International Civil Aviation Organization

The Fourth Meeting of System Wide Information Management Task Force (SWIM TF/4)

Web-conference, 3 – 6 November 2020

Agenda Item 7: State, Regional and Global SWIM Updates

NEW IWXXM DESIGN TO BETTER SUPPORT SWIM

(Presented by Hong Kong, China)

SUMMARY

This paper summarizes the latest update on the development of new IWXXM design being considered by WMO Task Team on Aviation Data (TT-AvData) for implementation in the future versions of IWXXM to better support SWIM.

1. INTRODUCTION

1.1 The introduction of the SWIM environment for the aviation community has vastly changed the way meteorological information can be made available to users. In addition to pre-defined packaged meteorological information to downstream users, there is the flexibility to extract and consolidate information as required into outputs which can be directly used by downstream users. The existing IWXXM reports derived from their TAC counterparts, however, are not able to fully utilise these capabilities of the SWIM environment.

1.2 The Hong Kong Observatory is one of the members of the Task Team on Aviation Data (TT-AvData) of World Meteorological Organization (WMO) and has been actively participated in the development of IWXXM. This paper provides an update on the development of a new IWXXM design being studied by WMO TT-AvData. It intends to overcome limitations imposed by deriving IWXXM reports from Traditional Alphanumeric Code (TAC) templates in ICAO Annex 3 - Meteorological Service for International Air Navigation, allows high-fidelity data and new data forms (e.g. time series), and provides better support to information retrieval in a SWIM environment.

2. DISCUSSION

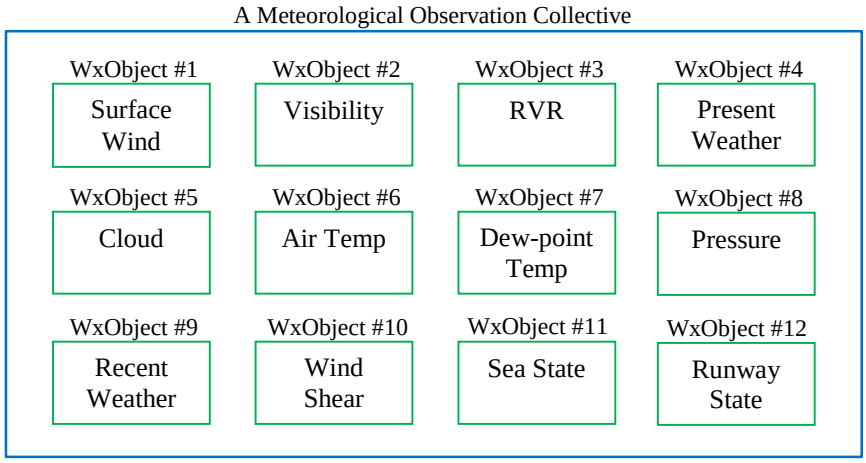
2.1 A new IWXXM information model has been proposed to develop in TT-AvData to represent instances of meteorological phenomena using Weather Objects (WxObjects). A WxObject describes a single meteorological phenomenon (e.g. wind, visibility, tropical cyclone, volcanic ash cloud etc.) at specified space and time:

(i) characterising the WxObject: Identifier, issue time, originating centre.
(ii) characterising the meteorological phenomenon: Phenomenon category, phenomenon time, phenomenon base time (forecast only), phenomenon, phenomenon geometry, phenomenon property.

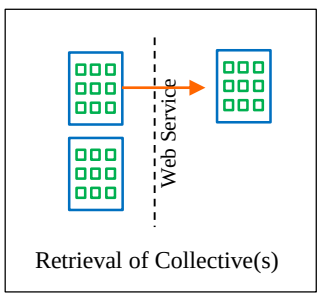
2.2 An example of XML fragment of a WxObject describing an elevated horizontal area of turbulence from a World Area Forecast System (WAFS) Significant Weather (SIGWX) forecast is

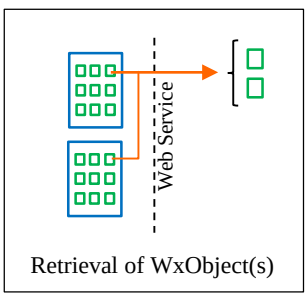
shown in Attachment A. WxObjects are not limited to "snapshots" of meteorological phenomena; they could also represent time varying features (e.g. time series, probabilistic data, etc) with the use of a suitable featureType.

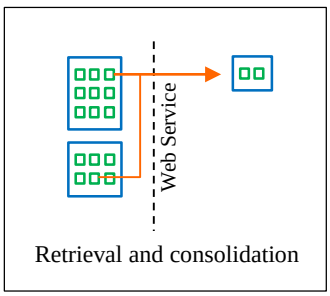
2.3 While an individual WxObject can exist on its own and be exchanged over the SWIM environment, selected WxObjects can be grouped together using IWXXM featureType "MeteorologicalFeatureCollection" to provide a comprehensive, self-consistent description of a meteorological situation. As an example for meteorological observation data, a "Meteorological Observation Collective" may contain a group of WxObjects of wind, visibility, etc. as a report of the meteorological conditions at an aerodrome by an aerodrome weather station, as indicated in the schematic diagram below.



2.4 The group of Meteorological Observation data could then be disseminated to downstream users using either publish-subscribe or request-reply messaging mechanism. The following are pictorial illustrations of some possible operations of making a query through request-reply in SWIM environment. With the introduction of "WxObjects" in IWXXM, retrieval and consolidation of individual WxObject of single meteorological element would become possible through the relevant SWIM services.







2.5 This new IWXXM design would be applied in the development of IWXXM for WAFS SIGWX forecast introduced in Amendment 79 to ICAO Annex 3. Further work is being explored by WMO TT-AvData to fine tune this information exchange model to cover other representations, such as information supporting end-user use cases. This initiative is also in line with the findings mentioned in Para. 2.2(iii) of the SWIM in ASEAN Demonstration Report (SWIM TF/4 – WP/06), and is particular important to better support future operations in the SWIM environment.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) discuss any relevant matter as appropriate.

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ATTACHMENT A

An example of XML fragment of a WxObject

```
<iwxxm:MeteorologicalFeature gml:id="uuid.E08DA8C8-A041-11EA-6485-09173F13E4C5">
   <gml:identifier codeSpace="http://wafs/sigwxobj">E08DA8C9-A041-11EA-6485-
09173F13E4C5</gml:identifier>
   <iwxxm:phenomenon xlink:href="http://codes.wmo.int/bufr4/codeflag/0-28-011/TURBULENCE"/>
   <iwxxm:phenomenonGeometry>
      <iwxxm:ElevatedVolume gml:id="uuid.E08DA8CA-A041-11EA-6485-09173F13E4C5"
                            srsDimension="2"
                            axisLabels="Lat Long"
                            srsName="http://www.opengis.net/def/ers/EPSG/0/4326">
         <gml:patches>
            <gml:PolygonPatch>
               <gml:exterior>
                  <gml:Ring>
                     <gml:curveMember>
                        <gml:Curve gml:id="uuid.E08DA8CB-A041-11EA-6485-09173F13E4C5"
                         srsDimension="2"
                         axisLabels="Lat Long"
                         srsName="http://www.opengis.net/def/ers/EPSG/0/4326">
                           <gml:segments>
                              <gml:CubicSpline>
                                 <gml:posList> -54.924243 107.500000 -52.847240 109.687197 -
49.767372 106.649977
                                                -46.708772 103.710378 -43.959094 100.574647 -
42.321515 97.918100
                                                -45.675438 99.458566 -48.492851 102.644812 -
51.932442 104.461422
                                                -54.924243 107.500000 </gml:posList>
                                 <gml:vectorAtStart> 0.14136 0.98996 </gml:vectorAtStart>
                                 <gml:vectorAtEnd> 0.14136 0.98996 </gml:vectorAtEnd>
                              </gml:CubicSpline>
                           </gml:segments>
                        </gml:Curve>
                     </gml:curveMember>
                  </gml:Ring>
               </gml:exterior>
            </gml:PolygonPatch>
         </gml:patches>
         <iwxxm:upperElevation uom="M">11278</iwxxm:upperElevation>
         <iwxxm:upperVerticalReference>MSL</iwxxm:upperVerticalReference>
         <iwxxm:lowerElevation uom="M">0</iwxxm:lowerElevation>
         <iwxxm:lowerVerticalReference>MSL</iwxxm:lowerVerticalReference>
      </iwxxm:ElevatedVolume>
   </iwxxm:phenomenonGeometry>
   <iwxxm:phenomenonProperty>
      <iwxxm:DegreeOfTurbulence xlink:href="http://codes.wmo.int/bufr4/codeflag/0-11-030/7"/>
   </iwxxm:phenomenonProperty>
</iwxxm:MeteorologicalFeature>
```