



*International Civil Aviation Organization*

**WORKING PAPER**

**TWENTIETH MEETING OF THE METEOROLOGY SUB-GROUP  
(MET SG/20) OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING  
AND IMPLEMENTATION REGIONAL GROUP (APANPIRG)**

*Bangkok, Thailand, 6 – 9 June 2016*

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**Agenda Item 6.2:      Research, development and implementation issues in the MET field  
Data exchange (including MET/IE WG Report)**

**GUIDELINES FOR THE IMPLEMENTATION OF OPMET DATA EXCHANGE  
USING IWXXM**

(Prepared by Tim Hailes, Presented by Sue O'Rourke)

**SUMMARY**

This paper presents a draft of the document “Guidelines for the Implementation of OPMET data exchange using IWXXM” which is being developed by METP WG-MIE and is presented to MET SG for information and comment.

**1. INTRODUCTION**

1.1            The first meeting of the ICAO Meteorological Panel (METP) Working Group on Meteorological Information Exchange (WG-MIE) was held in Montreal during 14-19 November 2015.

1.2            Amongst various other matters, this METP WG-MIE reviewed a draft “Concept of Operations related to IWXXM” (CONOPS) that had been developed by the European Data Management Group (EUR DMG). In reviewing this document, WG-MIE determined that the document structure did not match those of other ICAO CONOPS documents and its purpose was different to other CONOPS.

1.3            Subsequently the draft CONOPS document was renamed “Guidelines for the Implementation of OPMET data exchange using IWXXM” (Guidelines Document) and a small team was formed to update and adapt the document for global applicability (refer to Attachment).

## **2. DISCUSSION**

### **Document Scope**

2.1 The main intention of this first version of the Guidelines Document is to describe the activities relating to the transition of intra- and inter-regional OPMET data exchange in the 2016 to 2018 timeframe. During this period, it is anticipated that the amendments to Annex 3 requiring this transition towards XML data exchange (from November 2016) will become applicable for the international exchange of OPMET data and that the first regular global exchange of IWXXM data will commence.

2.2 The intention of this Guidelines Document is to provide guidance for a swift transition to IWXXM implementation.

### **Document Structure**

2.3 The Guidelines Document describes the general principles for transitioning the international exchange of OPMET data and defines terminology for the new architecture. This document will assist in establishing common understanding of the system architecture and roles. The document describes the functions of each of entity involved in IWXXM exchange and how regional and inter-regional coordination should occur. It also focuses on the international distribution of IWXXM data but the architecture and elements of the described functions could also be used to build the national Message Switch System infrastructure.

### **Document Governance**

2.4 METP WG-MIE agreed that there should be a primary global guidance document available and this would be best maintained by the METP. Any regional specifics, such as which centres would be a ROC, IROG, RODB, etc could be placed in an appendix to the document or in a separate regional document which refers to the global Guidelines Document. METP WG-MIE also agreed that the document requires a level of formality (i.e. ICAO publishing) to ensure that States have confidence in using it as guidance.

2.5 Over the last couple of months, a small team within METP WG-MIE has updated the Guidelines Document to make it more relevant to all regions, rather than focus on the European region. This document will be formally reviewed and likely adopted by the MET/P WG-MIE when it meets 23-27 May 2016. The document will also be discussed at the workshop on implementing the ICAO meteorological information exchange model (IWXXM) for the exchange of OPMET data (ICAO IWXXM Workshop) being held in Paris 31 May to 2 June 2016 and some minor updates may be required after this meeting.

2.6 Following any subsequent refinements, the Guidance Document will be submitted to METP for formal approval and publishing on the ICAO web-site.

**Feedback Sought**

2.7 Tim Hailes & Sue O'Rourke offer to be a conduit between MET SG and METP WG-MIE and we seek your comment on the suitability of the document and areas where further expansion or refinement is required. In particular, we request you consider:

- a) terminology used in the document;
- b) who will generate IWXXM within our region (each State or host State (e.g. an RODB) in some cases);
- c) where APAC specific information will be formally recorded (i.e. in an Appendix to the Guidelines Document or as a separate APAC document);
- d) advising of any other documentation that the region requires; and
- e) any other matters.

2.8 The architecture defined in the Guidelines Document requires Extended AMHS to each State. It is proposed that OPMET exchange in IWXXM format should become an Annex 3 Standard with Amendment 78, which is likely to become effective in November 2018. This would therefore require Extended AMHS to be available between all States prior to November 2018. Given there is only a small number of States with operational Extended AMHS connections, there is a significant gap to be overcome in a limited period of time.

2.9 To assess the feasibility of achieving IWXXM distribution by November 2018, it is recommended that the region may wish to assess the current status and planned implementation of Extended AMHS. If the Extended AMHS won't be available, one of the following 3 options may need to be considered:

1. States will be required to file a difference against the ICAO standard
2. The IWXXM architecture may need to be modified to remove the dependency on Extended AMHS; and/or
3. The exchange of OPMET information in IWXXM format may need to be delayed beyond 2018.

2.10 It is understood that other areas of the communication, navigation and surveillance community are also dependent on AMHS and in some cases Extended AMHS. It is understood that other working groups within APAC are monitoring the progress of AMHS installations and these groups could provide this information to the MET/SG. The APAC MET Secretariat liaise with APAC CNS Secretariat to identify the current and planned availability of Extended AMHS throughout the APAC region by November 2018.

**3. CONCLUSION**

3.1 The meeting is invited to consider the following Draft Conclusion

**Draft Conclusion 20/x – Availability of Extended AMHS**

That, the APAC MET Secretariat liaise with APAC CNS Secretariat to identify the current and planned availability of Extended AMHS throughout the APAC region by November 2018.

**4. ACTION BY THE MEETING**

4.1 The meeting is invited to:

- a) note the information contained in this paper (in particular items listed in paragraph 2.7);
- b) review the “Guidelines for the Implementation of OPMET data exchange using IWXXM” (Guidelines Document) contained in the Attachment;
- c) provide feedback on the Guidelines Document and items listed in paragraph 2.7 to Tim Hailes ([t.hailes@bom.gov.au](mailto:t.hailes@bom.gov.au)) and Sue O’Rourke ([s.orourke@bom.gov.au](mailto:s.orourke@bom.gov.au));
- d) consider the Draft Decision in para 3.1; and
- e) discuss any relevant matters as appropriate.

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**ATTACHMENT**

(Guidelines for the Implementation of OPMET Data Exchange using IWXXM v1.2  
attached as a separate paper)

# Guidelines for the Implementation of OPMET Data Exchange using IWXXM

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**1 February 2016**  
**Version 1.0**

Revision	Date	Description
0.1	21 September 2015	Initial draft. Based on EUR ConOps
0.2	29 October 2015	Presented to MET/P WG-MIE F2F-1
1.0	1 February 2016	Presented to MET/P WG-MIE WebEx 2016-3
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## 1 Introduction

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### 1.1 Purpose

---

The main intention of this document is to describe the activities relating to the transition of intra- and interregional operational meteorological (OPMET) data exchange in the 2016 to 2018 timeframe. During this period, it is anticipated that the amendments to ICAO Annex 3, *Meteorological Service for International Air Navigation*, requiring this transition towards digital data exchange will effectively become applicable for the international exchange of OPMET data.

### 1.2 Background

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The bilateral exchange of IWXXM (ICAO Meteorological Information Exchange Model) based information is introduced in Amendment 76 to ICAO Annex 3 from November 2013, enabling States to exchange their OPMET data not only in TAC (Traditional Alphanumeric Code form) but also in extensible markup language (XML) and geography markup language (GML). This represents the start of a significant change from the provision and exchange of textual OPMET data towards a digital environment supporting SWIM (System Wide Information Management). Since their inception, OPMET data have been promulgated to end systems and they were initially designed to be human readable, with a requirement to be highly compact due to bandwidth limitations.

The current use of OPMET in a TAC format presents an obstacle to the digital use of the data as it is not geo-referenced. This makes the handling of global data difficult to use correctly and expensive to maintain. These significant difficulties have been highlighted during past code changes. The current coding practices also present an obstacle to efficient automation as State coding exceptions are commonly used.

IWXXM represents the first step to move to an environment where the systems handling this data can make more use of standard applications and techniques. The development of new systems which provide and support digital OPMET will require initial investment but the use of enabling data exchange standards for other domains such as AIXM (Aeronautical Information Exchange Model) and FIXM (Flight Information eXchange Model) along with IWXXM will lead to a cost reduction due to the implementation of widely used data modelling techniques including OGC (Open Geospatial Consortium) segments.

Consequently, users will be presented with opportunities to create new products at a lower cost by fusing this data.

It is essential that the transition towards the use of IWXXM is adequately planned and equipped to make reliable data sets available to users for exploitation as soon as possible at both a Regional and a Global scale. This guidance document provides elements and steps for consideration in achieving that aim by defining common definitions and concepts, as well as structured phases to be implemented in relation to the International exchange of OPMET data.

### 1.3 Intended Audience

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This document is intended to be used by centres considering being involved in the exchange of IWXXM data, both within a region and internationally.

## 2 Current Operations and Capabilities

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### 2.1 Current Capabilities

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The current capabilities are dedicated to Traditional Alphanumeric Code (TAC) data exchange, via the Aeronautical Fixed Service (AFS), primarily the aeronautical fixed telecommunications network (AFTN), SADIS and WIFS.

### 2.2 Data Producer/Originating Unit

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The TAC Data Producer provides TAC data only.

### 2.3 Data Aggregator

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The function of the Data Aggregator is to take individual TAC reports and aggregates them into bulletins. Bulletins shall consist of one or more reports of the same type (e.g. METAR).

### 2.4 Data Switch

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A Data Switch will route the data according to the WMO abbreviated header structure, TTAAiiCCCC, of the bulletin. The bulletin header fulfils the regulations described in WMO doc No 386, *Manual on the Global Telecommunication System*.

### 2.5 National OPMET Centre (NOC)

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The role of the NOC is to collect and validate all - international required OPMET messages - AOP and non AOP - (refer to the (electronic) Regional Air Navigation Plans) generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

A NOC should perform the following functions:

- Data Aggregator; and
- Data Switch.

### 2.6 Regional OPMET Centre (ROC)

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A ROC is responsible for the collection from NOCs and validation of all AOP and non AOP required OPMET data in its area of responsibility (AoR) according to the regional distribution schema.

Each ROC is responsible for the collection of required OPMET data from the other ROCs in the region and the dissemination to the other ROCs of the required data from its AoR.

A ROC should perform the following functions:

- Data Aggregator; and
- Data Switch.

## 2.7 Interregional OPMET Gateway (IROG)

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An IROG is responsible for the collection of all required OPMET data from its interregional area(s) of responsibility (IAoR) and its dissemination to the ROCs in its region.

Furthermore, the IROGs are responsible for collection and dissemination of their region's required OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For TAC data exchange, an IROG should perform the following functions:

- Data Aggregator; and
- Data Switch.

## 2.8 International OPMET Databank

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An International OPMET Databank provides the capability for users to interrogate TAC data through the AFTN. In some regions the databank is known as a Regional OPMET Databank (RODB).

### Operational principles:

#### - OPMET Databank Requests

- Requests for TAC data can be sent via AFTN. These requests work as described in current Regional OPMET Data Bank (RODB) Interface Control Documents (ICD).
- The above example describes the syntax of TAC requests:
  - "RQM/" is used as the start of the query
  - only the new T<sub>1</sub>T<sub>2</sub> message types defined by the World Meteorological Organization (WMO) are allowedFor example: RQM/SALOWW/WSEBBR/WSLFFF=
  - the request is sent to the AFTN address of the International Databank

#### - OPMET Databank Replies

- Replies to TAC requests are described in the current RODB Interface Control Documents.
- Reply reports of a request will be aggregated into one or more messages, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file.
- The RODB Interface Control Documents should specify a set of standardized information & error replies, specifically when the required data are not defined (example: request for a SIGMET with a wrong location indicator)

## 3 Description of changes

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These indicated activities can also be considered in context of the ICAO SWIM-concept (Doc 10039, *Manual on System Wide Information Management (SWIM) Concept*).

- **Amendment 76** to Annex 3 enabled the bilateral exchange of XML data for, METAR, SPECI, TAF and SIGMET, for those States in a position to do so. The exchange may have been tested but with the lack of mature available XML schema, the testing has not been fully possible and, as based on bilateral exchange only, no regional plan has yet been established to follow it.
- The **planned Amendment 77** to Annex 3 recommends the international exchange of XML-formatted METAR/SPECI, TAF, AIRMET, SIGMET, VAA and TCA from November 2016.

- The **planned Amendment 78** to Annex 3 will require the international exchange of the aforementioned XML-formatted messages as a standard (planned 2018).

*Note:* The initial intention of this Concept of Operation is not to define Net Centric services but to provide guidance as a stepping stone for a swift transition to IWXXM implementation as a first step towards SWIM.

## 4 Proposed service concept

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### 4.1 Operating Principles

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This section outlines the general principles for transitioning the international exchange of OPMET data. These principles are based on continued use of the WMO abbreviated header structure and all participating States using the ICAO Extended AMHS. The intention is to support the different identified phases that will lead to a managed IWXXM-based international exchange of METAR/SPECI, TAF, TCA, VAA, AIRMET and SIGMET by the Amendment 78 to Annex 3 applicability date.

#### 4.1.1 Managing the transition

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A group responsible for managing the transition should be identified in each region, for the necessary intraregional and interregional coordination and should be guided by METP WG-MIE with the support of WMO. (**Recommendation 1**)

It is understood that different regions and States will progress at different rates. Therefore, it is necessary to create a plan that facilitates this different implementation pace.

*Note 1:* Groups such as Data Management Group for EUR, the Bulletin Management Group for MID and the Meteorological Information Exchange working group (MET/IE) for APAC could be the right groups to manage this transition (or equivalent groups in other regions).

*Note 2:* It is envisaged that the Meteorological Panels (METP) Working Group on Meteorological Information Exchange (WG-MIE) will coordinate at the global level.

#### 4.1.2 Variances to the IWXXM Model

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National extensions (such as remark sections) will only be supported when accompanied by necessary XML tags. The international exchange of these national extensions will only be supported for data fully compliant to the IWXXM model.

*Note:* The term “IWXXM model” should be understood as the XML schema including all necessary GML components (including metadata) necessary for the exchange of IWXXM data. The use of extensions within the IWXXM is discouraged and should only be utilised where absolutely necessary.

#### 4.1.3 Translation

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From Annex 3 Amendments 76 and 77, a State will be required to produce IWXXM data in addition to TAC data for international exchange. Generating both formats will help minimize, as

much as possible, the translation between formats. It will also avoid operational translation/conversion from IWXXM to TAC and onforwarding, as the bi-directional conversion will not necessary result in the same TAC.

Where a translation from TAC to IWXXM is necessary and conducted, the translation centre and date/time of when the translation occurred will be identified within the XML message. The translation centre metadata will be defined as part of a globally accepted GML/XML model.

#### 4.1.4 Data collection

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When creating a feature collection of the same type of IWXXM data (e.g. METAR) , further named as “bulletin”, the aggregating centre identifier and date/time group of when the collection was created will be indicated within the XML message. The aggregating centre metadata will be defined as part of a globally accepted GML/XML model.

Only regular reports (e.g. METAR and TAF) will be aggregated. Non-regular reports (e.g. SIGMET) will NOT be aggregated in the same file.

A single bulletin will only contain TAC or XML, never both.

A single File will contain only one bulletin.

#### 4.1.5 Transmission & Routing

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Given the size and character set of IWXXM messages, it will not be possible for these messages to be transmitted via AFTN. The file containing the bulletin will be compressed and FTBP (**File Transfer Body Part**) under Extended AMHS (**ATS Message Handling System**) will be used to exchange IWXXM data internationally through the AFS.

The principles of exchanging IWXXM data on AMHS are further described in section 4.1.4 but, in general, rules close to the ones governing the TAC transmission are applied.

The WMO abbreviated header structure (TTAAiiCCCC) will be part of the filename of the File Transfer Body Part and used as data identifier. The routing of IWXXM messages will associate this data identifier with AMHS address(es) that the message should be sent to.

As a file name extension, the appropriate suffix developed by WMO will be used to identify compressed data using globally agreed compression techniques.

*Note: The number of FTBPs and the maximum message size are subject to the AMHS specifications.*

#### 4.1.6 Compliance Testing

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IWXXM compliance testing platforms or software will need to be made available in order to allow States to test the compliance of their XML data to the IWXXM model before operational international exchange. This is to assure that the future internationally disseminated data are operationally usable. (**Recommendation 2**)

#### 4.1.7 International OPMET Databank

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In order to allow IWXXM data retrieval from International OPMET Databanks, a standard set of queries for IWXXM data will also need to be developed, agreed and documented. An Interface Control Document will be provided to describe the query structure, structure of the answer(s) and bulletin header(s) to be used by the International Databank, as well as all other information necessary for the automatic use of the query answers. The proposed query language for IWXXM data will follow similar rules as the TAC-requests (c.f. section 5.1.5).

#### 4.1.8 Aeronautical Information Metadata

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The relevant aeronautical information metadata are part of the XML model and should be transported by the IWXXM data. (**Recommendation 3**)

The metadata is additional information relevant to the type of the aeronautical information object i.e. an airport, a flight information region (FIR). A challenge resides in getting the correct state of this aeronautical information, especially for centres that will perform translation from TAC to XML that will require this. Therefore, obtaining this from an authorized source (details to be determined) is implied, in order to provide the right piece of information that characterizes the data (e.g. for a METAR, which airport location indicator and official name, its altitude, longitude, latitude etc ...).

*Note: A further step that could be foreseen is a possible indirect link to the AIXM model where the IWXXM data will just reference where to get this aeronautical information metadata from, therefore avoiding possible inconsistencies between the transported metadata inside the IWXXM data and the current status of this aeronautical information as part of the AIXM model.*

### 5 Functional requirements - Framework

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This section is intended to describe the generalized elements which can be used to establish a framework for the exchange of IWXXM data, both intraregionally and interregionally, with the neighbour Regions. One key aspect is that the framework needs to be flexible to permit development of an intra-regional structure suitable to the requirements, but at the same time allowing establishment of controlled and coordinated exchange between Regions.

The framework is organized into a basic set of functions/type of operations as described in section 5.1. A list of requirements that should be met to carry out each respective function as well as illustrations on how these functions may be performed/combined are provided in the same section.

In section 5.2, more complex regional entities which comprise some of the above functions are described.

#### 5.1 Functional definitions

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##### 5.1.1 Data Producer/Originating Unit

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###### TAC Producer

This producer provides TAC data only.

### IWXXM Producer

This producer will provide IWXXM. In some implementations, the IWXXM Producer may provide information in both TAC (until no longer required in Annex 3) and IWXXM forms.

The Data Producer-function may be performed by an aeronautical meteorological station (e.g. producing a METAR), a MWO producing AIRMET or SIGMETS or by an Aerodrome Meteorological Office (AMO) providing TAFs.

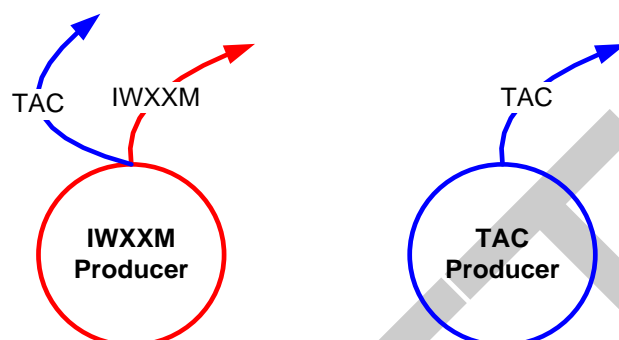


Figure 1: Comparison of IWXXM and TAC Producers

For an IWXXM Producer, the following functions could be the subject to compliance testing:

- The Producer output will conform to the IWXXM Schema;
- The Producer output will pass IWXXM Schematron/business rules; and
- The Producer will apply appropriate (defined) metadata following agreed ICAO rules and regulations.

### 5.1.2 Data Aggregator

This function takes individual IWXXM reports - decompresses them if already compressed – and aggregates them into bulletins and then compresses them. Bulletins shall consist of one or more reports of the same type (e.g. METAR).

When aggregating reports, the Aggregator shall collect and combine them as a bulletin – defined as a Feature collection - in conformance with the globally agreed GML/XML model. In particular, all required metadata information, as defined by the globally accepted GML model, should be indicated.



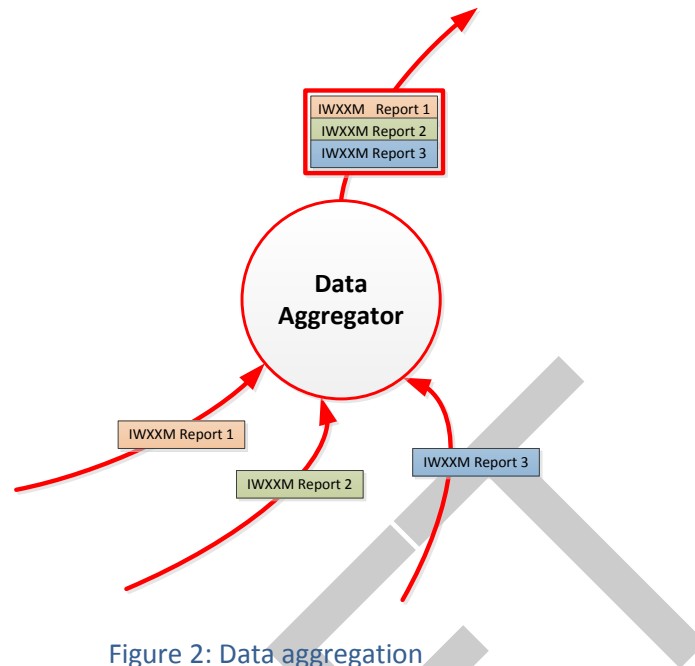


Figure 2: Data aggregation

For an IWXXM Aggregator, the following functions could be the subject of compliance testing.

- The Aggregator output will conform to the IWXXM Schema;
- The Aggregator output will pass IWXXM Schematron/business rules;
- The Aggregator will apply a correct filename to its output;
- The Aggregator correctly compresses data applying an appropriate suffix; and
- The Aggregator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

### 5.1.3 Data Translation Centre

A data translator converts TAC data into IWXXM on behalf of their State and/or another State (i.e. when the data producer is unable to do so). A bi-lateral or regional agreement should be defined for such circumstances. To do so, it shall be able to parse incoming TACs and apply the data to IWXXM schema. It is expected that this will be carried out on a bulletin basis so that the translator will always be associated with a Data Aggregator function.

The translator should provide an indication of where and when the translation has been carried out in order to provide traceability. This shall be achieved by introducing agreed metadata elements (centre identifier and time stamp) that shall be defined as part of a globally accepted GML/XML model.

It is highly likely that not all incoming TACs will be translatable because of non-conformance with TAC standards. There will be a need to have procedures in place to deal with any non-compliant data, which may involve further translation where predefined arrangements have been made.

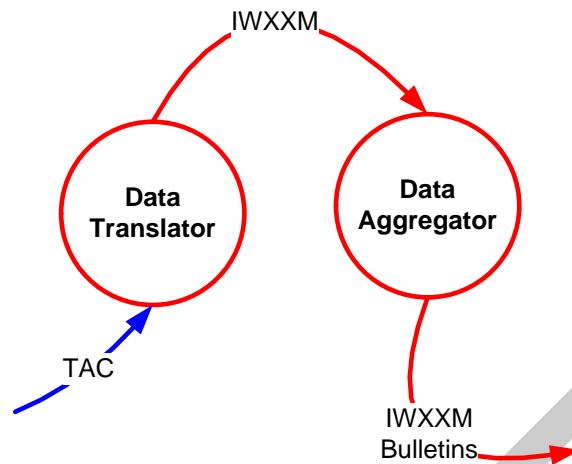


Figure 3: Data Translator generating IWXXM from TAC

For an IWXXM Translator, the following functions could be the subject of compliance testing.

- The Translator output will conform to the IWXXM Schema;
- The Translator output will pass IWXXM Schematron/business rules;
- The Translator will successfully translate a standard set of TAC test data;
- The Translator provides metadata related to when and where data have been translated - such metadata conforms to the agreed metadata structure; and
- The Translator will apply appropriate (defined) metadata following agreed ICAO rules e.g. for monitoring and validation issues.

*Note: A Translation centre should also perform Aggregator functions.*

#### 5.1.4 Data Switch

A Data Switch will route IWXXM data according to the TTAaiCCCC part of the filename of the File Transfer Body Part. The filename including the current WMO bulletin header will be structured as follows (WMO naming convention A):

**A\_TTAaiCCCCYGGgBBB\_C\_CCCC\_YYYYMMddhhmmss.xml.[compression\_suffix]**,

Where the elements in black and bold are fixed elements and:

**TTAAiCCCCYGGg** is the current WMO header with the date time group

**BBB** is *optional* (as usual),

**CCCC** is the repeated **CCCC** part from **TTAAiCCCC**,

**YYYYMMddhhmmss** is the date/time group

*Note: [compression\_suffix] will be subject to further acceptance, depending on which compression technique is agreed. Compression software such as zip should be avoided as it may allow transportation of more than one file and directories as well.*

The routing table will associate this **TTAAiCCCC** data identifier with the AMHS addresses where the data should be sent to. The compressed file will be named with the suffix appropriate to the compression and sent onto AMHS.

FTBP name examples with METAR from LFPW:

A\_LAFR31LFPW171500\_C\_LFPW\_20151117150010.xml.[**compression\_suffix**]

1<sup>st</sup> retarded bulletin:

A\_LAFR31LFPW171500RRA\_C\_LFPW\_20151117150105.xml.[**compression\_suffix**]

1<sup>st</sup> corrected bulletin:

A\_LAFR31LFPW171500CCA\_C\_LFPW\_20151117150425.xml.[**compression\_suffix**]

WMO defined T1T2 (from TTAAii) for the following data types:

- Aviation Routine Report (*METAR*): *LA*
- Aerodrome Forecast ("*short*" *TAF*) (VT < 12 hours): *LC*
- Special Aviation Weather Reports (*SPECI*): *LP*
- Aviation General Warning (*SIGMET*): *LS*
- Aerodrome Forecast ("*long*" *TAF*) (VT >= 12 hours): *LT*
- Aviation Volcanic Ash Warning (*VA SIGMET*): *LV*
- Aviation Tropical Cyclone Warning (*TC SIGMET*): *LY*

Note: The WMO T1T2 definition of the AIRMET, Tropical Cyclone Advisory and Volcanic Ash Advisory are yet to be defined.

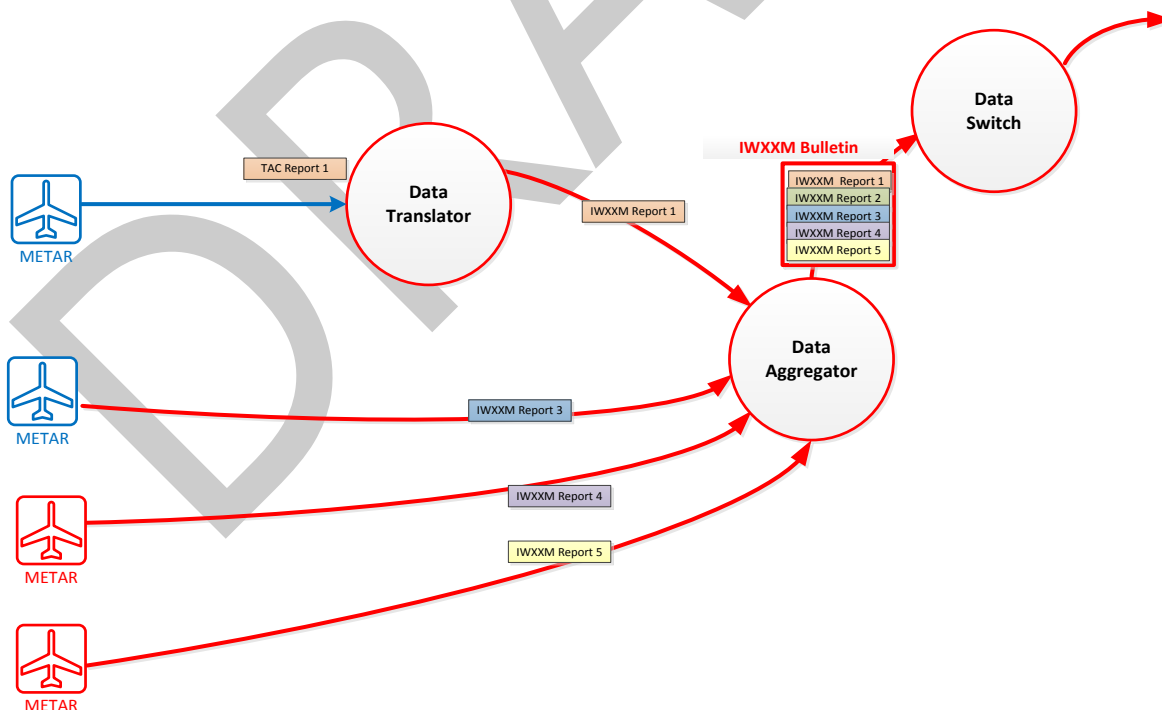


Figure 4: Example of showing the aggregation of TAC and IWXXM data

### 5.1.5 International OPMET Databank

An International OPMET Databank (called Regional OPMET databank (RODB) in some regional documentation) will provide the capability for users to interrogate IWXXM data through the AFS in much the same way as the RODBs currently and provide global TAC data.

There will be no TAC to IWXXM translation taking place by the Databank in case the requested OPMET is only available in TAC, as this translation should be done upstream by a Translation Centre, that is unless the databank has formal arrangements to convert TAC to IWXXM on behalf of a State.

Although the implementation of Net Centric Services is beyond the scope of this document, the Databank element could as well provide Net Centric services in addition to the AFS based IWXXM interrogation capabilities. As soon as agreed descriptions of the interface to request data via web-services are available, this additional feature may be added for the databank.

For an IWXXM OPMET Databank, the following functions could be the subject of compliance testing.

- The Databank output shall conform to the IWXXM Schema;
- The Databank output shall pass IWXXM Schematron/business rules;
- The Databank has an AMHS interface;
- Databank shall only send the response back to the originator;
- The Databank shall aggregate the reply reports according to the same rules used by the Data Aggregators;
- The Databank shall apply a correct filename to its output;
- The Databank base correctly compresses data applying an appropriate suffix; and
- The Databank shall respond correctly to the standard interrogations.

The picture below illustrates a possible implementation of an OPMET Databank with combined TAC and IWXXM functionalities.

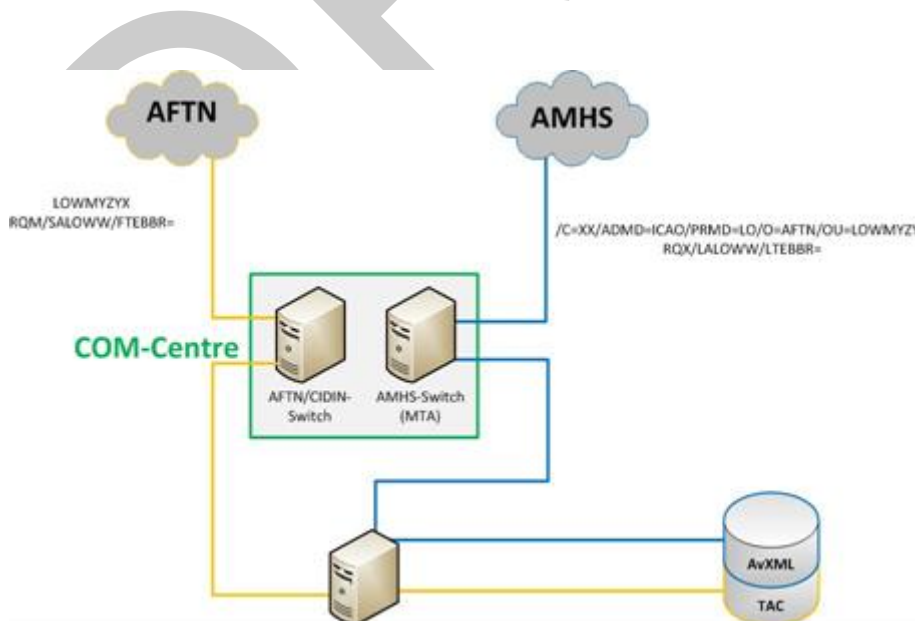


Figure 5: The implementation of a combined TAC & IWXXM Databank

### Technical principles:

- Interfaces:
  - o the Databank has an AMHS P3 connection to the AMHS Message Transfer Agent (MTA) of a COM centre; and
  - o in case the COM Centre still serves AFTN users, the Databank may have a separate AFTN connection to the COM Centres AFTN switch or alternatively, the COM Centre will take care of the AFTN-AMHS conversion.
  
- Databank tables: data in IWXXM and data in TAC are stored in separate sets of tables.

### Operational principles:

- DB Requests
  - o Requests for TAC data can be sent via AFTN or via AMHS (ia5 text). These requests will continue to work as described in the current RODB Interface Control Documents;
  - o Requests for IWXXM data shall be sent via AMHS;
  - o Requesting data in IWXXM will work in a similar way as requesting TAC data. The above example uses a syntax similar to the TAC requests, but:
    - "RQX/" is used as the start of the query
    - only the new IWXXM T<sub>1</sub>T<sub>2</sub> message types defined by WMO are allowedFor example: RQX/LALOWW/LTEBBR/LSLFFF=
  - o Requests for TAC data and requests for IWXXM data shall not be mixed; and
  - o Any violation of the above principles (e.g. the request "RQX/LSLOWW=" received via AFTN), will result in an automatic reply sent by the databank, informing the user that this is not allowed.
  
- DB Replies
  - o Replies to TAC requests will continue to work as described in the current RODB Interface Control Documents;
  - o Reply reports of an IWXXM request will be aggregated into one or more files, according to the same rules used by the Data Aggregators, e.g. no mixing of message types in one file;
  - o These files will be compressed and a correct file name with appropriate suffix supplied;
  - o These files will be sent as FTBP through AMHS and directory services should be used to ensure the recipient is capable to receive this; and
  - o The RODB Interface Control Documents will specify an extended set of standardized information & error replies.

## 5.2 Regional Centres Definitions

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### 5.2.1 National OPMET Centre (NOC)

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The role of the NOC is to collect and validate all AOP and non AOP required OPMET messages generated by all originating units within a State, to compile national data into bulletins and to distribute them internationally according to the regional distribution schema.

*Note: It is assumed that the data provided by NOCs is in accordance with the similar specifications as applicable for a Data Aggregator*

### 5.2.2 Regional OPMET Centre (ROC)

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A ROC is responsible for the collection from NOCs and validation of all AOP and non AOP required OPMET data in its Area of Responsibility (AoR) according to the regional distribution schema.

Each ROC is responsible for the collection of required OPMET data from the other ROCs in the region and the dissemination to the other ROCs of the required data from its AoR.

For IWXXM exchange, a ROC should perform the following functions:

- Data Aggregator;
- Data Translation centre; and
- Data Switch.

### 5.2.3 Interregional OPMET Gateway (IROG)

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An IROG is responsible for the collection of all AOP and non AOP required OPMET data from its Interregional Area(s) of Responsibility (IAoR) and its dissemination to the ROCs in its region. Furthermore, the IROGs are responsible for collection and dissemination of their Region's required OPMET data to their partner IROGs.

The IROG is responsible for the validation of the bulletins sent to the IROGs of its IAoR and received from their IAoR.

For IWXXM exchange, an IROG should perform the following functions:

- Data Aggregator
- Data Translation Centre
- Data Switch

### 5.2.4 International OPMET Databank

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The International OPMET Databank(s) (called Regional OPMET databank (RODB) in some regional documentation and further labelled RODB in this document) are supplied with required OPMET data by the ROCs. These databases can be queried via the AFS by using a specified query language. Details on the query language as well as the supported data types can be found in Regional Interface Control Documents for OPMET Database Access Procedures. Those documents will be updated to integrate the new functions.

A RODB shall be able to fulfil the requirements to handle IWXXM-code as described in paragraph 4.1.5.

DRAFT

## 6 Requirements to Transition

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The first necessary step is to define the prerequisites in order to be able to exchange IWXXM OPMET data. This will impact not only the network itself, but also the Message Switching Systems and most of the end-user systems.

### 6.1 Phase 1 - Pre-Requirements to Transition – until Nov 2016

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Phase 1 was enabled by Amendment 76 to Annex 3 in November 2013.

To achieve an efficient transition towards IWXXM, Phase 1 activities should be focused in the following areas and the particular elements identified per area.

#### *Governance*

##### *Managing the transition*

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Regional group(s) should be designated to deal with the transition in order to further define and monitor:

- Intra-regional plan on AMHS infrastructure/links planning and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
- Intra-regional implementation plan on IWXXM data exchange planning by the States to their ROC
- Agreement to define how the testing platform and software should be made available and accessible to each State.

It is desirable that responsible group(s) for managing the transition in each ICAO regions be identified and established, that could be responsible for defining the Regions structure and capabilities in the context of the framework.

Furthermore a full liaison should be established and maintained between the ICAO groups in charge of meteorology & data exchange and groups in charge of the AFS network.

For data translation purposes, if there is a systematic need for the translation of data on behalf of a State, this may be performed by the dedicated ROC for the part of the region under its Area of Responsibility and the IROGs for the interregional distribution.

##### *Documentation*

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The region will define and have a plan in place to provide IWXXM data. This plan shall be published and maintained by the designated responsible groups (FAQ's etc. should be available).

ICAO and WMO documentation and provisions should be published/available describing the IWXXM code itself as well as documentation referencing the appropriate schemas and rules made available in order to handle this new format.

##### *Facilities*

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An agreed process should be defined to ensure that data generated by Data Producers are compliant. In order to promote the use of IWXXM, the process should be widely known and shared and some tools to check the compliance state of the data easily accessible and usable.

An identical process should be agreed to initiate and enable the IWXXM exchange between regions.

An AMHS network will be available to support exchange IWXXM data by the use of FTBP between those States wishing to do so. Corresponding AMHS connections will be available between those Regions exchanging IWXXM data.

### Cyber Security

- appropriate AFS security elements should be defined by the ICAO groups in charge of information management / networks in order to introduce the operational exchange of IWXXM data via AMHS.

### Source of Metadata

- Updated processes, or notification on modifications about Aeronautical information metadata by the States, should be in place at the end of the period, or metadata sources should be defined and agreed.

### Action Plan to Reduce Rejections

- Actions plans based on monitoring results about TAC data not following the agreed coding rules could be undertaken in order to assist States in detecting and correcting incorrect coding policies.

- A task should be started to define a procedure that the ROC may use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports. This procedure would ideally provide a clear description on how to report errors to a State that provides these data and clearly define the service and its limitation.

### Interregional Cooperation/Coordination

The following tasks should be started:

- The updated processes and notification on modifications on IWXXM bulletins headers between adjacent regions.

- Identification of the interregional exchanges solely based on AOP and non AOP required data: actions plans to define clearly the interregional data/bulletins to be exchanged.

- Interregional plan to follow the AMHS infrastructure/links planning between AFS nodes supporting interregional data exchange of neighbouring IROGs.

- Implementation plan for interregional exchange between IROGs.

- An update process to introduce IWXXM in the contingency plans for the IROGs.

## 6.2 Phase 2 - From Nov 2016 until Amendment 78 applicability

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The following elements should be ready prior to ICAO Annex 3 Amendment 78 applicability (i.e. by Nov 2018 or Nov 2019):

### Operations

- The ROCs & IROGs should have the capability to act as translation centres, to aggregate and switch IWXXM data.
- Each NOC should be ready to exchange IWXXM data at the end of the period.
- The RODBs should have all the capabilities to deal with IWXXM data as well as TAC data.
- Update process or notification on modifications about metadata should be in place not later than the end of the period
- The standard set of queries for IWXXM data for a RODB should be implemented and documented.
- Updated processes and notification on modifications on IWXXM bulletins headers between adjacent Regions should be in place and tested.

*Note: if it happens that some delays occur in having the IWXXM model including metadata structure and agreement in FTBP use available, it is assumed that the operations in exchanging IWXXM data will be delayed and probably not be ready at the start of the period.*

### Institutional and Technical Issues

- A communication plan should be established and enacted to inform States and users - both from ICAO and WMO - about the IWXXM code, the metadata use, and the new procedures to access the RODBs.
- The IWXXM model should integrate the metadata related to Data Aggregator and Data Translator functions.
- A procedure used by the ROC should be in place on how to deal with errors in IWXXM-messages, in particular taking into account errors detected when converting TAC-reports. This procedure includes items on how to report errors to a State that provides these data.

### Action Plan to Reduce Rejections

- Action plans based on monitoring results about TAC data not following the agreed coding rules should be in place in order to assist States in detecting and correcting incorrect coding policies.
- A procedure that the ROC can use on how to deal with errors in IWXXM-messages, in particular taking into account errors detected in converting TAC-reports, should be agreed on and made available. This procedure would ideally provide information on how to report errors to a State that provides these data and clearly define this service and its limitation.

### Regional Coordination/Planning

- The regional group(s) designated to deal with the transition should define and monitor:
  - Intra-regional plans regarding AMHS infrastructure/links and IWXXM data exchange between the ROCs, and between the ROCs and RODBs.
  - Intra-regional plans regarding the IWXXM data exchange by the States to their ROC.
- The Contingency plans for the ROCs should integrate the IWXXM data and be ready before the end of the period.

- Testing platform and software are made available and accessible for every State.

### Interregional Cooperation/Coordination

- The interregional mechanism to follow the AMHS infrastructure/links planning between AFS nodes supporting interregional data exchange between IROGs should be in place, as should the interregional procedure to notify the changes and new IWXXM bulletins introduction.
- The Contingency plans for the IROGs should include the IWXXM data exchange and be ready at the end of the period
- It is proposed that bilateral agreements between neighbouring IROGs are set up for the translation of TAC data. This agreement should include notification processes on IWXXM data newly produced by the specific Region.

**Figure 1** below provides an example of the one ICAO Region interfacing with two other ICAO Regions.

In this example, it is assumed that:

- There is no operational exchange of IWXXM data between Region 1 and Region 3.
- There is operational exchange of IWXXM data between Region 2 and Region 1.

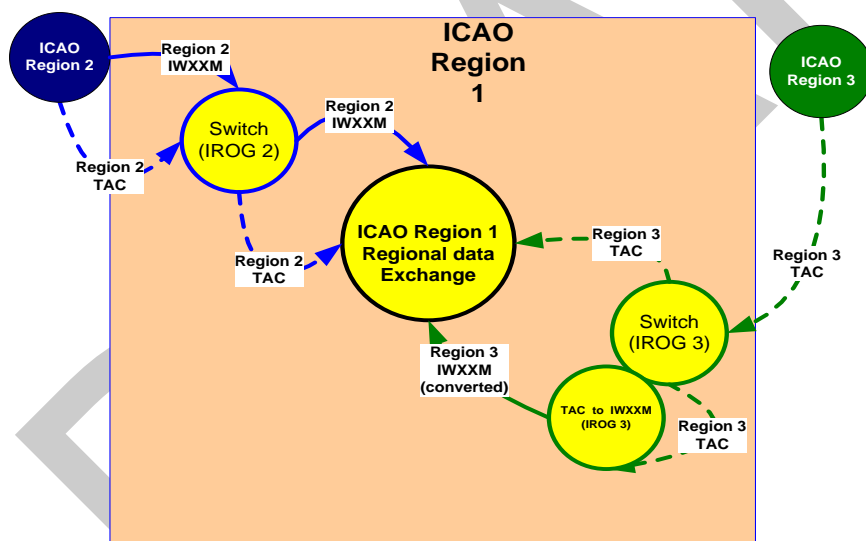


Figure 6: Phase 2, interregional exchange of OPMET with Region 2 (IWXXM & TAC capable) and Region 3 (TAC capable)

### 6.3 Phase 3 - After Amendment 78 applicability

This section is reserved for capability that should be ready from ICAO Annex 3 Amendment 78 applicability (Nov 2018 or Nov 2019):

**TBD**

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## 7 Acronyms and Terminology

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AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIXM	Aeronautical Information Exchange Model
AMHS	ATS Message Handling System
AMO	Aerodrome Meteorological Office
AoR	Area of Responsibility
APAC	ICAO Asia/Pacific Region
AvXML	Aviation XML
COM	Communication
DB	Databank
EUR	ICAO European Region
FAQ	Frequently Asked Questions
FASID	Facilities and Services Implementation Document
FIR	Flight information Region
FIXM	Flight Information Exchange Model
FTBP	File Transfer Body Parts
GML	Geography Markup Language
IAoR	Interregional Area of Responsibility
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IROG	Interregional OPMET Gateway
IWXXM	ICAO Meteorological Information Exchange Model
METAR	Meteorological Aerodrome Report
METP	ICAO Meteorology Panel
MTA	Message Transfer Agent
MWO	Meteorological Watch Office
NOC	National OPMET Centre
OGC	Open Geospatial Consortium
OPMET	Operational Meteorological information
ROC	Regional OPMET Centre
RODB	Regional OPMET Databank (International OPMET Databank)
RQM	Meteorological Databank Request in TAC-format
RQX	Meteorological Databank Request in IWXXM-format
SIGMET	Significant Meteorological Information
SPECI	Special Meteorological Report
SWIM	System Wide Information Management
TAC	Traditional Alphanumeric Code Form
TAF	Aerodrome Forecast
TCA	Tropical Cyclone Advisory
VAA	Volcanic Ash Advisory
WMO	World Meteorological Organization
XML	Extensible Markup Language