International Civil Aviation Organization

Thirteenth Meeting of the Common aeRonautical Virtual Private Network Operations Group (CRV OG/13)
Wellington, New Zealand, 05-08 March 2025

Agenda Item 3:   Review outcomes of relevant meetings

OUTCOMES OF THE FIRST WORKING SESSION OF THE SWIM IMPLEMENTATION PIONEER AD-HOC GROUP (SIPG WS/1)

(Presented by the Secretariat)

SUMMARY

This paper presents outcomes of the First Working Session of the SWIM Implementation Pioneer Ad-Hoc Group (SIPG WS/1).

1.   INTRODUCTION

1.1   The SIPG under the System-Wide Information Management Task Force (SWIM TF) was established by **the Decision SWIM/TF/07/03** during the SWIM TF/7 Meeting in 2023 to develop an initial version (prototype) of the Asia/Pacific regional SWIM.

1.2   Based on the 15 SIPG teleconferences held since its inception in June 2023 and the lessons learnt from the Joint Event of SWIM over CRV Demonstration and Surveillance Data over SWIM Trial conducted in Hong Kong China from 28-29 May 2024, the SIPG has identified critical tasks for the construction and implementation of SWIM in the Asia/Pacific region. Many of these tasks, which are related to the design of the regional SWIM, require in-depth discussions that are not feasible during 1.5-hour monthly teleconferences.

1.3   To expedite progress toward the regional SWIM implementation target as agreed through **Conclusion APANPIRG/33/9**, the SWIM TF Task Leads Meeting in August 2024 agreed to the need for an in-person SIPG working session. This session was planned to focus on four essential agenda items to develop a concrete proposal for consideration of the tenth Meeting of SWIM Task Force (SWIM TF/10) planned to be held in May 2025.

1.4   The First Working Session of the SWIM Implementation Pioneer Ad-Hoc Group (SIPG WS/1) was held from **14 to 17 January 2025** in the ICAO Asia Pacific Regional Office, Bangkok, Thailand. The meeting was attended by **51** Participants from **13** States/Administrations and **2** International Organizations. The Working Session report and presentations can be accessed at:
https://www.icao.int/APAC/Meetings/Pages/2025-SWIM-SIPG-Working-Session.aspx

1.5   This paper summarized the outcomes of the First Working Session of the SWIM Implementation Pioneer Ad-Hoc Group (SIPG WS/1) for CRV OG/13 Meeting information.

2.   DISCUSSION

2.1   The summary of the discussion in the Working Session is given in the following paragraphs.

SWIM Related Information Security – ICAO Doc 10204 Manual on Information Security

Trust Framework Panel Progress Report – Japan (SP/02)

2.2   Japan presented the work that is being done by the Trust Framework Panel (TFP). ICAO established the TFP to address the issues of cybersecurity in Civil Aviation Operations.

2.3   The objectives of the TFP are to

a) Develop and maintain provisions and guidance materials to support enabling trusted data and information exchange;
b) Develop governance principles, policies, procedures and requirements for a globally harmonized framework;
c) Define a global architecture and principles for interconnecting networks.

2.4   It was reported that the TFP currently has three job cards, which are looked after by three working groups: WG – Identity Management, WG – Trust Framework Considerations, and WG – Information Security.

2.5   The TFP has been focusing on developing three guidance documents: one on information security, one on certificate policy, and one on trust framework implementation. Specifically, ICAO Doc 10204: Manual on Aviation Information Security (MAIS) was published in December 2024. The other two documents, i.e., Doc 10169: Aviation Common Certificate Policy (ACCP) and the Manual on Trust Framework Implementation (pending document number), are expected to be published in December 2025.

2.6   The ACCP outlines how the X.509 Public Key Infrastructure (PKI) can be applied in civil aviation, including within the SWIM environment. It also describes the policies and certification practices that govern its use. The meeting was informed that the draft ACCP manual revolves around the concept of a Trust Framework Instance (TFI).

2.7   During the discussions, the need to establish a TFI to support SWIM implementation in the Asia/Pacific region was raised. However, it was emphasized that SWIM is just one of several use cases requiring the establishment of TFI and that PKI is needed for all TFIs within APAC, not only for SWIM. Other use cases identified by the TFP include Controller Pilot Data Link Communication (CPDLC), Satellite Based Augmentation System (SBAS), Electronic Personal Licenses, etc. This suggests that PKI implementation should not be the sole responsibility of the SWIM TF.

> *Action WS-1-1:* For SIPG to table a paper to the SWIM TF/10, articulating the need to implement PKI and to identify the responsible body for its implementation under CNS SG/APANPIRG

2.8   Additionally, the question of whether the PKI is necessary for all information types was raised. Using meteorological information as an example, it was argued that such information may not require certification for security. It was suggested that only safety-critical information would need to be secured with PKI, while other information types would not. However, the classification of information as safety-critical or not-safety-critical has not yet been decided.

2.9   While the implementation approach for PKI within APAC is still under discussion, it was suggested that the SIPG could continue exploring the use of certificates to establish trust, potentially through self-signed certificates. Once the PKI implementation is finalized, self-signed certificates could be easily replaced with PKI certificates.

>   ***Action WS-1-2:*** SIPG to explore the use of self-signed certificates and conduct trials of using such certificates to ensure secure information exchange within the SWIM environment.

2.10   It was raised that, as the contributory body responsible for the APAC regional network, the CRV OG should also be informed of the development of the ACCP.

>   ***Action WS-1-3:*** Singapore to prepare a paper for the CRV OG/13 to inform the CRV OG of the ACCP document and the SWIM TF's need for PKI.

SWIM Architecture

2.11   Four presentations and one working paper were presented under this agenda item with the objective of clarifying the proposed SWIM architecture for the construction of the APAC regional SWIM. Most of the discussions focused on addressing the issues raised in SWIM TF/9-WP/10, which highlighted the challenges of using the hierarchical SWIM architecture for the joint SWIM-over-CRV demonstration and Surveillance Data Sharing over SWIM technical trial.

SWIM Architecture – SIPG Lead (SP/03)

2.12   Singapore presented the SIPG Lead advocated for adopting a complete mesh architecture to resolve 2 of the 5 issues highlighted in SWIM TF/9-WP/10. It was pointed out that, even if a fully-meshed architecture is used for the APAC regional SWIM, issues would still arise when interconnection between different regional SWIMs needs to be established to form a Global SWIM.

Suggestion for Regional SWIM Architecture – China (SP/07)

2.13   China compared the implementation of a fully-meshed architecture and a hierarchical architecture. It concluded that the hierarchical architecture would require a shorter implementation cycle and lower cost than a fully-meshed one. Furthermore, by adjusting the design of the hierarchical architecture, some of the issues highlighted in SWIM TF9-WP/10 could also be addressed.

Implementation Approach for SWIM Message Exchange over CRV – Japan (SP/04)

2.14   Japan advocated for the hierarchical architecture for the regional SWIM implementation. Details on how each of the issues raised in SWIM TF9-WP/10 could be resolved within the implementation of the hierarchical architecture implementation was also provided.

Adopting Multiple Message Exchange Patterns to Optimize SWIM Information Services – China (WP/01)

2.15   China proposed the adoption of multiple Message Exchange Patterns (MEP) to optimize SWIM Information Services, designing different MEP application scenarios for both data sharing and system interoperability services, with the aim of reducing the reliance on guaranteed message delivery by EMS in a hierarchical architecture.

ICAO APAC SWIM TF SIPG Working Session 1 Recommendation – CANSO (SP/09)

2.16   CANSO provided seven recommendations for the implementation of the hierarchical SWIM architecture.

2.17   These presentations and working papers generated extensive deliberations on the appropriate architecture for regional SWIM, especially the pros and cons of fully meshed versus hierarchical options. The meeting concluded that a modified version of the hierarchical architecture used during the joint event would be the most suitable for implementation within APAC, considering the various recommendations and solutions proposed and discussed under this agenda item.

> ***Action WS-1-4:*** SIPG to propose to the SWIM TF/10 a modified version of the hierarchical architecture for regional SWIM implementation.

2.18   The need for specific performance requirements of the Gateway EMS was discussed, given the importance of its core functions in routing SWIM messages between all users. Particularly, it was agreed that more than one Gateway EMS is necessary and redundancy should be implemented to ensure continuous operation of the regional SWIM. Additionally, it was discussed that a key function of the Gateway EMSs was to route SWIM messages between the Edge EMSs connected to them.

2.19   The meeting deliberated on the requirements for the Gateway EMS and identified two categories: (i) the requirements for the Gateway EMS itself and (ii) the requirements for the Gateway EMS provider. The requirements discussed by the meeting can be summarized as follows.

System Level Requirements	Provider Specific Requirements

1. Gateway EMS is responsible for:
  a. Messaging and routing
  b. Forwarding
  c. Failover
 	
2. Gateway EMS must have the following Quality of Service (QoS)
  a. Availability >= 99.00%
  b. Throughput >= TBD
  c. Latency <= TBD
	1. Gateway EMS providers shall provide runtime governance.
	
	2. Gateway EMS providers must implement the Gateway EMS on a different device than their internal EMS. This means that the provider's internal EMS will function like an Edge EMS,
	
	3. Gateway EMS providers may choose to offer AMHS/SWIM protocol conversion service.

> ***Action WS-1-5***: SIPG to propose these requirements for the consideration of the SWIM TF/10.

2.20   With regard to the latency and throughput requirements, more studies were required before concluding on the specific numbers. It was proposed that the performance numbers collected during the joint event could be used as a starting point. At the same time, SIPG should also consult the US-FAA on how latency and throughput are addressed in the US-FAA's operational SWIM. ***Action WS-1-6***

2.21   The discussion on latency and throughput led to further considerations of the applicability of these QoS parameters in the SWIM environment. It was highlighted that SWIM-enabled applications/SWIM information services considered safety critical may require higher QoS than non-safety critical ones. However, it was emphasized that the justification for safety criticality largely depends on the use cases of the SWIM-enabled application/SWIM information services. Moreover, it was discussed that operational expert groups, who are users of these SWIM-enabled applications/SWIM information services, would be the qualified bodies to determine criticality.

Action WS-1-7: SWIM TF coordinates with the operational expert groups to determine the safety critically of SWIM-enabled applications/SWIM information services.

2.22   Based on the SWIM TF Terms of Reference, which specifies that the APAC regional SWIM is to be constructed principally over CRV and other IP-based networks, the meeting discussed the possible options to establish the APAC regional SWIM over CRV and the Internet as follows.

1) One or more Edge EMS can be connected to the Internet. The Edge EMS can then publish services as well as consume services from the Internet. Any information flows that are needed between CRV and the Internet layer will be handled by the Edge EMS.

2) The SWIM TI is constructed over both CRV and the Internet. Each Gateway EMS provider will need to span their Gateway EMS over both CRV and Internet links with the appropriate security mechanisms to segregate between these two zones of network traffic. Traffic can then be routed based on the needs.
    2.1)   If both the information producer and information consumer are in the same zone, the Gateway EMS only needs to route the SWIM traffic within that zone.
    2.2)   If the information producer and information consumer are in different zones, the Gateway EMS should be able to handle routing of SWIM traffic across the zones.

3) CRV service provider is also to provide connectivity to the Internet.

Action WS-1-8: SWIM TF to coordinate with CRV OG on various options proposed and discussed by the SIPG.

2.23   After extensive deliberation, the meeting concluded that further consideration is needed before deciding on the specific option. However, the meeting agreed that Option 1 could serve as an interim solution and should be considered for the early implementation of regional SWIM while discussions for a more permanent solution continue.

Action WS-1-9: SIPG to continue deliberating on options 2 and 3 while implementing option 1 for the early APAC SWIM. Proposal paper on the possible options to be submitted for the consideration of SWIM TF.

2.24   The meeting recalled that the requirement for Internet connectivity in the APAC SWIM was from the MET/IE WG. To determine the appropriate options for Internet connectivity, the clarification of these requirements with the MET/IE WG is needed. It was also noted that examples of meteorological use cases would help clarify the requirements.

Action WS-1-10: SWIM TF clarifies the requirements for Internet connectivity with the MET/IE and requests examples of meteorological use cases to help clarify the needs.

2.25   Due to time constraints, the following outstanding items related to SWIM architecture were identified for future discussion by SIPG.

a) PKI requirements for the APAC SWIM use case.
    A paper on the need for PKI within APAC to support APAC SWIM implementation for the consideration for CNS SG.
b) Routing Mechanisms.
    An approach for Gateway EMS to transfer SWIM messages between Edge EMSs, e.g. use of message headers, message properties or topics.
c) Limits on the total number of Gateway EMS in the APAC SWIM
d) Minimum performance requirements for Gateway EMS, e.g., latency and throughput.
e) Approach to enforce consistent runtime governance on Gateway EMS.
f) Common set of Queues for Gateway EMS
g) Testing requirements and procedures for onboarding Gateway EMS

SWIM Traffic in CRV

SWIM Traffic Priority – Thailand (SP/08)

2.26   Thailand presented SP/08, which discussed the possibility of using Differentiated Services Code Point (DSCP) markings to ensure the reliable delivery of SWIM messages in the physical network. This idea was introduced and discussed at the Workshop for Preparation of New-CRV Requirements and Specifications for Future SWIM/Other Aviation Services in September 2024. Specifically, the CRV OG proposed that SWIM traffic could be tagged with the DSCP markings to ensure guaranteed delivery, similar to how Voice-over-IP traffic and AFTN/AMHS traffic are currently handled in the CRV. It was noted that all SWIM traffic exchanged over CRV at the moment, using the residual bandwidth, is delivered on the "Best Effort" basis with no specific prioritization.

2.27   Six options for marking SWIM traffic with DSCP markings were presented and deliberated. The meeting concluded that the most appropriate approach would be to put all SWIM traffic into a new QoS queue, with the network marking the traffic based on the IP address (Option 2). Further priority segregation could then be applied at the messaging level by assigning AMQP priorities. It was also agreed that the DSCP marking for all SWIM traffic should be "AF21", the same as the AFTN/AMHS traffic.
    Action WS-1-11: ICAO Secretariat to inform the CRV OG of these conclusions for the new CRV.

SWIM Transition

SWIM Transition – SIPG Lead (SP/05)

2.28   The SIPG lead presented SP/05 to the meeting. The presentation highlighted the challenges of transitioning from a non-SWIM environment to a SWIM environment, in particular, from AMHS to SWIM. It is foreseen that the transition period might be a significant duration, and this highlighted the need to address how such a mixed-mode environment can work.

2.29		The presentation generated a lot of discussions on mixed-mode environments and how long such an environment is likely to exist. There was also discussion over the types of data currently being carried on AMHS that are not represented by the existing SWIM data models. After some deliberation, it was clear that there are some data types in AMHS that have a clear mapping to the SWIM data models. Some data models do not have similar mappings but have expert bodies working on migrating them to SWIM. Finally, there is at least 1 data type that does not have a SWIM mapping or a migration plan to SWIM. There are some AMHS data types that have a clear sunset date attached to them, e.g., FPL2012. There are some that have a migration target date set but no sunset date and others that have no dates set.

2.30		During the discussion, it was highlighted that the ACSICG has a group looking at the AMHS to SWIM transition. It would be good for the SWIM TF to work with this group to map the transition plan together.

2.31		After many discussions, the following conclusions were reached for this agenda item:

1)	Reach out to the relevant expert groups governing each data type within AMHS for their SWIM migration strategy, if any, and the proposed sunset date for the AMHS data type. E.g., AAITF, FF-ICE Ad-hoc group, MET IE, ATFM ad-hoc group, etc.)

2)	Work closely with the ACSICG AMHS to SWIM transition group to map out a transition plan together. One of the topics to clarify is the need for AMHS to SWIM conversion.

3)	Explore more on SWIM implementation using legacy formats. Starting with the list of common SWIM services, looking for services that can quickly be turned into SWIM information services using legacy data formats. Reference to the ATM Information Reference Model (AIRM) is necessary to maintain semantic interoperability.

4)	Inform the ATM Automation Systems Task Force (ATMAS TF) of the need for ATM automation Systems to integrate into SWIM.

Action WS-1-12: SIPG to capture the above conclusions in a working paper and present them at the SWIM TF/10 meeting.

Next Meeting Dates and Any Other Business

2.32		Two additional action items were raised during the various discussions during the working session. These action items do not fall under any of the agenda items of the working session but rather were a result of the various deliberations. They are as follows:

1)	Operational SWIM Governance, e.g., establishing a regional SWIM office or a SWIM Operations Group.

2)	Provide the link between the SWIM TI document and the SWIM Architecture that was proposed during this working session.

*Action WS-1-13***:** ICAO Secretariat to present these outcomes to the SWIM TF/10 for further actions by the SWIM TF

2.33   The scheduling of the next SIPG working session was deliberated. To minimize travel difficulties, it was decided to hold the next session back-to-back with SWIM TF/10 (19–23 May 2025), the date for the second working session of SIPG was 26-30 May 2025 at the ICAO APAC Regional Office in Bangkok, Thailand.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to:

a) note the outcomes of the SIPG WS/1 and discuss the proposal related to CRV and necessary follow-up actions; and

b) discuss any relevant matter as appropriate

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