International Civil Aviation Organization

The Ninth Meeting of System Wide Information Management Task Force (SWIM TF/9)

Bangkok, Thailand, 14 – 17 May 2024

Agenda Item 8: State, Regional and Global SWIM Updates

FAA STRATEGIC DECISION: LEVERAGE LEGACY TECHNOLOGY INVESTMENTS TO SUPPORT ATC DATA EXCHANGE WITH PRIORITIZING INTERNET-ENABLED SWIM FOR ATM INFORMATION SHARING

(Presented by United States / Federal Aviation Administration (FAA))

SUMMARY

SWIM introduces several benefits in realizing cost savings, achieving modernization, global interoperability, and provides flexibility and scalability, while ensuring a robust security posture. Although ATM information exchanges will be increasingly and exclusively shared over SWIM, the FAA remains committed to using AMHS for Air Traffic Control (ATC) messages, consistent with ICAO policy and compliance with international standards. Ultimately, this approach allows the FAA to introduce more efficient and secure collaborative information exchange between aviation partners.

1. INTRODUCTION

1.1 The Federal Aviation Administration (FAA) strategically prioritizes internet-enabled System Wide Information Management (SWIM) data exchange platform as the primary method for sharing Air Traffic Management (ATM) services. As an internet-enabled technology, SWIM is compliant with industry standards, technical and security protocols, and governance enforcement points, supporting seamless integration across diverse systems e.g., ANSPs, vendors, etc.). SWIM operates at an application layer (ISO layer 7) middleware compliant with internet protocol (IP) standards across diverse systems from ANSPs, vendors, etc. While SWIM users can choose dedicated network connections, they also have the option to use internet as network transport. This is especially important in relation to ANSP-to-ANSP SWIM information exchange.

2. DISCUSSION

FAA Strategic Decision: Leverage legacy technology investments to support Air Traffic Control (ATC) data exchange, while prioritizing internet-enabled SWIM for Air Traffic Management (ATM) information sharing between aviation partners.

2.1 Current information exchanges are supported by communications and information technology (CIT) characterized dedicated network connections and legacy text-based messages between aviation partners. Legacy message formats and protocols are typically expensive to maintain and are hosted on these expensive dedicated networks. System Wide Information Management (SWIM) standardizes information exchange making it significantly easier for

aviation partners to exchange information. The evolution of information exchange models for flight, aeronautical, meteorological, and flow aviation data will bring orders of magnitude in messages exchanged between aviation partners, introducing improvements in automation and operational decision-making.

2.2 The Federal Aviation Administration's (FAA) aims to minimize reliance on these legacy connections and optimize costs in the face of orders of magnitude increases in data exchange traffic anticipated with SWIM. The conclusion to prioritizing internet-enabled ATM information exchange over SWIM demonstrates a prudent approach to managing resources, while positioning to take advantage of modern technologies. For example, the FAAs SWIM implementation includes a cloud-enabled deployment architecture. Cloud technology introduces cost-effective, contemporary innovations for hosting SWIM information exchange services in a highly scalable infrastructure. This strategic decision underscores the FAA's commitment to modernization through seamless aviation partner integration in a cost-effective, scalable, and secure manner.

2.3 **Cost-Savings**: While the FAA has invested in dedicated network connections with select aviation partners, the anticipated surge in data exchange could result in escalating costs for increased bandwidth and maintenance. As an internet-enabled capability, SWIM leverages the global reach of the internet as a cost-effective, viable alternative. Redundant internet access points offer a method of achieving a resilient connectivity. This reduces the dependency on the need for further expansion of the dedicated CIT networks and information technology solutions, leading to substantial infrastructure and operational cost savings for the FAA and aviation partners.

2.4 **Modernization through Integration**: The FAA recognizes the transformative potential of leveraging standards-based, internet-enabled technologies for SWIM. This approach enables seamless interoperability for improved ATM information integration between aviation partners, and creates the opportunity to take advantage of new, innovative technologies, such as cloud services, web services, application programming interfaces (API) and advanced data analytics tools. The FAA is prioritizing SWIM for ATM information exchange to take advantage of these emerging capabilities. These technologies unlock possibilities for further ATM optimization strategies powered by Artificial Intelligence (AI), leading to enhanced decision-making and airspace efficiency. The closed CIT environment hosting AMHS limit the ability to access and integrate with these modern capabilities and are better suited to focus on ATC message exchanges.

2.5 **Global Interoperability**: Seamless communication among diverse ANSPs is essential for effective global Air Traffic Management. SWIM's foundation on standardized internet protocols and open data formats promotes system interoperability. This ensures smooth ATM information flow regardless of the specific systems used by different ANSPs, creating a more integrated and efficient global airspace management capability. While AMHS adheres to some standardized message formats, compatibility issues may still arise due to variations in how AMHS networks are implemented across different countries.

2.6 **Flexibility and Scalability**: The dynamic nature of air traffic services demands flexible and scalable solutions. SWIMs standards-based implementation model allows greater flexibility for SWIM users to access data services and offers flexibility in deployment alternatives. The FAAs SWIM implementation design incorporates a cloud-based deployment architecture that offers information exchange services with the ability to scale capacity and help manage fluctuations in traffic volume and accommodate new types of data as operational needs evolve. The flexibility of a cloud-based deployment, for example, offers significant potential benefits. In this model, aviation partners that choose a cloud-based SWIM deployment

architecture using the same specific cloud service provider (CSP) (e.g., Amazon Web Services, Microsoft Azure, etc.) can take advantage of dedicated CSP-managed network across hosted cloud environments. This represents a significant benefit to scale up SWIM capacity, based on expected information exchange growth, in compute and network transmission, and cost-savings using CSP resources. This type of flexibility is critical for managing the expected increase in SWIM data exchange, without incurring the costs and complexities of upgrading dedicated information technology and networks between each ANSP.

2.7 **Robust Security**: Cybersecurity is vital in aviation data exchange. SWIMs compliance with internet standards, protocols and technologies extend to include security standards. Although the closed nature of dedicated CIT resources offers a highly secure environment, with SWIM, the FAA has implemented cutting-edge encryption, multi-factor authentication, and granular security controls. FAAs SWIM has integrated identity access management (IAM) security protocols to address user access authentication and authorization and is implementing digital certificate authority to continue to enhance security regimen. SWIMs open architecture approach accommodates expanding the security architecture, adopting zero trust architecture (ZTA) security principles to protect against evolving cyber threats.

2.8 **Maintaining Critical Communications**: The FAA's commitment to safety remains paramount. Although ATM information exchanges will be shared over SWIM, the FAA remains committed to using AMHS for Air Traffic Control (ATC) messages. Consistent with ICAO policy and in compliance with international standards, ATC message exchange with ANSPs will continue over existing AMHS networks. However, ATM information exchanges will be increasingly and exclusively shared over SWIM.

2.9 **Conclusion:** SWIM operates at an internet protocol (IP) based, standards-based application layer middleware to facilitate global interoperability across diverse systems between aviation partners. As an internet-enabled technology, SWIM introduces a flexible, scalable mechanism for SWIM users to exchange ATM information. Although current ATC-based information exchanges are carried over dedicated CIT using AMHS message formats, security architecture solutions (e.g., ZTA) exist to assure a cyber-resilient Air Traffic Management (ATM) information exchange.

FAA has made the strategic decision to prioritize internet-enabled ATM information exchange over SWIM to deliver cost-saving, interoperability, flexibility and scalability benefits by taking advantage of modern technologies. This decision aligns with its goal of maximizing the value of existing network investments, while addressing the evolving demands of modern ATM.

FAA remains committed to compliance with ICAO policy and international standards for transporting ATC messages over AMHS. The FAA continues to invest in developing robust security protocols for SWIM with aviation partners to ensure a potential for creating a safer, more efficient, and globally connected ATM system. By embracing SWIM, the FAA positions itself for enhanced collaboration with international partners, cost-optimized operations, flexibility, and while sustaining a robust security posture.

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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