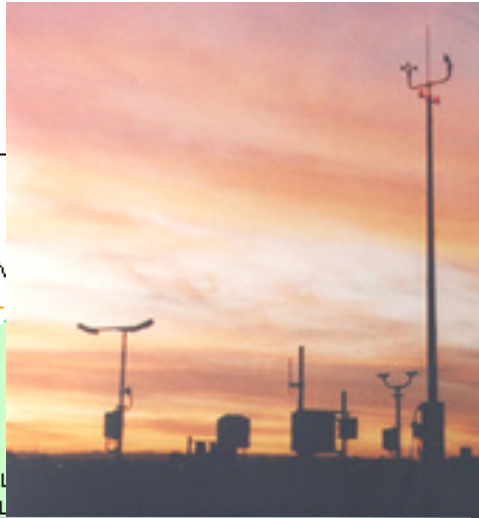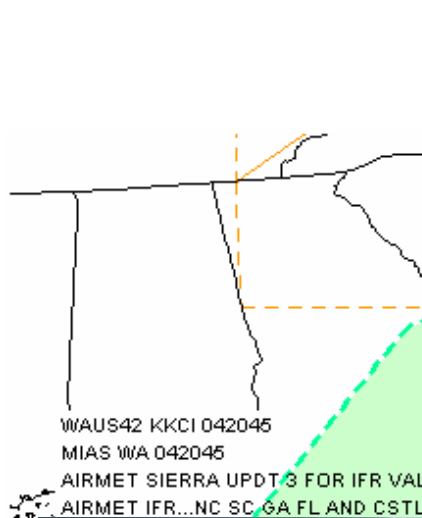Backscatter profiles along a look direction at fixed elevation but rotating in azimuth. E.g. Weather radar

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

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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

Corporation for Atmospheric Research

Background

WXXM 1.1.1 (April 2010):

Editors
- Eurocontrol
- FAA/NNEW

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):

Editors
- Eurocontrol
- FAA/NNEW
- …

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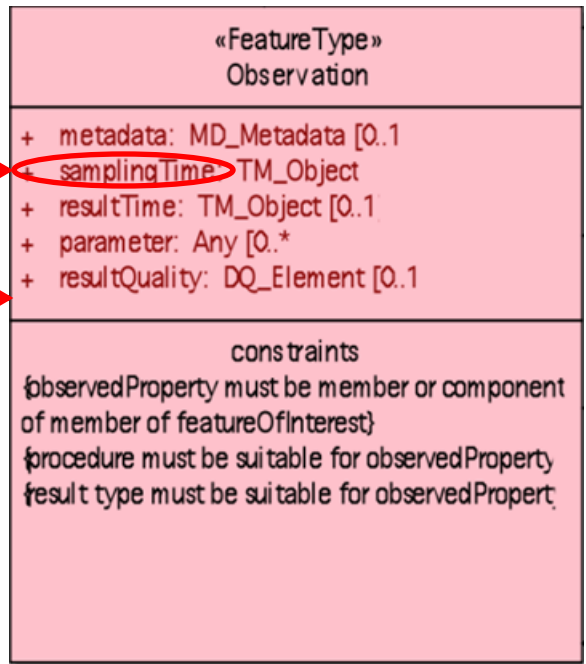- Observations and Measurements 2.0/ISO 19156
- CSML 3.0 convergence

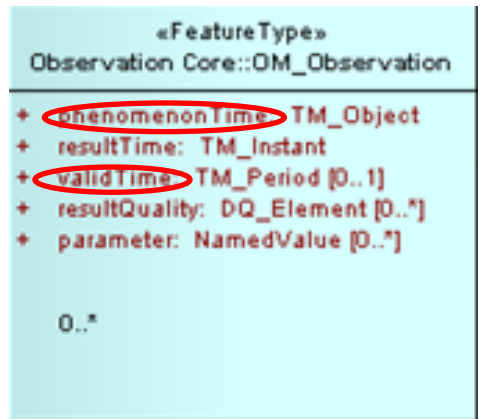Candidate for industry implementation and further standardization

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WXXM 2.0

O&M and Forecasts:

«FeatureType»
Observation

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

forecast sampling time? →

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

«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

Aligned with

Unidata CDM

WXXM Builds
on CSML 3.X

(XML encoding)

(Binary encoding)

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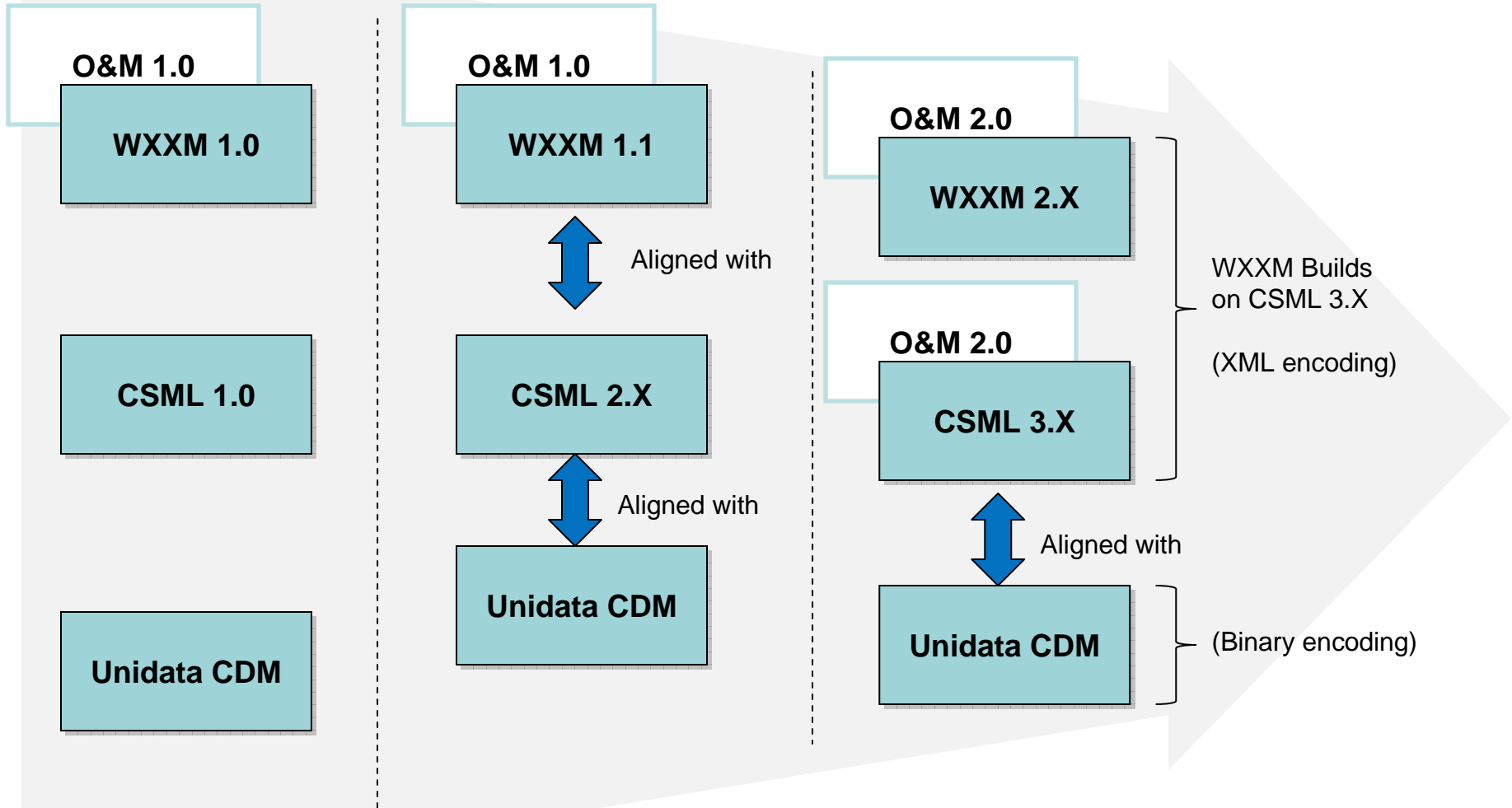
References:

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