International Civil Aviation Organization

THE ELEVENTH MEETING OF SYSTEM WIDE INFORMATION MANAGEMENT TASK FORCE (SWIM TF/11)

Bangkok, Thailand, 25 – 29 May 2026

Agenda Item 6: State, regional and global SWIM updates

VERIFICATION OF ATFM INFORMATION EXCHANGE BASED ON SWIM TEST PLATFORM

(Presented by China)

SUMMARY

This paper presents China's verification of ATFM information exchange using a SWIM test platform, based on the existing NTFM-IXP protocol. Eight standardized information services were developed in response to actual operational needs. A bidirectional adapter was deployed to enable legacy systems to interact with the SWIM test platform. XSD specifications and end-to-end automated data validation were implemented. Collaborative verification involved ANSPs, airlines, and airports across primary business scenarios. The validation demonstrates a practical approach for the lightweight integration of legacy traffic flow management systems into a SWIM environment.

1. INTRODUCTION

1.1 The National Traffic Flow Management (NTFM) System is China's national-level platform for ATFM. It aggregates various ATS information to support coordinated decision-making among all stakeholders, enabling integrated nationwide air traffic flow management. Over years of deployment, the system has connected the operational systems of 27 airlines and 63 airports via data interfaces, sharing key flight milestone times throughout the flight lifecycle. The system now supports most domestic collaborative scenarios, and its information exchange protocol (NTFM-IXP) is standardized and stable.

1.2 Despite effectively supporting domestic ATFM operations, NTFM-IXP has several shortcomings in the transition to a SWIM framework:

a) **Limited to point-to-point connections**: To ensure the information security of ATS data, each stakeholder must establish a dedicated link with the NTFM system at the network level. At the application level, separate configuration of message queues is required for each collaborating entity. This results in high maintenance costs and limited scalability.

b) **Lack of unified data validation**: Data validity checks are scattered across the business logic. No standardized pre-transmission validation mechanism is in place, which may lead to mismatches when processing data across systems.

c) **No standardized, reusable services**: The data exchange capability is tightly bound to specific links and interfaces, which do not conform to SWIM's requirements for standardized, service-oriented information sharing.

1.3 SWIM is an important foundation for digital transformation in ATM domains. Its core goal is to enable cross-stakeholder and cross-system information sharing through unified data standards and a service-oriented architecture (SOA). To facilitate a smooth transition from legacy systems without affecting primary business processes, China conducted this verification based on the mature NTFM-IXP. This validation explored a lightweight approach to applying SWIM concepts, avoiding large-scale system reconstruction while verifying the technical feasibility of service-oriented information exchange.

2. DISCUSSION

2.1 Overall Objectives and Core Approach

2.1.1 The validation aims to minimize modifications to existing systems. It extracts standardized information services from existing business scenarios and verifies the feasibility of integration with SWIM services using NTFM-IXP, thereby forming an implementation plan for legacy systems to access SWIM.

2.1.2 The validation process includes identifying data elements from NTFM-IXP to define standardized information services; developing unified interaction models, data formats and XSD specifications for these services; configuring a test environment; encapsulating these services to meet China's SWIM test platform requirements; and conducting full-scenario collaborative validation among representative operation stakeholders to confirm stability and practicality.

2.2 Scope of Validation

2.2.1 The validation covers the main domestic stakeholders. Representative participants include domestic regional ANSPs, five major airlines, and two hub airports.

2.2.2 The data exchange aligns with ATFM needs, covering two main categories: flight plan and status, and traffic management initiatives (TMI). Eight information services, such as flight plan and status exchange, Target Off-Block Time (TOBT) filing, and TMI publication, support the key data exchange requirements for traffic flow management and operational collaboration.

2.3 Architecture Adaptation Scheme

2.3.1 A lightweight adapter-based approach was adopted. A bidirectional adapter was added between the existing message queue and the SWIM test platform. This allows the sending and receiving of standardized data without changing the core NTFM system logic.

2.3.2 **Sending data to SWIM**: NTFM messages are sent to the adapter via the existing message queue. The adapter encapsulates the data, standardizes message headers, converts formats, and transmits the standardized messages to the SWIM platform via AMQP, following platform requirements.

2.3.3 **Receiving data from SWIM**: The adapter establishes an independent receiving queue with the SWIM platform. It retrieves standardized messages from other stakeholders, converts the formats back to the NTFM system, and forwards them to the internal NTFM message queues for further calculation and data processing.

2.3.4 This approach ensures secure separation of production and validation environments. It does not affect existing traffic management operations and requires no large-scale system changes, enabling reliable, stable, and low-impact validation.

2.4 XSD Specification and Application

2.4.1 XSD documents were developed for all eight information services, establishing a unified data specification covering all services and fields.

2.4.2 The XSDs define the data structure, field types, mandatory rules, allowed values, and length constraints for each information service. Automated validation mechanisms are deployed at both sending and receiving ends, performing checks before sending and after receiving to intercept abnormal data. This ensures improved data quality and reliability, and provides a basis for system data governance and SWIM service registration.

2.5 After multiple rounds of joint testing, the validation has achieved its expected objectives and obtained the following core outcomes:

a) Completed integration with China's SWIM test platform, realizing unified publication and reception of ATFM information, and verifying the technical feasibility of the lightweight access path for legacy systems into the SWIM environment.

b) Established end-to-end data exchange format and validity validation capabilities. Through unified XSD specifications and end-to-end automated validation mechanisms, the validation has effectively resolved the issues of scattered data validation and inconsistent standards in the original system, thereby improving data quality and exchange reliability.

2.6 Based on the outcomes of this verification, relevant work will continue to be advanced in the following aspects:

a) Continue to improve service standardization, explore compatibility with internationally accepted information models such as FIXM, and develop models for regional traffic flow management, laying the foundation for future SWIM application optimization in the Asia-Pacific region.

b) Participate in APAC SWIM implementation exchanges based on the pilot verification work, and jointly promote the optimization of regional SWIM collaborative development.

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.

– – – – – – – – – – – – – –