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Agenda Item 4: Aeronautical Fixed Service (AFS)

RESEARCH AND DEVELOPMENT OF SWIM

(Presented by Japan)

SUMMARY

The Mini-Global demonstration is a project of FAA to collaborate with other ANSPs such as the Civil Aviation Authority of Singapore, the Republic of Korea, NAV Canada, NAV Portugal, the Republic of Korea, AEROTHAI, Airservices Australia, and Japan Civil Aviation Bureau, to exchange air transportation information by using SWIM concept and standardized information exchange models. Through the opportunity to participate in this project, currently the primary research and development of SWIM in Japan has been conducted. In this demonstration, not only the semi-live data of practical operation system is shared among the member States, but also the scenario-based standardized message exchange between different member States is demonstrated. This paper introduces the JCAB's activities as well as the challenges resulting from the experience so far.

1. INTRODUCTION

1.1 In the Mini-Global demonstration, the team of JCAB is participating as a member State for this project. The objectives for us are not only to study and evaluate SWIM concept and key technologies, but also to promote international cooperation with other member States for the research and development of SWIM system in Asia-Pacific region. In this information paper, the activities, experiences and challenges resulting from this project are introduced.

2. DISCUSSION

2.1 Architecture

2.1.1 In the Mini-Global demonstration, all member States use the VPN over Internet connecting their own demonstration systems to the Mini-Global SWIM EMS (MG EMS). Then, all member States will share the information by applying standardized message format. The demonstration system of Japan is composed of two main subsystems, Data Processor and Communication Server, as shown in Figure 1.

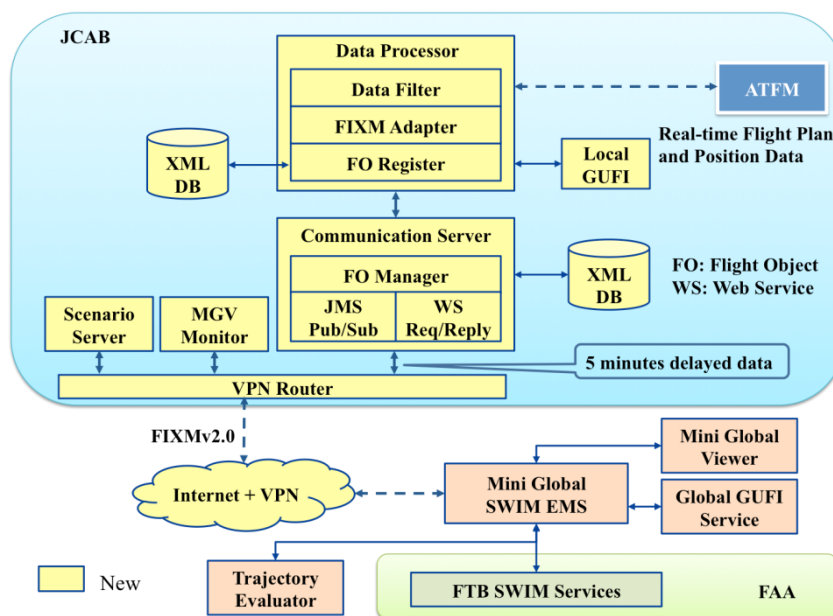


Figure 1. System architecture

2.2 Data Processor

2.2.1 ATS message of the aircraft flying within Fukuoka FIR is already unified with the identifier by the operators who are familiar with the ATS logical even if it is the current format. In this demonstration, since the Data Server is able to receive the flight information from the operational system of handling the unified information, without the work of a new identification, it is possible to build up the database that is adapted to XML in Form corresponding to the FIXM concept with GUFU.

2.2.2 The ATFM is Air Traffic Flow Management system for practical operation. The real-time flight plan and position data are forwarded to the Data Processor. The Data Filter extracts the required data, and then FIXM adapter changes these data from local format into FIXM 2.0 format. The Flight Object (FO) Register gets the ID for each flight from the Local GUFU service, and put the flight information into the XML Database.

2.2.3 This demonstration is not intended to support the operations of a real aircraft. Therefore, it was necessary to organize the governance to share information with an unspecified person beyond the scope of operational use. In this point, it is possible to gain experience in institutional addition to the technical aspects, in the future, it was strongly felt the need for unified governance.

2.3 Communication Server

2.3.1 For information exchange, both JMS based Publish/Subscribe and Web Service based Request/Reply communication methods are applied. The JMS based Publish/Subscribe communication is the main method for FIXM information exchange.

2.3.2 The communication server responses for message exchange between the local system and the MG EMS via the established VPN connection. The 5 minutes delayed data is utilized in the demonstration. The function of FO manager has two functions. One is to get the publishing flight data from the XML DB and send it to the MG EMS. The other one is to receive the subscribed flight data from the MG EMS and save it into the XML DB.

2.3.3 The various technologies to carry out functions of the data exchange have been suggested in the SWIM concept draft. For each function according to the purpose, the organizations that would provide the global SWIM ahead of others will be the leading edge, then it is expected to expansively formulate.

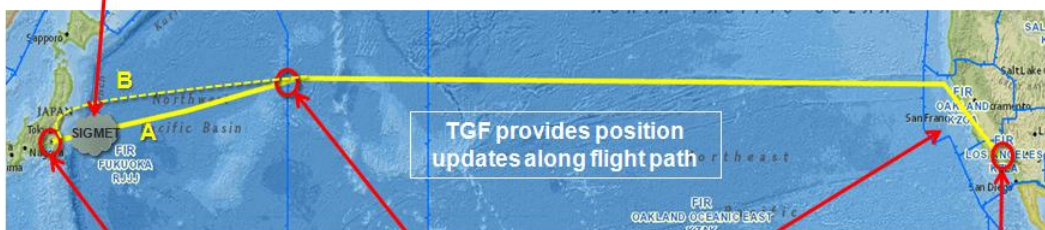
2.3.4 On the other hand, organizations that request international rule and standard may occur. As a State could plan the deliberate introduction, the standard specification will be required in this point.

2.4 Scenario

2.4.1 By utilizing FIXM, AIXM, and IWXXM, several scenarios are developed and each of them is demonstrating the sharing information on borderless. In the Figure 2, the scenario of volcanic ash for the flight from Tokyo to Los Angeles is shown. The main purposes of this scenario are to check the basic functions of SWIM based communication, and to confirm the message exchange by FIXM, AIXM and IWXXM.

• Scenario 1: Tokyo, Japan to Los Angeles, USA

- 1. SIGMET issued by JCAB for Volcanic ash



- 2. Trajectory Evaluator used to assess original flight plan (A)
 - 3. JCAB submits revised flight plan (B)
 - 4. JCAB provides FO updates with surface information
 - 5. Boundary coordination using AIDC protocol in FIXM initiated by JCAB
 - 6. Periodic FO updates from FAA containing; Flight Amendments, Track Information, Flight State
 - 7. Arrival into LAX
- *Material provided by FAA

Figure 2. Scenario of volcanic ash

2.4.2 It will be possible to facilitate the verification of interference between the tracking of aircraft and weather information by using Trajectory Evaluator, before submitting the flight information. Furthermore, the demonstration of continuous monitoring is easy to visually understand by using Mini-Global Viewer. Since the weather information, aeronautical information, and flight information has been standardized by the technology of GML, it will give impression of future concept to the audience by easy to mapping especially.

2.4.3 This scenario is work of the separation of data and services. In addition, it will foresee the system built by the SOA that is the essence of SWIM.

2.4.4 To show the effect of SOA approach, the team of JCAB is developing the application that is possible to display flight information based on the standardized data which is distributed via MG EMS in FAA (Figure 3). It will be shown that the easy system development can be expected in the consumer side of the standardized data.

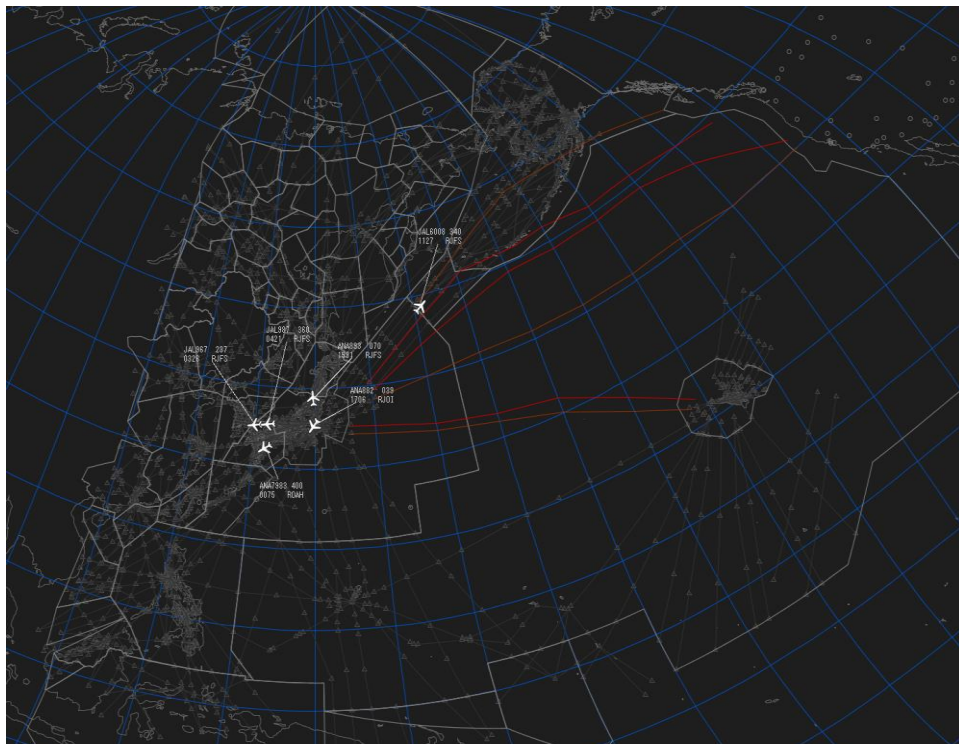


Figure 3. Flight monitor

3. CONCLUSION

3.1 Even if Mini-Global demonstration is in preparation, it is effective to verify the requirement for implementation of SWIM concept. Then, it is finding a lot of considerations by the experience. We are planning a demonstration at APANPIRG/25 in ICAO APAC region to share this achievement. So, it is encouraged to be attended by the personnel who assume the SWIM development in each State to APANPIRG/25 to find the SWIM study status and feed back to further understanding of SWIM concept.
