Weather Data Models

There are several weather data models (UML/XML) governed by different authorities for various purposes. This page describes their respective roles and areas of responsibility.

IWXXM

IWXXM is governed by ICAO and WMO to represent products in ICAO Annex 3 / WMO No. 49. IWXXM 1.0 was released in 2013 and is typically updated in alignment with ICAO Annex 3 updates (every two years). ICAO and WMO are UN agencies tasked with the governance of international aviation and weather, respectively, and therefore IWXXM should be considered the authoritative source for products that are included in ICAO Annex 3. IWXXM 2.0 includes seven products: METAR, SPECI, TAF, SIGMET, AIRMET, Tropical Cyclone Advisory, and Volcanic Ash Advisory. More ICAO Annex 3 products may be added in subsequent releases.

WMO/ICAO Web Validator

This is a web-based tool for validating messages hosted at http://wmo-icao-validator.rap.ucar.edu/.

International Model Releases

A list of model releases is below. Deprecated releases and products are shown in gray.

Model /Release	Date	Release Artifacts	Products	Notes
IWXXM				Official ICAO/WMO products from ICAO Annex 3 / WMO No. 49
IWXXM 2.1	Apr 2017	Release bundles Online schemas	ICAO METAR/SPECI, TAF, SIGMET, AIRMET, Volcanic Ash Advisory (VAA), Tropical Cyclone Advisory (TCA)	AIRMET and SIGMET fixed to handle multiple OBS/FCST and FCST positions, other bug fixes
IWXXM 2.0	Aug 2016	Release bundles Online schemas	ICAO METAR/SPECI, TAF, SIGMET, AIRMET, Volcanic Ash Advisory (VAA), Tropical Cyclone Advisory (TCA)	Added AIRMET, TCA, and VAA products along with a number of other improvements
IWXXM 1.1	Mar 2015	Release bundles Online schemas	ICAO METAR/SPECI, TAF, SIGMET	Minor bug fixes and improvements
IWXXM 1.0	Sep 2013	Online schemas	ICAO METAR/SPECI, TAF, SIGMET	Initial release with four products - more to be included in subsequent releases
WXXM				

WXXM 2.0	Mar 2015	Release bundles Online schemas	General purpose coverages ICAO SigWx ICAO AIRMET ICAO Volcanic Ash Advisory	ICAO products are deprecated once they have been represented in IWXXM
WXXM 1.1	Mar 2010		General purpose coverages, contours, gust front, motion vector, ICAO METAR/SPECI, TAF, AIRMET, SIGMET, VA Advisory WMO AMDAR/MDCR, AIREP G-AIRMET, PIREP, CCFP	Deprecated in favor of WXXM 2.0. Additionally, ICAO products have been replaced by the authoritative IWXXM representations
WXXM 1.0	2007		Initial representations of ICAO Annex 3 Products	Deprecated in favor of WXXM 1.1. ICAO products have been replaced by the authoritative IWXXM representations

IWXXM-US

The US and other countries have historically created and disseminated products slightly differently than ICAO. In the case of the US, this mostly comes in the form of additional content in the RMK section (in the traditional TAC formats). IWXXM-US was developed by US agencies (NWS, FAA and others) for representing ICAO products with additional US content. The US disseminates US METARs internally but strips off the extra content when transmitting on ICAO circuits.
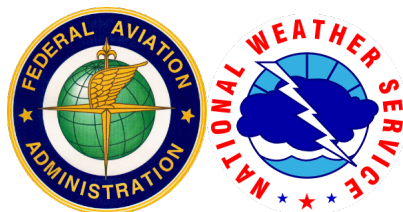
On a technical level IWXXM-US extends IWXXM. Therefore IWXXM-US XML documents have elements from both IWXXM (for ICAO standard content) and IWXXM-US (for US-specific ICAO content).

US Model Releases

Model /Release	Date	Release Artifacts	Products	Notes
IWXXM-US				US specializations of ICAO products
IWXXM-US 2.0	Sep 2016	Online schemas	US METAR/SPECI, TAF	Includes US specializations of products present in IWXXM 2.0
IWXXM-US 1.0	May 2014	Online schemas	US METAR/SPECI, TAF, SIGMET	Includes US specializations of products present in IWXXM 1.0
NAWX				US weather product representations
NAWX 1.5	Aug 2013		Alert, Echo Top Point, Gust Front, Leading Edge, Lightning, Microburst, Storm Motion, Storm Cell, Tornado, Convective Forecast Polygon, Guidance (probabilistic) TAF, MDCRS	Added MDCRS, corrected external schema locations. MDCRS now deprecated in favor of USWx AMDAR representation
NAWX 1.4	Aug 2012		Alert, Echo Top Point, Gust Front, Leading Edge, Lightning, Microburst, Storm Motion, Storm Cell, Tornado, Convective Forecast Polygon, Guidance (probabilistic) TAF	Deprecated. Added GuidanceTAF
NAWX 1.2.0-Alpha	May 2010		Alert, Echo Top Point, Gust Front, Leading Edge, Lightning, Microburst, Storm Motion, Storm Cell, Tornado	Deprecated
USWx				
USWx 1.0	Apr 2015		AMDAR, PIREP, AIREP	Official AMDAR and AIREP representations in XML have not yet been developed by the appropriate authorities. If they are developed the USWx representations will be considered deprecated
FAAWX				FAA-specific products, such as that used in terminal weather and convective forecasting on the ITWS, CIWS, and NWP programs

| FAAWX 2.1 | Nov 2016 | | Gust Front Alert, Tornado Alert, Lightning Alert, ATIS Alerts, Contours, Leading Edges, Motion Vector, Configured Alerts, Echo Top Point, Forecast Accuracy, Fronts, Gust Front, Jet Stream, Lightning, Microburst, Runway Configuration, Storm Information, Stream Lines, Terminal Wx, Tornado Detections, Wind Profiles | Minor changes from FAAWX 2.0. Data quality property added to Lightning. Runway Configuration RunwayStatusType changed from string to gml: StringOrRefType and made Ribbon Display Terminal (RBDT) properties optional (minOccurs="0") |
| FAAWX 2.0 | Jun 2015 | | Gust Front Alert, Tornado Alert, Lightning Alert, ATIS Alerts, Contours, Leading Edges, Motion Vector, Configured Alerts, Echo Top Point, Forecast Accuracy, Fronts, Gust Front, Jet Stream, Lightning, Microburst, Runway Configuration, Storm Information, Stream Lines, Terminal Wx, Tornado Detections, Wind Profiles | FAAWX version 2.0 is the initial release of FAA weather product extensions of WXXM 2.0 schemas including support for NextGen Weather Processor (NWP) products |

US-Wx/NAWX

The North-American weather schemas include weather constructs predominantly used and disseminated within the United States, *excluding* the US specializations of ICAO products from IWXXM-US. On a technical level NAWX extends WXXM with additional content. NAWX is managed by FAA with input from the NWS.

In 2015 NAWX was renamed to USWx to better represent the community of use.

North American Weather (NAWX) - US/FAA Extensions to WXXM - Deprecated

Version	Date	Description	Downloads
1.5.0	08/15/2013	Added full-featured MDCRS support. Corrected external schema locations	Schema
1.4.0	08/28/2012	Added Guidance TAF	Schema
1.2.0 Alpha	05/05/2010	FAA-built North American Weather (NAWX) extension to the WXXM standard.	Schema

FAAWX

The FAA Weather schemas include many constructs utilized by FAA systems, such as terminal weather (e.g., microbursts) and convective forecasting (e. g., Storm Extrapolated Positions, Growth Trends and Convective Weather Avoidance Polygons).Product Representations

This section lists the current representation to use for each product. **Last updated 19 April 2016**.

FAA Weather Models (FAAWX) - FAA Extensions to WXXM

Version	Date	Description	Downloads
2.1	Nov 2016	Minor changes from FAAWX 2.0. Data quality property added to Lightning. Runway Configuration RunwayStatusType changed from string to gml:StringOrRefType and made Ribbon Display Terminal (RBDT) properties optional (minOccurs="0")	Schema Docs
2.0	06/02/2015	FAAWX version 2.0 is the initial release of FAA weather product extensions of WXXM 2.0 schemas including support for NextGen Weather Processor (NWP) products	Schema

WXXM

EUROCONTROL

WXXM is governed by FAA and Eurocontrol for international products outside of those represented by ICAO or WMO. WXXM 1.0 was released in 2007, and WXXM is typically updated on 2-year intervals.

WXXM predates IWXXM by several years and initial releases included several products from ICAO Annex 3. All **WXXM** products that have been officially incorporated into **IWXXM** should be considered deprecated, as IWXXM is the designated representation for ICAO products. An ICAO METAR, for example, exists in both WXXM 1.1 and IWXXM 1.0. The IWXXM METAR should be used preferentially - WXXM included a METAR representation because IWXXM did not yet exist to carry official ICAO products.

WXXM, the Weather Data Model, is a UML and XML-based structural definition for the exchange of information by aviation weather users. WXXM was designed by Eurocontrol in concert with FAA.

WXXM defines a common vocabulary for exchanging weather information between organizations, but it does not inherently provide any sort of functionality to facilitate that exchange. It is, fundamentally, a set of guidelines for how to think about weather data.

Overview

Despite being referred to as WXXM, the Weather Data Model is in fact a set of three tiered data models, only one part of which is actually called WXXM: the Weather Exchange Model. Together, the three models provide conceptual, structural, and physical representations of weather data.

1. The aptly-named **Weather Conceptual Model (WXCM)** provides a high-level, implementation-independent look at how weather data concepts are connected.
2. The **Weather Exchange Model (WXXM)** provides a more logical and structural (if still implementation-independent) perspective of the same data, in more complete detail — the interrelationships of every weather data concept are spelled out.
3. Finally, the **Weather Exchange Schema (WXXS)** is a machine-generated, XML-formatted implementation of the Exchange Model — a "physical" code version of it.

Releases

Weather Information Exchange Model (WXXM)

Version	Date	Description	Downloads

2.0.0	Mar 17, 2015	WXXM 2.0 release. This release replaces the earlier WXXM 2 release candidates.
		
		Release notes relative to WXXM 1.1:
		
		• Fixed a number of schema issues from WXXM 1.1
		• Changed namespace from "http://www.eurocontrol.int/wx/1.1" and "http://www.eurocontrol.int/avwx/1.1" into "http://www.wxxm.aero/wxxm/2.0"
		• Removed ICAO Annex 3/WMO No. 49-2 products authoritatively represented in IWXXM 1.0 (METAR, SPECI, TAF, SIGMET)
		• Removed regional content, such as PIREP representations
		• Incorporated design elements similar to the IWXXM/METCE technical approach:
		  ○ Changed from Observations and Measurements version 1 to version 2
		  ○ Replaced WXXM 1.1 Units and Measures in favor of GML-standard units and measures
		  ○ Created an AIXM Profile for weather information that includes select portions of AirportHeliport, Airspace, AirspaceVolume, Runway, RunwayDirection, and Unit
		  ○ Improved weakly-typed representations (coverages) to allow for composite CodeList and measured quantities to allow references back to a semantic definitions, such as those found in the WMO Codes Registry. These coverage representations also allow additional temporal and spatial components in the domain consistent with ISO 19123 coverages. These domain specializations extend GML coverage types to allow for drop-in replacement
			Available from http://wxxm.aero

2.0.0-RC2	Nov 25, 2014	WXXM 2.0 Release Candidate 2. This is the second release of the WXXM 2.0 model, and includes additional product representations: AIRMET, SigWx, Volcanic Ash Advisory, and AMDAR	Schema ZIP UML Model ZIP UML/XSD Docs (online)
2.0.0-RC1	Oct 15, 2014	WXXM 2.0 Release Candidate 1. This is the first release of the WXXM 2.0 model, subsequent WXXM 2.0 versions will include ICAO AIRMET, SigWx, and Volcanic Ash Advisories	Schema

1.1.1	Mar 19, 2010	Resolved schema issues from 1.1. Neither the models nor the Primer were updated with this release	Models, Schema
1.1	Jan 12, 2010	Weather Information Exchange Model	Models, Schema, Primer

Product	Model
METAR/SPECI	ICAO: IWXXM 2.1
	ICAO/US: IWXXM-US 2.0
TAF	ICAO: IWXXM 2.1
	ICAO/US: IWXXM-US 2.0
SIGMET	ICAO: IWXXM 2.1
	ICAO/US: IWXXM-US 2.0
AMDAR	USWx 1.0
AIRMET	ICAO: IWXXM 2.1
PIREP	USWx 1.0
AIREP	USWx 1.0
Weakly-typed information, or data without an existing representation (such as loose collections of point data without a consistent set of values)	WXXM 2 Coverages
Volcanic Ash Advisory	IWXXM 2.1
Tropical Cyclone Advisory	IWXXM 2.1