

User's Guide to US Extensions in IWXXM

Slides prepared by Mark Oberfield (US National Weather Service)

Presented by B.L. Choy (Hong Kong Observatory, Hong Kong, China)



US Extensions in IWXXM

- Why should I know about this?

- A NTSB Aircraft Accident [Report](#) made a following safety recommendation to FAA:

Require that the remarks section of meteorological aerodrome reports be provided to all dispatchers and pilots in flight dispatcher papers and through the aircraft communication addressing and reporting system. (A-14-77)

- Shortly thereafter the NWS, directed by the FAA, issued a [Notice](#) that supplemental data (encoded after RMK keyword in the TAC form) would no longer be removed from METAR and SPECI reports before transmission over international circuits.
- To remain consistent with the TAC forms, US IWXXM METAR and SPECI reports will contain supplemental information and be transmitted over international circuits as well.

US Extensions in IWXXM

- Purpose
 - To encode FAA filed differences to WMO 49/ICAO Annex 3 recommendations and standards
 - To encode supplemental data
- Example of US SPECI observation in TAC form

SPECI KDCA 221348Z 21004KT 1/8SM R01/1600V2200FT FG VV002 18/18 A3026 RMK A02

- WMO 49/ICAO Annex 3 content
 - Filed Difference
 - Supplemental Data
- Filed differences w.r.t. prevailing visibility and pressure UOMs in non-SI units for TAC form can be represented in SI units without loss of accuracy, so no special handling in IWXXM is needed for these elements.

IWXXM METAR/SPECI Schema

- The following XML Complex Data Types in the METAR/SPECI schema have <extension> element(s)
- The <extension> element(s) serves as a ‘hook’ to allow States to add non-Annex 3 content

AerodromeCloudForecastType	AerodromeCloudType	AerodromeHorizontalVisibilityType
AerodromeSeaConditionType	AerodromeSurfaceWindTrendForecastType	AerodromeSurfaceWindType
AerodromeWindShearType	CloudLayerType	METARType
MeteorologicalAerodromeObservationType	MeteorologicalAerodromeTrendForecastType	SPECIType

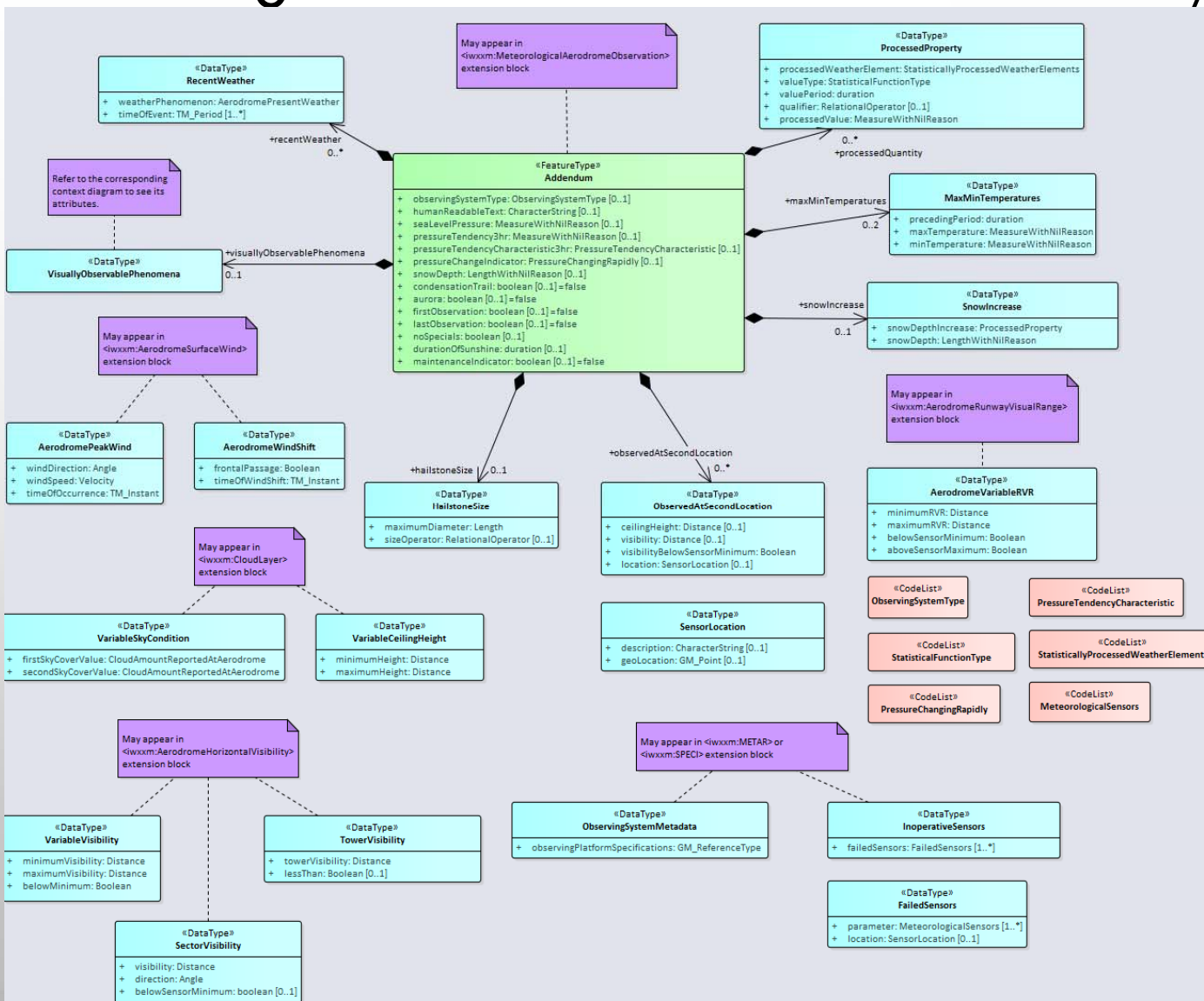
For a complete list of all IWXXM XML Complex Data Types that have <extension> elements, see the wiki page [“Encoding supplementary information in IWXXM”](#)

US Extensions in IWXXM

- XML Implementation
 - XML complex data types created to encode the filed differences and supplemental data
 - These XML types are bundled up into a XML schema file
 - Canonical location of US schemas for IWXXM extensions (<https://nws.weather.gov/schemas/iwxxm-us>)
 - Version 3.0 of US IWXXM extensions in operational use
 - Publically accessible as required for XML schema validation
 - XML not particularly easy to read by humans
- Logical Data Model representation of the XML complex data types
 - Completely optional but easier to read and understand the XML complex data types from LDM perspective
 - US IWXXM extension logical data model online (<https://nws.weather.gov/schemas/iwxxm-us/3.0/uml>)
 - BTW, WMO IWXXM logical data model online too (<https://schemas.wmo.int/iwxxm/3.0/html>)

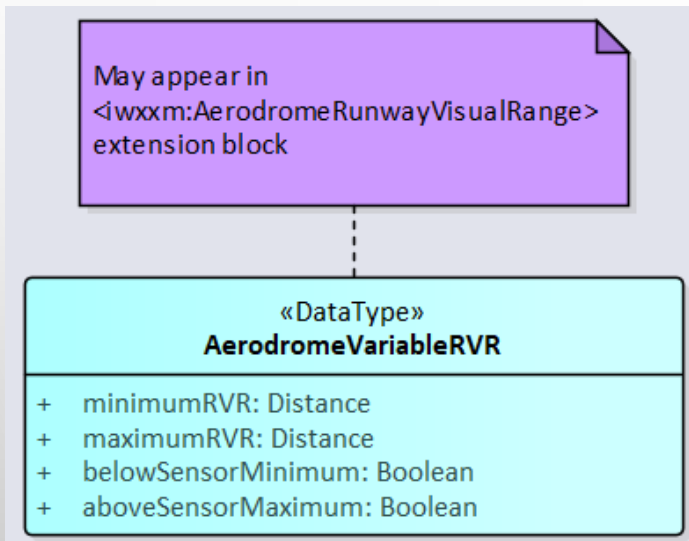


IWXXM-US Logical Data Model for US METAR/SPECI



IWXXM-US Logical Data Model for US METAR/SPECI

- Mouse click on any cyan or green box brings up documentation on the complex data type and its components.



US Extensions to IWXXM model

- US Extensions to IWXXM model
 - «Leaf» SIGMET
 - «Leaf» TerminalAerodromeForecast
 - «Leaf» METAR
 - Context Diagram: US METAR/SPECI C
 - Context Diagram: VisuallyObservableP
 - «FeatureType» Addendum
 - «DataType» AerodromePeakWind
 - «DataType» AerodromeVariableRVR
 - «DataType» AerodromeWindShift
 - «DataType» CharacterOfTheSky
 - «DataType» ConvectiveCloudLocation
 - «DataType» FailedSensors
 - «DataType» HailstoneSize
 - «DataType» InoperativeSensors
 - «DataType» MaxMinTemperatures
 - «DataType» Observations
 - «DataType» ObservedLightning
 - «DataType» ObservedAtSecondLocati
 - «DataType» ObservingSystemMetadat
 - «DataType» RecentWeather
 - «DataType» Sector
 - «DataType» SectorVisibility
 - «DataType» SensorLocation
 - «DataType» SnowIncrease
 - «DataType» ProcessedProperty
 - «DataType» TowerVisibility
 - «DataType» VariableCeilingHeight
 - «DataType» VariableSkyCondition
 - «DataType» VariableVisibility
 - «DataType» VisuallyObservablePheno
 - «CodeList» CloudTypes
 - «CodeList» ConvectiveCloudTypes
 - «CodeList» LightningFrequency
 - «CodeList» LightningType
 - «CodeList» MeteorologicalSensors
 - «CodeList» ObservingSystemType
 - «CodeList» PressureChangingRapidly
 - «CodeList» PressureTendencyCharact
 - «CodeList» QualitativeDistance
 - «CodeList» StatisticalFunctionType
 - «CodeList» StatisticallyProcessedWea
 - «Leaf» AIRMET
 - «Leaf» Common

AerodromeVariableRVR : Public «DataType» Class

Created: 5/16/2019 9:44:52 AM
Modified: 5/16/2019 9:56:33 AM

Project:
Advanced:

RVR that is varying shall be encoded.

Attributes Tagged Values

Attribute

Public Distance
minimumRVR

Details:

sequenceNumber=1

Notes: Lowest reported RVR distance.

Public Distance
maximumRVR

Details:

sequenceNumber=2

Notes: Highest reported RVR distance.

Public Boolean
belowSensorMinimum

Details:

xsdAsAttribute=true

Notes: Visibility is less than sensor's minimum limits.

Public Boolean
aboveSensorMaximum

Details:

xsdAsAttribute=true

Notes: Visibility is greater than sensor's maximum limits.

Purple boxes are Notes indicating where this (these) complex data type(s) may appear in the IWXXM document.



Encoding US filed differences in IWXXM

- Continuing with RVR reporting example

- WMO-49/Annex 3 state that the 10-minute mean RVR value shall be reported when prevailing visibility <1500 m
- If specific criteria are met, the US observing system may report varying RVR instead of a mean value

TAC FORM

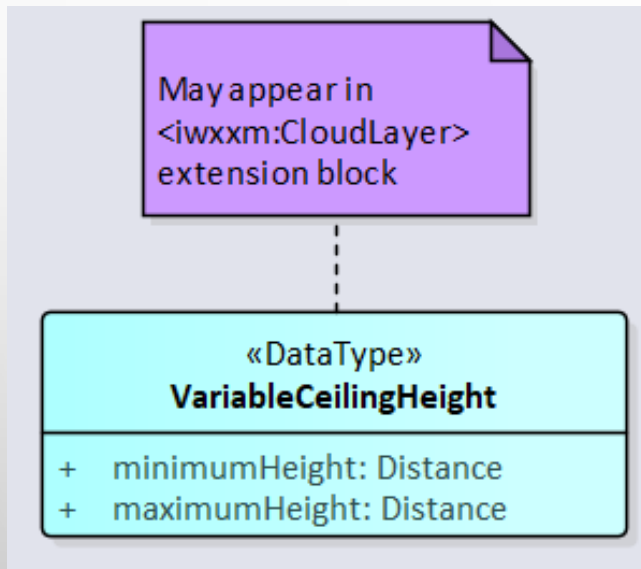
IWXXM

R01/1600V2200FT

```
<iwxxm:rvr>
  <iwxxm:AerodromeRunwayVisualRange>
    <iwxxm:runway>
      <aixm:RunwayDirection gml:id="uuid.a6c04767-32eb-45ad-a1d3-a24d15415ec3">
        <aixm:timeSlice>
          <aixm:RunwayDirectionTimeSlice gml:id="uuid.2da030b2-6b7f-4cdd-a457-1a69d70f78e0">
            <gml:validTime/>
            <aixm:interpretation>SNAPSHOT</aixm:interpretation>
            <aixm:designator>01</aixm:designator>
          </aixm:RunwayDirectionTimeSlice>
        </aixm:timeSlice>
      </aixm:RunwayDirection>
    </iwxxm:runway>
    <iwxxm:meanRVR uom="N/A" nilReason="http://codes.wmo.int/common/nil/withheld" xsi:nil="true"/>
    <iwxxm:extension>
      <iwxxm-us:AerodromeVariableRVR>
        <iwxxm-us:minimumRVR uom="m">490</iwxxm-us:minimumRVR>
        <iwxxm-us:maximumRVR uom="m">670</iwxxm-us:maximumRVR>
      </iwxxm-us:AerodromeVariableRVR>
    </iwxxm:extension>
  </iwxxm:AerodromeRunwayVisualRange>
</iwxxm:rvr>
```

IWXXM-US Supplemental Data Example

- Supplemental data contained in the METAR/SPECI reports are encoded in the same manner
 - Such as variable ceiling heights



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 - «DataType» SectorVisibility
 - «DataType» SensorLocation
 - «DataType» SnowIncrease
 - «DataType» ProcessedProperty
 - «DataType» TowerVisibility
 - «DataType» VariableCeilingHeight
 - «DataType» VariableSkyCondition
 - «DataType» VariableVisibility
 - «DataType» VisuallyObservablePheno
 - «CodeList» CloudTypes
 - «CodeList» ConvectiveCloudTypes

VariableCeilingHeight : Public «DataType» Class

Created: 7/6/2018 4:53:16 PM
Modified: 5/18/2019 5:17:49 PM

- + Project:
- + Advanced:

Variable ceiling height shall be reported if height varies significantly during the sampling period of the report. Considered significant if ceiling height < 1000 [ft_i] and varies more than 200 ft; height between 1000 and 2000 [ft_i] and varies more than 400 ft; height between 2000 and 3000 [ft_i] and varies more than 500 ft.

Attributes Tagged Values

Attribute

Public Distance
minimumHeight

+ Details:

sequenceNumber=1

Notes: Minimum ceiling height observed during sampling period

Public Distance
maximumHeight

+ Details:

sequenceNumber=2

Notes: Maximum ceiling height observed during sampling period

Purple boxes are Notes indicating where this (these) complex data type(s) may appear in the IWXXM document.

Encoding US supplemental content in IWXXM

- Continuing with Variable Cloud Ceiling Height

TAC FORM

METAR KICR 132053Z 01021G27KT 2SM BR **OVC004** 01/M01 A2923 RMK A02 PK WND 01030/2031 **CI G 003V008** \$=

IWXXM

```
<iwxxm:cloud>
  <iwxxm:AerodromeCloud>
    <iwxxm:layer>
      <iwxxm:CloudLayer>
        <iwxxm:amount xlink:href="http://codes.wmo.int/49-2/CloudAmountReportedAtAerodrome/OVC"/>
        <iwxxm:base uom="[ft_i]">400</iwxxm:base>
        <iwxxm:extension>
          <iwxxm-us:VariableCeilingHeight>
            <iwxxm-us:minimumHeight uom="[ft_i]">300</iwxxm-us:minimumHeight>
            <iwxxm-us:maximumHeight uom="[ft_i]">800</iwxxm-us:maximumHeight>
          </iwxxm-us:VariableCeilingHeight>
        </iwxxm:extension>
      </iwxxm:CloudLayer>
    </iwxxm:layer>
  </iwxxm:AerodromeCloud>
</iwxxm:cloud>
```

Encoding US supplemental content in IWXXM

- Many [more examples](#) of encoding extra content into IWXXM METAR/SPECI documents
- US TAFs and SIGMET make use of IWXXM extensions as well
 - But much fewer filed differences and supplemental content for these products
- US TCAs, VAAs and SWAs have no filed differences or additional content
- For information on versioning of IWXXM-US please see the [README](#) file

Thank you for your attention.

Additional questions on US Extensions in IWXXM, please contact [Michael Graf](#)

