International Civil Aviation Organization

THE SECOND MEETING OF SYSTEM WIDE INFORMATION MANAGEMENT TASK FORCE (SWIM TF/2)

Bangkok, Thailand, 09 – 12 April 2018

Agenda Item 4: State, Regional and Global SWIM Updates

RECENT DEVELOPMENT OF METEOROLOGICAL INFORMATION EXCHANGE SERVICES IN HONG KONG, CHINA

(Presented by Hong Kong, China)

SUMMARY

This paper presents a brief overview of the recent development of meteorological information exchange services in accordance with the draft MET-SWIM plan developed by ICAO METP WG-MIE in Hong Kong, China.

1. INTRODUCTION

1.1 The concepts of how meteorological (MET) information can be discovered and exchanged in the SWIM environment can be found in the Plan for Meteorology in System Wide Information Management (SWIM), or the MET-SWIM Plan, currently being developed by ICAO MET Panel (METP) Working Group on Meteorological Information Exchange (WG-MIE). To prepare for the transition to the provision of MET information in SWIM environment, the Hong Kong Observatory (HKO) has started to implement new meteorological information exchange services in accordance with the draft MET-SWIM plan for consumers to access the required information through SoA[1] services.

2. DISCUSSION

SWIM Information Exchange Service

2.1 ICAO Manual on System Wide Information Management (Doc 10039) defines the following five layers as the SWIM Global Interoperability Framework (**Figure 1**):

- SWIM-enabled applications
- Information exchange services
- Information exchange models
- SWIM infrastructure
- Network connectivity

[1] Service Oriented Architecture

2.2 According to the Framework, information exchange services are used by SWIM-enabled applications to operate and meet the needs of the providers/consumers.

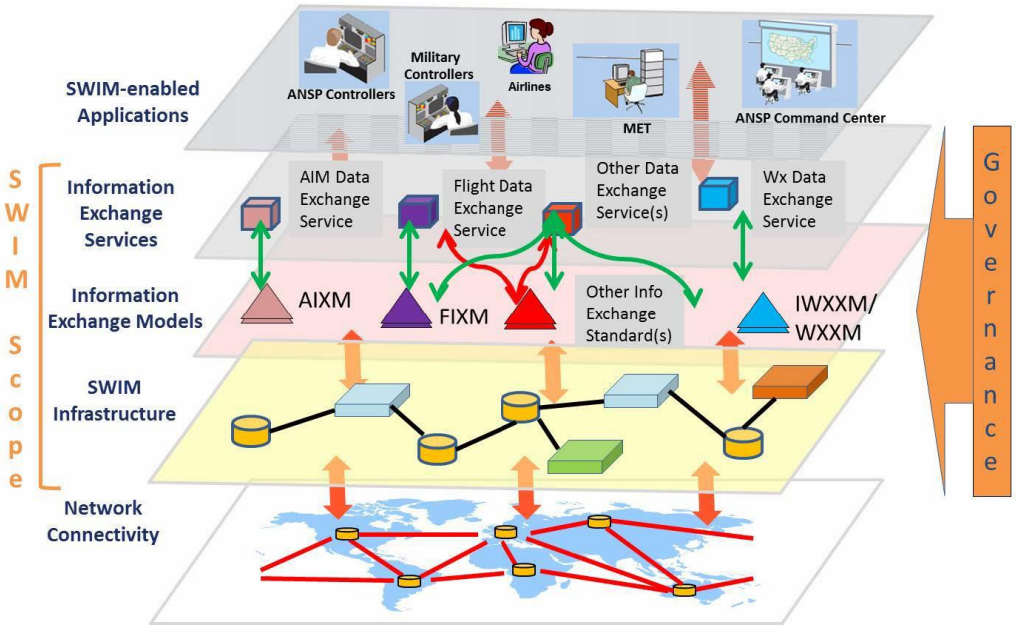

Figure 1: Five layers of the SWIM Global Interoperability Framework.

Use of Open Standards

2.3 One of the basic principles guiding the exchange of information in SWIM environment is the use of open standards as defined in ICAO Doc 10039. They are usually developed collaboratively and intended to facilitate maximum interoperability and widespread adoption. The draft MET-SWIM Plan identified some examples of open standards being used to develop modern new meteorological information exchange services, including:

- ICAO Meteorological Information Exchange Model (IWXXM)
- OGC[2] Web Coverage Service (WCS)
- OGC Web Feature Service (WFS)
- OGC Web Mapping Service (WMS)

Patterns of MET-SWIM Information Exchange Services

2.4 According to the draft MET-SWIM Plan, there are two main mechanisms by which MET data will flow from producers to consumers in the SWIM environment, namely request/reply and publish/subs

2.5 Request/reply is a "PULL" mechanism where users can request and receive MET information as needed using REST[3] standard URL format on Web Services (HTTP/HTTPS). On the other hand, publish/subscribe is a "PUSH" mechanism where users can subscribe for receiving MET information automatically using AMQP[4] (**Figure 2**).

[2] Open Geospatial Consortium
[3] Representational State Transfer
[4] Advanced Message Queue Protocol

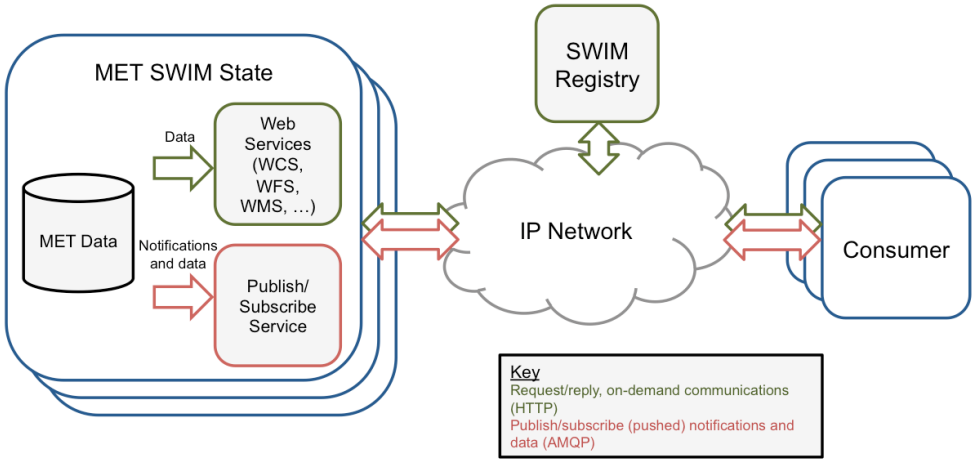

Figure 2: Mechanisms of MET-SWIM information exchange services as described in the draft MET-SWIM Plan

HKO's Implementation of Information Exchange Web Services

2.6 MET-SWIM information exchanges could involve large volume of data and information exchange services can be utilized to trim down the data involved to the exact needs of consumers. Due to the different nature of common MET information being exchanged (gridded, imagery and non-gridded), a specialized information exchange service is required for each. MET SWIM will utilize the OGC Web Feature Service (WFS) for non-gridded data, the OGC Web Coverage Service (WCS) for gridded data, and the OGC Web Map Service (WMS) for image data. **Figure 3** shows HKO's implementation of SoA services in request/reply pattern for provision of MET information.

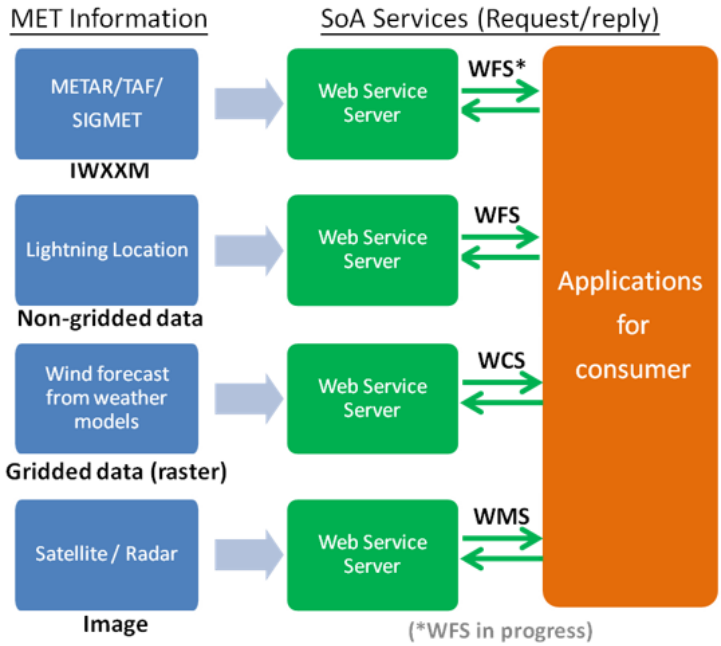

Figure 3: Information exchange web services developed by HKO for different MET information

2.7 For non-gridded information exchange using the WFS, the following capabilities are supported. An example of HKO's provision of lightning information by WFS is shown in **Figure 4**.

- Requesting data filtered by a geographic bounding box;
- Requesting data within a time range; and
- Requesting data that matches free-form queries, such as all lightning locations where discharge current is greater than a certain level.

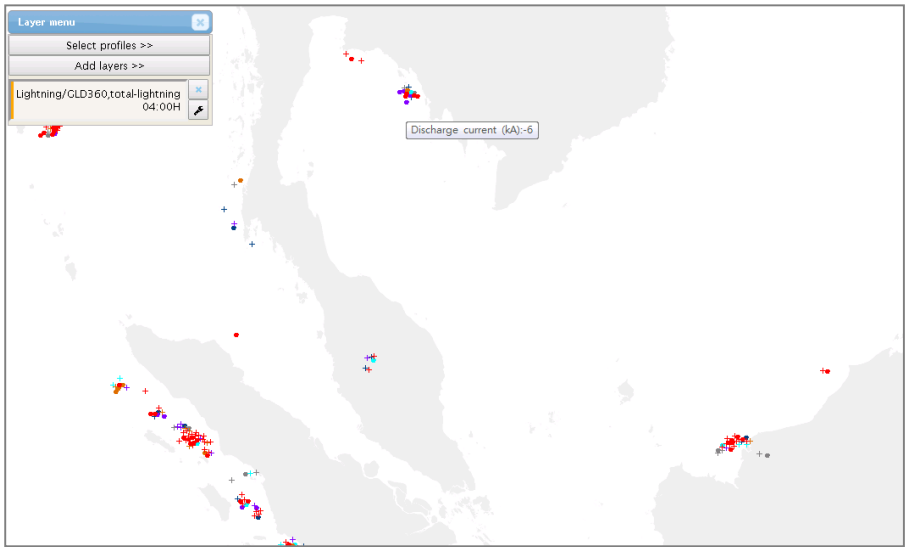

Figure 4: HKO's provision of lightning information via WFS

2.8 For gridded information exchange using the WCS, the following capabilities are supported. An example of HKO's provision of forecast winds extracted from weather model data via WCS is shown in **Figure 5**.

- Requesting data filtered by a geographic bounding box;
- Requesting data within a time range; and
- Requesting data which was generated at a specific model run time for model forecast data.

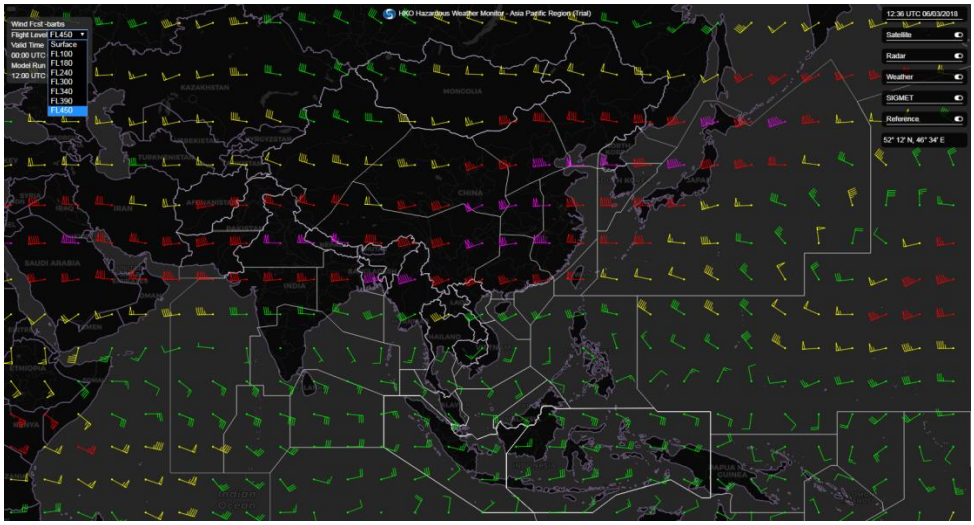

Figure 5: HKO's provision of forecast wind information via WCS

2.9 For imagery information exchange using the WMS, the following capabilities are supported. An example of HKO's provision of Satellite image by WCS is shown in **Figure 6**.

- Requesting data filtered by a geographic bounding box;
- Requesting data within a time range;
- Requesting imagery that is at a different image resolution than the original data;
- Requesting data with custom rendering options such as color scheme, transparency; and
- Requesting data in different image formats, such as JPEG, and PNG.

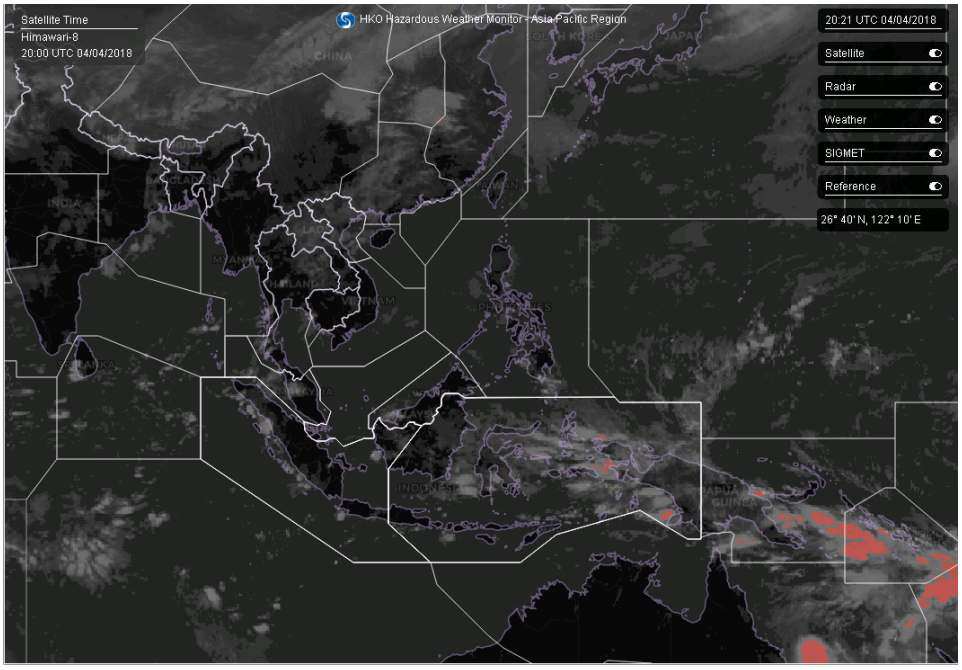

Figure 6: HKO's provision of Himawari-8 satellite image via WMS

The Way Forward

2.10 While information exchange services provide advanced capabilities for accessing MET data, they are insufficient to address all MET SWIM scenarios for real-time information exchange. The publish/subscribe messaging pattern would be required for exchanging information that is issued at an unpredictable rate, or information that must be delivered to the consumer as quickly as possible. HKO will continue to develop information exchange services in publish/subscribe pattern.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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