REPORT

OF

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

Bangkok, Thailand
25 – 29 May 2026

The views expressed in this Report should be taken as those of SWIM TF/11 Meeting and not of the Organization.

Approved by the Meeting
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MEETING OVERVIEW

1. Introduction

1.1 The Eleventh Meeting of the System Wide Information Management Task Force (SWIM TF/11) was held from **25 – 29 May 2026** in the ICAO APAC Regional Office, Bangkok, Thailand.

2. Attendance

2.1 The Meeting was attended by **100** participants from **16** Member States/Administrations and **3** International Organisations, namely Australia, China, Hong Kong China, Indonesia, Japan, Lao PDR, Maldives, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, United States, Viet Nam, CANSO, IATA and ICAO. The List of participants is provided in **Attachment 1**.

3. Opening of the Meeting

3.1 Dr Amornrat Jirattigalachote, Expert (Director Level), Strategy and Sustainability Office of Aeronautical Radio of Thailand Ltd. (AEROTHAI), Co-Chair of the SWIM TF, opened the Meeting. Dr Amornrat Jirattigalachote outlined the key agenda items, expected discussions and key deliverables for the Meeting. She expressed her appreciation to the participants for their significant contributions to advancing SWIM TF's work.

3.2 Dr Soniya Nibhani, Regional Officer, ANS (CNS) Implementation, warmly welcomed all participants and appreciated the support of Member States/Administrations for the ongoing works of the SWIM TF and ICAO regional activities. She also shared gratitude to all Task Leads for supporting SWIM TF.

4. Officers and Secretariat

4.1 Dr Amornrat Jirattigalachote, Expert (Director Level), Corporate Strategy and Sustainability Office of Aeronautical Radio of Thailand Ltd. (AEROTHAI), chaired the Meeting.

4.2 Dr Soniya Nibhani, Regional Officer ANS (CNS) Implementation, acted as the Secretary of the Meeting with the support of Ms Xu Jian, Associate Programme Officer (CNS) Implementation, and Ms Varapan Meefuengsart, the Programme Assistant from ICAO Asia and Pacific Regional Office.

5. Organisation, working arrangement, language and documentation

5.1 The SWIM TF/11 met as a single body. The working language for the Meeting was English, inclusive of all documentation and this report. A total of **Twenty-nine (29) Working Papers, Nine (9) Information Papers, Two (2) Flimsy,** and **Five (5) Presentations** were considered by the Meeting. The List of Papers is provided in **Attachment 2** to this Report**.**

6. Draft Conclusions, Draft Decisions and Decisions of SWIM – Definition

6.1 SWIM recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

> **Draft Conclusions** deal with matters that, according to APANPIRG's terms of reference, require the attention of States or action by the ICAO in accordance with established procedures;

Draft Decisions deal with the matters of concern only to APANPIRG and its contributory bodies; and

Decisions of the SWIM TF that relate solely to matters dealing with the internal working arrangements of the SWIM TF.

7. List of Conclusions/Decisions from SWIM TF/11

Reference Number		Title of (Draft) Conclusions/Decisions
1. **Draft Decision SWIM TF/11/01**	-	Need for Alignment of Information Service Definitions across Regions
2. **Draft Conclusion SWIM TF/11/02**	-	Adoption of ATFM FIXM Message Data Attributes and Associated Message Templates Based on FIXM Version 4.3 as Asia/Pacific Regional Standard
3 **Draft Conclusion SWIM TF/11/03**	-	Adoption of SWIM Discovery Service baseline standardised version for the APAC Region- SDS v2.0
4. **Draft Decision SWIM TF/11/04**	-	Adoption of APAC Common SWIM Information Services, v2.0

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REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of the Agenda

Adoption of Agenda – Sec (WP/01)

1.1 The provisional agenda presented in **WP/01** was adopted as the agenda for the Meeting.

Agenda Item 2: Election of Co-Chair

2.1 The ICAO Secretariat requested the Meeting for the nomination of the second Co-Chair position. However, no nomination was received at the Meeting. As a result, the position remains vacant. It was suggested that the election be held again at the future SWIM TF Meeting.

Agenda Item 3: Outcomes of relevant Meetings on SWIM-related matters

- ICAO APAC CNS/other relevant Meetings
- SWIM Implementation Pioneer Ad-hoc Group

Review of Relevant CNS Meetings – Sec (WP/02)

3.1 The paper summarised relevant information and updates, highlighting the outcomes of the Thirty-Sixth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/36), the Twenty-Ninth Meeting of Communications, Navigation, and Surveillance Sub Group (CNS SG/29) and the Tenth Meeting of the SWIM Task Force (SWIM TF/10).

3.2 It was noted that the CNS SG/29 adopted five (5) conclusions and six (6) decisions. In addition, based on the outcome of discussions on various agenda items, the CNS SG/29 developed three (3) Draft Conclusions and one (1) draft Decision for consideration by the APANPIRG/36, which were adopted by the APANPIRG/36. The Meeting noted the Conclusions/Decisions adopted by the CNS SG/29 and the APANPIRG/36 and discussed the follow-up.

3.3 The Meeting acknowledged the need for interconnection among different regional IP networks to support global SWIM implementation and requested additional information on CRV updates as well as the establishment and upgrade plans of other regional networks, particularly with regard to ensuring interoperability and interconnection among these networks. ICAO Secretary provided detailed updated information as per the details shared in WP/19 of ACSICG/13 Meeting.

3.4 The SWIM Task Force Co-Chair provided an update on the funding support available for the SWIM implementation support initiative under the Information Management (IM) Section at ICAO Headquarters. The ICAO Secretariat informed that, as part of this new initiative, a range of activities is being planned to facilitate the implementation of seamless information management, including SWIM, AIS/AIM, IP network interconnection, and related educational programmes. It was further noted that, subject to budget availability and necessary approvals, a workshop on the interconnection of CRV and REDDIG III is tentatively planned for the fourth quarter of 2026.

Summary of SWIM-Related Outcomes from Relevant APAC MET Meetings – Sec (WP/03)

3.5 This paper provided a consolidated update on SWIM-related outcomes from recent APAC MET Meetings (MET SG/29, MET/R WG/15, and MET/IE WG/24). It highlighted progress in MET-SWIM guidance, development of SWIM-based MET information services and use cases, and key implementation challenges affecting regional SWIM readiness. It also outlined implications of IWXXM implementation gaps for SWIM interoperability and service readiness to support SWIM TF/11 in refining APAC Common SWIM Information Services and enhancing cross-domain coordination.

3.6 The Meeting discussed the use of SWIM-based MET use cases to support the refinement and alignment of MET-related SWIM information services, including service definitions and exchange models, and to promote consistent development and coordination across relevant domain groups. The Meeting also discussed the use of service interaction models (in particular publish/subscribe and request/reply) for MET information services within the SWIM environment.

3.7 In response to the request to review and support the continued refinement of MET-related entries in the APAC Common SWIM Information Services, in line with ongoing MET/IE WG work, the Meeting noted that the MET-related APAC Common SWIM MET Information Services had been reviewed by the MET/IE WG/24 and would be further reviewed and considered by SWIM TF under WP/16.

3.8 In response to the request to consider the use of SWIM-based MET use cases to support the refinement and alignment of MET-related SWIM information services, including service definitions and exchange models, and to promote consistent development and coordination across relevant domain groups, it was recalled that the Information Management Panel (IMP), at its 4th Meeting, had reviewed the Information Service Definition (ISD) template, which could be used by all aviation-related information domains to ensure consistency in the development of information services.

3.9 It was informed that the work undertaken by the APAC region on the APAC Common SWIM Information Services was presented to the **IMP – Working Group Information/Services** at its 3rd Meeting in June 2025. It was further added that the fields included in the APAC Common SWIM Information Service list are aligned with, and constitute a subset of, the fields contained in the ISD template defined by the IMP.

3.10 It was added that the MET Panel (METP) is expected to undertake work on defining future MET information services. However, no work is currently planned within the METP to define MET information services for traditional MET products.

3.11 The Meeting discussed in detail the need to define MET information services for traditional MET products, and the contributory bodies responsible for defining information services and maintaining the APAC Common SWIM Information Services list as a whole. The Meeting agreed that the approach similar to that adopted by the Panels should be applied. Specifically, the IMP would be responsible for developing the ISD template, while the domain expert groups would be responsible for providing the detailed ISD content for services within their areas of expertise. Accordingly, for the APAC region, the MET/IE WG could consider providing details of MET information services and the FF-ICE Ad-hoc Group could consider providing details of FF-ICE related flight information services, while the consolidation and publication of the APAC Common SWIM Information Services would remain under the responsibility of the SWIM TF.

3.12 It was recalled that the request for the regular review and update of the APAC Common SWIM Information Services by the relevant expert groups had already been conveyed by SWIM TF to all relevant groups under CNS SG, ATM SG, and MET SG. Therefore, the Meeting agreed that there was no need to formulate an additional action item for this task.

3.13 The Meeting discussed the need to ensure alignment among ISDs for similar information services developed by different regions, in addition to the ISDs for information services to be developed by the Panels. It was considered that the need for interregional coordination on this matter should be raised and addressed at the global level, particularly for the ISD of information services related to existing services or products, such as MET products. The Meeting agreed on a two-pronged approach to address this issue, i.e. (*i*) for APAC members of the IMP and APAC members of other related Panels (e.g. METP) to share this concern with the IMP and their respective Panels, **ACTION ITEM 11-1** and (*ii*) formulating the following draft Decision for CNS SG/30 considerations.

<table>
<tr><td colspan="3">Draft Decision SWIM TF/11/01 Need for Alignment of Information Service Definitions across Regions</td></tr>
<tr><td colspan="2">What: To propose to the Information Management Panel (IMP) and relevant Panels to consider the need for alignment of Information Service Definitions for similar information services developed by different regions.</td><td>Expected impact:
☐ Political / Global
☒ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: Considering that the Asia/Pacific regional SWIM will form part of the global SWIM, that ISD template was agreed at IMP/4, and that ISDs for similar information services have been developed by various regions, the consideration of IMP and relevant Panels to ensure alignment of ISDs and cross-regional interoperability of information services is required.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 29-May-26</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☒ICAO HQ ☒Other: SWIM TF</td></tr>
</table>

3.14 Considering that SWIM serves as a foundation for ANS modernisation, and noting the example discussed regarding the challenge in achieving alignment in the implementation of similar information services across regions, the Meeting further agreed to prepare a presentation for the APANPIRG/37 Meeting, apart from regular updates of SWIM TF through the CNS SG Meeting report. This presentation aims to highlight the challenges related to SWIM implementation and seek consideration for further actions to be taken by ICAO HQ and the relevant Panels. **ACTION ITEM 11-2**

3.15 In response to the request to provide advice and guidance, as appropriate, on the use of service interaction models (in particular publish/subscribe and request/reply) for MET information services within the SWIM environment, it was shared that guidance material on the request/reply Message Exchange Pattern (MEP) would be discussed under WP/28. Further discussion is recorded under WP/28.

3.16 Regarding the request to support alignment between MET and SWIM activities, taking into account ongoing regional coordination and related work, the Meeting discussed options such as conducting joint Meetings of MET and SWIM experts, or holding SWIM TF and MET/IE WG Meetings in parallel with one designated joint Meeting day. It was recalled that SWIM TF Task Leads usually meet quarterly and also conduct quarterly joint Meetings with CRV OG experts. In such situations, conducting an additional quarterly Meeting with MET/IE WG experts would create a significant workload for SWIM TF experts. Regarding the option of holding MET/IE WG and SWIM TF Meetings in parallel, it was shared that many MET experts would miss the SWIM TF Meeting. Therefore, this option was not recommended.

3.17 It was decided that the SWIM TF Co-Chair and MET/IE WG Chair/Vice Chair will discuss together topics of common interest and plan for further Meetings as required. **ACTION ITEM 11-3**

Outcomes of ANSIA TF/1 – Sec (WP/04)

3.18 ICAO Secretariat presented the discussions and relevant outcomes of the First Meeting of the ANS Information Assurance Task Force (ANSIA TF/1), which was held from **28 to 30 January 2026** in the ICAO APAC Regional Office, Bangkok, Thailand. The Meeting report, working papers, information papers, and other resources can be accessed by this link.

3.19 It was noted that after Decision CNS SG/29/14 made by CNS SG/29 in 2025 for the creation of ANS Information Assurance Task Force (ANSIA TF), it was agreed that the ANSIA TF would prepare the draft Terms of Reference (ToR), its key deliverables, and plan in close coordination with CRV OG, ACSICG, SWIM TF, TFP Secretary and IMP Secretary. After CNS SG/29, with the collaborative efforts of ANSIA TF experts, the first draft of the ToR was finalised. The ANSIA TF/1 reviewed and modified the draft ToR, and the *Draft Decision ANSIA TF/1/1 – Adoption of Terms of Reference (ToR) of the ANS Information Assurance Task Force (ANSIA TF)* was endorsed by the ANSIA TF/1 for CNS SG/30 adoption.

3.20 The Meeting noted the following three work packages formulated by ANSIA TF/1 and their plan for the way forward:

1. Scoping the regional trust framework
2. Developing PKI and governance arrangements
3. Selecting use cases of regional interest

3.21 It was informed that each of these work packages needs a Statement of Work (SOW) to be elaborated with a scope statement, associated tasks, deliverables and proposed timelines. The Meeting noted the following volunteer States to participate in each work package of the ANSIA TF.

SN	Work Package (WP)	Volunteer States	Work Package Lead
1.	**WP01-** Scoping the regional trust framework	China, Fiji, India, Japan, Malaysia, Philippines, Singapore, Thailand, Tonga and the United States	Singapore
2.	**WP02-** Developing PKI and governance arrangements	Fiji, India, Japan, Philippines, Singapore, Thailand, Tonga and the United States	United States
3.	**WP03-** Selecting use cases of regional interest	Fiji, India, Japan, Philippines, Singapore, Thailand, Tonga, and the United States	India

Table 1- The Work Package of ANSIA TF

3.22 It was added that good progress has been made by **WP01, WP/02 and WP03, leading** to the drafting of the SOW for their work packages. All leads have shared the draft SOW with their work package contributors for review and feedback. The online Meeting of these experts was held on **14 May 2026**. The online Meeting reviewed and finalised the SOW, as well as outlined the next steps to advance the assigned WP.

3.23 The Meeting noted that, with the establishment of ANSIA TF, Task 3 Security Service under SWIM TF would be more appropriately undertaken by the ANSIA TF. Further discussion on this matter was conducted under the SWIM TF Tasks restructuring.

Outcomes of SURICG/11 Meeting – Sec (WP/05)

3.24 The Eleventh Meeting of the Surveillance Implementation Coordination Group (SURICG/10) was held at the ICAO APAC Regional Office, Bangkok, Thailand, from 25 – 27 March 2026. In addition, the Fifth Meeting of the Surveillance Study Group (SURSG/5) was held from 23 – 24 March 2026 at the ICAO APAC Regional Office in Bangkok, Thailand.

3.25 It was noted that SURSG/SURICG had recommended the use of ASTERIX and JSON for surveillance information sharing over SWIM in the APAC region. In addition, it was suggested that the Surveillance Panel (SP) be informed of these regional developments through an information paper for their consideration and feedback. The Meeting was informed that the SURICG Co-Chairs and SWIM TF Chair are preparing a paper to share this information with the Aeronautical Surveillance Working Group under the SP at its 24th Meeting in September 2026. Further updates will be shared with the SWIM TF/12 Meeting. **ACTION ITEM 11-4**

3.26 The SURICG/11 reviewed the revised list of APAC Common SWIM Surveillance Information Services, and further discussed whether the term "FPL" should be replaced with "flight information", as well as how to better reflect both surveillance data and flight plan information in the "Type of Information" field for the Surveillance Data with Flight Plan Information Sharing Service. Thailand volunteered to lead a study on the terminology of "FPL", with participation from Singapore, while China volunteered to study the inclusion of a footnote in the "Type of Information" field. Both tasks will report back to the next SURICG Meeting.

3.27 It was recalled that the SURSG/5 recommended that Guidance Material for the sharing of surveillance data in SWIM should be added as a reference document for APAC Common SWIM Surveillance Information Services to support service implementers. This information was shared with Task 6 of the SWIM TF.

3.28 The SURSG/5 reviewed and finalised *the Guidance Materials for the sharing of surveillance data in SWIM*. The finalised Guidance Material was endorsed by **Draft Conclusion SURICG/11/01** (SURSG/5/01) – *Guidance Materials for the sharing of surveillance data in SWIM* for CNS SG/30 adoption. The draft Guidance Material for the sharing of surveillance data in SWIM is provided in **Appendix 1** to this report. As SWIM development in the region is ongoing, it was anticipated that future updates on the Guidance Material would be necessary, especially on any further required details of the surveillance information services. The Meeting was informed that SURICG has assumed this responsibility and will respond appropriately.

3.29 The Meeting was informed that SURICG/11 reviewed the Work Plan of SURSG in view of the progress and development following SURSG/1 to SURSG/4. As all the tasks under the ToR allocated to SURSG had been completed, the dissolution of the SURSG was endorsed through **Draft Decision SURICG/11/02** (SURSG/5/02) – *Proposing dissolution of SURSG*.

3.30 The Meeting appreciated the SURSG for the successful completion of the tasks assigned to it and its contribution to SWIM development in the APAC region.

Outcomes of ACSICG/13 Meeting – Sec (WP/06)

3.31 The paper summarised relevant information and updates on the outcomes of the ATN Workshop and the Thirteenth Meeting of the Aeronautical Communication Services Implementation Coordination Group (ACSICG/13) held at Nadi, Fiji, from 20 to 24 April 2026. The Meeting report, working papers, information papers, and other resources can be accessed by the following link:
https://www.icao.int/APAC/Meetingdocs?fid=42491

3.32 It was noted ATSCG Chair presented the outcomes of recent ATSCG discussions on the AMHS to SWIM transition in the APAC region. He summarised observed risks and issues associated with prolonged mixed AMHS–SWIM operations, key conclusions reached by ATSCG, and proposed recommendations and follow-up tasks, as well as the minimum safeguards intended to support regional coordination, service continuity, and interoperability during the transition period, while recognising that States retain responsibility for national implementation and safety assessments. The ACSICG/13 Meeting discussed the significance of the information shared in minimum safeguards and added that these safeguards are essential to keep business continuity while migrating from AMHS to SWIM. Accordingly, the ACSICG/13 Meeting endorsed the **Draft Conclusion ACSICG/13/01 -** *Adoption of Minimum Safeguards for AMHS–SWIM Transition* for adoption at APANPIRG/37 through CNS SG/30.

3.33 The MET/IE WG Chair shared the concern about the implications of the content of the Minimum Safeguards for AMHS–SWIM Transition document. The Meeting discussed the motivation for developing the document and agreed to recommend that the leadership of contributory bodies related to the use of AMHS and/or SWIM, namely the FF-ICE Ad-Hoc Group, AAITF, and MET/IE WG, review the document and provide their feedback to the ICAO Secretariat for further sharing with the ATSCG Meeting planned on 19 August 2026. **ACTION ITEM 11-5**

Outcomes of SWIM TF Task Leads Meetings and Joint Meetings of SWIM TF Task Leads and CRV OG Experts in 2025-26 – Sec (WP/07)

3.34 The paper presented outcomes of SWIM TF Task Leads (TLs) Meetings and Joint CRV OG experts and SWIM TF TLs Meetings, after the SWIM TF/10 Meeting, held in 2025-2026. The Meeting noted that a total of **three** (3) SWIM TF TLs coordination Meetings were held after SWIM TF/10 to review the outstanding SWIM TF/10 action. The Minutes of the Meetings (MoM) of the three Meetings on **21 August 2025, 17 November 2025** and **3 February 2026** were shared with the Meeting.

3.35 In addition, a total of three (3) Joint Meetings of the CRV OG experts and SWIM TF TLs were conducted on 1-5 September 2025, 20 November 2025 and 5 February 2026. Out of three Meetings, the 1-5 September 2025 Meeting was an in-person Meeting, which was named the *ICAO APAC CRV-SWIM Experts Workshop: Reviewing of CRV II Specifications and ICAO APAC SWIM Architecture***.**

SWIM Implementation Pioneer Ad-hoc Group Progress Report – Singapore (WP/08)

3.36 Singapore presented the work done by the SWIM Implementation Pioneer ad-hoc Group (SIPG) since the last SWIM TF Meeting (SWIM TF/10) held from 20 to 23 May 2025. It was recalled that the SIPG Terms of Reference (ToR) were revised through SWIM TF/10 -Flimsy/01. Resulting from the SIPG WS/2 held following the SWIM TF/10 from 26 to 30 May, the SIPG laid out its work program in the form of 11 Tasks and assigned priorities to them, as well as agreed on the initial planned timeline as follows:

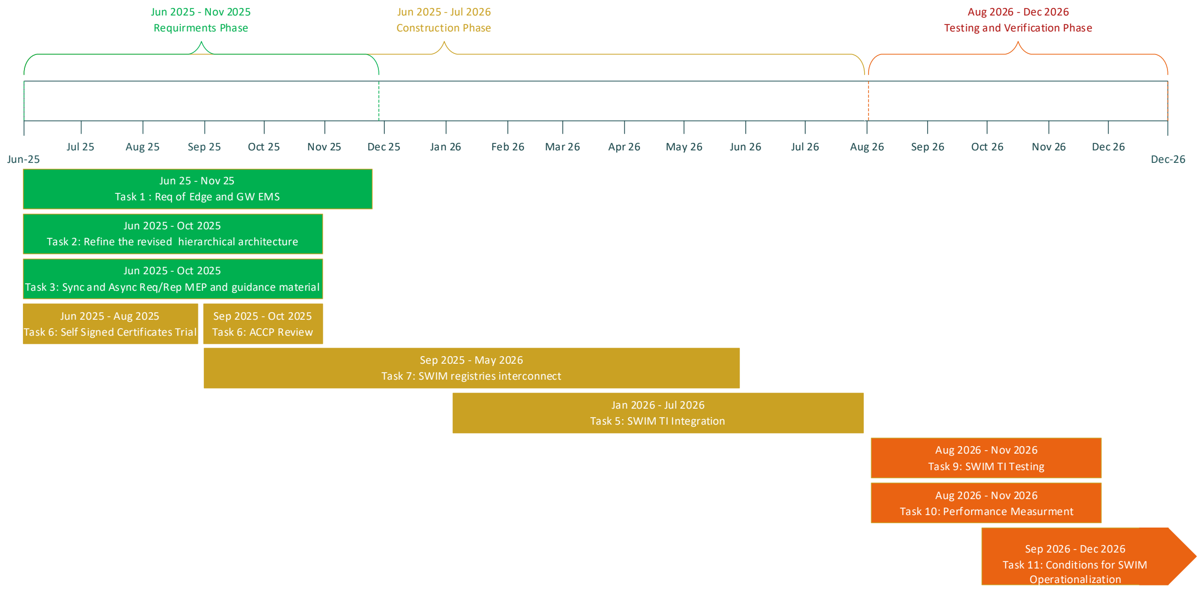

Figure 1- Initial SIPG Work Program Timeline

3.37 It was noted that SIPG conducted 10 online Meetings since SWIM TF/10 to make progress on the work plan as presented above. However, due to administrative hurdles and unexpected technical challenges faced by some of the task members, the timeline has been revised as follows:

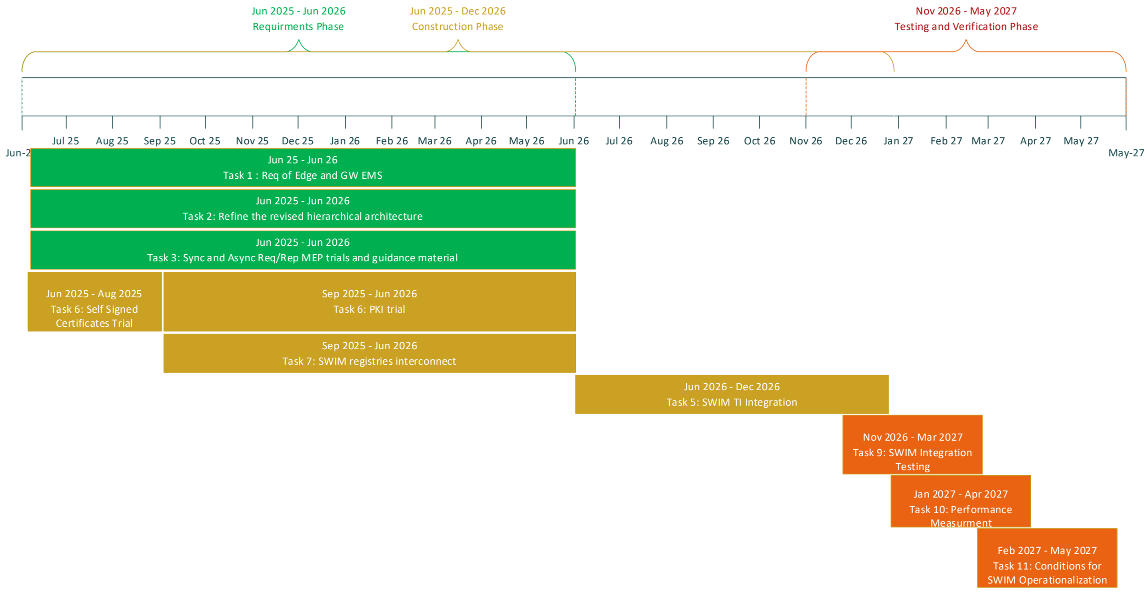

Figure 2: Revised SIPG Work Program Timeline

3.38 The Meeting was informed of the SIPG achievements under Task 2, Task 3, Task 6 and Task 7. It was noted that further details on the progress of the respective tasks were presented in the separate working papers. The Meeting was also informed that SIPG will continue to advance the work according to the revised work plan. Additionally, it was highlighted that the need for closer coordination with the ANS Information Security Task Force had been raised during the SIPG monthly discussions, especially regarding their deliverables and timelines, to ensure proper sequencing with the SWIM Task Force timeline.

3.39 The Meeting was informed that the 3rd working session will be conducted immediately after the SWIM TF/11 Meeting, from 1 to 5 June 2026. The SIPG will be developing a more detailed work programme for Tasks 5, 9, 10 and 11. The target is for SIPG to complete the work by Q1 2028 in order to be able to present the outcomes at the SWIM TF Meeting that year.

3.40 SWIM TF Co-Chair expressed her appreciation to SIPG for the tremendous amount of work being undertaken by the group.

3.41 In response to a question regarding the SIPG work plan for the period from Q2 2027, when the regional SWIM TI prototype is expected to become available, to Q1 2028, when SIPG expects to complete its work, it was clarified that testing of selected information services on the APAC SWIM TI prototype is anticipated during that period.

3.42 In response to a query regarding cybersecurity, the Meeting was informed that the focus will be placed on SWIM TI security rather than information security.

3.43 The Meeting emphasised the importance of participation by Telecom Malaysia, which is leading Task 6 of SIPG, in all key discussions, including in-person Meetings, to enhance the overall efficiency of SIPG. It was noted that the absence of key members from significant Meetings would lead to delays in the work assigned to the group, thereby affecting multiple States. The Meeting requested the support of the ICAO Secretariat to coordinate with the Civil Aviation Authority of Malaysia (CAAM) to encourage the active participation of Telecom Malaysia in both in-person and online SIPG Meetings. **ACTION ITEM 11-6**

3.44 In response to a request for suggestions regarding the involvement required by SIPG Task 6 in the work of ANSIA TF, it was suggested that SIPG Task 6 participate in all three work packages of ANSIA TF. To enhance the effectiveness of Task 6 activities, the Meeting requested the ICAO Secretariat to coordinate with CAAM to consider nominating a member to Work Package 2 of ANSIA TF. **ACTION ITEM 11-7**

3.45 In response to the need for more than one SWIM TF Meeting per year due to the ongoing critical phase of APAC SWIM implementation, the Meeting agreed that additional Meetings can be conducted, if necessary. However, given the current political situation impacting on the economy, it was suggested that the need and feasibility of holding multiple Meetings be evaluated in the future.

Asia/Pacific Regional Flight and Flow Information for a Collaborative Environment (FF-ICE) Release 1 Implementation Plan – FF-ICE Ad Hoc Group (WP/09)

3.46 Singapore and Thailand, on behalf of the ICAO APAC FF-ICE Ad-Hoc Group, presented the draft APAC Regional FF-ICE Release 1 Implementation Plan.

3.47 The Meeting noted that the APAC FF-ICE/R1 Plan provides regional guidance for implementing FF-ICE/R1 services, covering operational and technical requirements, and recommends areas of harmonisation for the APAC region (e.g., FF-ICE flight plan (eFPL) validation checks, the interpretation of Filing Status, the Filing Status responses for identified ATFM scenarios). The APAC FF-ICE/R1 Plan highlights that the implementation of SWIM, a key enabler for FF-ICE, within the APAC region, should follow the regionally agreed-upon guidelines, including APAC SWIM Technical Infrastructure Profiles Version 1.0, and the APAC Common SWIM Information Services, to ensure interoperability and harmonised implementation. The Plan also identifies that interactions between the FF-ICE capable ATM Service Providers (eASPs) and the FF-ICE capable Airspace Users (eAUs) through FF-ICE services are conducted via SWIM-based message exchanges.

3.48 It was also noted that the APAC FF-ICE/R1 Plan specifies the use of Flight Information Exchange Model (FIXM) and the regional Extension to support the digital flight information exchange in a SWIM environment. As agreed by APANPIRG/35 through its Conclusion APANPIRG/35/4, the APAC FF-ICE/R1 Plan identifies that FIXM version 4.3 shall be used as the standard format for the implementation of FF-ICE/R1 services in the APAC region starting from Q3/2026. Additionally, the APAC regional FIXM version 4.3.0 Extension shall be used for cross-border ATFM operations, A-CDM, ATFM/A-CDM integration, and traffic synchronization within the region, as agreed by APANPIRG/36 through its Conclusion APANPIRG/36/12. The change process for the cross-border FIXM operating version used to support system-to-system information exchange via SWIM shall follow the procedure agreed by ATM/SG/13 through its Conclusion ATM/SG/13-5. It was shared that, in FF-ICE operations, eFPL evaluations require checks against restrictions/constraints managed by existing ATM systems; if available, SWIM information services should be used to provide more details of applicable restrictions and constraints.

3.49 The Meeting was informed that the APAC FF-ICE/R1 Plan recommended implementation timeline for APAC as follows:

a) 2030: commencement of technical tests and trials involving eAUs and cross-border eASP interactions;

b) 2031: begin operational tests to identify and resolve any issues; and

c) 2032: full operationalisation of three FF-ICE/R1 services (Filing Service, Flight Data Request Service and Notification Service).

3.50 It was also informed that the draft APAC FF-ICE/R1 Plan, as agreed by the ICAO APAC FF-ICE Ad-Hoc Group in March 2026 was reviewed by the ATFM & A-CDM SG/16 in April 2026. The ATFM & A-CDM SG/16 provided two suggestions: to review paragraph 6.3.6.2.4, in particular the example related to the “ACCEPTABLE” Filing Status, and to consider the inclusion of ATFM Daily Plan (ADP) in the scenarios in the table stipulated in the Appendix C of the Plan.

3.51 The Meeting reviewed the draft APAC FF-ICE/R1 Plan provided in **Appendix 2**, particularly the implementation timeline. It was informed that the draft APAC FF-ICE/R1 Plan, including all feedback from ATFM & A-CDM SG/16 and SWIM TF/11, will be submitted to CNS SG/30 (6-10 July 2026) and ATM SG/14 (3-7 August 2026) for approval. Subject to approval by both groups and the availability of Doc 9965 Manual on FF-ICE Vol. II – Implementation Guidance, the draft APAC FF-ICE/R1 Plan will be submitted to APANPIRG/37 (tentatively in November 2026) for endorsement.

3.52 Additionally, the Meeting was informed that the dissolution of the FF-ICE Ad-Hoc group and the establishment of the APAC FF-ICE Implementation Task Force will be proposed to ATM SG. The Implementation Task Force would, *inter alia*, address the transition from FPL2012 to FF-ICE, operations in a mixed-mode environment, and FF-ICE/R1 implementation issues in the APAC region.

3.53 The Meeting shared the concern about the proposed implementation timeline. It was discussed that, if the timeline proposed by the FF-ICE Ad-Hoc Group is based on the assumption that fully operational SWIM would be available by 2030, the proposed three-year period from the commencement of technical tests and trials to the full operationalisation of three FF-ICE/R1 services is highly challenging. It was suggested that the FF-ICE Ad-Hoc group consider testing the FF-ICE R/1 services over the SWIM TI prototype being developed by SIPG, which is expected to be ready by Q2 2027. **ACTION ITEM 11-8** By doing so, it would allow ample time for services testing, while ensuring that the regional SWIM TI would be able to support the requirements of FF-ICE/R1. For further discussion on the possibility of conducting tests and trials on the regional SWIM TI prototype starting from Q2 2027, it was suggested that the FF-ICE Ad-Hoc group and SIPG first discuss the feasibility of such tests and trials. **ACTION ITEM 11-9**

3.54 In response to a question regarding the appropriate timeframe for the FF-ICE Ad-hoc Group to initiate coordination with SIPG for testing activities, it was suggested that coordination commence from March 2027, given that the regional SWIM TI prototype is expected to be ready by Q2 2027. **ACTION ITEM 11-10**

3.55 MET/IE WG Chair suggested considering the meteorological information services proposed for introduction from 2030 in the APAC FF-ICE Implementation Plan. It was clarified that the current draft of the APAC FF-ICE Implementation Plan refers to restrictions and constraints arising from environmental conditions (e.g. SIGMETs, WAFs, TAFs, and volcanic ash) that impact airspace availability (line 728 of the draft Plan). While SIGMETs and TAFs reflect traditional meteorological products, the METP is presently finalising requirements for new aeronautical meteorological information services — namely Aerodrome Meteorological Observation Information Services (AMOIS), Aerodrome Meteorological Forecast Information Services (AMFIS), and the Hazardous Weather Information Service (HWIS) — which are expected to be introduced as a Recommended Practice from 2030. It was suggested that the meteorological terminology used in the APAC FF-ICE Implementation Plan be generalised to ensure compatibility with both current and future services. For example, the text could refer more broadly to “aerodrome and en-route meteorological forecasts and hazards”, or similar. The following modifications were proposed for the FF-ICE Ad-Hoc Group consideration:

> *“environmental conditions such as ~~SIGMETs, WAFs, TAFs, and volcanic ash areas~~ aerodrome and enroute meteorological forecasts and hazards, affecting airspace availability or constraints*;”

Update on MET-SWIM Documentation – Australia (WP/10)

3.56 This paper provided updates on guidance documents to support the implementation of meteorological aspects of SWIM. This included an updated MET-SWIM Roadmap, a new Guidelines for MET-SWIM Implementation and the deprecation of the MET-SWIM Plan.

3.57 It was informed that Version 2.3 of the MET-SWIM Roadmap was finalised and published following the Fifth Meeting of the METP (METP/5) in 2021. Since this time, the development of MET information services has greatly progressed, requiring a substantial update to the MET-SWIM Roadmap. As such, the WG-MIE prepared Version 3 of the MET-SWIM Roadmap to reflect the latest advancements and the updated predictions for the future environment. The key changes in version 3 of the MET-SWIM Roadmap include:

- Alignment of Figures 1-4 with updated expected capabilities within each Global Air Navigation Plan (GANP) Aviation System Block Upgrade (ASBU)
  - Block 1 (2019-2024): Exchange of TAC and IWXXM formats over the Aeronautical Fixed System (AFS)
  - Block 2 (2025-2030): Implementation of information services as Recommended Practice
  - Block 3 (2031-2036): Cessation of international TAC exchange
  - Block 4 (2036+): Information services as the primary exchange mechanism for MET information
  - Updated roadmap for modernization of MET exchange (Table 1): SWIM-enabled capabilities optional in Block 2, expected in Block 3.

- Updated plan for removal of TAC as a Standard format: Proposed to be included in Amendment 83 to ICAO Annex 3 (expected applicability of November 2027) with embedded applicability of November 2030

- Updated guidance on issuing single location messages instead of bulletins

- General editorial revisions.

3.58 It was noted that the METP/6 agreed to the proposed Version 3 of the MET-SWIM Roadmap and formulated the **Decision 5/6 — MET-SWIM Roadmap.**

3.59 The Meeting was informed that the First Edition of the Guidelines for MET-SWIM Implementation, Version 3 of the MET-SWIM Roadmap, and the current version (v5) of the IWXXM Guidelines are available at ICAO APAC e-doc portal -> MET.

3.60 The Meeting noted that the METP WG-MIE is preparing further updates to the MET-SWIM Guidelines and MET-SWIM Roadmap and welcomes suggestions for additional content or changes to the current editions. New editions of MET-SWIM Guidelines and IWXXM Guidelines are expected within the 2026 calendar year.

3.61 The Meeting was encouraged to review the MET-SWIM and IWXXM guidance documents and provide any suggested changes. It was agreed that feedback on both documents can be provided by SWIM TF experts at any time; however, to facilitate incorporation of proposed changes into the next editions, it was suggested that comments be submitted before **July 2026**. It was also suggested that States/Administrations review both documents and provide any proposed amendments to the ICAO Secretary before July 2026 as well. **ACTION ITEM 11-11**

Work Progress of SIPG Task 2: Refine the Revised Hierarchical Architecture – China (WP/24)

3.62 China presented the progress of SIPG Task 2: Refine the revised hierarchical architecture. The Meeting was informed that SIPG Task 2 is led by China, with participants including Australia, Hong Kong China, India, Japan, Fiji, Singapore, Thailand, Malaysia, USA, Republic of Korea, New Zealand, and CANSO. It was informed that a hierarchical architecture scheme has been proposed, with participants currently conducting joint testing and verification based on consensus. It was also noted that SIPG Task 2 collaborates with Tasks 1 and 3 to establish a unified test environment to provide stable, interoperable architectural support for the implementation of APAC SWIM.

3.63 China shared that the SIPG Task 2 research currently focuses on routing mechanisms under different business scenarios, naming and configuration specifications of multiple queues and the specification of message priority, data model and other features through message metadata. It was further explained that the SIPG Task 2 test plan adopts a layered approach that progresses from simple to complex and supports continuous expansion in order to ensure effective support for the research work. The detailed task, technical solutions and test plan were shared with the Meeting.

3.64 The Meeting was informed that SWIM TI Interoperability Routing Mechanism integrates on-demand routing strategies, relying on message brokers and routing services to meet the Message Exchange Patterns (MEPs) and Quality of Service (QoS) requirements of SWIM information services. Proposals for Business Scenario Routing, Transmission Path Routing, and Granularity-Adapted Routing were shared with the Meeting.

3.65 For APAC SWIM Address Naming Pattern, scope and environment identification, routing-oriented address architecture, and information domain classification were explained.

3.66 It was noted that based on the APAC SWIM hierarchical architecture, SIPG Task 2 has formulated a seven-level test plan for heterogeneous EMSs interconnected over the CRV network. The test plan follows the principles of progressive correlation and full-scenario coverage:

a) Level 1 and Level 2 focus on basic connectivity to verify inter-node reachability;

b) The middle three levels (Level 3 - 5) focus on message transmission and routing to ensure reliable and accurate message delivery;

c) The upper two levels (Level 6 and Level 7) focus on stability and adaptability to guarantee service availability under anomalies and adaptation to topology adjustments.

3.67 The Meeting noted that to date, some participants of SIPG Task 2 have constructed their physical SWIM TIs based on hierarchical architecture, enabling participants to conduct testing on the SWIM TI. Six participants have indicated their intention to deploy EMS nodes and join the testing activities. Five participants have successfully passed the Level 1 (Basic Network Connectivity) and Level 2 (Direct EMS Interconnection) tests, with all inter-node communication links verified as fully qualified, as shown in Figure 1.

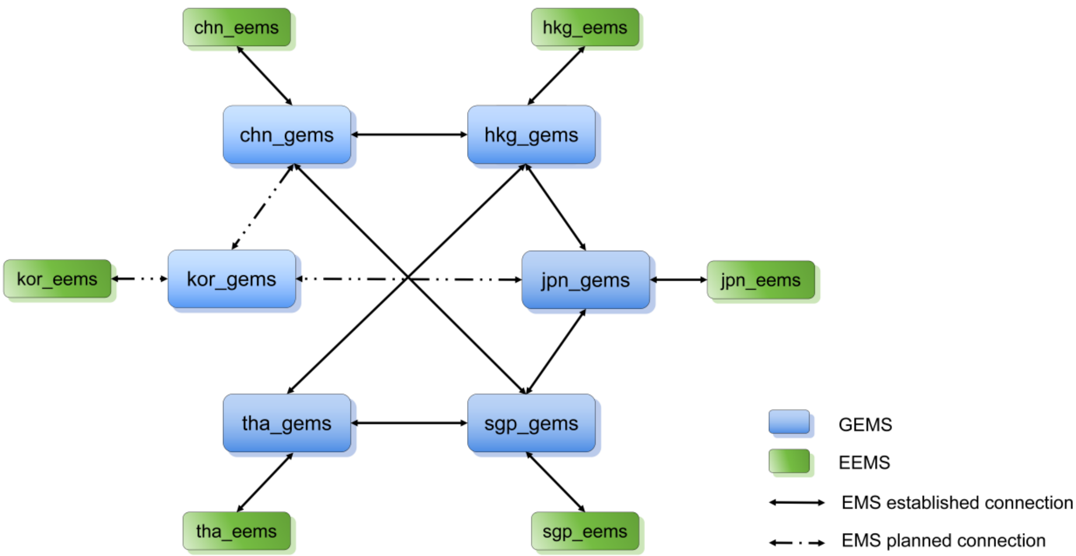

Figure 3: Participants' Connection Status

3.68 The Meeting noted that the Level 3 (Basic Message Transmission) testing is progressing as scheduled, laying a solid foundation for subsequent advanced testing phases, including multi-node routing and exception fault tolerance. Additionally, it was shared that verification is planned to be completed in 2026. As the testing activities move forward, test levels and EMS participants will be expanded as required by actual operational and testing needs.

3.69 The Meeting was presented with "**APAC SWIM Hierarchical Architecture Test Plan",** provided in **Appendix 3,** drafted by SIPG Task 2**.** The Meeting encouraged more States/Administrations to consider participating in the SIPG Task 2 activities and to provide feedback on the Test Plan.

3.70 In response to a query regarding performance testing, such as latency and failover tests, it was clarified that these tests will be conducted in coordination with SIPG Task 1. Regarding a question on the plan to conduct testing over the internet, it was shared that currently, there is only a plan to conduct tests using CRV.

3.71 It was queried whether SIPG Task 2 will conduct testing using other types of routing, e.g. topic-based routing, in addition to message-header based routing, and whether a comparison of message header-based routing and topic-based routing will be assessed. Task 2 Lead shared that other types of routing are being considered for future testing, including evaluation of the outcomes of tests using different routing methods under various scenarios. The Meeting was informed that the results of such testing will be shared in the future.

3.72 The Meeting noted that, based on the SIPG plan presented in WP/08, Task 2 is expected to be completed by June 2026. However, according to the plan shared by China in this working paper, all levels of testing are scheduled for completion by the end of 2026. It was clarified that the timeline provided in WP/08 is based on the completion of Level 4 testing, whereas the timeline shared by China is based on the completion of Level 6 testing. The Meeting requested SIPG to further discuss and establish clear criteria and indicators for determining the completion of Task 2 and reconciling the timelines at the next SIPG Meeting. **ACTION ITEM 11-12**

Outcomes of ATFM & A-CDM Steering Group 16 Meeting – ATFM & A-CDM SG Chair (WP/29)

3.73 This paper presented the discussions and relevant outcomes of the Sixteenth Meeting of Air Traffic Flow Management and Airport Collaborative Decision-Making Steering Group (ATFM & A-CDM SG/16), which was held in Bangkok, Thailand, from 6 to 10 April 2026. The Meeting report, working papers, information papers, and other resources can be accessed by the following link: [APAC Meetings | International Civil Aviation Organisation].

3.74 It was noted under ATFM & A-CDM SG/16 - *Agenda Item 6b*: *ATFM, A-CDM systems communication – ATFN/AMHS, FIXM, SWIM,* two WPs were discussed:

i. Guidance Material to Assist APANPIRG Subsidiary Groups in Reviewing and Updating the List of APAC Common SWIM Information Services (WP-6b-01)

ii. ATFM FIXM Message Data Attributes and Associated Message Templates Based on FIXM Version 4.3 as Asia/Pacific Regional Standard (WP-6b-02)

3.75 Guidance material provided in ATFM & A-CDM/SG/16 WP-6b-01 Appendix A illustrated the type and level of detail required, including business functionality of the information service, a brief description of the service, type of information to be exchanged, information exchange model/message type, message exchange pattern, and priority. A worked example was included for reference.

3.76 The ATFM & A-CDM SG/16 was informed that APANPIRG subsidiary groups were invited to assess whether existing entries combine multiple business functions and, if so, consider splitting them into more detailed and focused information services. Additionally, the ATFM & A-CDM SG/16 noted that a working draft of the Second Version had been developed, and APANPIRG subsidiary groups were requested to submit updates using "track changes" for consolidation at the SWIM TF/11 (26–29 May 2026).

3.77 The ATFM & A-CDM SG/16 noted the feedback from the APAC FF-ICE Ad-Hoc Group, which emphasised that domain-specific groups should focus on defining business rules and business process completion criteria, while the SWIM TF should determine MEP. The APAC FF-ICE Ad-Hoc Group also recommended inclusion of comprehensive operational scenarios as appendices to the Business Functionality for APAC Common SWIM Information Services document.

3.78 During the discussions at the ATFM & A-CDM SG/16, Singapore and Thailand presented a joint response that aligned with the recommendations of the APAC FF-ICE Ad hoc Group discussion. The response proposed updates to the APAC Common SWIM Information Services related to ATFM, focusing on improving clarity and usability. Key proposals included replacing the existing “Priority” column with two new columns - “Applicability” and “Desired Implementation Timeframe” – to better reflect operational relevance and implementation planning considerations. It was also noted by the ATFM & A-CDM SG/16 that the current MEP column had created ambiguity between business and technical aspects; therefore, it was proposed that MEP be addressed by the SWIM TF.

3.79 In addition, the ATFM & A-CDM SG/16 agreed with the recommendation by the APAC FF-ICE Ad-Hoc Group to enhance the “Brief description of the service” column by incorporating a reference to a dedicated appendix, to provide detailed use cases and required MEPs. Derived from the existing work of the Asia-Pacific Cross-Border Multi-Nodal ATFM Collaboration (AMNAC), **five ATFM information exchange scenarios** related to Flight-Specific ATFM Measure Service and ATFM/A-CDM Integration Service were developed. The finalised scenarios, provided in **Appendix 4**, were submitted to SWIM TF/11 for identification of the appropriate MEP. The Meeting reviewed the document and agreed that the proposed content is sufficient for SWIM TF to initiate the identification of MEP.

3.80 The Meeting discussed whether the receipt confirmation for ATFM messages identified in the five scenarios is required, as this would affect the selection of the MEP. It was clarified that, apart from ATFM units, airspace users, and airport operators, confirmation is not required. Furthermore, the Meeting discussed whether all possible MEPs for all types of users of ATFM-related SWIM information services should be included in the breakdown scenario tables. The Meeting agreed that only the MEP required to fulfil the operational requirements identified by the domain expert groups should be included, in order to avoid confusion and to provide a minimum implementation requirement for information service implementers.

3.81 The Meeting was informed of the work on identification, mapping, and development of ATFM FIXM message data attributes and associated message templates based on FIXM version 4.3, to support cross-border ATFM operations, A-CDM, ATFM/A-CDM integration, and traffic synchronisation in a SWIM environment in the APAC region.

3.82 The Meeting noted *Conclusion APANPIRG/36/12* on the adoption of APAC Regional FIXM 4.3 Extension, which includes data attributes required to support regional operational requirements that are not included in the FIXM 4.3 Core. Based on this identification and mapping, the Technical Sub-Group (TSG) of AMNAC developed ATFM FIXM message templates (*ATFM & A-CDM/SG/16 WP-6b-02 Appendix C*). These templates defined the structure and rules for automated validation of ATFM-related FIXM messages, covering CTOT/CTO allocation/cancellation and TTOT allocation. The templates also integrated the use of FIXM 4.3 Core and APAC Extension within the template schema to ensure harmonised and interoperable message construction for cross-border ATFM system-to-system exchanges via SWIM. It was noted that Appendix A of ATFM & A-CDM SG/16 – WP-6b-02 provides the list of data attributes for the five identified ATFM FIXM messages. Appendix B provides a mapping of data attributes to the FIXM version 4.3 Core and the APAC Extension. Appendix C provides the associated ATFM FIXM message templates to support harmonised and automated message validation.

3.83 It was added that, following the ATFM & A-CDM SG/16, additional feedback on the ATFM FIXM message templates was received, and the message template schema was updated accordingly. The validation of the updated message template scheme was successfully conducted by Singapore and Thailand in May 2026, as presented in SWIM TF/11 – WP/12.

3.84 The Meeting was shared that the associated ATFM FIXM message templates developed to support harmonised and automated message validation fall under the responsibility of the SWIM TF. Therefore, the ATFM FIXM message templates schema required review by the SWIM TF. Discussion on this matter was recorded under WP/12.

Agenda Item 4: Updates on progress and issues under the SWIM TF Task groups structure

a) Implementation planning
- Task 1: Regional Implementation Philosophy & Roadmap

b) SWIM infrastructure
- Task 2: Regional SWIM Infrastructure
- Task 3: Security Services

Hierarchical SWIM Architecture to Achieve Message Exchange Patterns in the APAC Region – Japan (WP/21)

4.1 The Meeting noted that in accordance with the decision of the SWIM TF, a hierarchical architecture has been adopted for the APAC SWIM implementation. Therefore, the approaches to achieving the different message exchange patterns defined in ICAO Doc 10203 Manual on SWIM Implementation based on this architecture need to be discussed and clarified. This working paper clarified the application requirements for these message exchange patterns and discussed technical approaches for achieving them through coordination among Edge and Gateway Enterprise Messaging Services (EMSs).

4.2 It was informed that to ensure the utilisation of various information services, the Manual on SWIM Implementation (ICAO Doc 10203) defines several Message Exchange Patterns (MEPs), including synchronous and asynchronous request/reply, publish/subscribe and one-way. These MEPs are expected to be supported by SWIM TI. However, the practical implementation of these patterns within the APAC SWIM hierarchical architecture requires further discussion and clarification. In particular, the coordination between Edge and Gateway EMSs introduces specific technical and operational considerations that need to be addressed to ensure interoperability and consistency across States.

4.3 Processes and constraints of Synchronous Request/Reply MEP, Asynchronous Request/Reply MEP, Publish/Subscribe MEP and one-way MEP were shared with the Meeting.

4.4 It was shared that, within the APAC SWIM TI, AMQP 1.0 is mandated as the communication protocol for the Asynchronous Request/Reply MEP. The AMQP header properties, which are included in messages to improve reliability and efficiency in a multi-hop delivery environment, were recommended at the Meeting. The message headers supporting message routing across Edge and Gateway EMSs (EEMS and GEMS) in the APAC region, as well as the naming convention and source, recipient, and system identifier format for the Asynchronous Request/Reply MEP were explained.

4.5 The Meeting noted that, within the APAC SWIM TI, AMQP 1.0 is also used to support the publish/subscribe MEP. Topics are modelled as AMQP node addresses, whereby publishers establish a sender link to a topic node and consumers establish receiver links. The EMS is responsible for the fan-out of messages received on a topic link to all attached receiver links. As Topics are structured as hierarchical address strings using a defined delimiter convention, a consistent topic naming convention was recommended to enable topic relay and filtering among Edge and Gateway EMSs. The topic naming convention was recommended for the publish/subscribe MEP for use in the APAC SWIM environment.

4.6 The Meeting was informed that, within the APAC SWIM TI, HTTP/HTTPS is the designated protocol for synchronous exchange, aligning with the RESTful, resource-oriented information service interface. HTTPS shall be used for all inter-EMS and cross-domain traffic. Mutual TLS (mTLS) should be applied for machine-to-machine service invocations across EMS domains. Unlike AMQP-based patterns, HTTP/HTTPS does not support brokered intermediary routing. It was informed that implementation approaches have been discussed by SIPG Task 3. A hybrid approach via the coordination between Edge EMS and Gateway EMS is recommended. An API Gateway deployed at the Edge EMS level provides centralised management for local service requests. The following key functions should be considered:

- Service registry and endpoint resolution: Maps logical SWIM information service to physical backend URIs.
- Authentication and authorisation enforcement: Validates OAuth 2.0 tokens, mTLS and client certificates before forwarding requests.
- Rate limiting and throttling: Protects downstream services from overload.
- Request/response transformation: Adapts message formats where necessary for legacy or heterogeneous services.
- Load balancing: Distributes traffic across multiple instances of a service

4.7 It was proposed the following coordination principles apply across all three MEPs and should be adopted in APAC SWIM TI implementations.

- Federation links: AMQP federation links between Edge and Gateway EMSs should use persistent, durable connections with automatic reconnect logic to handle network interruptions.
- Naming convention governance: A shared, registry-maintained topic/URI naming convention must be established and governed by the SWIM Task Force to prevent conflicts and ensure interoperability in the APAC region.
- Failover and redundancy: Gateway EMS nodes should be deployed in active-active or active-standby pairs; Edge EMS nodes should support automatic failover to alternate Gateway EMS connections.

4.8 The Meeting noted that the practical validation and evaluation have been conducted through SIPG activities and agreed to provide this working paper to the relevant SIPG Tasks and SWIM TF Task group, particularly SIPG Tasks 1, 2, and 3, and SWIM TF Task 6, for further deliberation.

4.9 The Meeting discussed in detail all recommendations provided in this Working Paper and agreed that there remains a need for more detailed deliberation on each recommendation to ensure alignment with other work being conducted under SIPG, such as the development of Guidance Material on Request/Reply MEP. It was suggested that these recommendations be further discussed at the SIPG Meeting. **ACTION ITEM 11-13**

c) Technical architecture

– Task 4: Development and Maintenance of Regional Information Exchange Models

ATFM FIXM Message and Associated Message Templates based on FIXM Version 4.3 – ATFM SG (WP/12)

4.10 This paper presented the work on the development of ATFM FIXM message and associated message templates based on FIXM version 4.3 to support cross-border ATFM operations, A-CDM, ATFM/A-CDM integration, and traffic synchronisation in the SWIM environment in Asia/Pacific region. The Meeting noted that FIXM version 4.3 was formalised as the regionally agreed information exchange model for information exchange between operational ATFM systems. In support of cross-border ATFM operations and ATFM/A-CDM integration, successive regional FIXM extensions were developed collaboratively by the ATFM SG and the SWIM TF. In line with *Conclusion APANPIRG/35/4* and to ensure readiness of the implementation of ATFM FIXM information exchange, the Technical Sub-Group (TSG) of the Asia-Pacific Cross-Border Multi-Nodal ATFM Collaboration (AMNAC), in collaboration with members of the SWIM TF, identified the ATFM FIXM message data attributes, mapped them to the FIXM version 4.3 Core and Extension, and developed the associated message templates.

4.11 It was informed that this work was presented to the ATFM & A-CDM SG/16 through WP-6b-02 in April 2026. Consequently, the ATFM & A-CDM SG/16 agreed, through its *Draft Conclusion ATFM & A-CDM/SG/16-6*, to the adoption of the identified ATFM FIXM message data attributes, mapping, and the associated message templates, based on FIXM version 4.3, as regional standard templates effective Q1/2027.

4.12 The Meeting noted that additional feedback was received after ATFM & A-CDM SG/16, and the templates were subsequently updated. Singapore and Thailand successfully validated the updated message templates in May 2026. It was highlighted that with the updated message template schema, the identified ATFM message data attributes and their mapping to the FIXM version 4.3 Core and the APAC Extension, as agreed by ATFM & A-CDM SG/16, remain unchanged.

4.13 With the abovementioned, the following draft conclusion was proposed, which was endorsed by the SWIM TF/11 Meeting for APANPIRG/37 adoption through CNS SG/30 endorsement.

<table>
<tr><td colspan="3">Draft Conclusion SWIM TF/11/02 – Adoption of ATFM FIXM Message Data Attributes and Associated Message Templates Based on FIXM Version 4.3 as Asia/Pacific Regional Standard</td></tr>
<tr><td colspan="2">What: The ATFM FIXM version 4.3 message templates described in Appendix 5 be:
a) adopt the ATFM FIXM message data attributes and associated message templates, based on FIXM Version 4.3, as Asia/Pacific regional standard templates effective Q1/2027 to support cross-border ATFM information exchange via SWIM
b) uploaded to the ICAO Asia/Pacific Regional Office website for use by Asia/Pacific Administrations, to support cross-border ATFM operation, A-CDM, ATFM/A-CDM integration, and traffic synchronisation.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To support harmonised and automated message validation for cross-border ATFM system-to-system data exchanges, in alignment with Conclusion APANPIRG/35/4 and Draft Conclusion ATFM & A-CDM/SG/16-6.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 29-May-26</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: ATM/SG</td></tr>
</table>

4.14 In response to a query regarding whether the ATFM FIXM message template schema is required to be published on the official FIXM website (www.fixm.aero), it was clarified that such publication may not be necessary, as the ATFM FIXM message template scheme is intended for regional use within APAC. It was further noted that publication on the ICAO Asia/Pacific Regional Office website should sufficiently serve the purpose.

d) Governance

– Task 5: Regional SWIM Governance Framework

APAC SWIM Implementation Framework – Japan (WP/20)

4.15 This paper re-examined key outstanding issues related to the APAC SWIM implementation framework within the scope of the SWIM TF and sought further guidance from the Meeting to facilitate the finalisation of associated agreements and technical specifications. It was noted that there is a need to establish a common understanding of what constitutes APAC SWIM and to accelerate the development of consensus-based documentation and technical specifications, SWIM implementation framework, including the roles, responsibilities and accountabilities of stakeholders, governance structure, standards and specifications, policies and processes were clarified and proposed in the Meeting.

4.16 The Meeting was informed about the concern that several elements of the implementation framework for SWIM remain insufficiently defined, particularly in terms of governance structure, role allocation, and policy alignment at the regional level, which may impact the consistency and interoperability of SWIM implementation across the APAC region.

4.17 Roles, responsibilities and accountabilities of different SWIM stakeholders were shared. Given that APAC SWIM is a federated system involving multiple States and stakeholders, a governance structure is essential to ensure coordination, consistency, and transparency, and the following structure was proposed:

- **Regional SWIM Board (working title)**
The highest decision-making body responsible for regional policy direction, approval of standards, and resolution of cross-border coordination issues.

- **Technical Steering Group (working title)**
Responsible for the development, maintenance, and harmonisation of technical specifications. This function may evolve from the current SWIM Task Force.

- **Operations Committee (working title)**
Responsible for operational coordination, including service deployment, monitoring, and usage management.

4.18 It was noted that, while the draft APAC SWIM implementation framework identifies a governance structure comprising a Regional SWIM Board, a Technical Steering Group, and an Operations Committee, further clarification may be beneficial with regard to the institutional positioning and decision-making arrangements of such governance bodies at the regional level.

4.19 The Meeting was also informed that, taking into account the federated and multi-State nature of APAC SWIM, as well as different possible approaches to regional coordination, the following two governance options were identified for further consideration. It was added that these options are not mutually exclusive and may evolve over time depending on regional consensus and implementation maturity.

Option 1: Governance Based on ICAO APAC Institutional Framework	***Option 2***: State-Led Governance Independent of ICAO Structures
1. Under this option, APAC SWIM governance would be established by leveraging existing ICAO APAC institutional arrangements, in particular within the framework of APANPIRG.	1. Under this option, APAC SWIM governance would be established through a multilateral, State-led arrangement outside the formal ICAO institutional structure, while remaining aligned with ICAO standards and guidance.
2. A dedicated **APAC SWIM Board** could be established as a subordinate body under APANPIRG, with participation from	2. A **APAC SWIM Board** could be established based on a governance agreement or memorandum of

States of the Asia/Pacific Region and support from the ICAO APAC Office. This Board would serve as the highest regional decision-making body for APAC SWIM, providing strategic direction, endorsing governance arrangements, and approving key policies and specifications related to SWIM implementation.	understanding among participating States. The Council would be composed of officially designated State representatives and would be responsible for approving regional SWIM policies, technical specifications, and participation arrangements.
3. The existing SWIM Task Force could evolve into, or form the basis of, a **Technical Steering Group**, operating under the oversight of the APAC SWIM Board. This group would be responsible for the development, maintenance, and harmonization of technical specifications, including APAC-specific extensions to ICAO information exchange models, as well as supporting implementation activities across the region.	3. A supporting **Technical Steering Group** would be responsible for developing and maintaining technical and architectural specifications, informed by practical implementation experience, trials, and demonstrations. While ICAO information exchange models and guidance would be used as the baseline, this group could manage regional adaptations and implementation-driven refinements in a flexible manner.
4. An **Operations Committee** could be established to support coordination of operational deployment, service monitoring, and operational issue resolution among participating stakeholders, reporting to the APAC SWIM Board as appropriate.	4. An **Operations Committee** could be established to address practical aspects of federated operations, including service availability coordination, trust frameworks, security arrangements, and information-sharing practices among participating stakeholders.
5. This option would ensure strong alignment with ICAO global provisions, including PANS-Information Management (Doc 10199), and would benefit from established ICAO governance processes and regional recognition, while recognising that decision-making processes may be subject to existing ICAO procedural timelines.	5. Under this model, the ICAO APAC Office could participate as an observer or advisor, facilitating information exchange with ICAO activities and supporting consistency with global SWIM developments. This option may offer increased flexibility and implementation agility, while requiring careful consideration of how outcomes are coordinated with ICAO regional and global processes.

4.20 It was noted that both governance options provide viable pathways for establishing effective regional SWIM governance in the APAC region. The choice of approach, or a phased combination of both, may be informed by regional consensus, implementation priorities, and the desired balance between institutional alignment and operational flexibility.

4.21 The Meeting noted that SWIM TF has developed, or is developing, a range of standards and specifications. Key deliverables include:

- APAC SWIM Service Overview Extensions (draft)
- SWIM Discovery Service (SDS) Implementation Specification (v1.0.0)
- SWIM Metadata Exchange Service (SMXS)
- FIXM v4.3 APAC Extension
- APAC SWIM Technical Infrastructure Profiles (TI Profiles) v1.0

- APAC SWIM Implementation Guidance (IGD)

4.22 Additional specifications, including those related to information security, are expected to be developed. The Meeting recommended that the APAC SWIM implementation framework be formalised by consolidating governance arrangements, roles, standards, and procedures into a single agreed framework document, subject to endorsement by relevant stakeholders. A draft agreement, provided in **Appendix 6** to this report, was shared with the Meeting.

4.23 By Flimsy/01, Japan proposed a separate online survey on the Draft APAC SWIM Governance Agreement at: https://forms.cloud.microsoft/r/sauqDAGtrY. States/Administrations were encouraged to complete the survey before 30 June 2026.

4.24 The Meeting agreed that Option 1 is the preferred approach, as it ensures harmonisation of SWIM implementation in line with ICAO provisions, supports SWIM interoperability, and promotes adherence to United Nations policies and ethical principles. The Meeting requested Japan to continue exploring further details of Option 1 together with the SWIM TF Task 5 group and to share the outcomes with SWIM TF at a future Meeting. **ACTION ITEM 11-14**

4.25 The Meeting discussed that, in the future, the SWIM TF may evolve into a new Subgroup, as the SWIM concept extends beyond CNS. The ICAO Secretary shared that each section within the ICAO APAC Regional Office is responsible for one Subgroup, and that the establishment of additional Subgroups would require additional resources, which are not currently available. The Meeting recalled that SWIM TF has been retained under the CNS Subgroup as its current work is highly technical in nature. For the time being and in the near future, the SWIM TF will continue to ensure appropriate coordination with other relevant domain expert groups. Once the regional SWIM technical foundation has been established, should the SWIM TF consider it appropriate, it may request APANPIRG to establish a new Subgroup or consider other alternatives, such as reassignment to another existing Subgroup.

4.26 The Meeting agreed to request all possible stakeholders from States/Administrations participating in SWIM TF/11 to respond to the survey before the deadline of **30 June 2026**. **ACTION ITEM 11-15** It was also agreed that there is currently no need to share the survey with States/Administrations that did not participate in the SWIM TF/11 Meeting**.**

e) Information services
- Task 6: Information Services

f) Validation and demonstration
- Task 7: SWIM Demonstration
- Task 8: SWIM Services and Application Validation

Establishment of a SWIM Test Environment for APAC SWIM – Japan (WP/22)

4.27 Japan presented potential options for the establishment of an evaluation environment within APAC SWIM, including an analysis of their respective advantages and disadvantages, in order to support decision-making by States concerning regional implementation.

4.28 It was recalled that the APAC SWIM infrastructure is envisaged to comprise Gateway Enterprise Messaging Services (GEMS) provided by several States, as well as Edge EMS (EEMS) implemented by individual APAC States. SWIM operations depend on user systems (applications), such as those operated by airlines, which consume information services primarily provided by national ANSPs via the platform. In this context, it is essential that both service providers and service consumers undertake appropriate validation and evaluation activities.

4.29 Relevant requirements and guidance from ICAO Doc 10199 PANS-IM, a part of the Information Service Overview requirements and existing practices, such as a case study of FAA, Eurocontrol, and JCAB, were shared with the Meeting.

4.30 A proposal to build a Testing Environment for APAC SWIM, along with its advantages and disadvantages, was shared.

<table>
<tr><td>Option 1: Continuation of the SIPG Test Environment (CRV-based)</td><td>Option 2: Internet-Based SWIM Sandbox Environment</td></tr>
<tr><td>Advantages

• Closely replicates the operational (live) environment

Disadvantages

• Participation may be limited due to resource constraints
• Connectivity challenges may arise for certain States
• Bandwidth testing requires CRV provisioning, incurring additional costs
• No established framework for connectivity via the Internet

Risks

None</td><td>Advantages

• Facilitates simpler, faster, and more cost-effective connectivity
• Supports accelerated implementation, testing, and capacity-building
• Enables flexible bandwidth testing
• May function as an interim Edge EMS
• Particularly suitable for MET information services

Disadvantages
• Does not fully replicate the operational CRV environment
• Potential concerns regarding data sensitivity

Risks
• May require policy adjustments in certain States
• Potential implications in terms of operational costs</td></tr>
</table>

4.31 The Meeting noted that Option 1, the regional SWIM testing environment over CRV, is aligned with the current SIPG test setting. Maintaining this approach during the initial phase of APAC SWIM implementation may therefore be advantageous. However, as APAC SWIM evolves with operational SWIM traffic carried over CRV and the demand for service validation increases, constraints on CRV capacity may arise. On the other hand, a regional SWIM testing environment over the Internet may accommodate a wider group of information consumers and support testing of bandwidth-intensive information services (e.g. MET) in a regional environment. Accordingly, it was recognised that there may be a future need to transition from the regional SWIM testing environment from CRV to the Internet. The Meeting therefore requested Japan to further explore feasible approaches for transitioning the testing environment from CRV-based connectivity to Internet-based connectivity **ACTION ITEM 11-16** It was further suggested that the study considers the associated technical work and costs required for such transition and the long-term maintenance of the environment. In this regard, the CRV network model, which is based on cost-sharing among APAC member States, may serve as a useful reference.

g) Coordination and promotion

- Task 9: Monitoring of Panels' Work
- Task 10: Regional Coordination and SWIM-related Information Sharing
- Task 11: SWIM Implementation Education and Promotion

IMP Updates – Japan (IP/04)

4.32 Japan provided an overview of the fourth Meeting of the Information Management Panel (IMP/4), held at ICAO Headquarters in Montréal from 20 to 24 April 2026. Proposed amendments to the *Procedures for Air Navigation Services — Information Management (PANS-IM, Doc 10199)* and the *Manual on SWIM Implementation (Doc 10203)* were discussed with a view to enhancing SWIM interoperability. In addition, an action plan to improve global interoperability was developed, and the Panel's work programme (Job Card) was reviewed in the IMP/4 Meeting.

4.33 The Meeting was informed that progress related to the ATM Information Reference Model (AIRM), including the planned release of version 1.3.0 in 2026 (current approved version: 1.2.0), was reported to the IMP/4. It was added that submission of AIRM 1.3.0 to the IMP for approval is planned for autumn 2026.

4.34 The Meeting noted that the Services Working Group introduced the Global SWIM Registry Interoperability Concept, which proposed a method to improve interoperability among SWIM registries. It was also reported that no major revisions to existing SWIM guidance are currently envisaged. In addition, updates were provided on the SWIM Discovery Service (SDS) Specification under development within the APAC SWIM TF. IMP/4 also shared that APAC and the FAA plan to conduct operational scenario development and testing in 2026. Future work at the IMP level will continue in coordination with the Services and Architecture Working Groups.

4.35 It was noted that several working and information papers were submitted addressing topics related to the Global SWIM environment. Given the complexity of issues related to the Global SWIM environment, including the need to consider operational aspects across multiple domains and coexistence with existing systems such as AFTN/AMHS, the IMP agreed to request the Air Navigation Commission (ANC) to establish a dedicated task force involving relevant panels, recognising that the work would require border coordination across multiple domains and stakeholders.

Raising Airlines' Awareness of SWIM, FF-ICE and TBO – IATA (IP/07)

4.36 IATA presented an update on current and planned activities by IATA to raise awareness in all levels of member airlines in the fields of SWIM, FF-ICE and TBO. The Meeting was informed that three webinars are planned: Two 2-hour webinars for airline operational and technical SMES, including technical/management and pilots, and one 45-minute webinar with high-level content for executive-level attendees. Feedback from airlines during and after the webinars will be used to update the APAC Pathfinder TBO education material published in 2025. IATA encouraged all ANSPs that do not yet have strong points of contact with their home-based airlines for SWIM and other concepts to liaise with IATA to establish appropriate connections with airlines in order to align development and implementation roadmaps.

Agenda Item 5: SWIM requirements for the regional physical network

Review of outcomes and action items from the ICAO APAC CRV-SWIM Experts Workshop: Reviewing of CRV II Specifications and ICAO APAC SWIM Architecture in September 2025 – Sec (WP/14)

5.1 The paper presented the key outcomes of the ICAO APAC CRV-SWIM experts Workshop: Reviewing of CRV II Specifications and ICAO APAC SWIM Architecture, held in Bangkok, Thailand, from 01-05 September 2025. Detailed information on the Meeting proceedings is available in the Report of the Meeting.

5.2 The Meeting noted that day 1 and the first half of day 2 of the workshop were dedicated to outstanding topics from SWIM TF; the second half of day 2, day 3 and day 4 were dedicated to outstanding topics from CRV OG experts that required clarification and/or suggestions from SWIM TF experts. The Meeting reviewed all pending action items from the workshop and agreed to incorporate them into the Action Item list arising from SWIM TF/11. It was noted that, following the incorporation of all action items for which SWIM TF is the responsible action party, those action items can be closed in the workshop action item list, as the monitoring of the action items would thereafter be transferred to SWIM TF. It was also agreed to review these action items during the review of other action items under agenda item 7.

Agenda Item 6: State, regional and global SWIM updates

Progress of TBO Pathfinder Development in the Asia/Pacific Region – Hong Kong China, Indonesia, Japan, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, Viet Nam, USA and IATA (WP/11)

6.1 This paper presented progress by the Asia-Pacific (APAC) Trajectory-Based Operations (TBO) Pathfinder project (Pathfinder). It was recalled that Pathfinder was initiated under the APAC Air Navigation Service Provider (ANSP) Committee (AAC) to develop pathways for implementing the ICAO global TBO concept in the region.

6.2 It was informed that throughout 2025, Pathfinder efforts were focused primarily on the FF-ICE/R1 application. A summative report of the efforts to support the implementation planning efforts among ANSPs was presented to ATM/SG/13. With the focus for 2026 being FF-ICE Release 2 (FF-ICE/R2), Airspace Users (AUs) will be involved as key stakeholders. Activities in 2026 include updating TBO communication materials, conducting stakeholder engagement in the Philippines, and organising regional webinars led by IATA to raise AU awareness. It was added that technical preparations for the FF-ICE/R2 lab demo (scheduled for March 2027) are underway through technical interchange Meetings and table-top exercises, with AUs input being organised to enhance operational realism and initial meetings have taken place to support two of the airlines to participate as FF-ICE enabled AUs.

6.3 It was added that Pathfinder will also develop trajectory analysis methodologies to quantify TBO benefits for city pairs and ANSPs, documented in a TBO benefits report. It was emphasised that FF-ICE/R2 will extend trajectory negotiation beyond current flight dispatch and tactical airborne changes to negotiation, including pilots, flight operations units and ATM systems, altering the roles and responsibilities of all. States/Administrations were encouraged to support ANSPs and national airlines in raising TBO awareness, work towards SWIM deployment by 2030 and FF-ICE/R1 implementation by 2032 and participate in IATA's regional webinars.

Update on MET Information Exchange Via AMQP in Europe – Australia (WP/13)

6.4 Australia provided an update on the implementation of AMQP brokers in Europe for meteorological information exchange, which describes the current state of the standardisation of AMQP headers and message structure as defined by the European MET3SG and key lessons learned during implementation. Australia highlighted the need for detailed, globally agreed technical specifications for AMQP message and application properties, and the practical differences encountered between different AMQP implementations. Aggregation data being performed across the Northern Europe Aviation Meteorology Consortium (NAMCON) states was also highlighted.

6.5 The Meeting was requested to consider adopting the same approach and guidance for meteorological information exchange aspects of APAC SWIM, as well as to consider if there is a need to align the metadata used across different information domains.

6.6 Singapore informed the Meeting that it has been working with its MET service provider on migrating certain weather services towards AMQP adoption. Singapore further queried, with respect to non-IWXXM products (e.g., other data models, imagery, etc.), whether there are any ongoing initiatives within the METP to support their migration to SWIM-compliant frameworks, for example, via HTTP, in order to align them with the AMQP environment alongside IWXXM-based message exchanges. Another query was raised regarding whether there is a requirement to standardise the topic address delimiters for MET services.

6.7 Australia informed the Meeting that discussions are ongoing under the updating work of the MET-SWIM Roadmap and Guidelines for MET-SWIM Implementation regarding different data types and the associated exchange mechanisms. It was noted that many MET services are likely to adopt AMQP as a notification service, carrying IWXXM messages together with associated payloads, similar to the approach implemented in Europe. Australia also provided an example of standardised notifications between Volcanic Ash Advisory Centres (VAACs), which may include IWXXM data and polygon information representing ash extents. User systems could then utilise request/reply services to retrieve higher-volume gridded data, concentration levels, or imagery products as needed.

6.8 Regarding the requirement to standardise topic address delimiters for MET services, METP is currently looking to adopt the European approach. The Meeting was invited to share recommendations, if any. Japan suggested considering the implementation of metadata for the AMQP-based PUB/SUB.

6.9 With respect to the request to consider adopting the same approach and guidance for meteorological information exchange aspects within APAC SWIM, it was agreed that this can be further assessed and considered by SIPG Task 2, as the group is currently working on routing mechanisms for the APAC region. It was acknowledged that the SIPG Task 2 work is mainly based on the message property-based routing; however, the topic-based routing can be discussed within Task 2. **ACTION ITEM 11-17**

6.10 Regarding the request to consider whether there is a need to align metadata used across different information domains, it was shared that it would depend on the type of metadata involved. As the naming convention and structure are currently under discussion within SIPG Task 2, it was suggested that this request also be considered under that work. **ACTION ITEM 11-18** Australia requested that, should SIPG develop any recommendations arising from both requests, these be shared with the MET/IE WG / MET SG Secretary. **ACTION ITEM 11-19**

Latest Status of IWXXM – Hong Kong China (WP/23)

6.11 Hong Kong China highlighted the latest status of the ICAO Meteorological Information Exchange Model (IWXXM) and related outcomes of the 13th and 14th Meetings of the ICAO Meteorological Panel (METP) Working Group of Meteorological Information Exchange (WG-MIE) being held in September 2025 and May 2026, respectively.

6.12 The Meeting was informed that the WMO Task Team on Aviation Data (TT-AvData) had published a new version of IWXXM in November 2025 – IWXXM 2025-2 – to meet the changes involved in Amendment 82 to ICAO Annex 3 and PANS-MET (Doc 10157). It was noted that **Decision MIE/13-03: Managing IWXXM Version** was made at the 13th Meeting of ICAO Meteorological Panel Working Group on Meteorological Information Exchange (METP WG-MIE/13) regarding the deprecation of older IWXXM versions and ceasing their use in operational exchange of meteorological information. Subsequent to METP WG-MIE/13, ways to make IWXXM better fit the publish-subscribe and request-reply exchange patterns in SWIM were further discussed at WG-MIE/14.

6.13 The paper recapped the major changes involved in IWXXM 2025-2 with respect to IWXXM 2023-1. Details regarding IWXXM 2025-2, including the schemas, examples, UML model, and release notes, are available at https://schemas.wmo.int/iwxxm/2025-2/

6.14 It was noted that to address the issues concerning IWXXM version recommendations and compatibility, the MET/IE WG/24 Meeting held in April 2026 formulated the **Draft Conclusion MET/IE WG/24-01 – IWXXM Version Compatibility** for further consideration by MET SG.

6.15 The Meeting was informed that, in response to Decision MIE/13-03 b), future IWXXM versions should be managed as independent packages. In particular, TT-AvData has started to work on a solution that allows packages to be separately managed and used. It was added that this new organisation will be implemented in the next release of IWXXM. A discussion of the current state of standardisation of AMQP headers and message structure as defined by the European MET SWIM Services Sub-Group (MET3SG) community of interest, with regard to the implementation of SWIM information services according to the European CP1 regulation, was made. It was shared that further investigation would be taken by WG-MIE and TT-AvData to identify further operational metadata needs, consider cross-exchange pattern interoperability and introduce necessary operational metadata into IWXXM schemas. Lastly, it was added that learning from other information domains on their requirements and the application of such metadata in information service features would also be carried out.

6.16 The Meeting reminded States/Administrations to ensure that systems being developed or procured will work with current and upcoming versions of IWXXM.

Data Volume of Digital NOTAM Messages Handled on SWIM – Japan (IP/05)

6.17 Japan informed that, in accordance with Action Item 10-22 agreed at the SWIM TF/10 Meeting, the JCAB shared the results of a survey conducted in 2016 with the SWIM Implementation Planning Group (SIPG) members via email on 30 June 2025.

6.18 The Meeting was informed that, in the 2016 analysis conducted by JCAB, the data volume resulting from the conversion of conventional NOTAM text messages circulated over AFTN/AMHS into AIXM format was estimated to be approximately 50 KB at maximum. Based on the results of this 2016 survey, JCAB designed and developed a system with a maximum data size limit of 100 KB per digital NOTAM message and evaluated the overall processing performance and service quality of the SWIM Technical Infrastructure (SWIM TI). However, during system evaluations using actual NOTAM issuance scenarios, several cases were identified in which the total data volume of a digital NOTAM exceeded the predefined limit of 100 KB.

6.19 Japan provided an example of NOTAM concerning taxiway closures at Tokyo Haneda Airport. It was shared that digital NOTAM data consists of two main parts: Area 1, which contains the message header and content encoded in AIXM and Area 2, which contains location and geometry-related information encoded in GML. It was observed that the data size of Area 1 increased considerably due to the large number of closure locations described in the NOTAM. This confirmed that the complexity and quantity of operational elements directly affect the data volume of AIXM-based digital NOTAM messages. It was added that JCAB has expanded the maximum allowable size of Area 1 to 300 KB and conducted a reevaluation to verify that no adverse effects on system performance or network behaviour would arise. It was noted that JCAB launched the digital NOTAM information service on 4 March 2026.

6.20 The Meeting noted that the total volume of digital NOTAM data exchanged over the APAC SWIM network may exceed current estimates shared in this paper. Furthermore, various approaches exist for reducing the size of AIXM messages. To prevent excessive load on the CRV network, it was important to appropriately manage the size of digital NOTAM data. Where necessary, an upper limit on data size should be established using appropriate technical or operational methods.

6.21 In response to a question regarding whether there is plan to study the accumulated bandwidth requirements for the estimated number of digital NOTAM messages based on historical data in Japan, it was clarified that, as the digital NOTAM service has only recently been launched, further study will be conducted in the future.

Progress Update on SWIM Implementation in Japan (IP/06)

6.22 Japan presented a progress update on the implementation of SWIM in Japan. It outlined Japan's strategic approach, the development of SWIM technical infrastructure, and the commencement of operational information services in March 2026. It also highlighted Japan's alignment with ICAO Global Air Navigation Plan (GANP) and the APAC SWIM Implementation Roadmap, as well as future steps toward full SWIM-enabled operations.

6.23 The Meeting was informed that Japan's SWIM implementation has been guided by a phased and operationally focused approach. Rather than a single system replacement, Japan has pursued the gradual integration of SWIM concepts into existing ATM environments, ensuring continuity of operations while enabling future scalability. It was added that the key principles of Japan's SWIM roadmap include:

- Coexistence with legacy systems during transition,
- Early operational use of various types of digital information
- Provision of standardised information services via a centralised SWIM platform

6.24 It was added that Japan has established a national SWIM technical infrastructure as a digital information platform for aviation-related data. The infrastructure enables centralised collection, management, and dissemination of aeronautical, meteorological, and operational information through standardised interfaces. Key characteristics of Japan's SWIM Technical Infrastructure include:

- Internet-based access with appropriate security controls,
- Service-oriented architecture supporting multiple information services,
- Capability to provide information in internationally standardised digital formats

6.25 It was noted that the launched SWIM services are provided through a SWIM portal, allowing authenticated and authorised users to access information via web-based interfaces and system-to-system connections. Japan emphasised early operational benefits through practical information services such as Digital Aeronautical Information Services, Integrated Airport and Airspace Information Services, and Flight Plan and ATS Information Services. It was noted that these services are designed to coexist with existing AMHS/AFTN-based processes while offering a pathway toward future ICAO concepts such as FF-ICE. It was added that Japan's SWIM implementation is fully aligned with the ICAO APAC SWIM Implementation Roadmap, including the dual operation strategy where legacy systems and SWIM services coexist during the transition period.

6.26 Japan shared its plans to further expand SWIM capabilities and its willingness to continue to refine governance, cybersecurity, and service management frameworks to ensure sustainable SWIM operations.

6.27 In response to a question on difficulties faced in coordinating with different stakeholders, Japan informed the Meeting that most users currently use browser-based services, while efforts are ongoing to promote the use of Web API and PUB/SUB services.

6.28 In response to a question about the SWIM governance framework implemented in Japan, it was informed that a SWIM steering committee consisting of multiple aviation stakeholders has been established. It was further added that SWIM usage and enhancement are promoted through the SWIM Education and Enhancement Committee (SWIMEE). To accelerate SWIM implementation and encourage wider SWIM adoption, Japan emphasised the importance of providing SWIM education to users.

Verification of ATFM Information Exchange Based on SWIM Test Platform – China (IP/08)

6.29 China presented its verification of ATFM information exchange under the SWIM test platform, based on the existing NTFM-IXP protocol. The Meeting noted that eight standardised information services were derived from operational needs. A bidirectional adapter in this verification environment system is deployed to enable legacy systems to interact with the SWIM test platform. In addition, XSD specifications and end-to-end automated data validation were implemented. It was added that collaborative verification involved ANSPs, airlines and airports across the main business scenarios.

6.30 China informed that 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, realised unified publication and reception of ATFM information through the SWIM test platform, and verified the technical feasibility of the lightweight access path for legacy systems to the SWIM environment.

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

6.31 Building on these outcomes, China added that it will continue to improve service standardisation and explore compatibility with internationally accepted models such as FIXM, while participating in APAC SWIM implementation exchanges to promote regional SWIM collaborative development.

6.32 The Meeting was informed that the ATM Requirements and Performance Panel (ATMRPP) and ATM Operations Panel (ATMOPSP) are studying how to integrate ATFM with FF-ICE, and that one of the subjects under discussion is the information exchange model to support the exchange of ATFM (flow) information in a SWIM environment. It was shared that China's effort could contribute to the work of this ATMRPP-ATMOPSP Joint Task Force.

Application of the SWIM concept for MET information provision in the low-altitude economy- Hong Kong China (IP/09)

6.33 Hong Kong China presented extending the SWIM concept to weather support for low-altitude economy (LAE) development in Hong Kong China, providing guiding principles for meteorological information provision for safer and more efficient operations in low-altitude airspace, although LAE possesses characteristics distinct from the traditional aviation industry.

6.34 The Meeting noted that since 2024, Hong Kong has been developing LAE enabled by Advanced Air Mobility (AAM), with low-altitude infrastructure and flying application scenarios as key priorities. The vision aligns with the SWIM concept, providing standards, infrastructure, and governance for secure information exchange via interoperable services. The ICAO AAM Study Group's discussions on UTM Guidance were identified as valuable references for LAE development in Hong Kong's urban environment.

6.35 The Meeting also noted that Hong Kong launched the Low-altitude Economy Regulatory Sandbox in March 2025 and Sandbox X in November 2025 to foster innovation and test application scenarios. Through engagement with LAE operators, valuable insights on weather support use cases, user requirements, and data specifications were gathered. However, data exchange processes remain time-consuming and lack agility, with standardised data formats and repositories still in early development. The Meeting recognised that LAE operators span diverse applications with varying drone types and requirements, unlike traditional aviation, necessitating an interoperable environment to address thousands of unique demands from the LAE sector.

6.36 It was stated that ATM/UTM integration is a critical issue that will become increasingly necessary with LAE development. It was shared that the Hong Kong Observatory intends to apply SWIM principles as guiding frameworks for developing standards, infrastructure, and governance for

LAE meteorological information. Although standardisation may not be achievable immediately, SWIM progress will drive LAE development and reduce fragmented efforts. It was added that similar challenges regarding the lack of a common meteorological information 'language' for LAE were raised at ICAO APAC MET/R WG/15, attracting considerable attention from participants. Given LAE's distributed and diversified nature, adopting SWIM principles will likely spur local development and contribute to regional progress.

6.37 The Meeting was informed that the global AAM Study Group has recently conducted the coordination process with the technical panels regarding its global and holistic vision of the AAM ecosystem. In the vision paper, SWIM is identified as one of the foundational elements supporting future AAM operations. Therefore, the work of SWIM TF is significant not only for traditional ATM operations and future concepts such as FF-ICE and TBO, but also for other advanced future operations.

Agenda Item 7: SWIM Task Force ToR, Programme, Work Plan, and Action Items review

- SDS schema update
- APAC Common SWIM Information Services
  - APAC Common SWIM Information Services updates
  - Guidance Material for Business Functionality of APAC Common SWIM Information Services
- Development of an explanation for synchronous REQ/REP and asynchronous REQ/REP
- APAC SWIM Implementation Guidance (IGD) materials
- APAC SWIM implementation progress indicators
- SWIM TF Tasks restructuring

SWIM Discovery Service (SDS) Update: Schema release, testing, and global adoption for Registry Interconnection – United States (WP/15)

7.1 The paper discussed updates to the SWIM Discovery Service (SDS) development, a standardised approach to support registry interoperability and federated information service discovery across independently managed SWIM registry environments. It was informed that recent SDS developments (post APAC SWIM TF/10) include alignment with the latest PANS-IM data model and standardisation of protocols for registry metadata exchange and preparation for demonstration, testing, and implementation.

7.2 The Meeting was informed that originally developed as a collaboration between the FAA and Korea Airports Corporation (KAC), SDS has been further matured and adopted in the APAC region and the FAA, both regionally and as members of the IMP, through collaborative initiatives. The recent schema release and updated service description artefacts now enable ICAO States implementing SWIM registries with harmonised metadata exchange and service discovery across individual registries.

7.3 The paper highlighted how SDS aligns with the regional frameworks and ICAO IMP objectives under the SWIM Registry Interoperability Job Card, and upcoming initiatives to develop operational scenarios, test cases, and an implementation plan for registry interconnection and adoption at both regional and global ICAO levels. The Meeting noted the importance of SDS implementation to achieve the global SWIM registry interoperability concept and enable SDS as a candidate global technical solution.

7.4 It was stated that regional test cases and test plans should be developed for SDS testing and continued maturity, implementation plans and schedules should also be socialised for SDS development and service roll-out. Additionally, it was noted that cross-regional SDS demonstrations should be conducted for global adoption. States/Administrations were encouraged to continue socialisation and adoption efforts among both SWIM TF and IMP stakeholders to support the implementation of the SDS concept and associated data exchange mechanisms across SWIM registries for global interoperability.

7.5 Regarding the proposal to develop regional test cases and test plans for SDS testing and continued maturity, it was noted that this task is already within the scope of SIPG activities.

7.6 Regarding the proposal to conduct cross-regional SDS demonstrations for global adoption, it was recalled that SDS demonstrations have previously been conducted between Europe and the United States, as well as within the APAC region. It was added that SWIM TF, through members common to both SWIM TF and IMP, continues to share updates on SDS developments at IMP Meetings. To continue demonstrations with other regions, it was highlighted that there is currently no information about the availability of the SWIM registry in regions other than those mentioned above. Therefore, further SDS demonstrations cannot be planned at this time.

7.7 Regarding the proposal to conduct SDS demonstrations over CRV in addition to the Internet, it was agreed that, as most APAC States currently plan to implement SWIM registries over the Internet, demonstrations over CRV may be reconsidered in the future.

7.8 The Meeting discussed the need for a baseline standardised version of SDS for the APAC region. It was recalled that all APAC States/Administrations intending to implement SWIM registries would need to implement SDS in accordance with the agreements reached at SWIM TF/3 and SWIM TF/8. In this context, the Meeting agreed that it would be prudent to adopt SDS v2.0 as the baseline SDS version for the APAC region. Following detailed deliberation, the Meeting drafted the following draft Conclusion for APANPIRG/37 adoption through CNS SG/30.

<table>
<tr><td colspan="3">Draft Conclusion SWIM TF/11/03 Adoption of SWIM Discovery Service Baseline Standardised Version for APAC Region – SDS v2.0</td></tr>
<tr><td colspan="2">What: To adopt the SWIM Discovery Service version 2.0 (SDS v2.0) as a regional baseline standard for Asia/Pacific SWIM implementation.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: Considering that the target completion of the Asia/Pacific regional SWIM implementation is 2030, and that many APAC States/Administrations intend to implement SWIM registries, the provision of a baseline SDS version is essential to support harmonised SWIM implementation within the APAC region. SDS v2.0 has been studied and tested by the SWIM TF and that it is aligned with Doc 10199 PANS IM, to support its adoption as the regional baseline standard for SDS.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 29-May-26</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: CNS SG</td></tr>
</table>

7.9 To ensure accessibility to the SDS Implementation Specification, Version 2.0, the Meeting requested the United States to upload the latest edition of the document to the SWIM Service Discovery website (discovery.swim.aero). **ACTION ITEM 11-20**

7.10 The Meeting discussed the need for a minor update to SDS v2.0 to include additional information service overview fields, i.e. “Information service definition reference” and “Use limitation”, which were recently agreed at IMP/4. The United States agreed to undertake the task of updating SDS v2.0 accordingly. **ACTION ITEM 11-21**

SWIM Discovery Service Jump Starter Kit v2.0 - Republic of Korea (WP/26)

7.11 The Meeting recalled that, at the APAC SWIM TF/9, the SWIM TF requested to verify whether differences between SDS implementation specifications v1.0 and v2.0 would result in the update required for the developed SDS Jump Starter Kit and suggested sharing findings with the future SWIM TF Meeting (ACTION ITEM 9-13). At the SWIM TF/10, ROK presented a Comparison of SWIM Discovery Service (SDS) Implementation Specification between v1.0 and v2.0 (WP/21), which compared the differences between SDS implementation specifications v1.0 and v2.0 and provided mapping between service overview and SDM-J v1.0.1/SCDM v3.0.

7.12 To implement ACTION ITEM 9-13 of SWIM TF/9, ROK developed the SDS Jump Starter Kit v2.0 in alignment with the SDS specification v2.0.0 as of April 2026 to contribute to a better understanding and the global implementation of the SDS. ROK introduced the SDS Jump Starter Kit v2.0, specifically intellectual property, system requirements, installation, and usage.

7.13 The Meeting noted that the SDS Jump Starter Kit v2.0 is available on GitHub (https://github.com/Korea-Airports-Corporation/SWIM-Discovery-Service-Jump-Starter-Kit-v2) and there will be continuous updates and maintenance of the SDS Jump Starter Kit v2.0 as schema cleaning is in progress, and there will be a test based on a selected operational test scenario (e.g., caching or federation).

Development of Updated Version of Business Functionality of APAC Common SWIM Information Service and Associated Guidance Material – Task 6 Leads (WP/16)

7.14 The Meeting recalled that Decision 36/11 from APANPIRG/36 in November 2025, adopted the First Version of the Business Functionality for APAC Common SWIM Information Services. At SWIM TF/10 in May 2025, it was noted that the level of detail differed across different information domains (e.g. aeronautical information, flight information, surveillance data, meteorological information, etc.), potentially caused by different levels of understanding as to what detail was needed by SWIM TF to facilitate the development of SWIM information services within the APAC region. Two actions were raised at SWIM TF/10 to improve the utility and information in the listing of APAC Common SWIM Information Services.

7.15 The paper proposed the initial draft, second working version of the Business Functionality of APAC Common SWIM Information Services, taking into account inputs from the relevant APANPIRG Subsidiary Groups, including FF-ICE Ad-Hoc Group, SURSG, SURICG, ATFM & A-CDM/SG, MET/IE WG and AAITF and also incorporated additional suggested improvements that were identified through the consultation with those Subsidiary Groups.

7.16 The suggested improvements to the Business Functionality for Common APAC SWIM Information Services were proposed as follows:

a) Replace “Priority” with two independent columns (not yet incorporated into the table):
   i. “Applicability” (“region-wide” in order to achieve the anticipated benefits, vs. “as needed" to meet local needs); and
   ii. “Desired implementation timeframe” (Immediate (before 2030), Medium-term (2030-2035), Long-term (beyond 2035)).

b) Inclusion of a “maturity” attribute only in the working version of the table (i.e. not in the published version) to highlight the state of development of the associated Information Service (e.g. mature, under development, ideation). This will provide easy insight to all relevant stakeholders, for example, when deciding which Information Services to include when recommending the publishing of subsequent versions of the Business Functionality of APAC Common SWIM Information Services at the ICAO APAC e-doc website, i.e. only “mature” and “under development” Information Services would be published.

c) Identification of the relevant Subsidiary Group responsible for the associated entry(ies) in the document, by relevant Information Service domains (e.g. Flight Information Services, Aeronautical Information Services). Note that this has resulted in creating a new separate Information Service domain grouping, “Flow Information Services”, which had been grouped with the Flight Information Services in the published First Version.

7.17 The specific suggestions from Subsidiary Groups regarding the usability, clarity, and structure of the information in the list of APAC Common SWIM Information Services were shared at the Meeting.

7.18 It was noted that, at the Fourth Asia/Pacific FF-ICE Ad-Hoc Group Meeting and Workshop, held from 16 to 18 March 2026, the Ad-hoc Group reviewed the Business Functionality of APAC Common SWIM Information Services, Version 1.0, and agreed on the following recommendations for consideration by the SWIM TF.

a) Recognising the limited technical expertise within domain-specific groups such as the FF-ICE Ad-Hoc Group, it was agreed that the group should **focus on defining business rules and business process completion criteria** for information services. The determination of appropriate Message Exchange Patterns (MEPs) for each business process should be undertaken by SWIM TF, which possesses the relevant technical expertise.

b) To support the determination of MEPs, it was agreed that **comprehensive operational scenarios**, including operational requirements and business process completion criteria, are essential. Accordingly, such scenarios, where required, should be provided as an appendix to the Business Functionality of APAC Common SWIM Information Services document. A reference to the appendix should also be included in the ‘Brief description of the service’ column. Figure 1 illustrates an example of how these comprehensive scenarios may be incorporated:

Business functionality of the information service	**Brief description of the service**	**Type of information to be exchanged**	**Information exchange model / Message type**	**Message exchange pattern**	**Priority ~~of Recommended sService in iInitial APAC Common SWIM IS~~ (1) / (2) / (3)**
FF-ICE filing service	Provides a means to submit, update or cancel flight plans through a SWIM-based interface using FIXM. Appendix A: Filing Scenario	Flight plan for registration, update or cancellation	FIXM	Appendix A	1

SWIM TF to fill in

Appendix A: Filing Scenario

	Message	Details	Timeout	Comments	Message Exchange Pattern
1	eAU send eFPL (FFP) to eASP	Mandatory	N/A	-	
2	eASP returns Submission Response (SR) #1 to eAU	Mandatory (after eFPL received)	1 minute	eASPs validate message format and basic rules. SR ACK: Validation passed SR REJ: Validation failed SR MAN: Manual Processing needed	
3	eASP returns Submission Response (SR) #2 to eAU	Conditional (only if SR#1 = MAN)	Variable (manual processing time)	Any subsequent SR is provided after manual intervention of eFPL (after SR MAN)	
4	eASP returns Filing Status (FS) #1 to eAU	Mandatory (If final SR = ACK)	1 minute after SR "ACK"	eASPs evaluate flight plan against operational constraints and ATM configuration	
5	eASP returns Filing Status (FS) #2 to eAU	Conditional (If FS #1 = PENDING, or due to **re-evaluation**)	Variable (2nd evaluation)	eASP sends updated FS when flight is ready to be evaluated (for PENDING) or when operational changes affect flight status	

Figure 4: An example of how the comprehensive scenarios may be incorporated in the Business Functionality of APAC Common SWIM Information Services.

7.19 The SURSG/5 and SURICG/11 Meetings deliberated at length on the initial set of APAC Common SWIM Surveillance Information Services and provided input and comments. The SURSG/5 and SURICG/11 Meetings recommended that *Guidance Materials for the sharing of surveillance data in SWIM* should be added as a reference document for APAC Common SWIM Surveillance Information Services to support service implementers. This has been incorporated into the draft second working version of the document.

7.20 At the ATFM & A-CDM/SG/16 Meeting, Singapore and Thailand presented a joint response (SP/14) that aligned with the outcomes of the FF-ICE Ad-Hoc Group discussion. The response proposed updates to the APAC Common SWIM Information Services related to ATFM, focusing on improving clarity and usability. It was also noted that the current "Message Exchange Pattern (MEP)" column had created ambiguity between business and technical aspects; therefore, it was proposed that MEP determination be separated and addressed by the SWIM TF. In addition, Singapore and Thailand recommended enhancing the table by incorporating a clearer "Brief description of the service" through referenced filing scenarios example developed by the FF-ICE Ad-Hoc Group. The proposed next steps included finalising these scenarios and submitting them to the SWIM TF within agreed timelines in 2026 to support the identification of MEP. The finalised scenarios are attached in **Appendix 7** and submitted to SWIM TF/11 to undertake the identification of MEP.

7.21 The ATFM & A-CDM SG/16 Meeting noted that Appendix B of the working paper identified four ATFM-related SWIM Information Services; however, **only two services—namely the Flight-Specific ATFM Measure Service and the ATFM/A-CDM Integration Service**—had been included in the first published edition. The ATFM & A-CDM SG/16 encouraged further review of the remaining two services, i.e. the ADP Distribution Service and the Flow-Specific ATFM Measure Service, considering any progress since the SWIM TF/10 discussions, and invited feedback on their potential inclusion in the next revision.

7.22 It was clarified that the proposed ATFM messages in the five ATFM information exchange scenarios were associated with two APAC Common SWIM Information Services, with the first message exchanged under the ATFM/A-CDM Integration Service and the remaining four messages under the Flight-Specific ATFM Measure Service; additional administrative clarity might be provided through supporting appendices. The Meeting noted that, while a reference document for the ADP Distribution Service was made available following the elevation of the Asia-Pacific ADP exchange procedure, the digital data format for ADP remained under development and the exchange model was yet to be defined. The Flow-Specific ATFM Measure Service was similarly recognised as less mature, given the absence of a harmonised, region-wide operational application and potential network impacts. It was agreed that further operational and technical development was required before detailed SWIM messaging could be specified, and that relative maturity or priority could be reflected in the information services table, with coordinated input from the ATFM & A-CDM/SG to be provided to the SWIM/TF Meeting in May 2026.

7.23 The ATFM & A-CDM/SG/16 Meeting proposed no changes in the provided list of ATFM-related information services. In addition, the message types proposed to the information services table will be mapped to relevant information services for SWIM TF reference to identify the Message Exchange Pattern.

7.24 The MET/IE WG/24 Meeting noted the information presented in WP/27 and reviewed the guidance material provided by SWIM TF. During the discussion, the Meeting suggested that **the SWIM TF may wish to consider addressing possible options for push "pub-sub" services and on-demand "request/reply" services as part of future refinement of the document.** The MET/IE WG/24 Meeting reviewed the list of APAC Common SWIM Information Services related to MET and agreed that no amendments or modifications were needed at this Meeting**.**

7.25 The ICAO Aeronautical Information Services − Aeronautical Information Management Implementation Task Force (AAITF/21) Meeting does not propose any new amendments to the APAC Common SWIM Aeronautical Information Services already published in version 1 of the document in 2025.

7.26 In response to a suggestion to develop, at the global level rather than the regional level, a list of Common SWIM Information Services, in addition to those being defined by the technical panels, it was informed that, due to differences in current SWIM implementation maturity across regions, the IMP has different priorities. However, considering the APAC SWIM implementation timelines of 2024-2030, it was essential for the SWIM TF to define a prioritised list of Common SWIM Information Services to support APAC States/Administrations in identifying required information services that should be implemented on SWIM as a priority within the APAC region. It was further added that, as several key IMP members and other relevant panels are also part of the SWIM TF, efforts are being made to ensure that APAC Common SWIM Information services remain aligned with the global format and other relevant global recommendations.

7.27 The Meeting reviewed the draft Second Version of the APAC Common SWIM Information Services document and agreed that SWIM TF is best placed to determine the most appropriate Message Exchange Pattern for each defined Information Service proposed in the table of Business Functionalities for APAC Common SWIM Information Services.

7.28 It was agreed that the revised version template will incorporate all suggestions provided by different expert groups. In addition, all services containing some fields marked with "TBD" or "?" and not incorporated into the first version will be included in version 2.0 to avoid confusion within expert groups regarding the exclusion of information services for which the groups had previously provided inputs. It was added that new columns for which information is currently unavailable will be left blank, with all possible options available for further selection by relevant expert groups. These measures were intended to ensure that the APAC Common SWIM Information Services v2.0 document will be used by the relevant expert groups for regular review during their upcoming Meetings.

7.29 It was suggested to upload "Guidance Material for Business Functionality of APAC Common SWIM Information Services", provided in **Appendix 8**, to the ICAO APAC e-Document webpage as a supporting document to the second version of APAC Common SWIM Information Services, to support other domain expert groups in updating the second version of APAC Common SWIM Information Services. **ACTION ITEM 11-22**

7.30 To align with the Second Version of the document, Task 6 was requested to update the Guidance Material to cover the new columns and the methodology to define complex services through detailed scenario breakdowns**. ACTION ITEM 11-23**

7.31 The Meeting agreed to publish the document as the second version and present the revised document for consideration by CNS SG/30 through the following Draft Decision and subsequent adoption by APANPIRG/37. Following APANPIRG/37's adoption of the proposed Draft Decision, the list of APAC Common SWIM Information Services will be uploaded to the ICAO APAC e-document portal.

<table>
<tr><td colspan="2">Draft Decision SWIM TF/11/04 - Adoption of APAC Common SWIM Information Services, v2.0</td></tr>
<tr><td>What: The second version of APAC Common SWIM Information Services, provided in Appendix 9, be adopted for immediate use by APAC States/Administrations. The set of APAC Common SWIM Information Services, and the associated performance of SWIM Technical Infrastructure underpinning these services, is not specified to support the provision of aircraft separation.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To assist APAC States/Administrations in planning and implementing their SWIM information services.</td><td>Follow-up: ☐Required from States</td></tr>
<tr><td>When: 29-May-26</td><td>Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="2">Who: ☒Sub groups ☐APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other: MET SG, ATM SG, AOP SG</td></tr>
</table>

7.32 The Meeting discussed at length the definition and categorisation of "Maturity". Regarding the definition of "Maturity", two concepts were deliberated, i.e. (*i*) the maturity of details of table elements for a specific information service included in the APAC Common SWIM Information Services list, and (*ii*) the maturity level representing readiness of the information service itself for implementation. Regarding the categorisation of "Maturity", one proposal was to adopt the Maturity Levels applied to ASBU elements under the ASBU framework in the Global Air Navigation Plan. After detailed deliberation, it was agreed that further discussion under Task 6 is required to develop the definition and categories of "Maturity". **ACTION ITEM 11-24**

Feedback on Business Functionality Requirements for APAC Common SWIM Information Services – Flight Information Services – FF-ICE Ad Hoc Group (WP/17)

7.33 This paper presented feedback from the ICAO APAC FF-ICE Ad-Hoc Group on the approach for defining business functionality requirements for APAC Common SWIM Information Services. The FF-ICE Ad-Hoc Group proposed breaking down FF-ICE services into detailed operational scenarios with business completion criteria, in order to enable the SWIM TF in determining appropriate Message Exchange Patterns (MEPs) at the scenario step level rather than at the service level. This approach aimed to provide clearer business requirements to enable the SWIM TF to identify more accurate technical specifications.

7.34 The Meeting was presented with the process to define complex services by domain expert groups as follows:

a. **Service-Level Definition** – Domain expert groups continue to provide broad-level information service definitions by populating the existing service definition table in the "Business Functionality for APAC Common SWIM Information Services" document, as per current practice.

b. **Scenario Identification** – Domain expert groups identify which services are complex that require scenario-level analysis, and then identify all operational scenarios associated with each of those services.

c. **Scenario-Level Analysis** – Domain expert groups expand on the 'Brief Description of Service' column by conducting detailed analysis for each identified scenario and documenting it in appendices, including:

  i. **Business completion criteria**: Define when actors can consider their business operation complete and proceed with subsequent operations for that specific scenario

  ii. **Detailed workflow analysis** – Define each message exchange step using the Scenario Steps Table

7.35 The Meeting discussed and agreed with the proposed enhanced methodology for analysing complex information services through detailed scenario breakdowns, including the specification of business completion criteria and the Scenario Steps Table. It was agreed that the proposed methodology can be applied to the analysis of any complex service. However, it was clarified that not all information services included in the *Business Functionality of APAC Common SWIM Information Services* would necessarily require the level of detail developed following this methodology. The contributory bodies responsible for updating relevant information services, at their discretion, may consider adopting this methodology. It was suggested to incorporate this information in the **"Guidance Material for Business Functionality of APAC Common SWIM Information Services"**. **ACTION ITEM 11-25**

7.36 Based on the business requirements and completion criteria defined by domain expert groups, it was proposed that the SWIM TF take the responsibility to determine the appropriate MEPs for each step in the Scenario Steps Table. A summary of the fields in the Scenario Step Table and the respective responsible bodies is as follows.

Fields	Description	Responsibility
Step	Sequential identifier for each message exchange within the scenario	Domain Expert Group
Message	Specific message type, e.g. FF-ICE message type, with sender and recipient identification (e.g., "eAU sends Filed Flight Plan to eASP", "eASP returns Submission Response to eAU")	Domain Expert Group
Message Requirements	Message requirement classification and prerequisite conditions that must be satisfied prior to message transmission • Mandatory - Message must be sent/received in all instances of the scenario without exception • Conditional - Message must be sent/received when specific triggering conditions are met, but is not required when those conditions do not occur	Domain Expert Group
Business Timeout	Maximum acceptable time duration for message response from an operational perspective. The message originator is expected to contact the recipient if no response is received within the timeout period.	Domain Expert Group

Comments	Additional operational context, processing requirements, or business rule specifications that inform technical implementation	Domain Expert Group
Message Exchange Pattern	A template or pattern that defines the sequence and structure of messages exchanged between interacting components to accomplish a single complete information exchange. The Message Exchange Pattern helps the information service provider understand how the information service should behave, and the information service consumer understand how to interact with the information service.	SWIM TF

Table 2: Scenario Step Table Fields

7.37 The Meeting was requested to review the proposed definition of the "Message Exchange Pattern" field in Table 2, for which the SWIM TF is responsible for determining. The definition of Message Exchange Pattern was deliberated at length. It was agreed that the Message Exchange Pattern definition in ICAO Doc 10203 Manual on the SWIM Implementation can be used instead of creating a new definition. With this agreement, the revised definition of Message Exchange Pattern was amended as follows:

> ***Message exchange pattern**. A template that describes relationships of multiple messages exchanged between interacting components to accomplish a single complete information exchange*

7.38 This new definition was incorporated into the revised Appendix A to APAC Common SWIM Information Service v2.0.

7.39 It was agreed that SWIM TF will undertake the determination of appropriate MEPs for each scenario step based on the business requirements defined by domain expert groups and consider applying this approach to other complex SWIM Information Services that contain multiple operational scenarios with varying business requirements.

7.40 Task 6 was assigned to identify the appropriate MEP for FF-ICE related Flight Information Services in Appendix A to APAC Common SWIM Information Service v2.0, with the support of China, Japan, the Republic of Korea, Singapore and Thailand, which are involved in the FF-ICE Ad-Hoc group. **ACTION ITEM 11-26**

API Management and Gateway Introduction, Framework, and Best Practices for Harmonised SWIM Request/Reply Messaging – United States (WP/18)

7.41 The Meeting noted that the FAA and APAC region are considering Application Programming Interface Management and Gateway solutions to implement web services with Request-Reply message exchange patterns for SWIM data exchange. It was informed that Application Programming Interfaces (API) enable software systems to securely communicate and share data across government agencies and international partners. API gateways serve as a centralised entry point, managing routing, security, and system performance. API management provides governance through monitoring, access control, and lifecycle oversight. Together, they support the development of scalable, secure, and reliable digital services. Organisations benefit from faster system integration; users gain greater control and consistency with improved user experience.

7.42 The Meeting was informed that FAA is modernising its SWIM messaging infrastructure with API Gateways for synchronous messaging and event-brokers for asynchronous messaging. FAA provided an overview of the latest FAA-APAC developments on API Gateways for SWIM messaging, benefits of an API Management and Gateway solution, and best practices to develop a framework for

API governance and harmonised cross-regional SWIM data exchange. Operational use cases and examples of SDS implementation leveraging API Gateway were noted by the Meeting.

7.43 The Meeting was requested to include API Governance Framework and guidance materials development in the Governance Working Group and offered to collaborate in SIPG and related APAC Task Force regarding API Gateway strategy discussions and demonstrations.

7.44 The Meeting shared concerns about schema validation requirements as part of the API Gateway governance, as in some States/Administrations' SWIM implementations, information service providers and the information service consumers are responsible for conducting schema validation, while the API Gateway is considered part of SWIM TI. However, in the FAA framework, schema validation is treated as a security requirement for all data entering the system. Due to these differing considerations, it may be difficult to reach an agreement on the proposed API governance framework, as different States/Administrations may impose varying national security regulations and measures.

7.45 Regarding the request to include the development of an API Governance Framework and related guidance materials under the Governance Working Group, it was noted that additional detailed discussions on the features and functionalities of API Gateway are still required. It was therefore recommended to first establish and agree on the **minimum required features and functionalities of the API Gateway** before considering its adoption at the APAC regional level. Once these foundational elements are defined, development of the API Governance Framework can be revisited at a later stage. Considering that the current stage of work is to focus on agreeing upon the minimum features and functionalities of the API Gateway, it was agreed to assign this activity SIPG Task 3, rather than Task 5 under the SWIM TF. **ACTION ITEM 11-27** As SIPG Task 2 is closely related to the API Gateway concept, it was further suggested that SIPG Task 3 work closely with Task 2, as the minimum features and functionality to be agreed upon may affect the implementation topology, namely a centralised or distributed API Gateway. **ACTION ITEM 11-28**

7.46 In response to concerns regarding the incorporation of this new activity under the limited SIPG timelines, the SWIM TF Co-Chair informed the Meeting that the finalisation of various MEP mechanisms and guidance materials related to the Request and Reply MEP should be given the highest priority for SIPG. If the proposed API Gateway study cannot be completed before Q2 2027, it can instead be considered under a future SIPG task. **ACTION ITEM 11-29**

Progress on Development of R-R MEP Guidance Material – SIPG (WP/27)

7.47 This paper presented the progress on development and main contents of R/R MEP Guidance Material drafted by SIPG Task 3 and outlined implementation approaches for the APAC SWIM TI prototype. The Meeting noted that this guidance material is not the final version but rather serves as the initial baseline for implementing R/R MEP within the APAC region. It was recalled that, since SWIM TF/10, extensive discussions have been held at the SIPG level regarding the implementation of R/R MEP in the APAC region. While consensus has been reached on certain topics, such as the adoption of HTTP for synchronous R/R MEP, others, including the choice between full mesh and hierarchical architectures, remain subject to ongoing debate. These unresolved issues will be further discussed under SIPG Task 3. It was added that under the SIPG, R/R MEP will be implemented, tested and validated in the APAC SWIM TI prototype based on the current version of guidance material and, through a continuous feedback loop, any deficiencies or areas for improvement identified during the prototyping phase will be iteratively reflected in the guidance material to improve its maturity.

7.48 The Meeting discussed the significance of this document. It was noted that this document serves as guidance material providing a regional baseline for the major MEPs to be used in the future. It was recommended that all States/Administrations review the document and provide their feedback to SIPG Task 3 for further improvement. **ACTION ITEM 11-30**

7.49 MET/IE WG Chair informed that the proposed description of synchronous and asynchronous R/R MEP for FF-ICE scenarios may not align with many MET scenarios. It was agreed that the MET/IE WG will provide feedback to ensure the guidance document covers most use cases in the region. **ACTION ITEM 11-31**

7.50 The Meeting reviewed the guidance material and no immediate feedback was provided. The draft version of the guidance material reviewed by the Meeting is provided in **Appendix 10.**

Progress on Development of REST API URI Structuring and Naming Guidance Material – SIPG (WP/28)

7.51 ROK, on behalf of the SWIM Pioneering Group (SIPG), provided the progress on development of REST API URI Structuring & Naming Guidance Material, a subsequent deliverable of the R/R MEP Guidance Material within the SIPG Task 3.

7.52 The Meeting noted that the R/R MEP Guidance Material provides a high-level approach to implement the R/R MEP in the APAC region, and as of April 2026, at the SIPG level, there is a tentative consensus on how to implement synchronous R/R MEP. The consensus focuses on four key technical pillars:

- Protocol: HyperText Transfer Protocol(HTTP)/HTTP(Secure)S v1.1
- Architecture: Representational State Transfer(REST) as an architectural style
- Implementation: Application Programming Interface(API) Gateways(GW) (or Proxies)
- Routing: Path-based Routing (PBR)

7.53 It was informed that if future implementation proceeds based on these technical pillars, service instances using RESTful API are expected to be exposed through API GWs deployed at regional and local levels, common conventions and standardised URI structures ought to be defined and applied across the region.

7.54 The Meeting was informed that the REST API URI Structuring & Naming Guidance Material outlines how to design and apply RESTful API URI structuring and naming conventions for implementing synchronous R/R MEP in the APAC region, which includes the definition of REST and RESTful APIs, the rationale for URI structuring and naming conventions, path element definitions, and data flow diagrams illustrating how requests are routed when the conventions defined in this guidance material are applied. The paper summarised the key concept of REST API URI structuring and naming for regional SWIM. The main contents of the REST API URI Structuring & Naming Guidance Material were shared in the Meeting, and the guidance material is provided in **Appendix 11**.

7.55 The Meeting noted that the URI naming related recommendations provided by WP/21 of SWIM TF/11 and the discrepancies between those recommendations and the considerations presented in this document. SIPG Task 3 was requested to further study recommendations contained in WP/21 and amend the guidance material, if deemed necessary. **ACTION ITEM 11-32**

Comments on Technical Memorandum of Cooperation (TMC) Document for ATM Information Exchange through SWIM – New Zealand (WP/25)

7.56 This paper presented New Zealand's comments on the draft Technical Memorandum of Cooperation (TMC) document for ATM Information Exchange through SWIM, following Actions 10-11 and 10-12 from SWIM TF/10.

7.57 As part of the collaboration outlined in Action 10-12, Australia advised Malaysia and New Zealand that they understood the original intent of the SWIM TMC, based on the SWIM TF/8 working paper, to: 1) To have States formally "establish SWIM", 2) To clarify boundaries of responsibility (in terms of SWIM TI), and 3) Establish operational capability. New Zealand agreed with this core of this understanding and with the intent expressed, with the following additional views/proposals:

a) Creation of a unilateral agreement issued at the ICAO APAC-level rather than bilateral or multilateral agreements. In this, New Zealand agrees with Australia's feedback from their SWIM TF/10 Information Paper, section 2.3.2, which suggested a non-binding head agreement at the regional level. New Zealand agrees that a memorandum of cooperation is needed (as outlined in section 2.3 of the SWIM TF/8 Working Paper) but bilateral agreements between contracting states would result in too many agreements to be workable, while multilateral agreements could be hard to reach consensus on.

b) Creation of a suite of documents that includes but is broader than the TMC to allow the appropriate level of detail to be developed at the right time and by the relevant parties. In this, New Zealand largely endorses Australia's feedback from their SWIM TF/10 Information Paper, section 2.3.3, which suggested a subordinate set of documents to the head agreement to address any specific, detailed procedural and administrative matters.

c) Revision of the approach to the TMC (or equivalent artefact) within this suite of implementation and operational documents, such that it becomes a document that describes intent and practical arrangements rather than technical implementation. This allows it to be agreed between interconnecting parties without constraining technical implementation or requiring the documentation of successful transition to operations. This revised TMC should address Thailand's feedback from SWIM TF/8 Final Report, section 2.2, that it would be premature to adopt the draft TMC given the status of SWIM implementation within the region. New Zealand agrees with this feedback and notes that, with the changes proposed, New Zealand expects that an earlier agreement of a revised TMC would be possible and beneficial. The revised TMC would also still be aligned with the intent behind the TMC, to ensure participants within APAC are aligned on SWIM, as outlined by Malaysia in their working paper to SWIM TF/8 (section 2.3, which noted that the first Meeting of SIPG identified the need for a TMC.

7.58 New Zealand's proposal for this suite of documents is to adapt the CRV suite of documents to SWIM, based on learnings from CRV, as outlined in the table below:

SWIM Artefact	Purpose (SWIM)	Approvers (SWIM)	Developed by:
ICAO letter, from APAC statement at the regional level	Outlines the cooperative intent and outcome of SWIM	Signatories not required – issued by ICAO to APAC members	Drafted by the Task Force, endorsed by the Chair and the majority on behalf of the Task Force, issued by ICAO for APAC members, and added to the Implementation Guidance
Technical Memorandum of Cooperation (TMC) aligned to the ICAO Letter	Establishes high-level technical/procedural arrangements and obligations between APAC participants	Potentially design/system owners or operational management within the participant organisation	Drafted by the Task Force, template added to the Implementation Guidance

SWIM Artefact	Purpose (SWIM)	Approvers (SWIM)	Developed by:
Implementation Manual	Sits next to the TMC – outlines the detailed technical and other requirements to establish a messaging system and connections	Design authorities and/or their representatives (e.g., SIPG members)	Drafted by SIPG, evolved by the Task Force, and added to the Implementation Guidance
Operations Manual	Sits next to the TMC - outlines the operational details for SWIM, i.e., who is who, who has what connections, etc.	Design / operational authorities and/or their representatives (e.g., SIPG members)	Drafted by SIPG, evolved by the Task Force, and added to the Implementation Guidance

Table 3: Suite of documents for SWIM

7.59 New Zealand proposed a revised TMC, provided in **Appendix 12** to this report, that reflects the above structure, as well as the following approach and addresses feedback to date in the following way:

a) The scope should be for the long-term relationship between APAC members, and not just for the Pioneer Group/trial and initial implementation of SWIM. The revised TMC incorporates implementation and operations.

b) By focusing on Message Systems, it allows non-ANSP / non-Country Message System participants to be included as well as ANSPs.

c) The proposed revised TMC removes the ANSP/country aspect but suggests a common type of agreement among integrating Message Systems without imposing agreements on Information Service Providers (ISPs) and Information Service Consumers (ISCs), which are able to be devolved to Edge Message System providers independently. The country aspect would be tackled by the head agreement (i.e., ICAO APAC letter) level instead, which addresses Australia's feedback.

d) Agreements for connection of ISPs and ISCs to Edge Message Systems (assuming Gateway Message Systems do not connect directly to ISPs and ISCs, only through Edge Message Systems) would be down to the terms and conditions established by each Edge Message Systems' provider for connection to their services. These are, therefore, not considered part of the SWIM TMC.

e) There is a need for participants to cooperate on SWIM for operational, and non-operational (i.e., testing/development systems), systems. However, a participant may decide to vary from a specific SWIM specification (especially for non-operational systems). In this instance, the assumption is that the participant would establish their own agreement with all other affected participants for its non-operational systems, outside of the SWIM TMC.

f) The Need for SWIM Operations Group was reflected in the 'Governance' section of the revised TMC, New Zealand agrees in principle with Australia's feedback from their SWIM TF/10 Information Paper that they would support a dedicated group (such as SWIM OG), however New Zealand sees the Task Force performing this function until such time as such a body exists and the Task Force relinquishes its role to that group.

g) New Zealand proposes that Australia's feedback from their SWIM TF/10 Information Paper, which was related to wording in the draft TMC, could be covered in the subordinate agreements instead of the TMC.

h) The revised TMC has been reviewed by Airways' Legal team, who agree that it includes relevant required feedback from the previous working paper, noting one change to earlier feedback, specifically reversing the original 'settlement of dispute' feedback back to the original, simpler text. This is due to the proposal that there should be a head of agreement ICAO APAC-wide and the resulting non-technical / specific nature of the revised TMC lessens the concerns about disputes.

7.60 The Meeting expressed its appreciation to New Zealand for providing a comprehensive paper and a revised TMC document. The Meeting agreed to adopt a revised multilayer approach; however, it was noted that the roles and details of each SWIM Artefact require further review and discussion. It was suggested that WP/20 from SWIM TF/11 and the proposals contained in this paper be considered jointly within Task 5 of the SWIM TF. **ACTION ITEM 11-33** Australia, Malaysia, and New Zealand were invited to participate in Task 5 to support further discussions on TMC. Australia and New Zealand confirmed their willingness to join Task 5. The ICAO Secretariat will coordinate with Malaysia on this matter. **ACTION ITEM 11-34**

Updates from Editorial Ad-hoc Group - Editorial Ad-Hoc Group (SP/03)

7.61 The Editorial Task Ad-hoc Group recalled the topics discussed and agreed at SWIM TF/9 to be addressed in the APAC Regional SWIM Implementation Guidance Document (IGD), including:

- SWIM TI specifications;
- Information exchange models;
- Registry model; and
- Service specifications.

7.62 The Meeting was informed that major challenges in drafting the first version of IGD are stability and maturity of the content required for the drafting process. It was noted that, prior to SWIM TF/11, only details of the APAC SWIM TI specifications and FIXM version 4.3, including the regional Extension, were considered sufficiently mature for inclusion in the IGD. It was further noted that the updated version of the APAC Common SWIM Information Services list, which will form part of the Service Specifications chapter of the IGD, would be reviewed during SWIM TF/11, while agreement on a specific SDS version, the regional baseline would also be discussed at the SWIM TF/11.

7.63 A request was received to compile all key documents related to the APAC SWIM implementation that have been developed or are being developed under the SWIM TF. SWIM TF Co-Chair agreed to prepare a document titled **"Existing References for ICAO APAC SWIM Documents",** which will be uploaded on the ICAO APAC e-documents webpage to provide consolidated reference information for APAC States/Administrations in support of their SWIM implementation activities. **ACTION ITEM 11-35**

APAC SWIM Implementation Progress Indicators - SWIM TF Co-Chair (SP/04)

7.64 The Meeting recalled that, under the ANS commitments in the Delhi Declaration, there is a commitment related to SWIM: *Expediting the implementation of ICAO provisions related to SWIM*. It was informed that the ICAO Secretariat provides progress updates on all Delhi Declaration Commitments in every Subgroup, APANPIRG, DGCA Conference, and Ministerial Conference Meetings. However, difficulties were encountered in measuring SWIM implementation progress within the APAC region due to the absence of established indicators.

7.65 The Meeting was informed that, in response to Action Item 10-31, the ICAO Secretariat informed the **DGCA/60 Conference** that indicators to measure SWIM implementation progress in the APAC region were under development, and the latest status of APAC States/Administrations' readiness for SWIM implementation will be shared with the **DGCA/61 Conference**. At the same time, Action Item 10-32 was assigned to the ICAO Secretariat and the SWIM TF Co-Chair to draft indicators for finalisation at the SWIM TF/11 Meeting.

7.66 Following the Action Item 10-32 of SWIM TF/10, three SWIM implementation progress stages – "In Preparation/Planning", "Under Development/Implementation", and "In Operation" – were agreed upon during SWIM TF Task Leads held Meetings held in August 2025, November 2025, and February 2026. For each stage, further refinements were presented to the Meeting, taking into account feedback received from Japan and Singapore.

7.67 The proposed SWIM indicators were reviewed by the Meeting. The finalised indicators are provided in **Appendix 13** to the report.

7.68 The Meeting noted that, for the scoring, a status of "Not implemented" will be assigned a score of 0, "Partially implemented" will be assigned a score of 0.5, and "Fully Implemented" will be assigned a score of 1. It was further agreed that the score of each stage will be represented by the average score of the relevant criteria.

7.69 It was also agreed that all key criteria of each stage will be assessed using the same methodology and weighed equally. It was also agreed that the consolidated SWIM implementation progress survey results will be processed and presented, including details of the implementation levels for each stage. **ACTION ITEM 11-36**

7.70 For the way forward, it was agreed that all SWIM TF/11 participants will provide feedback to the finalised ICAO APAC SWIM Indicators **before 12 June 2026** for any proposed changes; however, major changes will not be considered. **ACTION ITEM 11-37**

7.71 Furthermore, it was agreed that the ICAO Secretariat will develop an online platform for reporting of SWIM implementation progress in accordance with the finalised indicators. Access to the platform will be shared through a State letter and by email **on 3 July 2026** for States/Administrations' reporting. **ACTION ITEM 11-38** It was added that all States/Administrations are required to respond to the SWIM implementation progress reporting request, **ACTION ITEM 11-39,** as this information and detailed analysis of results will be presented to **the DGCA/61 conference**, as requested by the **DGCA/60 Meeting. ACTION ITEM 11-40**

7.72 It was also added that **only one response** from each State/Administration will be accepted. Therefore, States/Administrations were advised to conduct broader consultation, primarily with AIS providers, ANSPs, MET service providers, and airport operators, when reporting their SWIM implementation status. States/Administrations are expected to submit their response through the online reporting platform **by 14 August 2026**, so that results can be processed and presented to the DGCA/61 Conference, planned for the first week of September 2026. **ACTION ITEM 11-41**

SWIM TF Tasks restructuring- SWIM TF Co-Chair (SP/05)

7.73 The Meeting was informed of the current SWIM TF task structure, and leads are as follows:

Groups	Task No.	Subject/Task	Task Leads
Implementation Planning	1	Regional implementation philosophy & roadmap	David Leow (Singapore) Amornrat Jirattigalachote (Thailand)
SWIM infrastructure	2	Regional SWIM infrastructure	Xiaodong Lu (Japan), Yosuke MORO (Japan) Henry Chan (Hong Kong, China)
	3	Security service	Jim Laymon (USA)
Technical Architecture	4	Development and maintenance of regional information exchange models	Amornrat Jirattigalachote (Thailand) Wen Zhu (USA)
Governance	5	Regional SWIM Governance Framework	Young Jin Ha (ROK) Mark Kaplun (USA), Yosuke MORO (Japan) Xiaodong Lu (Japan), Honglei Gao (China)
Information Services	6	Information services	Marco Kok (Hong Kong, China) Jeremy Bienkowski (Australia)
Validation & Demonstration	7	SWIM Demonstration	David Leow (Singapore) Amornrat Jirattigalachote (Thailand)
	8	SWIM services and application validation	Yosuke MORO (Japan) Xiaodong Lu (Japan), Honglei Gao (China), Young Jin Ha (ROK)
Coordination and Promotion	9	Monitoring of Panels' work	Yosuke MORO (Japan)
	10	Regional coordination and SWIM-related information sharing	John Moore (IATA)
	11	SWIM implementation education and promotion (New task)	Vacant

Table 4- The Existing Task Structure leads

7.74 It was noted that, during the SWIM TF Task Leads Meetings conducted after the SWIM TF/10 Meeting, there were discussions on the need for restructuring of tasks under SWIM TF. The proposal presented by the SWIM TF Co-Chair included the removal of **Task 3 – Security Service**, as the ANSIA TF is currently working on the ANS information security aspects. It was clarified that the SWIM TF will continue collaborating and coordinating with the ANSIA TF to ensure SWIM security requirements are incorporated into their relevant deliverables. The second proposal was to remove **Task 7 – SWIM Demonstration**, as the APAC region is currently in the SWIM implementation phase rather than the validation stage. The third proposal was to rename **Task 8 – SWIM Services and Application Validation** to **Task X – SWIM Services Validation,** as SWIM applications are beyond the scope of SWIM as defined in Doc 10039 Manual on the SWIM Concept**.** Lastly, it was suggested to merge three tasks: **Task 9 – Monitoring of Panels' Work**, **Task 10 – Regional Coordination and SWIM-related Information Sharing**, and **Task 11 – SWIM Implementation Education and Promotion** into a single task entitled "Coordination and Promotion", considering that regional coordination is currently conducted through the well-established coordination process between the ICAO Secretariat of SWIM TF and relevant expert groups.

7.75 The Meeting discussed the proposed restructuring of tasks and their respective leads. After detailed deliberations, the agreed task structure and corresponding task leads are as follows:

Groups	Task No.	Subject/Task	Task Leads
Implementation Planning	1	Regional implementation philosophy & roadmap	David Leow (Singapore) Amornrat Jirattigalachote (Thailand)
SWIM infrastructure	2	Regional SWIM infrastructure	Xiaodong Lu (Japan), Yosuke MORO (Japan) Henry Chan (Hong Kong, China)
Technical Architecture	3	Development and maintenance of regional information exchange models	Amornrat Jirattigalachote (Thailand) ~~Wen Zhu (USA)~~ Vacant
Governance	4	Regional SWIM Governance Framework	Young Jin Ha (ROK) ~~Mark Kaplun (USA)~~ (retired) Justin Prasai (U.S) Yosuke MORO (Japan) Xiaodong Lu (Japan), Honglei Gao (China)
Information Services	5	Information services	Marco Kok (Hong Kong, China) ~~Jeremy Bienkowski (Australia)~~ Vacant
Validation & Demonstration	6	SWIM services ~~and application~~ validation	Yosuke MORO (Japan) Xiaodong Lu (Japan), Honglei Gao (China), Young Jin Ha (ROK)
Coordination and Promotion	7	Coordination and Promotion	Yosuke MORO (Japan) Elvin Liow (Singapore)

Table 5- New Task Structure and leads

7.76 To ensure that the objectives set in the ToR can be achieved in alignment with the newly proposed task structure, the Task Leads were requested to update the Statement of Work (SOW) for each task. **ACTION ITEM 11-42** The current version of SOWs is provided in **Appendix 14** to this report.

7.77 As the workload of the SWIM TF Task Leads has significantly increased, and recognising the importance of effectively communicating SWIM-related developments and understanding among SWIM TF members, as well as the benefits that members would gain through participation in the development work of each task, the Meeting encouraged States/Administrations to nominate participants for each task. **ACTION ITEM 11-43**

Review of SWIM TF ToR, SOW, Work Plan, and Outstanding Action Items – Sec (WP/19)

7.78 The paper presented the current SWIM TF's ToR, the revised SWIM TF's work plan, and the Action List to reflect the latest work status achieved. The Meeting reviewed the latest ToR of SWIM TF, which was adopted by CNS SG/26 through ***Decision CNS SG/26/07 (SWIM TF/06/05)*** – *Revised SWIM TF Terms of Reference*, and agreed that no revision to the ToR is required. The latest ToR of SWIM TF is provided in **Appendix 15** to the Report

7.79 **Appendix 16** of the Report provides the latest version of the SWIM TF Work Plan, which will be further updated by Task Leads, if required, following the new task restructuring. **ACTION ITEM 11-44**

7.80 The Meeting also updated the action item list. The updated action item list is provided in **Appendix 17** of the Report.

Agenda Item 8: Next Meetings and Any Other Business

Organisation of SWIM Training cum Workshop in August 2026 – Sec (IP/02)

8.1 The Meeting was informed that the ICAO APAC Office is organising the ICAO Asia/Pacific SWIM Training cum Workshop from 25-27 August 2026 in Hanoi, Viet Nam, generously hosted by the Viet Nam Air Traffic Management Corporation (VATM) in response to DGCA/60 Conference Action Item 60/20, requesting that ICAO organise SWIM-related seminars and workshops to support States in this area. The Meeting was informed that State Letter Ref.: T 8/5.3 – AP064/26 (CNS) dated 12 May 2026 has been issued. More information about this event will be published on the event website at: https://www.icao.int/APAC/Meetingdocs?fid=94781

8.2 The Meeting was requested to take this opportunity and consider planning a delegation composed of regulators and service providers' personnel involved in SWIM implementation to attend the event.

8.3 Australia noted that the workshop did not currently cover all information domains and suggested the program be extended to support other information domains such as MET. Australia offered to coordinate with our MET leaders to identify if we have someone available to present at the workshop. The Meeting requested formal confirmation of the speaker's in-person attendance at the workshop, along with the proposed presentation topic. Upon receipt of this information, the workshop program will be modified accordingly. **ACTION ITEM 11-45**

First ICAO global Communications, Navigation, Surveillance, and Spectrum Symposium (CNSS 2026), Kotor, Montenegro, from 12 to 15 October 2026 – Sec (IP/03)

8.4 The Meeting was informed that ICAO will convene the First ICAO Global Communications, Navigation, Surveillance, and Spectrum Symposium (CNSS 2026) in Kotor, Montenegro, from 12 to 15 October 2026. It was noted that ICAO HQ has issued State Letter Ref.: TC12/46.3 – 26/42 dated 30 April 2026, sharing information about this event. More information about this event will be published on the event website at: First ICAO Communications, Navigation, Surveillance, and Spectrum Symposium, an Air Navigation World Event (ANW|CNSS 2026). The Meeting was requested to attend the symposium.

SWIM harmonization

8.5 The Meeting discussed the need for a harmonised level of implementation among all significant APAC States/Administrations in order to realise the full benefits of SWIM across the region. The Meeting expressed concern regarding the absence of India from SWIM TF meetings in recent years, which has resulted in an incomplete understanding of the SWIM implementation status in the State. It was recalled that, in the past, India had been highly active in sharing progress on SWIM implementation, as well as participating in regional trials and demonstrations.

8.6 The Meeting requested the ICAO APAC Office to kindly encourage India to re-engage in SWIM TF meetings and to share its implementation status, with a view to ensuring the benefits of harmonised and timely SWIM implementation across the APAC region. **ACTION ITEM 11-46**

Date and Venue for the Next Meeting

8.7 The Meeting discussed the next SWIM TF Meeting dates. The SWIM TF/12 is tentatively planned to be held from **7 to 11 June 2027**. Interested member states that were to host the Meeting were requested to inform the ICAO Secretariat at least six months before.

8.8 In closing the Meeting, the Co-Chair and ICAO Secretariat thanked all participants for their active participation in the Meeting and valuable contributions to the work programme of the SWIM TF.

Guidance Materials for the sharing of surveillance data in SWIM

Jan 2026

Study Group Under SURICG On Sharing of Surveillance Data In SWIM (SURSG)

Table of Contents

1. Introduction

1.1. Background

1.1.1. Surveillance Study Group (SURSG)

The establishment of the SURSG and its Terms of Reference (TOR) was endorsed by the CNS SG/24 on 4 December 2020 under the ***"Decision CNS SG/24/16 (SURICG/5/1) - Establishment of Study Group under SURICG on Sharing of Surveillance Data in SWIM"***. Based on the TOR, the objectives of the Study Group are to:

1) Study, provide expert views and recommendations:
   a) to achieve harmonized sharing of surveillance data in SWIM in the Asia and Pacific Regions (APAC) according to the Surveillance Strategy adopted by APANPIRG and in support of ICAO's GANP and ASBU initiatives; and
   b) on the possible models of sharing surveillance data in SWIM in the SWIM environment, in consideration of the SWIM technical infrastructure, SWIM information service, Common aeRonautical Virtual Private Network (CRV) infrastructure and any applicable governance, and technical requirements.

2) Review, identify and provide expert views and recommendations to address major issues, raised to the SURSG by ICAO APAC, in the technical, operational or regulatory aspects of surveillance data sharing to facilitate the implementation of surveillance from "departure to destination" in APAC.

1.1.2. SURSG Study Report

With members' support, inputs, and efforts from task leads, all tasks in the feasibility study stage were completed in Feb 2022 with a Concept of Operations (CONOPS) and a Study Report been published in ICAO portal (SURICG/6-IP17 and Appendix E in CNS SG/26-WP13) which formed the basis for shaping the performance requirements and service categorization of surveillance data sharing in the region. One of the recommendations and moving forward from the Study Report was the proposal for the establishment of a Surveillance Sharing in SWIM Trial Implementation Group (S3TIG) to oversee a trial with the following main responsibility and objectives:

1) Coordinating with the SWIM Task Force, CRV OG to reflect SWIM development in the trial
2) Leading and coordinating with interested states/administrations, and stakeholders (commercial and non-commercial) to conduct the trial:
   a) to demonstrate as far as practicable the general, technical and administrative aspects of surveillance sharing in SWIM in the Study Report; and
   b) to serve as a reference model for future surveillance sharing implementation in SWIM.

1.1.3. S3TIG and Joint Event

S3TIG was then established in December 2022 to support and promote the trial implementation of surveillance data sharing based on SWIM. With the endorsement of SURSG/3, SWIM TF/7, and SURICG/8, the SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial were successfully conducted as a Joint Event by S3TIG in Hong Kong, China, from 28 to 29 May 2024. The report of the joint event can be found in the ICAO portal (SWIM TF/10-WP/05).

1.1.4. Guidance Materials

Guidance materials (i.e. this document) for the sharing and access of surveillance data is one of the deliverables under SURSG. Upon successful completion of the Joint Event, States/Administrations including Hong Kong China, Singapore, and the USA have volunteered and contributed to producing this document.

1.2. Purpose of the Document

This document provides guidance for system planning, design, and implementation of SWIM platforms in the APAC region for surveillance data sharing, with the purpose of ensuring continuous and coherent development of the SWIM platforms for surveillance data sharing that is harmonized and interoperable within the region.

2. Summary of Major Considerations from the Study Report and their Outcomes from the Joint Event

2.1. Implementation Model

2.1.1. Starting small and simple

To align with the philosophy and roadmap for the implementation of SWIM in APAC, the same incremental approach (i.e. starting small and simple) has been leveraged for surveillance data sharing in the Joint Event. With a focus on operations selected (i.e. ATFM, FF-ICE, and MET) to benefit from surveillance data sharing, the infrastructure and associated information service have been identified and implemented. Where the first implementation of surveillance data sharing of ADS-B data proved feasible and beneficial.

2.1.2. SWIM over CRV

CRV has been endorsed as the carrier of SWIM data at CRV OG/5 and SWIM TF/3 meetings. S3TIG considered that the option to use the operational CRV for the Joint Event was not preferred considering the potential bandwidth impact and cyber security risks, even if remote, on the operational CRV, which is the network carrying safety critical operation data.

Instead, PCCWG established a pseudo-CRV network for the Joint Event. The pseudo-CRV operated exactly like the operational CRV, utilizing a dedicated and segregated CRV network with the same hardware setup. Similar to the operational CRV, dedicated network interface devices were installed at the site for each participant participating with an EMS.

For participants without an EMS, PCCWG provided SIM cards for mobile connection through its Console Connect platform. This platform allows users to access the simulated SWIM environment in the Joint Event to publish/subscribe data services and interact with the HMI of the SWIM services provided by PCCWG. The network infrastructure used in the Joint Event is illustrated in Figure 1 below.

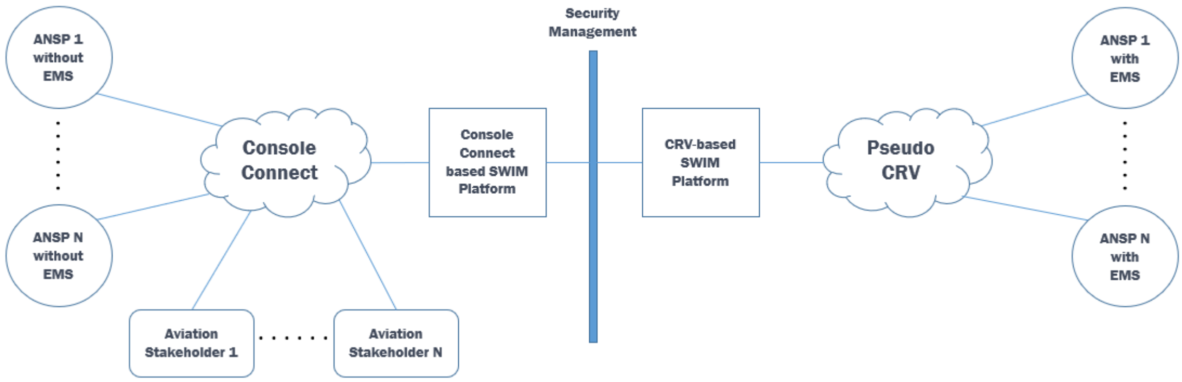

Figure 1 – Network Infrastructure for the Joint Event

The outcome of the Joint Event confirmed that the proposed implementation of surveillance data sharing using a SWIM platform, as depicted in Figure 1 above, with a combination of CRV-based SWIM platform and third-party/commercial interest providing the internet-based SWIM platform (i.e. Console Connect in the case of the Joint Event) for different kinds of stakeholders is feasible.

Moreover, stakeholders who are currently outside the CRV network's coverage can subscribe to the surveillance data sharing service (whether it is within the CRV network or not) through Console Connect (left side of the diagram), using various connection means. With proper security management, the Console Connect-based SWIM platform will be able to communicate with the CRV network and allow surveillance data exchange between the two platforms.

It should be noted that the 2Mbps bandwidth tentatively offered for each State/administration in the pseudo-CRV was not sufficient to carry surveillance data sharing with a 1s data rate. Section 4 of this document provides more detailed bandwidth considerations for surveillance data sharing.

2.2. Infrastructure Model

2.2.1. SWIM Technical Infrastructure

The hybrid infrastructure model as proposed by the Study Report, comprising private EMSes owned by States/Administrations and public/commercial EMSes was adopted in the Joint Event. While setting up the EMS architecture for the Joint Event, the SWIM Implementation Pioneer Group (SIPG) noted that a GRE tunnel would have to be established between each communication pair under the CRV provision. This approach would put restrictions on the future SWIM implementation as lots of GRE tunnels have to be constructed for any-to-any connections. To mitigate the impact of such restriction, a 2-tier hierarchical architecture was proposed by SWIM TF and was adopted for the Joint Event. In the hierarchical architecture, participants were divided into sub-communities and one representative from each sub-community would act as the gateway for message exchange among all sub-communities ("the Gateway EMS"). Participants under each sub-community with EMS provision would act as the EMS provider ("the Edge EMS") for their local downstream users. This approach could effectively reduce the number of GRE tunnels required. For participants without EMS, PCCWG would act as the 3rd party EMS provider to provide network-based EMS services for them. Figure 2 below shows a schematic diagram of such EMS architecture.

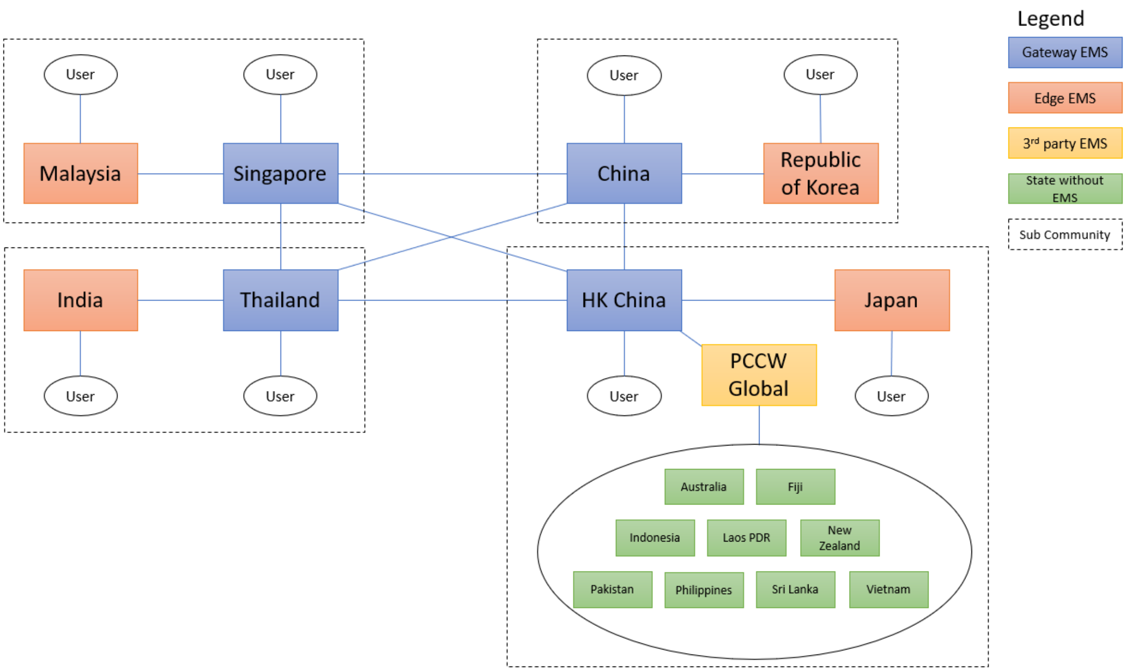

Figure 2 – EMS Infrastructure for the Joint Event

Some participants had expressed doubts about whether the hierarchical architecture is the appropriate architecture for the APAC region. There were several observations with this architecture identified during the preparation of the Joint Event, such as specific configuration required for different brands of EMS, potential message loop back if source and recipient checking was not implemented properly, combining byte message and text message into a single queue, single point of failure of the current architecture, etc.

It should be highlighted that the development of the SWIM technical infrastructure for APAC region is still ongoing. States/Administrations should refer to the latest development status as published by SIPG from time to time.

2.2.2. Surveillance Central Data Processor (SCDP)

Surveillance data sharing can be supported by direct interfacing between data contributor and data consumer. If any 3rd party wishing to provide a centralized surveillance data-sharing service may do so by way of an SCDP, which filters and collates surveillance data feeds from data contributors and outputs user-selectable data streams as a SWIM service. Figure 3 below shows a conceptual model of SCDP. While the SCDP functions were not tested in the Joint Event as such functions cannot be delivered by the SCDP service provider on time, it should be noted that the SCDP concept could bring benefit on bandwidth saving, especially for non-contributing EMS that only interested data will be transmitted from the SCDP, rather than receiving all surveillance data from all the contributing EMSes.

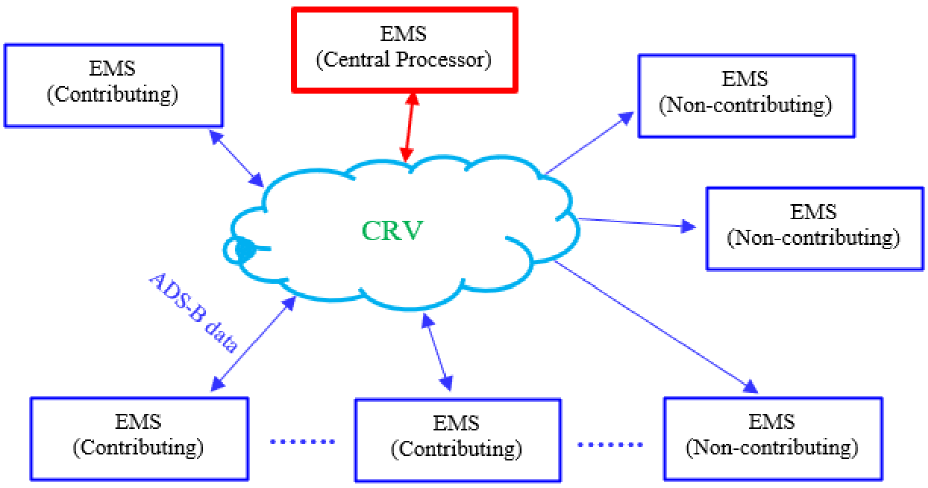

Figure 3 – Conceptual Model of SCDP

2.3. Business Model

The following are the major recommendations from the Study Report on the business model. For details, please refer to the Study Report as referred to in Section 1.1.2.

2.3.1. CONOPS

It is envisaged that States/Administrations will have varying needs for the shared surveillance data. Based on the nature of ATS applications, the service levels of shared surveillance data may be roughly classified into two types as below:

1) Level 1 Data Services for supporting ATS applications which make use of the shared surveillance data for aircraft separation.
2) Level 2 Data Services for supporting ATS applications which do not use shared surveillance data for aircraft separation (e.g. Air Traffic Flow Management (ATFM), situation awareness at FIR boundaries, etc.)

It should be highlighted that the APAC Common SWIM Information Services for surveillance data sharing in the region is not specified to support the provision of aircraft separation (i.e. Level 1 Data Services).

The Level 2 Data Services is suitable for:

a. FIR coordination.
b. Air situation awareness at FIR boundaries.
c. Flight tracking.
d. Strategic planning and analysis.

and is **not suitable** for:

a. Separation assurance.
b. Controller tactical operations.
c. Surveillance-based conflict resolution.

2.3.2. Format of Data

ASTERIX CAT 21 Edition 2.1 is recommended for the initial implementation, as most of the States/Administrations can support without additional data conversion efforts. The SCDP would be able to provide data conversion services between different ASTERIX CAT 21 editions, to support legacy systems if required. Accordingly, S3TIG proposed the data structure for surveillance data sharing. Such data structure could serve as a reference model for future surveillance-sharing implementation in SWIM. Two message payloads (i.e. ASTERIX and JSON) were tested in the Joint Event. The finalized data structure can be found in Section 6.2 - Annex 2.

2.3.3. Integrity of ADS-B Data

The data contributors should not modify the content of the surveillance data except for the following purposes:

1) ASTERIX Edition upgrading or downgrading;
2) Format conversion to meet the agreed data format for sharing;
3) SAC/SIC amendment; and
4) Fusion of data from multiple sensors, such as removal of duplicated ADS-B position reports. Position report extrapolation shall not be shared.

The time stamp of the surveillance data report shall be based on a reliable time source with timeliness performance as mentioned in Section 5.4, without any modification by the data contributors.

2.3.4. Report Filtering

Screening out special or non-civilian flights (e.g. State aircraft) is allowed with the filters being agreed upon prior to implementation. The filtering mechanism shall be detailed in the data services provided. For ADS-B data, the data contributors shall not perform any data filtering based on ADS-B quality indicators or blacklist. All the ADS-B data shall be shared with users as far as possible. Considering that States/Administrations will be making the assessment of data usability, and that lower NUC/NIC can still support lower-level operations, all data should be sent without filtering based on NUC/NIC.

2.3.5. Serviceability

Two data services, namely Level 1 (use for aircraft separation) and Level 2 (not use for aircraft separation) Data Services, were recommended to support the operation needs on surveillance data sharing in the region. These two data services are equivalent to Category 1 (support aircraft separation) and Category 3 (support enhanced flight operation) under "*Baseline ADS-B Service Performance Parameters*" of ICAO'S *ADS-B Implementation and Operations Guidance Document Edition 15.0 – September 2022"* with details as below.

Service Parameters	Level 1[1]	Level 2[2]
System Availability	Total Service Availability > 99.9%	Total Service Availability > 90%
System Reliability	Total Service MTBF > 50,000 hours	Total Service MTBF> 200 hours
Aircraft Updates	0.5 second < Interval < 10 seconds	0.5 second < Interval < 60 seconds
Data Latency	95%: < 2 seconds	95%: < 60 seconds

2.3.6. Data Coverage

Data contributor to share ADS-B data from stations that are near the FIR boundaries (useful to cover surveillance gaps) to support Level 1 data service and/or ADS-B stations that are near airports for international flights (useful for ATFM) to support Level 2 data service is recommended to be the minimum for a data contributor. Other choices to share ADS-B data from (i) all its ADS-B stations; (ii) one of its ADS-B stations; and (iii) all its international flights could be considered if such a use case is available.

2.4. Participation Model

2.4.1. Data Contributors

Due to the varying degrees of SWIM implementation status of States/Administrations, data contributors should offer flexibility to allow surveillance data sharing to the data consumers either by direct interfacing or by centralized SCDP services provided by a 3rd party.

Direct interfacing between data contributor and data consumer can be established regardless of whether an SCDP exists. However, an SCDP is expected to greatly accelerate the implementation of surveillance data sharing and popularize its utilization in accordance with the "starting small and simple" philosophy. SWIM-enabled States/Administrations can choose this collaboration model for an initial trial with a "local SCDP" and then populate the SCDP services through further collaboration in a later stage by expanding their capabilities or by way of 3rd-party SCDP centralized services.

Surveillance data sharing services (Level 1 and Level 2), if offered via SCDP, require the collaboration between States/Administrations (as data contributors) and the SCDP service provider for the data provision mechanism, including data format, data update rate, etc., to ensure the SCDP can deliver the ultimate surveillance data sharing services, meeting the service parameters mentioned in Section 2.3.5.

Data charging schemes or incentives provided to States/Administrations who are data contributors to the SCDP should be explored to encourage data contribution to the SCDP.

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[1] Level 1 standards are for supporting ATS applications which make use of the shared surveillance data for aircraft separation. It should be highlighted that the service parameters mentioned in the table have been referenced from AIGD for 5NM separation, and may differ from any specific performance requirements specified in EUROCONTROL-SPEC-147 (EUROCONTROL Specification for ATM Surveillance System Performance (Volume 2 Appendices))

[2] Level 2 standards are for supporting ATS applications which do not use shared surveillance data for aircraft separation (e.g. Air Traffic Flow Management (ATFM), situation awareness at FIR boundaries, etc.)

With the presence of SCDP, States/Administrations without SWIM infrastructure can also contribute their data by legacy means and in legacy data formats (if this is the case) to the SCDP, which will then take care of data conversion and onward data surveillance sharing service for dissemination.

2.4.2. Data Consumers

States/Administrations, based on their own SWIM implementation status, can choose between direct interfacing with the data contributor or using the surveillance data sharing service provided by SCDP. States with SWIM infrastructure may participate in the initial trial by directly interfacing with data contributors. Data consumers without SWIM infrastructure can subscribe to the surveillance data sharing services from the SCDP to benefit from shared surveillance data.

Data will be shared among all the participating users in the spirit of sharing and benefiting the aviation community.

2.4.3. Data Governance

It should be highlighted that the development of the SWIM data governance for APAC region is still ongoing. States/Administrations should refer to the latest development status as published by SIPG from time to time.

2.5. Implementation Roadmap and Timeframe

2.5.1. Development of CONOPS

Singapore, Hong Kong, China, Thailand, and Vietnam have developed a proposed concept of operations (CONOPS) for surveillance data sharing in SWIM (SURICG/6-IP/17). A comprehensive discussion has been included, ranging from practical models for collaboration and operation to business models, considering available platform(s) and other technical considerations.

2.5.2. Preparation of guidance material and multilateral agreement

With reference to the models and recommendations advised in the Study Report, guidance material, specified system requirements, performance requirements, operation and maintenance practice, and so forth, should be developed to facilitate and harmonize the implementation of surveillance data sharing. The guidance material should also provide guidance for the design, testing, and commissioning of the system for surveillance data sharing to ensure coherent system development.

A multilateral agreement may involve a lengthy negotiation process, depending on the size of the participant group and agendas. Despite the considerable time it may take, a multilateral agreement is considered a more suitable option over a bilateral agreement to attain non-discrimination data sharing with transparent, fair, and equitable treatment.

2.5.3. Implementation of infrastructure – SWIM, CRV and EMS

SWIM over CRV is the default means to share surveillance data. The hybrid infrastructure model is considered the most suitable one with maximum efficiency and minimal geopolitical concerns. The States/Administrations are suggested to evaluate and determine which options to be adopted, based on their own context. The infrastructure should be implemented according to the requirements set out with considerations of latency, throughput, network security, system reliability, and cost effectiveness.

2.5.4. Implementation of information service

It is envisaged that information services developed based on the functional and performance requirements, such as message format and data filtering, will be properly tested and validated locally or with the adjacent regions to ensure a reliable system for surveillance data sharing.

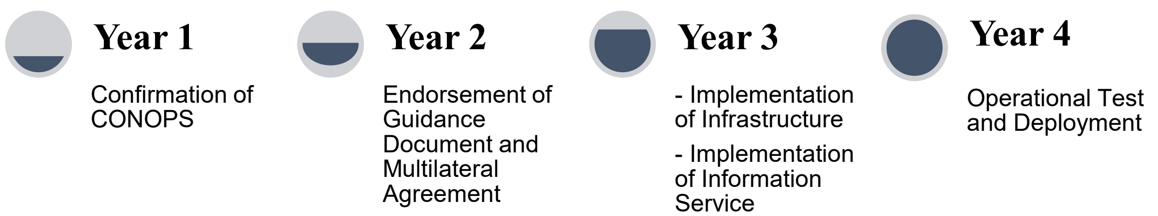
2.5.5. Operational test, validation user acceptance, and operation deployment

Upon the completion of the implementation of infrastructure and information service, the overall functions of sharing surveillance data could be verified through operational tests and user acceptance tests. State/Administration's involvement in this stage is important to identify system deficiencies or interface issues, if any, for further investigation and improvement before putting into operation.

After comprehensive testing and review, the system would be ready to deploy for operation. Regular meetings across the States/Administrations should be held with an operations group to review performance and examine any issues found. A collaborative review process and cooperative system fine-tuning will be crucial for the continuous improvement and further development of surveillance data sharing.

2.5.6. Timeframe

The implementation timeline chronologically arranges the tasks identified in the implementation roadmap proposed in Sections 2.5.1 to 2.5.5. The timeline may differ to some extent depending on the actual deployment model and approach, and also for the level of services to be delivered (e.g. quicker deployment for Level 2 Data Services than Level 1 Data Services). The implementation of the SWIM platform is a key contributing factor to the timeline of surveillance data sharing.



3. Surveillance Information Service Security

The security of the Surveillance Information Service in the SWIM platform is critical to ensuring the integrity, confidentiality, and availability of surveillance data. While the overall SWIM-related information security would be based on the guidance documents developed by the Trust Framework Panel (TFP), this document will focus on industrial best practices for securing surveillance information services and their interfaces.

3.1. General Security Principles

1) **Authentication and Authorization**: Verify the identity of all entities accessing the SWIM services and enforce strict role-based access control (RBAC).
2) **Confidentiality**: All surveillance data exchanged between systems must be encrypted to prevent unauthorized access.
3) **Integrity**: Mechanisms must be in place to detect and prevent any unauthorized alterations to surveillance data.
4) **Availability**: Ensure that the SWIM platform and its services remain operational and resistant to denial-of-service (DoS) attacks.

3.2. Security for External Interfaces

The external interface of the SWIM platform would be over CRV or the internet. This interface is vulnerable to external cyber threats and requires robust protection mechanisms, such as:

1) **Data Encryption**
   a) Use TLS for encrypting data exchanged over the external interface.
   b) Ensure that all endpoints support secure transport protocols.
2) **Authentication**
   a) Implement mutual TLS (mTLS) to authenticate both the SWIM platform and external entities.
   b) Use digital certificates issued by a trusted Certificate Authority (CA) for secure communications.
3) **Access Control**
   a) Apply firewall rules to restrict access to the SWIM platform to only authorized IP addresses or ranges.
   b) Use Application Layer Gateways (ALG) or dedicated API gateways to filter and validate incoming and outgoing messages.
4) **Monitoring and Intrusion Detection**
   a) Deploy an Intrusion Detection System (IDS) or Intrusion Prevention System (IPS) to monitor traffic between the SWIM platform and external entities.
   b) Log all access attempts and regularly audit logs for suspicious activity.
5) **Message Validation**
   a) Validate incoming messages for conformance to the expected format (e.g. ASTERIX CAT 21 or SWIM-based messages).
   b) Reject malformed or unexpected messages to prevent injection attacks or malformed data propagation.
6) **Rate Limiting and DoS Protection**
   a) Apply rate limiting to prevent excessive requests from external entities.

   b) Use traffic filtering and scrubbing solutions to mitigate DoS or Distributed Denial of Service (DDoS) attacks.

3.3.Security for Internal Interfaces

The SWIM platform's internal interface would be connected to the data conversion engine and the internal ADS-B system. While the internal network is more protected, it still requires robust security to prevent insider threats or breaches.

1) **Network Segmentation**
   a) Separate the SWIM platform, data conversion engine, and internal ADS-B system into distinct network zones.
   b) Use firewalls to enforce strict segmentation and limit communication to only necessary connections.
2) **Encryption**
   a) Secure internal communications using IPSec or TLS to prevent interception or tampering of data.
3) **Data Validation and Filtering**
   a) Validate and sanitize all messages exchanged between the data conversion engine and the SWIM platform.
   b) Ensure that no unauthorized or malformed data is passed through the internal interface.
4) **Authentication**
   a) Use secure tokens or certificate-based authentication for all communications between internal systems.
   b) Implement two-factor authentication (2FA) for administrative access to internal components.
5) **Access Control**
   a) Enforce strict access control policies for internal systems. Only authorized personnel and systems should have access to the SWIM platform and the data conversion engine.
6) **Audit and Logging**
   a) Maintain detailed logs of all interactions between the SWIM platform, data conversion engine, and internal ADS-B system.
   b) Implement real-time monitoring to identify unauthorized access or unusual activity.

3.4.Security for Data Conversion Process

The data conversion engine, which converts legacy ASTERIX format data to SWIM-based messages, must be secured to ensure reliable and accurate data transformation.

1) **Input Validation:**
   a) Validate and sanitize all data received from the internal ADS-B system before processing.
   b) Ensure that only ASTERIX CAT 21 messages are accepted for conversion.
2) **Controlled Data Transformation:**
   a) Perform data conversion within a sandboxed environment to mitigate the risk of malicious payloads affecting the SWIM platform.
3) **Error Handling and Exceptions:**

   a) Implement robust error handling to prevent corrupted or incomplete data from being transmitted to the SWIM platform.

4) **Data Integrity Checks:**
   a) Use hashing algorithms (e.g. SHA-256) to verify the integrity of data before and after conversion.

3.5.Security Governance and Compliance

1) **Compliance with Standards:**
   a) Ensure compliance with ICAO guidelines, such as the Global Air Navigation Plan (GANP) and Aviation System Block Upgrade (ASBU) framework.
   b) Follow guidance documents developed by the TFP.
2) **Regular Security Assessments:**
   a) Conduct periodic vulnerability assessments and penetration testing for both internal and external interfaces.
   b) Review and update security policies regularly to address emerging threats.
3) **Incident Response Plan:**
   a) Develop and maintain an incident response plan to quickly detect, respond to, and recover from security incidents.
   b) Conduct regular drills and simulations to ensure readiness.
4) **Training and Awareness:**
   a) Provide cybersecurity training to all personnel involved in the operation and management of the SWIM platform.
   b) Promote awareness of phishing, social engineering, and other common threats.

4. Infrastructure and Bandwidth Considerations

4.1. Infrastructure Considerations

The ANSP's infrastructure to support surveillance data sharing over SWIM should include at least the following components and interconnections among them.

1) Internal ADS-B system;
2) An interfacing module with flight plan system (for supporting surveillance data with flight plan information)
3) A data conversion engine/services to convert legacy ASTERIX format data to SWIM-based surveillance messages, which would most likely be a new system to be implemented, as existing automation systems typically incorporate surveillance data processing which create surveillance tracks no longer representative of the original data source (i.e. existing automation system outputs will not meet the requirement to supply the unprocessed ADS-B data).
4) An EMS to publish the SWIM based surveillance messages

Schematic diagrams showing the possible infrastructures are depicted below, with option 1 to be owned by ANSP and option 2 be cooperated with 3rd party service provider.

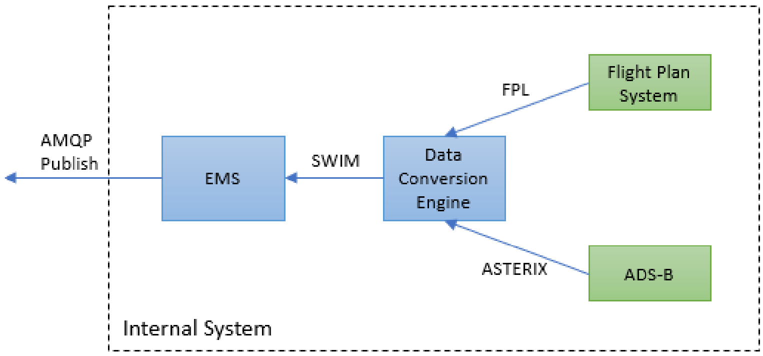


Figure 4 – Possible infrastructure (option 1)

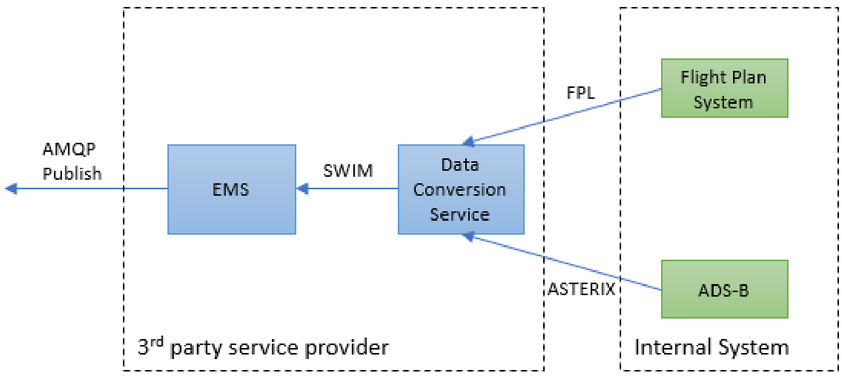


Figure 5 – Possible infrastructure (option 2)

The comparison between the two options are similar to other provision of SWIM services and could be considered by ANSP according to its situation. Some consideration factors are listed below.

1) On-premise vs Cloud-based SWIM infrastructure;
2) Self-development vs service-subscribed services;
3) Self-maintenance vs service-subscribed maintenance;
4) One-time cost vs recurrent cost; and
5) Level of data ownership and data sensitivity.

4.2. Bandwidth Considerations

In planning for the transmission of surveillance data over SWIM, it is essential to consider the bandwidth implications associated with the selected data format, message frequency, and operational requirements. Ensuing paragraphs provides considerations into the bandwidth calculation based on the Joint Event for surveillance data sharing over SWIM as presented in the WP05 in SURSG/4, 28 – 31 May 2024.

a) Transmission Overhead
Analysis of packet captures has revealed that Advanced Message Queuing Protocol (AMQP) messages incur an approximate 8% overhead relative to the size of the original message content (header and body).

b) Message Size
Statistical data from the Joint Event highlights that AMQP messages containing both ADS-B surveillance data and Flight Plan information can vary in size depending on the number of data fields and format used. Notably:
- Messages in JSON format that carry 32 data fields have an average size of **1.1K bytes** per message.
- Including the **8%** transmission overhead, the effective size per message increases to approximately **1.2K bytes**.

This represents the upper bound of message size observed and is suggested to be used as a reference for capacity planning.

c) Peak Bandwidth Estimation Example
In the case of Hong Kong, China, during peak traffic periods, the ADS-B system detects and processes data for approximately 300 aircraft targets per second within its area of responsibility. Assuming each target is associated with a message of 1.2 KB, the estimated bandwidth consumption is as follows:
- 300 messages per second × 1.2K bytes = 360K bytes per second
- This equates to approximately **2.88 Mbps**

This estimation provides a useful reference point for States/Administrations when planning their bandwidth provision in similar operational environments.

d) Suggested Calculation for Required Bandwidth

[maximum number of targets per second] x 1.2K bytes x 8 bps

5. Performance Requirements

5.1. Overview

This section defines the minimum performance requirements for sharing surveillance data in a SWIM-compliant environment. The framework assumes a fixed surveillance data refresh rate of between every 4 to 30 seconds and aims to support **Level 2 Data Services only** (align with the APAC Common SWIM Information Services) including strategic ATM operations such as situational awareness at FIR boundaries, planning, and safety monitoring—not tactical control. Emphasis is placed on the integrity, timeliness, and efficient distribution of surveillance data between contributing systems and consumers.

5.2. Surveillance Refresh Cycle and Data Management

5.2.1 Surveillance Refresh Rate

1. All surveillance data (track-level or processed target reports) shall be refreshed between every 4 and 30 seconds (0.25 and 0.03 Hz).
2. This interval defines the **data validity window** for each update; messages older than this window must be **discarded** and **replaced with the most current message**.
3. EMS and EMS Central Processing units must synchronize their output to this cycle and align time stamps using a standard (e.g., UTC-based ISO 8601).

5.2.2 Surveillance Central Data Processing (SCDP) Interface

1. The SCDP must act as the **authoritative node** aggregating surveillance feeds from contributing **EMS or EMS Central Processing nodes**.
2. All contributing EMS nodes must:
    a. Push updates to the SCDP in harmony with the surveillance update rate, between every 4 to 30 seconds.
    b. Include metadata indicating the source system, timestamp, and message sequence.
    c. Implement logic to **replace stale messages** and ensure that only the most current data is available for downstream dissemination.
    d. SCDP shall enforce **version control** and prevent duplication or delivery of outdated data.

5.3. Message Distribution Architecture

5.3.1 Push Message Model

1. **Definition**: Data is delivered continuously from the publisher (e.g., SCDP) to subscribed consumers without solicitation.
2. **Performance Characteristics**:
    a. Suitable for systems needing continuous streams (e.g., ground situation displays, traffic flow tools).
    b. Requires **high bandwidth**, especially during peak operational hours.
    c. Messages must be prioritized and queued efficiently to avoid congestion.
    d. Tolerable one-way distribution time: **≤ 1 second end-to-end**, including **200–400 ms over CRV**, depending on available bandwidth.

5.3.2 Pull Message Model

1. **Definition**: Consumers request specific data sets from the SCDP or an intermediary data service.
2. **Performance Characteristics**:
    a. Pull requests must be **governed and filtered**: consumers may only access messages that are:
    b. Related to their airspace of responsibility.
    c. Within their operational context or authorization.
    d. Response times to pull queries should not exceed **2 seconds**, including message retrieval and filtering.
    e. Pull services must implement **access control**, **query scope limits**, and **load-balancing mechanisms** to preserve the system.

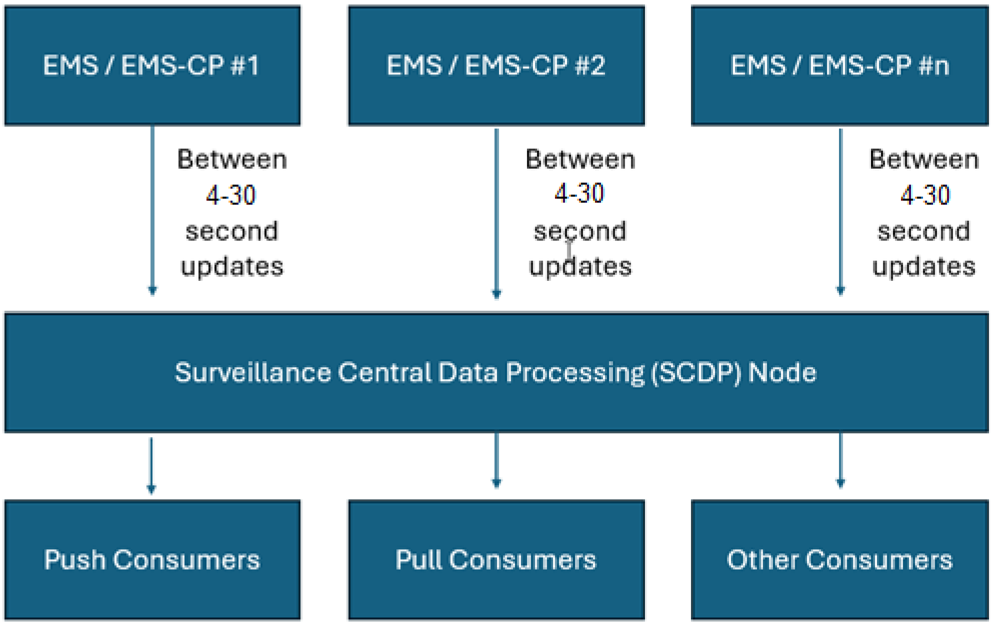
5.4. Key Performance Parameters

Parameter	Requirement
Update Rate	Between every **4 and 30 seconds** from all contributing EMSs to SCDP.
Latency	End-to-end delivery from EMS to consumer: **≤ 1 second** (nominal).
CRV Distribution Time	**200–400 ms**, subject to bandwidth; tolerance for up to 600 ms in constrained conditions.
Data Integrity	All messages must include verification (e.g., checksum, digital signature). Invalid or corrupted data shall be rejected.
Availability	99.9% availability (max 8.76 hours downtime per year).
Continuity	Surveillance data source shared via SWIM to maintain message delivery such that, for each individual source, no more than one consecutive expected message is missed within any rolling 24-hour period.
Timeliness	All surveillance data must be time-stamped to UTC with an accuracy of ±1 second.
Bandwidth Efficiency	Push models must implement flow control. Pull models must restrict volume by request scope and role-based access.
Scalability	Systems must scale to support a growing number of consumers (e.g., FIRs, ATFM units, adjacent ANSPs) without degradation in latency.

5.5. Quality Assurance and Monitoring

1. SWIM surveillance data services must implement continuous **performance monitoring** at key nodes (EMS, SCDP, CRV interface, consumer).
2. **Alerts** must be generated for:
    a. Missed updates.
    b. Latency exceeding defined thresholds.
    c. CRV congestion or message drops.
3. Logs must retain metadata for **audit and post-event analysis** for at least 30 days.

5.6.SWIM Surveillance Data Sharing Architecture



5.7. Key Components and Data Flow

1. **EMS / EMS-CP Nodes**:
    a. **Function**: Collect raw surveillance data (e.g., radar, ADS-B).
    b. **Data Transmission**: Send processed surveillance messages to the SCDP every 4 to 30 seconds.
    c. **Time Synchronization**: Ensure all messages are time-stamped using UTC (e.g., ISO 8601 format).
2. **Surveillance Central Data Processing (SCDP)**:
    a. **Function**: Aggregate, validate, and manage surveillance data from multiple EMS/EMS-CP sources.
    b. **Data Management**:
        i. Discard outdated messages beyond the 4-to-30-second refresh cycle.
        ii. Replace old messages with new ones to maintain data currency.
    c. **Data Distribution**:
        i. **Push Model**: Broadcast data to subscribed consumers.
        ii. **Pull Model**: Respond to specific data requests from consumers.
3. **Push Consumers**:
    a. **Examples**: Air Traffic Flow Management systems, situational awareness displays.
    b. **Data Reception**: Receive continuous data streams.

   c. **Bandwidth Consideration**: High bandwidth usage, especially during peak operational hours.
4. **Pull Consumers**:
   a. **Examples**: Analytical tools, post-event analysis systems.
   b. **Data Access**: Request specific data subsets based on criteria (e.g., geographic area, time frame).
   c. **Access Control**: Governed to ensure consumers receive only relevant and authorized data.
5. **CRV (Common Regional Virtual) Network**:
   a. **Function**: Facilitate data transmission between EMS/EMS-CP nodes and the SCDP.
   b. **Performance**:
      i. Typical distribution time: 200–400 milliseconds.
      ii. Potential for increased latency if bandwidth is constrained.
6. **Performance Parameters Summary**
   a. **Surveillance Refresh Rate**: Between every 4 and 30 seconds.
   b. **Message Validity**: Messages older than 4-to-30 seconds are discarded and replaced.
7. **Push Model**:
   a. **Bandwidth**: High during peak hours.
   b. **Latency**: Target end-to-end delivery within 1 second.
8. **Pull Model**:
   a. **Access Control**: Consumers receive only data pertinent to their role and authorization.
   b. **Latency**: Response time should not exceed 2 seconds.
9. **CRV Network**:
   a. **Distribution Time**: 200–400 milliseconds under optimal conditions; may increase with bandwidth limitations.

6. Annexes

6.1. Annex 1 – Message Headers for the Joint Event

Header Name	Values	Descriptions	Mandatory / Optional	Data Type
APAC_SOURCE	VH_HKCAD	Hongkong ASP (Contibutor & Consumer)	Mandatory	String
	RJ_JCAB	Japan ASP (Contibutor & Consumer)		
	WM_CAAM	Malaysia ASP (Contibutor & Consumer)		
	RK_KAC	ROK ASP (Contibutor & Consumer)		
	WS_CAAS	Singapore ASP (Contibutor & Consumer)		
	VT_AEROTHAI	Thailand ASP (Contibutor & Consumer)		
	VA_AAI	India (Contributor & Consumer)		
	RJ_JAL	Japan Airlines		
	VH_PCCW	PCCW		
APAC_RECIPIENT_LIST	ZB_ATMB	China ASP (Observer)	Mandatory	String
	VH_HKCAD	Hongkong ASP (Contibutor & Consumer)		
	RJ_JCAB	Japan ASP (Contibutor & Consumer)		
	WM_CAAM	Malaysia ASP (Contibutor & Consumer)		
	RK_KAC	ROK ASP (Contibutor & Consumer)		
	WS_CAAS	Singapore ASP (Contibutor & Consumer)		
	VT_AEROTHAI	Thailand ASP (Contibutor & Consumer)		
	VA_AAI	India (Contributor & Consumer)		
	WI_CAI	Indonesia ASP (Observer)		

Header Name	Values	Descriptions	Mandatory / Optional	Data Type
	VL_LPDR	Laos ASP (Observer)		
	NZ_AIRWAYS	NZ ASP (Observer)		
	OP_CAAPK	Pakistan ASP (Observer)		
	RP_CAAP	Philippines ASP (Observer)		
	YM_ASA	Australia (Consumer)		
	NF_FIJI	Fiji (Consumer)		
	RJ_JAL	Japan Airlines		
	VH_PCCW	PCCW		
APAC_CATEGORY	FIXM	All FIXM Messages	Mandatory	String
	AIXM	All AIXM Messages		
	IWXXM	All IWXXM Messages		
	ASTERIX	Surveillance Messages		
	GEOJSON	Meteorological Report Messages		
	JSON	Surveillance Messages in JSON Format		
APAC_CATEGORY _VERSION	FIXM_4_1	FIXM v4.1.0	Mandatory	String
	FIXM_4_1_APAC	FIXM v4.1.0 APAC Extension		
	FIXM_4_2	FIXM v4.2.0		
	FIXM_4_2_FF_ICE	FIXM v4.2.0 (for FF-ICE R1 and R2)		
	FIXM_4_2_APAC	FIXM v4.2.0 APAC Extension		
	AIXM_5_1	AIXM v5.1		
	IWXXM_2_0	IWXXM v2.0		

Header Name	Values	Descriptions		Mandatory / Optional	Data Type
	IWXXM_3_0	IWXXM v3.0			
	ASTERIX _CAT021	ASTERIX ADS-B Data Category			
	GEOJSON_4	GEOJSON v4.0			
	JSON_1	JSON v1.0			
APAC_MESSAGE_TYPE	**Values**	**Descriptions**	**Format**		
	PRELIMINARY_FLIGHT_PLAN	Preliminary Flight Plan	FIXM_FF-ICE R1	Mandatory	String
	FILED_FLIGHT_PLAN	Filed Flight Plan	FIXM_FF-ICE R1		
	SUBMISSION_RESPONSE	Submission Response	FIXM_FF-ICE R1		
	FILING_STATUS	Filing Status	FIXM_FF-ICE R1		
	PLANNING_STATUS	Planning Status	FIXM_FF-ICE R1		
	FLIGHT_PLAN_UPDATE	Flight Plan Update	FIXM_FF-ICE R1		
	FLIGHT_ARRIVAL	Arrival	FIXM_FF-ICE R1		
	FLIGHT_DEPARTURE	Departure	FIXM_FF-ICE R1		
	FLIGHT_CANCELLATION	Flight Plan Cancel	FIXM_FF-ICE R1		
	TRIAL_REQUEST	Trial Request	FIXM_FF-ICE R1		
	TRIAL_RESPONSE	Trial Response	FIXM_FF-ICE R1		
	FLIGHT_DATA_REQUEST	Flight Data Request	FIXM_FF-ICE R1		
	FLIGHT_DATA_RESPONSE	Flight Data Response	FIXM_FF-ICE R1		
	TRACK_RAW	Track Raw Data	ASTERIX Binary Data		
	TRACK_JSON	Track JSON Message	ASTERIX JSON Data		
	TRACK	Track Message	FIXM APAC Extension		
	CTOT	Calculated Take Of Time	FIXM APAC Extension		
	NOTAM	Notices to Airmen	AIXM		
	SAA	Special Activity Airspace	AIXM		

Header Name	Values	Descriptions		Mandatory / Optional	Data Type
	METAR	Aviation Routine Weather Report	IWXXM		
	SPECI	Special weather report	IWXXM		
	TAF	Terminal Area Forecast	IWXXM		
	SIGMET	Significant Meteorological information	IWXXM		
	AIRMET	Meteorological Information	IWXXM		
	VAA	Volcanic Ash Advisory	IWXXM		
DEP_AIRPORT	4 Letter ICAO Code	Departure Airport (used for flight identification)		Optional	String
ARR_AIRPORT	4 Letter ICAO Code	Arrival Airport (used for flight identification)		Optional	String
AIRLINE	Use ICAO Airline	Name of Airline		Optional	String
ACID	FIXM-defined format for ACID	Aircraft Identification (Mandatory for Tracks and Flight Plans)		Conditional Mandatory	String
GUFI	GUFI from message	Globally Unique Flight Identifier		Optional	String
EOBT	EOBT from message	Estimated off-block time (used for flight identification)		Optional	String
FFICE_PHASE	PRELIM	Preliminary phase of FF-ICE		Optional	String
	FILED	Filed phase of FF-ICE (Filed Flight Plan has been sent)		Optional	String
APAC_TIMESTAMP	epoch time	Timestamp of the message out or in the system. The time is to be appended to this field whenever the message is posted into a message queue. This field is delimited with commas E.g. JAL_OUT:1675213637251, JCAB_IN: 1675213638200 Comma delimited string of 64-bit signed integer representing the number milliseconds since Jan 1, 1970 00:00:00.000 UTC		Mandatory	String

6.2. Annex 2 – Data Structure of Surveillance Data for the Joint Event

6.2.1. JSON Structures for Surveillance Data with Flight Plan Information

Data fields below are based on ASTERIX CAT 21 version 2.1 specifications.

Field Name	Type	CAT21 Data Item Reference	Compulsory	Values	Descriptions
GUFI	String	N/A	No	0248982c-4384-49f4-bdb3-7956bd553383	Globally Unique Flight Identifier (obtained from FF_ICE services)
ACID	String	N/A	Yes	TLM912	Aircraft Identification
ADEP	String	N/A	Yes	VTBS	Departure Aerodrome
ADES	String	N/A	Yes	ZGGG	Destination Aerodrome
ARCTYPE	String	N/A	No	A339	Aircraft Type
WKTRC	String	N/A	No	H	Wake Turbulence Category
LAT	Number	I021/130 or I021/131	Yes	18.6701799113899	Latitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
LONG	Number	I021/130 or I021/131	Yes	103.180853652939	Longitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
FL	Number	I021/145	Yes	310	Flight Level
GS	Number	I021/160	No	498	Ground Speed (Knot) Use I021/160 x 3600 because I021/160 provides Ground Speed in NM/s
HEADING	Number, Null	I021/152 or I021/160	No	34.2773437344	Heading (Degree) Use I021/152 If I021/152 does not exist, use I021/160 null, if both not exist.

Field Name	Type	CAT21 Data Item Reference	Compulsory	Values	Descriptions
ARCADDR	String	I021/080	Yes	883031	Aircraft Address (ICAO 24-bit Mode S address)
SSRCODE	String	I021/070	No	5035	Mode 3A Code
DT	String	I021/071 or I021/073 or I021/075	Yes	2022-09-13T15:41:3	Date and Time (Date from server date and Time from packet) Use I021/073 If I021/073 does not exist, use I021/075 If I021/075 does not exist, use I021/071 I021/071, I021/073 and I021/075 are time only value. Publishers have to add date themselves.
QITYPE	String	I021/210	Yes	NUCp or NIC	NUCp = Navigational Uncertainty Category for Position NIC = Navigational Integrity Category
QI	Integer	I021/090	Yes	6	Range is 0-11 for NIC and 0-9 for NUCp
SAC	Integer	I021/010	Yes	78	Data Source Identification (SAC)
SIC	Integer	I021/010	Yes	29	Data Source Identification (SIC)

6.2.2. JSON Structures for Surveillance Data only

Data fields below are based on ASTERIX CAT 21 version 2.1 specifications.

Field Name	Type	CAT21 Data Item Reference	Compulsory	Values	Descriptions
ACID	String	I021/170	Yes	TLM912	Target Identification in 8 characters, as reported by the target.
LAT	Number	I021/130 or I021/131	Yes	18.6701799113899	Latitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130

Field Name	Type	CAT21 Data Item Reference	Compulsory	Values	Descriptions
LONG	Number	I021/130 or I021/131	Yes	103.180853652939	Longitude (Degree) Use I021/131. If I021/131 does not exist, use I021/130
FL	Number	I021/145	Yes	310	Flight Level
GS	Number, Null	I021/160	No	498	Ground Speed (Knot) Use I021/160 x 3600 because I021/160 provides Ground Speed in NM/s
HEADING	Number	I021/152 or I021/160	No	34.2773437344	Heading (Degree) Use I021/152 If I021/152 does not exist, use I021/160 null, if both not exist.
ARCADDR	String	I021/080	Yes	883031	Aircraft Address (ICAO 24-bit Mode S address)
SSRCODE	String	I021/070	No	5035	Mode 3A Code
DT	String	I021/071 or I021/073 or I021/075	Yes	2022-09-13T15:41:3	Date and Time (Date from server date and Time from packet) Use I021/073 If I021/073 does not exist, use I021/075 If I021/075 does not exist, use I021/071 I021/071, I021/073 and I021/075 are time only value. Publishers have to add date themselves.
QITYPE	String	I021/210	Yes	NUCp or NIC	NUCp = Navigational Uncertainty Category for Position NIC = Navigational Integrity Category
QI	Integer	I021/090	Yes	6	Range is 0-11 for NIC and 0-9 for NUCp
SAC	Integer	I021/010	Yes	78	Data Source Identification (SAC)
SIC	Integer	I021/010	Yes	29	Data Source Identification (SIC)

6.2.3. Message Header for Surveillance Data with Flight Plan Information

Header Name	**Values**	**Descriptions**
APAC_SOURCE	RJ_JCAB	Name of message publisher
APAC_RECIPIENT_LIST	RJ_JAL,VT_AEROTHAI	Name list of recipients (comma delimited)
APAC_CATEGORY	ASTERIX	Name of information exchange model (ASTERIX)
APAC_CATEGORY_VERSION	ASTERIX _CAT021	Version of information exchange model (Data Category of ASTERIX)
APAC_MESSAGE_TYPE	TRACK_RAW or TRACK_JSON	Message type of information exchange model • TRACK_RAW for binary data • TRACK_JSON for JSON data
DEP_AIRPORT	RJAA	Departure Airport
ARR_AIRPORT	VTBS	Arrival Airport
AIRLINE	JAL	Name of Airline
ACID	JAL707X	Aircraft Identification
GUFI	0248982c-4384-49f4-bdb3-7956bd553383	Globally Unique Flight Identifier
EOBT	2023-02-01T03:00:00Z	Estimated Off-Block Time
APAC_TIMESTAMP	JCAB_OUT:1675213637251	Timestamp of the message out or in the system

6.2.4. Message Header for Surveillance Data Only

Header Name	Values	Descriptions
APAC_SOURCE	RJ_JCAB	Name of message publisher
APAC_RECIPIENT_LIST	RJ_JAL,VT_AEROTHAI	Name list of recipients (comma delimited)
APAC_CATEGORY	ASTERIX	Name of information exchange model (ASTERIX)
APAC_CATEGORY_VERSION	ASTERIX _CAT021	Version of information exchange model (Data Category of ASTERIX)
APAC_MESSAGE_TYPE	TRACK_RAW or TRACK_JSON	Message type of information exchange model • TRACK_RAW for binary data • TRACK_JSON for JSON data
ACID	JAL707X	Aircraft Identification
APAC_TIMESTAMP	JCAB_OUT:1675213637251	Timestamp of the message out or in the system

7. Acronyms and Abbreviations

2FA	Two Factor Authentication
ADS-B	Automatic Dependent Surveillance - Broadcast
ALG	Application Layer Gateways
AMQP	Advanced Message Queuing Protocol
ANSP	Air Navigation Service Provider
APAC	Asia Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
API	Application programming interface
ASBU	Aviation System Block Upgrade
ASTERIX	All Purpose Structured EUROCONTROL Surveillance Information Exchange
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
bps	Bits per second
CA	Certificate Authority
CONOPS	Concept of Operations
CNS SG	Communications, Navigation and Surveillance Sub-group
CRV	Common aeRonautical Virtual Private Network
CRV OG	Common aeRonautical Virtual Private Network Operations Group
DoS	Denial of Service
DDoS	Distributed Denial of Service
EMS	Enterprise messaging system
FF-ICE	Flight and Flow Information for a Collaborative Environment
FIR	Flight Information Region
GANP	Global Air Navigation Plan
GRE	Generic Routing Encapsulation
HMI	Human Machine Interface
ICAO	International Civil Aviation Organization
IDS	Intrusion Detection System
IPSec	Internet Protocol Security

JSON	JavaScript Object Notation
MET	Aeronautical Meteorological Services
MTBF	Mean Time Between Failure
NIC	Navigation Integrity Category
NUC	Navigation Accuracy Category
PCCWG	PCCW Global
RBAC	Role-based Access Control
S3TIG	Surveillance Sharing in SWIM Trial Implementation Group
SAC	System Area Code
SCDP	Surveillance Central Data Processor
SHA	Secure Hash Algorithm
SIC	System Identification Code
SIM	Subscriber Identity Module
SIPG	SWIM Implementation Pioneer Group
SURICG	Surveillance Implementation Coordination Group
SURSG	Surveillance Study Group
SWIM	System Wide Information Management
SWIM TF	System Wide Information Management Task Force
TFP	Trust Framework Panel
TLS	Transport Layer Security
TOR	Terms of Reference

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ASIA/PACIFIC REGIONAL FLIGHT AND FLOW – INFORMATION FOR A COLLABORATIVE ENVIRONMENT RELEASE 1 (FF-ICE/R1) IMPLEMENTATION PLAN

Version 1.0, xxxx yyyy

This guidance was developed by the Asia/Pacific Flight and Flow Information for a Collaborative Environment Ad Hoc Group

Approved by APANPIRG/xx and published by the
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CONTENTS

1. SCOPE OF APAC REGIONAL FF-ICE/R1 IMPLEMENTATION PLAN

1.1 Alignment with Global Framework

1.1.1 This *Asia/Pacific Regional Flight and Flow – Information for a Collaborative Environment Release 1 (FF-ICE/R1) Implementation Plan* (the "Plan") has been developed to complement the International Civil Aviation Organization (ICAO) global framework and guidance. This Plan supplements and tailors the global Flight and Flow – Information for a Collaborative Environment (FF-ICE) concepts and objectives to the regional context of the Asia/Pacific (APAC), providing a practical roadmap for implementation in APAC States while remaining aligned with ICAO's provisions. This Plan operates on established relevant ICAO materials and on the foundational concepts, principles, and guidelines of System-wide Information Management (SWIM), Air Traffic Flow Management (ATFM) practices, and aviation information security requirements. Therefore, this Plan does not duplicate fundamental explanations from the *Manual on Flight and Flow — Information for a Collaborative Environment (FF-ICE)* (ICAO Doc 9965) or other global manuals. Instead, it focuses on regional implementation aspects bridging the gap between ICAO's global guidance and the specific needs of APAC stakeholders.

1.1.2 In accordance with other APAC regional plans, such as the *Asia/Pacific Plan for Collaborative Aeronautical Information Management*, this Plan is not intended to duplicate or pre-empt global guidance issued by ICAO expert groups. Rather, it builds upon the issued guidance to outline how FF-ICE can be implemented across the APAC region in a coordinated and harmonized manner. Global reference documents, i.e. *Manual on FF-ICE - Implementation Guidance* (ICAO Doc 9965 - Volume II), *Manual on System-wide Information Management (SWIM) Concept* (ICAO Doc 10039), etc., contain these foundational concepts, and this Plan serves to apply those concepts in the regional implementation setting.

1.1.3 This Plan uses the terms "shall", "should", and "may" to indicate the level of compliance expected from States in following this document.

1.1.3.1 "Shall" indicates provisions that are compulsory for States to implement as these provisions are considered necessary for regional harmonization and interoperability.

1.1.3.2 "Should" indicates provisions that are recommended as best practices for regional coordination. States are encouraged to implement these provisions where operationally feasible.

1.1.3.3 "May" indicates provisions that are optional and can be implemented at the discretion of individual States based on their operational requirements and capabilities.

1.1.4 This Plan recognizes that States retain control over their implementation decisions, while encouraging regional harmonization.

1.2 APAC Regional Context and Guidance

1.2.1 The FF-ICE implementation in the APAC region is being undertaken in parallel with the region's broader air navigation modernization strategies. The *Asia/Pacific Air Navigation Plan Volume III* explicitly identifies FF-ICE and Trajectory-based Operations (TBO) as key elements of future Air Traffic Management (ATM) enhancements. The *Asia/Pacific Air Navigation Plan (ANP) Volume III* calls on APAC States to work collaboratively through ICAO and regional platforms towards a seamless ATM environment, including the implementation of SWIM, FF-ICE, and TBO to support future traffic growth and sustainability. Particularly, the implementation of SWIM, a key enabler for FF-ICE, within the APAC region, should follow the regionally agreed-upon guidelines, including *APAC SWIM Technical Infrastructure Profiles Version 1.0*, and the *APAC Common SWIM Information Services*. Following these guidelines will ensure interoperability and harmonized implementation.

1.2.2 Moreover, the *Asia/Pacific Plan for Collaborative Aeronautical Information Management Version 4.0* and the *Asia/Pacific Regional Framework for Collaborative ATFM Version 4.0* complement the FF-ICE initiative by simultaneously addressing the Aeronautical Information Management (AIM) and ATFM improvements that are needed. The *Asia/Pacific Plan for Collaborative Aeronautical Information Management* provides guidance on the transition from Aeronautical Information Services (AIS) to AIM and digital data exchange, which is a foundational element for successful FF-ICE implementation.

1.3 Mandatory and Optional FF-ICE Services

1.3.1 In accordance with *Procedures for Air Navigation Services – Air Traffic Management* (ICAO Doc 4444), Filing Service and Flight Data Request Service are mandatory. Additionally, to support the sunsetting of ICAO 2012 Flight Plan (FPL2012) and, at a minimum, DEP and ARR related Air Traffic Services (ATS) messages, the Notification Service is a mandatory service within the APAC region. The FF-ICE Planning Service, Trial Service, and Publication Service are considered optional within the APAC region.

2. EXECUTIVE SUMMARY

2.1 This Plan provides regional strategy and guidance for the implementation of the FF-ICE within the APAC region. This Plan also supports the transition from the traditional FPL2012 to the modernized FF-ICE environment, enabling collaborative, service-based information exchange among ATM Service Providers (ASPs), Airspace Users (AUs), and other aviation stakeholders. This Plan is aligned with the *Global Air Navigation Plan* (GANP) (ICAO Doc 9883), and the *Asia/Pacific ANP Volume III*.

2.2 The implementation of FF-ICE represents a significant step towards achieving TBO in the region. Through standardized information services and system-to-system interoperability, FF-ICE will facilitate the sharing and management of comprehensive flight and flow data through all phases of flight. This Plan defines the regional approach to implementing FF-ICE/R1 covering the pre-departure phase and lays the foundation for a future expansion to Release 2 (FF-ICE/R2 - post-departure operations).

2.3 The APAC region is adopting a harmonized approach to the use of global data standards, particularly the Flight Information Exchange Model (FIXM) version 4.3.0, together with the APAC regional FIXM version 4.3.0 Extension to support cross-border ATFM and Airport Collaborative Decision Making (A-CDM) integration. Mixed-mode operations between legacy and FF-ICE environments are expected during the transition period, and guidance has been included regarding translation mechanisms, validation procedures, and coordination processes necessary for maintaining seamless operation.

2.4 This Plan details the operational and technical requirements for the implementation of FF-ICE services. Filing Service and Flight Data Request Service are established as mandatory in accordance with *the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM)*, ICAO Doc 4444), with the Notification Service also identified as mandatory within the APAC region to support the eventual retirement of the FPL2012 and related ATS messages. The Planning, Trial, and Publication Services are considered optional but are recommended, to enhance collaborative decision-making and information availability.

2.5 Recognizing the importance of data integrity and operational assurance, this Plan introduces a common validation process, standardized submission response codes, and uniform filing-status interpretations. It outlines cybersecurity considerations for FF-ICE operations, recommending implementation of secure communication protocols and promoting adherence to ICAO information security guidance.

2.6 Implementation of FF-ICE/R1 across the APAC region will be achieved in phases. Technical trials and cross-border testing are targeted to begin in 2030, followed by operational testing in 2031. The testing will lead to full operational capability (FOC) of the regionally mandatory FF-ICE/R1 services (Filing Service, Flight Data Request Service and Notification Service) by 2032. This timeline supports regional readiness for the planned global sunset of the FPL2012 in 2034. States and Administrations will report progress to the ICAO APAC Regional Office annually to ensure synchronous advancement and to identify any areas requiring additional support or coordination.

2.7 This Plan will be maintained and updated in alignment with revisions to *GANP* (ICAO Doc 9883), and the *Asia/Pacific ANP Volume III*. Post-implementation coordination and performance monitoring will ensure continuous improvement and harmonization across the region. Through the collaborative and progressive implementation of FF-ICE, the APAC region will advance towards a fully information-driven ATM environment that enhances safety, efficiency, and predictability in support of the global vision for a seamless and interoperable air navigation system.

3. DEFINITIONS (REFERENCED FROM DOC 9965)

Air Traffic Management (ATM) — The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

ATM community — The aggregate of organizations, agencies or entities that may participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATM system.

ATM configuration — The arrangement of the non-flight elements of the Air Traffic Control (ATC) System. The ATM configuration imposes constraints on flights through such factors including military airspace reservations and releases, sector configurations, runway combinations and runway usage.

ATM Service Provider (ASP) — A Unit involved in performing Air Traffic Management responsibilities as introduced in the PANS-ATM.

ATM system limitations — Inherent characteristics that limit its ability to support desired aircraft operations or effectively accommodate demand on resources.

Coordinated airport — Any airport where, in order to land or take off, it is necessary for an aircraft operator to have been allocated a slot by an appropriate authority.

Effective flight constraints — The subset of flight constraints that actually affected the flight's unconstrained trajectory.

Emergency Service Provider (ESP) — Provider of emergency services, such as search and rescue organizations.

Flight and Flow – Information for a Collaboration Environment (FF-ICE) — Information necessary for planning, coordination, and notification of flights exchanged in a standardized format between members of the ATM community, including those involved in flight operations and aerodrome operations.

FF-ICE can refer to a single instance (an individual flight) and also to an aggregation of flights (each with their own flight information in FF-ICE).

Flight and Flow – Information for a Collaboration Environment (FF-ICE) services — A set of services established for the purpose of facilitating the exchange of flight and flow – information for a collaborative environment, more accurate assessment of demands, appropriate resource planning, and optimum flight planning and execution.

Flight constraint — Results from applying a restriction to a particular flight and describes bounds (e.g. in altitude, speed, time, and route) that constrain free movement of the flight.

Note: Throughout this document, the term 'constraint' should be understood as 'flight constraint' unless explicitly indicated otherwise.

Flight plan — Specified information relative to an intended flight or portion of a flight of an aircraft.

Note 1: the term "flight plan" may be prefixed by the words "preliminary", "filed", "current" or "operational" to indicate the context and different stages of flight.

Note 2: when the word "message" is used as a suffix to this term, it denotes the context and format of the flight plan data as transmitted.

Operational flight plan. The operator's plan for the safe conduct of the flight, based on considerations of aeroplane performance, other operating limitations, and relevant expected conditions on the route to be followed and at the aerodromes concerned.

Preliminary flight plan (PFP). The flight plan submitted by an operator or a designated representative to conduct collaborative planning of a flight, prior to filing a flight plan for use by ATS units.

Filed flight plan. The latest flight plan as submitted and updated by the pilot, an operator or a designated representative for use by ATS units.

Note: the FPL denotes a filed flight plan exchanged using aeronautical fixed services while eFPL denotes a filed flight plan exchanged using FF-ICE services. The eFPL allows for the exchange of additional information not contained within the FPL.

Current flight plan (CPL). The flight plan that reflects changes to the filed flight plan by subsequent ATC clearances.

Repetitive flight plan (RPL). A flight plan related to a series of frequently recurring, regularly operated individual flights with identical basic features, submitted by an operator or a designated representative, for retention and repetitive use by ATS units.

eFPL. A symbol used to designate a filed flight plan exchanged using FF-ICE services.

FPL. A symbol used to designate a filed flight plan exchanged via Aeronautical Fixed Services (AFS).

Flight plan originator — An operator or the operator's designated representative that has flight planning responsibility for the flight.

Gate-to-gate — An expression that describes the ground and airborne segments of aircraft operations from the first movement with intention of flight (from gate, stand or parking position) to completion of movement after flight (gate, stand or parking position).

Globally unique flight identifier (GUFI) — An unchangeable data element associated with a flight that allows all eligible members of the ATM community to unambiguously refer to information pertaining to the flight.

Message — A discrete unit of communication, expressed electronically, and intended by the source for consumption by some recipient or group of recipients. The term "message" is thus not limited only to ATS messages over AFTN, but can include communication via other technologies including those described in ICAO Doc 10039.

Message originator — An operator, their designated representative, or an ATS unit that transmitted the message.

Note: This is equivalent to the use of Originator in PANS-ATM Chapter 11.

Operator — The person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Procedure — A procedure is an established practice or prescribed method of proceeding with an action, normally non-systematic, under given circumstance or situation, in the provision of a service or part thereof.

Process — A process is an operation or series of operations performed in a definite manner, normally systematically, in the provision of a service or part thereof.

Ranked trajectories — A series of desired trajectories organized in the order of preference, with tolerances supplied, if necessary, by the airspace user, to define when the next ranked trajectory should be used.

Note: *Tolerances are used to express the bounds of variation on the trajectory, triggering a preference for the next ranked trajectory.*

Relevant ASP — Unit(s) designated by the appropriate ATS authority to which the flight plan for a particular flight needs to be provided and includes:

- The Area Control Centre (ACC) or flight information centre serving the control area of the Flight Information Region (FIR) within which the departure aerodrome is situated;
- The centres in charge of each FIR or upper FIR along the route;
- For flights along specified routes or portions of routes in close proximity to FIR boundaries, the centres in charge of each FIR or upper FIR adjacent to such routes or portions of routes;
- When a potential re-clearance in flight (RIF) request is indicated in the flight plan, the additional centres concerned and to the aerodrome control tower of the revised destination aerodrome;
- The aerodrome control tower at the destination aerodrome;
- Flow management centres responsible for ATS units along the route.
- Flight and flow – information services unit along the route of the flight.

Restrictions — Documented rules that are aimed at managing the ATM System, which act on, and reduce the freedom of a group of flights (i.e., flights with certain common characteristics). Restrictions result from ATM system limitations.

Note: a published restriction, in addition to the cause and applicability criteria, may also include the constraint. For example, "due to congestion all flights departing ABCD between Monday and Friday during the hours from 07:00 to 17:00 and routing via AWY1 to destination WXYZ must remain below FL250".

Typically, an Air Traffic Flow Management (ATFM) measure, which is a type of restriction, will require a specific flight constraint to be issued to each impacted flight. For example, "between 09:00 and 14:00, the airspace <airspace ref> can only accept 15 aircraft per hour. Flights planned to enter the airspace during this time period will be issued with an ATFM slot".

Runway Visual Range (RVR) — The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Service — A service is the provision of a pre-defined set of work including any associated information intended to benefit the customer.

Trajectory — The representation of an aircraft continuous path, both in the air and on the ground, comprised of position (x, y, z) and time.

Desired trajectory — The trajectory that is requested and generated by the airspace user with its knowledge of the ATM system's configuration and published restrictions and that reflects the most recent request of the airspace user.

Note: *there is only one desired trajectory for any given flight at any time. To allow for flexibility and as the ATM system has unpredictable or uncontrollable events, it is likely that it will be necessary to renegotiate trajectories leading to a revision in the agreed trajectory. The desired trajectory therefore reflects the most recent airspace user request. Where the agreed trajectory is not the desired trajectory then the ASP will negotiate to obtain a revised agreed trajectory.*

Negotiating trajectory — A trajectory proposed by eAU or eASP as a potential agreed trajectory.

Note: *each participant would be allowed only one negotiating trajectory at a time which represents their most recent proposal in the negotiation. These trajectories may not necessarily be a gate-to-gate trajectory and are intended to be transitory.*

Agreed trajectory — The trajectory that reflects the most recent agreement between the airspace user and the ASP after collaboration, and/or imposition of pre-collaborated rules.

Note: *There is only one agreed trajectory for any given flight at any time.*

Executed trajectory — The actual trajectory of the aircraft from the start-up to the last known position.

Note: *The executed trajectory is what was executed and is not necessarily the desired or agreed trajectories. The executed trajectory relates only to the current flight of the aircraft (and does not contain information from previous flights, even with an en-route to en-route perspective). The executed trajectory information can be used for performance and operational analysis.*

Trajectory synchronization — The process of aligning the trajectories for a single flight held by operationally relevant entities (including ground and airborne) such that remaining differences are operationally negligible for the execution of the flight.

Minutes in Trail (MINIT) / Miles in Trail (MIT) — MINIT/MIT are tactical ATFM measures and are expressed as the number of minutes or miles between each successive aircraft at an airspace boundary point. (Doc 9971)

4. INTRODUCTION

4.1 FF-ICE is a global ICAO initiative to modernize flight planning and trajectory management through enhanced information exchange methods and collaboration. At the global level, FF-ICE is designed to address the limitations of the traditional FPL2012 by enabling a fully collaborative TBO environment. This means that a flight's trajectory can be shared, managed, and adjusted among stakeholders in all phases of flight, improving predictability and efficiency in line with the TBO concept. By exchanging more comprehensive flight and flow data (such as detailed route trajectories and aircraft performance information) in a standardized, system-wide manner, FF-ICE aims to increase airspace capacity and flight efficiency while maintaining safety. This is a key objective identified in the *Global Air Traffic Management Operational Concept* (GATMOC) (ICAO Doc 9854) for future ATM systems, and a critical goal for the FF-ICE effort overall.

4.2 ICAO's FF-ICE concept is documented in ICAO Doc 9965, which is organized into two volumes. Volume I outlines the overall FF-ICE Concept, covering how information for flight planning, flow management, and trajectory management will support a collaborative ATM environment. Volume II, *FF-ICE Implementation Guidance,* provides detailed guidance to ASPs and AUs for implementing FF-ICE in the pre-departure phase, particularly the FF-ICE/R1 capabilities. According to this ICAO guidance, FF-ICE/R1 introduces a set of new services including Planning Service, Filing Service, Trial Service, Flight Data Request Service, Notification Service, and Publication Service, which collectively enable stakeholders to file collaborative flight plans, perform trial trajectory analyses, update or cancel plans, share flight event updates, and request flight information through SWIM-based messages. Each service is defined through agreed-upon procedures and message formats to help ensure consistent information exchange among FF-ICE participants, while allowing flexibility in interface implementation. The subsequent FF-ICE/R2 will extend these principles into the post-departure phase by supporting in-flight trajectory updates and collaborative adjustments between ASPs and AUs, further building on the foundation established by FF-ICE/R1.

5. BACKGROUND

5.1 SWIM as an Enabler for FF-ICE

5.1.1 The implementation of FF-ICE is fundamentally supported by the concept of SWIM. SWIM provides the technical infrastructure, standards, and governance needed to allow seamless information exchange among ATM stakeholders.

5.1.2 In the FF-ICE environment, flight data sharing is accomplished through SWIM-based information services rather than traditional point-to-point messaging. FF-ICE operates within a SWIM operational environment where the key flight planning processes are described and offered in terms of services.

5.1.3 These services are published and discovered via SWIM, enabling authorized stakeholders to exchange flight and flow information in real time, using common formats and protocols. SWIM ensures that all FF-ICE messages are exchanged on a secure, interoperable network with agreed-upon data exchange models and service interfaces. Crucially, SWIM's service-oriented architecture means that FF-ICE information exchanges are standardized at the service level, even as the underlying technologies and implementations may differ between States.

5.1.4 Guidance on implementing SWIM information services, such as those to support FF-ICE, are provided in the *Procedures for Air Navigation Services – Information Management* (PANS-IM, ICAO Doc 10199) requirements and *Manual on the SWIM Implementation* (ICAO Doc 10203).

5.1.5 As the SWIM technical infrastructure evolves over time, the focus for FF-ICE will be on creating and maintaining adaptive operational services and data exchanges, ensuring that any State's system can communicate using the standard FF-ICE service definitions. The hardware/software implementation within each State can be flexible and technology-agnostic on the condition that the State is able to provide and consume the defined FF-ICE services and related information services through SWIM.

5.2 FIXM and Regional Extensions

5.2.1 The information exchange mechanism of FF ICE relies on standardized data formats. Notably, it relies on the Flight Information eXchange Model (FIXM) for encoding flight information. While FF-ICE defines what flight information needs to be exchanged among stakeholders, FIXM defines how that information is structured for digital exchange within a SWIM environment. As the globally standardized information exchange model, FIXM provides the rich, detailed, and structured flight and flow information required by the FF-ICE concept, representing a major advancement from the traditional teletype-format flight plan (FPL2012).

5.2.2 APAC stakeholders implement FF-ICE using the globally defined FIXM standard for flight data. However, in recognizing certain regional operational needs, the APAC region has developed its own endorsed extensions to FIXM to accommodate additional information specific to the region. An APAC FIXM extension was developed to include flight-specific data attributes necessary for cross-border ATFM operations, A-CDM, ATFM/A-CDM integration, and traffic synchronization. The APAC FIXM extension adds fields for information such as target take-off time, target time over, and other collaborative decision-making parameters that are crucial for coordinating operations across Flight Information Regions (FIRs) within the region.

5.2.3 This approach allows APAC States to exchange all necessary flight and flow information, including regional specifics, under FF-ICE, supporting the implementation of regional initiatives while still adhering to global standards and ensuring interoperability between APAC and other ICAO regions.

5.2.4 **Appendix A** provides guidance on translating FF-ICE FIXM information to ATS messages, and the structure of the legacy FPL2012, which may be needed to support ingestion of the FPL2012 flight plan.

5.2.5 **Appendix B** maps the FIXM Core version 4.3.0 data attributes required to support cross-border ATFM information exchanges.

5.3 Mixed-Mode Operations During Transition

5.3.1 As the APAC region begins implementing FF-ICE, there is expected to be an extended transition period during which legacy and new systems will operate in parallel. Not all States or ASPs will be ready to switch to FF-ICE/R1 on the same date. System upgrades and operational readiness will vary. Consequently, a mixed-mode environment will exist for several years, wherein some flights will be filed and managed using traditional FPL2012 procedures, while others will use the new FF-ICE services.

5.3.2 Section 6.1.8 provides regional implementation considerations for mixed-mode operations.

6. APAC REGIONAL IMPLEMENTATION PLAN

6.1 General

6.1.1 Information Exchange Standards

6.1.1.1 FF-ICE operations, as described in ICAO Doc 9965 Volume II, are performed through FF-ICE services. Each FF-ICE service is encompassed with a set of FF-ICE messages for exchanging flight information between stakeholders. These messages are constructed using FIXM, a globally standardized information model for flight and flow information exchange.

6.1.1.2 ATM Information Reference Model (AIRM) (https://airm.aero/), a standardized dictionary for ATM information, shall be used as a reference for ATM vocabulary in digital information exchange among stakeholders within the FF-ICE/R1 processes, to prevent ambiguities. To ensure semantic interoperability and consistency across information domains, AIRM also underpins the development of FIXM, Aeronautical Information Exchange Model (AIXM), and the ICAO Meteorological Information Exchange Model (IWXXM).

6.1.1.3 FIXM is comprised of the following components:

a) FIXM Core – provides globally harmonized flight data structures;

b) FIXM Applications – built upon FIXM Core to provide specific flight data structure such as FF-ICE messages and FF-ICE message templates; and

c) FIXM Extensions – Extends FIXM Core to support additional local, national, or regional information exchange requirements.

6.1.1.4 To ensure harmonized FF-ICE operations, the FF-ICE message templates specified in ICAO Doc 9965 Volume II and published on the official FIXM website (https://fixm.aero/) shall be used for FF-ICE implementation. Use of these templates will ensure consistent validation of data fields across stakeholders.

6.1.1.5 FIXM version 4.3.0 shall be used as the standard format for the implementation of FF-ICE/R1 services in the APAC region starting from Q3/2026, as agreed by APANPIRG/35 through its *Conclusion APANPIRG/35/4.*

6.1.1.6 The APAC regional FIXM version 4.3.0 Extension shall be used for cross-border ATFM operations, A-CDM, ATFM/A-CDM integration, and traffic synchronization within the region, as agreed by APANPIRG/36 through its *Conclusion APANPIRG/36/12*.

6.1.1.7 The change process for the cross-border FIXM operating version used to support system-to-system information exchange via SWIM shall follow the procedure agreed by ATM/SG/13 through its *Conclusion ATM/SG/13-5*.

6.1.1.8 It is recommended that the FIXM version used within the APAC region for FF-ICE services implementation and cross-border ATFM information exchange remain aligned to ensure effective communication and interoperability across ATM operation support systems throughout the region.

6.1.2 Globally Unique Flight Identifier (GUFI)

6.1.2.1 Under the current operational format, multiple fields are used to identify a specific flight, such as aircraft identification, departure aerodrome, destination aerodrome, date of flight, and Estimated

Off-Block Time (EOBT). However, this method may not always uniquely identify a flight, for example, when a flight is delayed. Automation will play a critical role in the FF-ICE environment where large volumes of simultaneous transactions and message exchanges are expected.

6.1.2.2 To avoid ambiguity in flight identification and accurate correlation of flight data, GUFI shall be used. The GUFI provides a unique reference to each flight and ensures clear distinction between flights with otherwise similar information.

6.1.2.3 When a flight plan is cancelled and a new flight plan is submitted, a new GUFI shall be assigned, even if the flight is considered the same by the operator. Alternatively, in place of the cancel and refile option, a new filed flight plan message can be provided with the same GUFI but with an incremented flight plan version and as a consequence, it will be treated as a complete replacement of the existing data.

6.1.2.4 It is recommended that the current flight association practices continue to be applied in parallel with the use of GUFI, during the initial implementation of FF-ICE. This approach will provide more robust data correlation and support operations in a mixed-mode environment.

6.1.3 Flight Plan Differentiation

6.1.3.1 In the early stage of FF-ICE implementation and the introduction of using GUFI as an additional field to differentiate a flight, it is possible that two flight plans with two different GUFIs may refer to the same flight. One of the scenarios is a system failure causing incomplete cancellation but followed by re-filing of eFPL. eAUs and eASPs should perform typical flight plan differentiation using aircraft identification, departure aerodrome, destination aerodrome, and EOBT, in addition to the check using only GUFI.

6.1.3.2 During the transition period, the eASPs should verify that multiple eFPLs with distinct GUFIs do not refer to the same flight. When such incidents are detected, manual resolution may be required.

6.1.4 GUFI Allocation Criteria

6.1.4.1 For GUFI allocation, the operation of an aircraft is considered “a flight” from the submission of its first flight plan – whether a Preliminary Flight Plan (PFP) or an eFPL – until the aircraft is in-block at the arrival aerodrome. For multi-leg operations, a different GUFI shall be allocated for each leg, as the departure aerodrome differs.

6.1.4.2 A key consideration in determining a flight is whether the aircraft becomes airborne. Once airborne, and subsequently landed at an aerodrome – whether the intended destination aerodrome, a diversion aerodrome, or even the departure aerodrome – the flight is deemed complete. If the aircraft intends to continue its operation, a new flight plan with a new GUFI shall be required.

6.1.4.3 If an aircraft is compelled to return to its parking stand prior to becoming airborne, such as in a “ground return” or “aborted take-off”, the original flight plan and GUFI may be retained, provided the intention is to continue the same flight. Otherwise, the flight plan shall be cancelled.

6.1.5 GUFI Procedure

6.1.5.1 An operator, or its designated representative, shall generate and allocate a GUFI to each flight plan. The operator should also ensure that all flight data submitted for that flight uses the same GUFI, and that no GUFI is reused for any other flight.

6.1.5.2 Upon receipt of either a PFP or an eFPL, the eASP shall verify it against the flight plan differentiation checks to ensure that:

a) the same PFP with a different GUFI does not already exist in the system;

b) the same eFPL with a different GUFI does not already exist in the system; and/or

c) a different PFP or eFPL with the same GUFI does not already exist in the system. If such a case exists and the newly received PFP or eFPL contains a later version number, it should be treated as a complete replacement of the existing data.

6.1.5.3 An eFPL should carry the same GUFI as its corresponding PFP, if submitted, but with an incremented version number.

6.1.5.4 Upon receipt of a Flight Plan Update message or a Flight Cancellation message, the eASP shall use the GUFI to retrieve the associated flight plan information before performing the required actions. It is also recommended that the eASP perform verification using other key fields in the received messages (e.g. aircraft identification, departure aerodrome, destination aerodrome, EOBT, etc.) to ensure accurate flight plan association.

6.1.6 GUFI Composition and Validation

6.1.6.1 A GUFI shall include a version 4 Universally Unique IDentifier (UUID) that has been standardized by the Open Software Foundation (OSF). The UUID specification is published by the Internet Engineering Task Force (IETF) as RFC 9562.

Note: RFC 9562 supersedes RFC 4122 (referenced in ICAO Doc 9965) and is backward compatible.

6.1.6.2 The UUID used in a GUFI shall be supplemented with the following additional information:

a) <u>Namespace Identifier</u>: captures the originator of the GUFI. Recommendations for constructing the namespace are as follows:

   i) eAU should use the three-letter designator in accordance with the *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services* (ICAO Doc 8585);

   ii) eASP should use the four-letter location indicator in accordance with the *Location Indicators* (ICAO Doc 7910); and

   iii) Other GUFI originators should construct their namespace based on the Fully Qualified Domain Name (FQDN) of their organization.

b) <u>Creation Timestamp:</u> provides increased uniqueness of the generated GUFI. The timestamp should be in the Coordinated Universal Time (UTC), in accordance with FIXM version 4.3.0 schema.

6.1.6.3 The namespace portion of the GUFI should be static for a given originator. The UUID portion of the GUFI should be validated for proper formatting. In addition, the UUID portion should also be checked for duplication against existing UUIDs, generated by its own system and previously received from external systems.

6.1.6.4 The sole use of UUID as a GUFI is not recommended as it may lead to interoperability issues among stakeholders and potential GUFI collisions.

6.1.7 Cyber Security

6.1.7.1 eASPs and eAUs shall ensure that their FF-ICE systems are protected against cyber-attacks and that all exchanged information is authentic. Network and server protections such as a firewalls shall be implemented. Cybersecurity recommendations provided in *Aviation Common Certificate Policy* (ICAO Doc 10169) and *Manual on Aviation Information Security* (ICAO Doc 10204) should be utilized.

6.1.7.2 In the absence of a regionally agreed-upon Public Key Infrastructure (PKI) framework, a Transport Layer Security (TLS) self-signed certificate should be implemented, at minimum.

6.1.8 Mixed Mode Operations

6.1.8.1 eASP Responsibility

6.1.8.1.1 An eASP may provide a translation service to convert eFPL into FPL2012 to support the varying capabilities of AUs and ASPs within the APAC region during mixed-mode operations.

6.1.8.2 eAU Responsibility

6.1.8.2.1 An eAU or its designated representative shall submit eFPL to all relevant eASPs and FPL2012 to aASPs in accordance with ICAO Doc 4444 Chapter 17. The eAU or its designated representative shall ensure that all Flight Plan Updates are submitted to all relevant eASPs and aASPs using the appropriate message type:

a) <u>If any changes are made after submitting eFPL (e.g. aircraft, route, delay):</u> the eAU shall submit a Flight Plan Update to all relevant eASPs, and a CHG or DLA message to aASPs.

b) <u>If a flight is expected to be delayed by more than 30 minutes:</u> the eAU shall submit a Flight Plan Update to all relevant eASPs and a CHG or DLA message to aASPs.

c) <u>If a flight is cancelled:</u> the eAU shall submit a Flight Cancellation to all relevant eASPs and a CNL message to aASPs.

6.1.8.3 Translation

6.1.8.3.1 Translation between legacy FPL2012 and other relevant ATS messages in the current flight planning process into FF-ICE messages will play an important role in accommodating differing implementation timelines during the transition to full FF-ICE/R1 operations. ASPs may need to consider implementing the legacy-to-FF-ICE translation function to support its internal automation.

6.1.8.3.2 Translation is, however, only considered an interim solution. FF-ICE operations represent not only a change in flight plan format, but a paradigm shift in flight information exchange and management among ATM stakeholders.

6.1.8.3.3 Potential data loss may occur during translation between eFPL and FPL2012, because eFPL contains significantly more information than the legacy FPL2012. eAUs and eASPs are therefore encouraged to leverage the full benefits of FF-ICE services rather than prolonging reliance on translation.

6.1.8.3.4 For translation guidance, reference should be made to ICAO Doc 9965.

6.1.9 Access Management for FF-ICE Services

6.1.9.1 All FF-ICE services should implement robust access control mechanisms to ensure that only authorized parties can access FF-ICE services and receive flight data, safeguarding the confidentiality and integrity of sensitive information.

6.1.9.2 The following security safeguards should be implemented for all FF-ICE services:

a) authentication mechanisms to verify the identity of service users; and

b) authorization controls to ensure users can only access data and services appropriate to their role.

6.1.9.3 All FF-ICE service usage should be logged for operational monitoring, troubleshooting, and accountability purposes.

6.2 Common Validation Process for FF-ICE Services

6.2.1 Submission Response Message

6.2.1.1 Submission Response Messages are responses provided by the message recipient for every message submitted to them to acknowledge that they have received the messages and to indicate whether they are able or unable to process the messages. Submission Responses are used in a similar manner for five of the FF-ICE/R1 Services (Filing Service, Flight Data Request Service, Notification Service, Planning Service, and Trial Service). A Submission Response shall be "ACK", "REJ" or "MAN", where:

a) ACK: indicates the message will be processed by the eASP.

b) REJ: indicates the message cannot be processed and no data will be retained by the eASP.

c) MAN: indicates that manual intervention is required before processing can be completed.

6.2.1.2 Status Response Messages (Filing Status, Planning Status, and Trial Response) are only provided when the Submission Response status is "ACK". If an eAU receives a Submission Response of "REJ", no status response will be provided. The eAU must address the issues identified in the Submission Response explanation and resubmit the message until an "ACK" Submission Response is received, after which the appropriate status response will be provided.

6.2.2 General Validation Requirements

6.2.2.1 Upon receipt of any messages, the message recipient shall perform the following checks before returning a Submission Response. These checks include:

a) Basic syntax and semantic validation including FIXM version 4.3.0 schema compliance and applicable FIXM FF-ICE Applications; and

b) Other validation checks specific to the individual FF-ICE/R1 services.

Note: these are explained in greater detail in subsequent sections under each of the relevant FF-ICE/R1 services.

6.2.3 **Submission Response “REJ”**

6.2.3.1 When validation fails, the message recipient shall provide a Submission Response of “REJ” and include an explanation in the explanation note field. While harmonization of explanation notes is not required, eASPs should ensure that explanations are precise enough for eAUs to rectify their original message if necessary.

6.2.3.2 **Table 1** provides a sample template for eASPs to use within the explanation note regarding the various types of validation checks that might result in a Submission Response of “REJ”.

Table 1: FF-ICE Submission Response Feedback for General Validation

Checks	**Explanation Note**
Syntax and Semantic Check	Wrong data format in field <X>
FIXM schema compliance	Field <X> not compliant to FIXM version 4.3.0
Mandatory Fields	Mandatory field <X> missing

6.2.4 **Manual Processing Requirements**

6.2.4.1 While FF-ICE processes are expected to be predominantly automated, manual processing may be required for specific operational needs. eASPs should clearly document their manual processing procedures and criteria and make them available to AUs.

6.2.4.2 When manual processing is required, eASPs shall send a “MAN” Submission Response to the message originator.

6.2.4.3 No action is required of the message originator on receipt of a “MAN” Submission Response from the eASP. The message originator should not submit any other messages relating to that flight until such time as an “ACK” or “REJ” Submission Response is received for that message.

6.2.4.4 After manual processing is completed, an "ACK" Submission Response shall be sent if the issue is resolved. A "REJ" Submission Response shall be sent if the issue remains unresolved. The eASP shall also provide a clear explanation of any manual changes made in their copy of the eFPL, within the explanation field of the Submission Response message.

6.2.4.5 Upon receipt of an "ACK" following a "MAN" Submission Response, the eAU should determine the need to submit a Flight Plan Update or Filed Flight Plan to all relevant ASPs incorporating the manual change that has been made to maintain a consistent flight plan across all ASPs.

6.2.4.6 The following scenarios should be considered for manual processing:

a) Special Handling Flights: flights requiring special handling (e.g. MEDEVAC, SAR) as identified in the Special Handling field, as defined in ICAO Doc 4444.

Note: these flights should normally not be rejected, even if they are non-compliant with standard restrictions. If these flight plans fail automatic validation checks, manual processing is recommended to ensure prompt facilitation and appropriate consideration of their special status.

b) Known System Issues: flights requiring manual intervention.

Note: these are cases where ATM system errors or configuration data errors which require manual intervention.

c) Other Exceptional Cases: these cases will be identified and documented by the eASP.

6.3 Filing Service

6.3.1 Introduction

6.3.1.1 The Filing Service is a mandatory service. Operators use the Filing Service to submit eFPLs and send updates, which are necessary to receive air traffic services.

6.3.1.2 To support the organized implementation of Filing Service in this region, a set of operational requirements and business rules should be utilized to provide clarity and operational consistency. While each eASP may have unique considerations and priorities, the transboundary nature of flights necessitates that certain processes be regionally agreed-upon, to allow for efficient flight planning for both eAUs and eASPs.

6.3.1.3 The Filing Service encompasses three primary processes:

a) Flight plan filing;

b) Flight plan updating; and

c) Flight plan cancellation.

6.3.1.4 **Figure 1** depicts the workflow and associated FF-ICE message exchanges for each Filing Service process, detailing the interaction between eAUs and eASPs throughout the flight plan lifecycle.

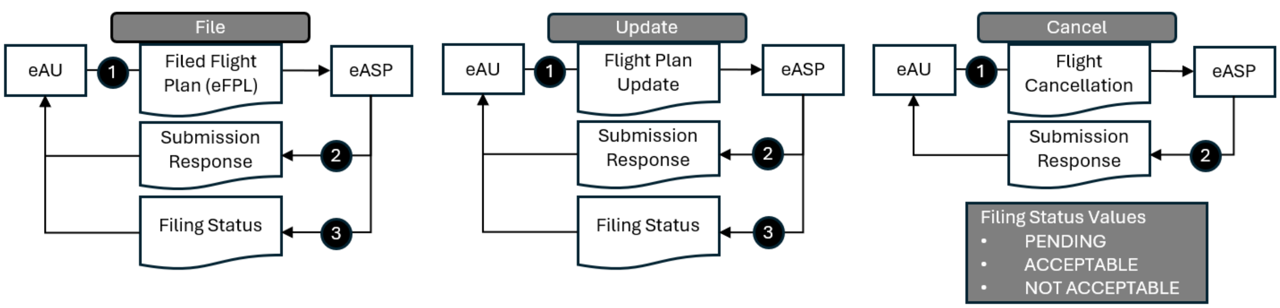


Figure 1: Filing Service Process Overview

6.3.1.5 There are five FF-ICE messages available under the Filing Service:

a) Filed Flight Plan Message;

b) Flight Plan Update Message;

c) Flight Cancellation Message;

d) Submission Response Message; and

e) Filing Status Message.

6.3.1.6 The following sections discuss the necessary processes and identify areas that would benefit from regional co-ordination for each of the Filing Service messages.

6.3.2 Filed Flight Plan Message

6.3.2.1 eFPLs are submitted by the eAUs as the first step under the Filing Service to obtain air traffic services. The eFPLs are subjected to validation checks resulting in a Submission Response, and evaluation checks resulting in a Filing Status.

6.3.3 Flight Plan Filing Cut-off Times

6.3.3.1 Flight plan filing cut-off times refer to the earliest and latest submission times for the filed flight plan. The earliest and latest submission times are defined in ICAO Doc 4444. However, regional agreements may impose stricter requirements necessitating that eAUs file their flight plans earlier than the standard latest submission time. The relevant cut-off times should be published by eASPs in the States' Aeronautical Information Publication (AIP). The flight plan filing cut-off times for the APAC region include:

a) <u>Earliest submission timings:</u> in accordance with ICAO Doc 4444 Section 4.4.2.1.1, eFPL shall not be submitted more than 120 hours before the EOBT of a flight. This requirement applies specifically to eFPL and does not extend to PFP.

b) <u>Latest submission timings:</u> In accordance with ICAO Doc 4444 Section 11.3.2, basic flight plan data necessary for flow control procedures shall be furnished at least 60 minutes in advance of the flight. eFPL shall therefore be submitted at least 60 minutes before EOBT.

6.3.3.2 The requirements specified in the *Asia Pacific Regional Framework for Collaborative Air Traffic Flow Management* should be followed, i.e. eFPL is to be submitted no less than three hours prior to the EOBT, except where operational or technical constraints necessitate otherwise.

6.3.4 Versioning

6.3.4.1 eASPs should refer to ICAO Doc 9965 Volume II Chapter 3.8 *Versioning & Reference Information*. It is the sole responsibility of the eAUs to increase the versioning of the flight plans. eASPs shall refer to the version numbers provided by eAUs and not change the flight plan versions.

6.3.4.2 eAUs shall increment the flight plan version by one, for the following scenarios:

a) a Flight Plan Update is made to the PFP;

b) a PFP has been previously submitted and the eAU is filing the flight plan (eFPL) for the same flight; or

c) an update is made to the eFPL.

6.3.4.3 It should be noted that the version number for the first submission of the eFPL received by an eASP might not be "1". This might occur when:

a) the eASP does not provide Planning Service and the eAU has previously submitted PFP to other eASPs that provide Planning Services; or

b) route changes result in the eASP becoming newly relevant to the flight, requiring the eAU to submit an eFPL with the current version number to inform the eASP of the existing flight plan.

6.3.4.4 If there is a concern of inconsistent version numbers between eAU and eASP, Flight Data Request Service can be used to obtain the eFPL which includes the version number.

6.3.5 Submission Response

6.3.5.1 The general validation requirements in accordance with section 6.2.2.1 also apply to the Submission Response Message.

6.3.5.2 Specific Validation Requirements for Filed Flight Plan

6.3.5.2.1 In addition to the checks listed in paragraph 6.2.2.1, submission timeframe, versioning, and flight association checks should also be conducted for Filed Flight Plans and Flight Plan Updates. eASPs may also implement additional checks based on local requirements to ensure that route/trajectories filed by eAUs contain valid routes, fix names, coordinates, etc. These checks include, but are not limited to:

a) trajectory syntactic checks; and

b) semantic checks.

6.3.5.2.2 **Table 2** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of “REJ”:

Table 2: FF-ICE Submission Response feedback for Filed Flight Plans and Flight Plan Updates

Additional Checks for Filed Flight Plans and Flight Plan Updates	
Checks	***Explanation Note***
Submission Timeframe	EOBT is outside allowable submission timeframe
Versioning	A later version <Y> exists in the system
Flight association	Same flight with different GUFI found Different flight with same GUFI found
Route validation (Structure of route, lat/long of point, fix names)	Trajectory Info Error Invalid Route Structure Invalid Fix/waypoint

6.3.6 Filing Status Message

6.3.6.1 Overview

6.3.6.1.1 Filing Status reflects the operational acceptability of a flight plan based on the eASP's evaluation or re-evaluation against its operational environment, including but not limited to airspace configuration, published restrictions, and other relevant constraints. eASPs provide feedback to eAUs to identify the restrictions and constraints applicable to the flights. The Filing Status serves as a key mechanism for eASPs to communicate flight plan acceptability to eAUs before departure.

6.3.6.1.2 eASPs should evaluate eFPLs against restrictions and constraints managed by existing ATM systems to ensure comprehensive evaluation of flight plan acceptability. Restrictions and constraints considered should include but are not limited to:

a) aerodrome, airspace and route availability;

b) ATFM measures;

c) environmental conditions such as SIGMETs, WAFs, TAFs, and volcanic ash areas, affecting airspace availability or constraints; and

d) aircraft operations requirements (e.g. required navigation performance specifications, required equipage, etc.)

Note: the above list represents constraints and restrictions that eASPs should consider. However, not all of these will necessarily result in a "Not Acceptable" Filing Status.

6.3.6.2 Filing Status Values and Expected Actions from the eAUs

6.3.6.2.1 While eASPs retain the option to determine the specific criteria for each Filing Status based on their operational environment, the interpretation and expected actions from the eAUs for each Filing Status value shall be established as described in **Table 3**.

Table 3: FF-ICE Filing Status Interpretation and Expected eAU Action

Filing Status	Interpretation	Expected eAU Action
ACCEPTABLE	The flight plan complies with operational requirements. Any constraints identified can be accommodated without flight plan modifications.	No immediate action or update required. Note any provided constraints for awareness. Prepare for possible tactical clearances reflecting identified constraints.
NOT ACCEPTABLE	The flight plan does not comply with operational requirements and requires modification.	Submit Flight Plan Update to address non-compliance. If close to EOBT, the operator may be unable to update their flight plan in time, using FF-ICE/R1 processes. In these cases, the operator may update their flight plan as needed through tactical coordination with ATC. *Note: if departure eASP provides a "Not Acceptable" Filing Status, eAU can expect refusal to start-up clearance if non-compliance requires flight plan modification (e.g. aerodrome closure). This does not apply to "Not Acceptable" status received from downstream eASPs.*
PENDING	Flight plan evaluation has not yet been performed. More details under Section 6.3.6.5.1	Await subsequent filing status update. Monitor Expected Evaluation Time if provided.

6.3.6.2.2 The Filing Status is intended to indicate the acceptability of a proposed route or trajectory within airspaces where ATS are provided. It cannot be interpreted as the issuance of ATC clearance.

6.3.6.2.3 A "NOT ACCEPTABLE" Filing Status indicates that the flight plan is operationally inconsistent with the ATM configuration and/or with published restrictions and that operator action is required to obtain a clearance. eAUs are expected to submit Flight Plan Updates to address the non-compliance. Note that the Filing Status reflects route/trajectory acceptability only and does not prevent ATC tactical coordination during operations.

6.3.6.2.4 An "ACCEPTABLE" Filing Status can include potential constraints to alert eAUs of constraints that may affect the flight plan. For example, if a flight plan is 'Acceptable' but there is an applicable ATFM program for the arrival airport, the arrival eASP should include this constraint in the Filing Status even though its specific impact (e.g. constraint time) is not yet known. When Filing Status is "ACCEPTABLE", eAUs are not expected to make any changes to their eFPLs.

6.3.6.2.5 When a Filing Status is "PENDING" or "NOT ACCEPTABLE", an explanation shall be included within the Filing Status response to eAU.

6.3.6.3 **Feedback Methods for Restrictions/Constraints**

6.3.6.3.1 When providing restrictions and/or constraints to eAUs within the Filing Status, eASPs shall make use of one or more of the following methods:

a) Filing Status Explanation;

b) General Flight Constraint; and/or

c) Route/Trajectory (R/T) Point Constraint.

6.3.6.3.2 eASPs should retain flexibility in determining their Filing Status feedback methods and content, except in the scenarios described in paragraph 6.3.6.4.1, which require harmonized responses to ensure regional interoperability and consistent handling of situations.

6.3.6.3.3 <u>Filing Status Explanation</u>

6.3.6.3.3.1 The Filing Status Explanation is a mandatory field when the status is "PENDING" or "NOT ACCEPTABLE", but is otherwise optional. It should provide information necessary for eAUs to understand why a flight plan is not operationally acceptable or to be alerted to potential constraints that could impact the flight. Where available, the explanation should include references to published restriction identifiers to facilitate the eAU's understanding and response.

6.3.6.3.4 <u>General Flight Constraint</u>

6.3.6.3.4.1 General Flight Constraints may be used to indicate constraints that apply to the entire flight rather than specific trajectory points. These types of constraints may include:

a) applicability period of the constraint;

b) operational impact on the flight;

c) reference to published restriction identifiers where available; and

d) other operational information affecting flight.

6.3.6.3.5 <u>Route/Trajectory (R/T) Point Constraints</u>

6.3.6.3.5.1 Providing an "Agreed" or "Negotiating R/T" within the Filing Status is optional. When provided, eASPs may include specific constraints at route or trajectory points. These constraints may specify speed, level, and/or time requirements that the flight is expected to meet. Such constraints should be accompanied by information for the eAU to understand their operational impact, including but not limited to:

a) description of the constraint;

b) speed, level, and/or time constraints where relevant;

c) reference to published restriction identifiers, where available; and

d) other point-specific operational requirements.

6.3.6.4 Harmonized Filing Status Responses for Identified ATFM Scenarios

6.3.6.4.1 While eASPs maintain flexibility in determining their trajectory evaluation criteria and feedback methods, certain scenarios require pre-determined Filing Status responses to ensure regional interoperability and consistent handling of operational conditions. The following ATFM scenarios were identified to benefit from pre-established Filing Status responses:

a) Calculated Time Over (CTO) a point or Calculated Landing Time (CLDT) imposed by eASPs;

b) Ground Stop (GSt) imposed by arrival eASPs;

c) flight level restrictions imposed by relevant eASPs;

d) fix balancing imposed by relevant eASPs; and

e) re-routing imposed by relevant eASPs.

6.3.6.4.2 <u>Harmonized Filing Status Responses</u>

6.3.6.4.2.1 The regionally agreed-upon Filing Status Responses for these scenarios are detailed in **Table 10**. Consistent implementation by all eASPs in APAC is necessary to facilitate the processing requirements of eAUs.

6.3.6.4.2.2 eASPs are not required to suggest alternative solutions to eAUs. However, if eASPs choose to offer suggestions to assist eAUs, they may:

a) add additional suggested details to the end of the regionally agreed-upon explanation format in the Filing Status Explanation field; and/or

b) provide a Negotiating R/T containing the suggested alternative trajectory, including route, levels, or timing.

6.3.6.4.2.3 The regionally agreed-upon explanation format shown in **Table 10** should remain the primary response, with any additional suggested information considered as supplementary content rather than replacing the required format.

6.3.6.4.3 <u>Scenario A) Calculated Time Over (CTO) a point or Calculated Landing Time (CLDT) imposed by eASPs</u>

6.3.6.4.3.1 Due to demand capacity imbalance, the eASP may impose a time constraint of CTO or CLDT to flights.

Note: eASP shall provide feedback only on constraints within airspace where it provides ATS or ATFM service. Where constraints are to be applied outside this airspace, e.g. assignment of Calculated Take-Off Time (CTOT) at the departure aerodrome in an airspace outside the eASP's jurisdiction, special arrangement between ASPs shall be established.

6.3.6.4.3.2 When a CTO or CLDT is imposed on flights, the following responses shall be provided as presented in **Table 10**:

a) Filing Status value shall be "NOT ACCEPTABLE";

b) an explanation shall be provided, specifying at a minimum the ATFM constraint/restriction affecting the flight;

c) a Negotiating R/T shall be included to indicate the constrained point and its associated time constraint;

d) when providing constraint details in the Negotiating R/T, eASPs should:

   i) use ElementStartPoint to identify the location of the constraint;

   ii) provide the time constraint using Constraint.Time, and any additional level/speed constraints using Constraint.Level/Constraint.Speed, if applicable;

   iii) provide the REGCAUSE in the constraint description;

   iv) provide the REGUL in restriction reference; and

e) the message format for REGCAUSE and REGUL should be in accordance with the *Asia/Pacific Region AFTN/AMHS-based Interface Control Document (ICD)* for ATFM.

6.3.6.4.4 <u>Scenario B) Ground Stop (GSt) imposed by arrival eASPs</u>

6.3.6.4.4.1 The arrival eASP may need to restrict arrivals for a period when capacity has been severely reduced.

6.3.6.4.4.2 When a GSt is implemented, the eASP initiating the measure the following responses shall be utilized as detailed in **Table 10**:

a) Filing Status value shall be NOT ACCEPTABLE;

b) an explanation shall be provided. The following format should be used: GSt imposed on flights arriving into <aerodrome> from <YYYY-MM-DDTHH:mm:ssZ> to <YYYY-MM-DDTHH:mm:ssZ>;

c) if available, eASP should provide reference to the applicable restrictions within the explanation note: See NOTAM <XXX> / ADP <XXX> for details;

d) if available, SWIM information services should be used to provide more details of applicable restrictions; and

e) a Negotiating R/T is not required for GSt restrictions.

6.3.6.4.5 Scenario C) Flight level restrictions imposed by relevant eASPs

6.3.6.4.5.1 Restrictions resulting in unavailability of certain flight levels may be imposed.

6.3.6.4.5.2 When flight level restrictions are imposed, the following responses shall be utilized as detailed in **Table 10**:

a) Filing Status value shall be "NOT ACCEPTABLE";

b) an explanation shall be provided. The following format should be used: <FL or altitude, FL or altitude> on route <XXXX> not available;

c) if available, eASP should provide reference to the applicable restrictions within the explanation note: See NOTAM <XXX> for details;

d) if available, SWIM information services should be used to provide more details of applicable restrictions; and

e) a Negotiating R/T is not required for flow restrictions.

6.3.6.4.6 Scenario D) Fix balancing imposed by relevant eASPs

6.3.6.4.6.1 Fix balancing is a tactical ATFM measure aimed at distributing demand and avoiding delays, whereby the aircraft is assigned a different arrival or departure fix. This can be used, for example, during conditions where a STAR or a SID is unusable.

6.3.6.4.6.2 When fix balancing measures are imposed on flights, the following responses shall be utilized as detailed in **Table 10**:

a) Filing Status value shall be NOT ACCEPTABLE;

b) an explanation shall be provided. The following format should be used: Trajectory Point <XXXXX> not available;

c) if available, eASP should provide reference to the applicable restrictions within the explanation note: See NOTAM <XXX> for details;

d) if available, SWIM information services should be used to provide more details of applicable restrictions; and

e) a Negotiating R/T is not required for fix-balancing.

6.3.6.4.7 Scenario E) Re-routing imposed by relevant eASPs

6.3.6.4.7.1 eASPs may require flights to use alternative routing if specific routes/airspace are unavailable or constrained.

6.3.6.4.7.2 When re-routing measures are imposed on flights, the following responses shall be utilized as detailed in **Table 10**:

a) Filing Status value shall be "NOT ACCEPTABLE";

b) an explanation shall be provided in the format: Route <XXXXX> not available;

c) if available, eASP should provide reference to the applicable restrictions within the explanation note: See NOTAM <XXX> for details;

d) if available, SWIM information services should be used to provide more details of applicable restrictions; and

e) a Negotiating R/T is not required for re-routing.

6.3.6.4.8 Expected eAU Action

6.3.6.4.8.1 Upon receiving a "NOT ACCEPTABLE" Filing Status, eAUs shall submit a Flight Plan Update (refer to Section 6.3.7 for more details on Flight Plan Updates) to comply with assigned restrictions/constraints. In a mixed-mode environment, the corresponding CHG/DLA message should be submitted when applicable.

6.3.6.4.9 eASP Compliance Checking and Filing Status Response

6.3.6.4.9.1 eASPs shall evaluate the Flight Plan Update to check for compliance against the restrictions/constraints where applicable. Paragraphs 6.3.6.4.9.2 to 6.3.6.4.9.6 provide an example on how this evaluation can be performed for the following scenarios.

6.3.6.4.9.2 For Scenario A, eASPs should check the Estimated Time Over (ETO) of the constrained point submitted within the Flight Plan Update for compliance to the CTO:

a) If the ETO falls within the compliance window, the Filing Status response of the Flight Plan Update will be "ACCEPTABLE".

b) If the ETO falls outside the compliance window, the flight will be re-evaluated by the eASP.

c) The compliance window parameters as established through regional ATFM procedures shall be applied.

6.3.6.4.9.3 For Scenario B, the arrival eASP should check that the updated estimated landing time of the Flight Plan Update is not within the constrained period.

6.3.6.4.9.4 For Scenario C, the eASPs should check the Flight Plan Update to ensure that the unavailable Flight Levels of the specific trajectory points are not being used.

6.3.6.4.9.5 For Scenario D, the eASPs should check the Flight Plan Update to ensure that the unavailable trajectory points are not being used.

6.3.6.4.9.6 For Scenario E, the eASPs should check the Flight Plan Update to ensure that the unavailable routes are not being used.

6.3.6.4.9.7 When ATFM restrictions are cancelled and the last Filing Status value was "NOT ACCEPTABLE", the eASP shall provide an updated Filing Status with the value of "ACCEPTABLE" and an explanation that the ATFM restriction is no longer applicable or has been cancelled.

6.3.6.4.9.8 When ATFM restrictions are cancelled and the last Filing Status value was "ACCEPTABLE", the eASP should provide an optional updated Filing Status with the value of "ACCEPTABLE" and an explanation that the ATFM restriction is no longer applicable or has been cancelled.

Note: an "ACCEPTABLE" Filing Status may include information about applicable ATFM restrictions that do not constrain the flight (e.g. MIT/MINIT). This additional information is provided for situational *awareness. The eAUs may choose to modify their flight plan to optimize operations or may proceed without changes. The flight remains acceptable as filed, but operators can use this information to make informed decisions about potential route adjustments or other operational considerations.*

6.3.6.4.9.9 When ATFM restrictions are cancelled and the eAU had previously modified their Desired Route/Trajectory to comply with the restriction, the eAU may use available SWIM services to identify when restrictions are lifted and may submit a Flight Plan Update to adjust their Desired Route/Trajectory.

6.3.6.5 Usage of “PENDING” Status

6.3.6.5.1 It is recommended that eASPs evaluate flight plans as soon as they are available. However, in situations where immediate evaluation is not possible, a “PENDING” Filing Status may be used when the eASP's system requires more time than the time-out period (see paragraph 6.8.1.1) to provide a definitive Filing Status. This could occur in scenarios such as:

a) When the flight plan has been received well in advance of the eASP's processing horizon for the flight; and

b) When eASPs do not conduct a re-evaluation process and hence prefer to provide the filing status nearer to the EOBT.

Note 1: this is not recommended as it may create a situation where other eASPs have returned a filing status to the flight plan, and there is no clarity for eAUs to determine whether the flight plans are accepted by all relevant eASPs.

Note 2: ICAO Doc 9965 recommends that the first non-Pending Filing Status should be provided no later than three hours before EOBT, provided the submission was made in the correct timeframe.

6.3.6.5.2 When providing a “PENDING” status, the eASP shall include an explanation. An Expected Evaluation Time should be included to indicate when the flight plan is likely to be fully processed.

6.3.7 Flight Plan Update Message

6.3.7.1 Flight Plan Updates are submitted by eAUs to inform on changes to the eFPL. These updates are subjected to similar validation and evaluation checks as the eFPLs.

6.3.7.2 When route changes result in new eASPs becoming concerned with the flight that did not previously receive the eFPL, the eAU shall submit the current version of the complete set of flight plan data in eFPL to those new eASPs, rather than a Flight Plan Update.

6.3.7.3 Flight Plan Update Cut-off Times

6.3.7.3.1 The submission timeframe for Flight Plan Update should provide sufficient flexibility to eAUs to cater to operational issues and any additional considerations that may arise after the filing of the eFPL. It is recommended that Flight Plan Updates are permitted from the time that the eAU receives the Filing Status of a submitted eFPL until route clearance delivery or the flight’s AOBT, whichever occurs first.

6.3.7.3.2 eASPs shall ensure that any Flight Plan Update received after route clearance delivery results in appropriate clearance revision by ATC to maintain consistency between the flight plan and delivered clearance.

6.3.7.4 Flight Plan Update Threshold

6.3.7.4.1 ICAO Doc 9965 states that eASPs may publish threshold modification values that trigger the transmission of an update (see ICAO Doc 9965). With FF-ICE automating most of these processes, eAUs should be able to provide eASPs with the most recent data as possible, to increase operational predictability for all stakeholders.

6.3.7.4.2 It is recommended that eAUs submit Flight Plan Update each time there is a change in eFPL data, subject to their system capabilities. At a minimum, eAUs shall submit Flight Plan Update due to changes equivalent to an FPL2012 data update (ICAO Doc 4444 Section 11.4.2.2.4 states that a CHG message shall be transmitted when any change is to be made to basic flight plan data contained in previously-transmitted FPL or RPL data).

6.3.7.4.3 The same recommendation applies for updates to EOBT. eAUs should submit Flight Plan Update each time there is a change in EOBT, subject to their system capabilities. At a minimum, eAUs shall submit Flight Plan Update if EOBT is delayed by more than 30 minutes (ICAO Doc 4444 Section 11.4.2.2.3.1 states that a DLA message shall be transmitted if the flight is delayed by more than 30 minutes after the estimated off-block time contained in the basic flight plan data).

6.3.7.4.4 Providing the most recent data to eASPs ensures that all stakeholders have the most accurate and updated information of the flight plan available to perform their ATM functions, as even minor changes to route can affect trajectory predictions.

6.3.7.4.5 While the varying update thresholds for FPL2012 and eFPL will result in varying information received by eASPs versus aASPs, it should be noted that in a mixed-mode environment eASPs have the advantage of receiving the most updated information that eAUs are most likely to utilize. For this reason, the varied information received by eASPs versus aASPs should not present cause to delay sending more precise Flight Plan Updates to eASPs only.

6.3.8 Flight Cancellation

6.3.8.1 Specific Validation Requirements for Flight Cancellation

6.3.8.1.1 In addition to the general validation checks indicated in paragraph 6.2.2.1, eASPs should perform a flight association check, verify that the flight has not yet departed, and authenticate that the message originator has the authority to cancel the flight.

6.3.8.1.2 **Table 4** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of “REJ”.

Table 4: FF-ICE Submission Response Feedback for Flight Cancellation Messages

Additional Checks for Flight Cancellation Messages	
Checks	***Explanation Note***
Flight association	Same flight with different GUFI found Different flight with same GUFI found
Authenticated user	No information available
Flight Plan State	Flight has already departed

Note: If the source of the request has no authorized access to the identified flight, a Submission Response of “REJ” should be returned, with an explanation that the recipient *does not have the requested information. Note that a response indicating non-authorization verifies for the sender that the flight exists, which is information in itself. Therefore, a generic message indicating that there is no information for the flight is preferable.*

6.3.8.1.3 In accordance with ICAO Doc 9965, the eASP shall provide an "ACK" response when cancellation is successful, which shall terminate operational use of GUFI, as well as any further processing of all instances of the flight plan (preliminary and filed). A "REJ" response shall be given with an explanation, when cancellation is unsuccessful.

6.3.8.1.4 A cancelled flight cannot be reinstated. If the operator later decides to operate the flight, a new flight plan with a new GUFI shall be submitted.

6.3.9 Filing Requirements for Cross-ANSP and Local Agreements

6.3.9.1 Individual eASPs may consider establishing cross-ANSP agreements and local agreements with eAUs to facilitate seamless filing processes and the coordination of flight plan submissions across different airspace jurisdictions.

6.3.9.2 eASPs may likewise establish regional agreements with other eASPs for regional flight plan distribution and/or coordinated feedback on airspace restrictions.

6.3.9.3 eASPs may also establish local agreements with eAUs to facilitate FF-ICE implementation through translation services, Filing Status handling procedures, and tactical coordination arrangements.

6.3.9.4 However, the operational challenges that could arise from the potential complexity arising of a multitude of agreements, especially in the context of mixed mode operations, should also be a consideration.

6.3.9.5 It is recommended that APAC States adhere to the procedures in this Plan. Any local agreements or cross-ANSP agreements should not contradict the guidance provided in ICAO Doc 9965 or this Plan, which should supersede any supplementary or tangential agreements.

6.4 Flight Data Request Service

6.4.1 Introduction

6.4.1.1 The Flight Data Request Service is a mandatory service that eASPs will provide in the FF-ICE environment to allow authorized parties to obtain information about a flight, including flight plans, supplementary data, and flight status.

6.4.1.2 **Figure 2** depicts the workflow and associated FF-ICE message exchanges between FF-ICE participants during flight data queries.

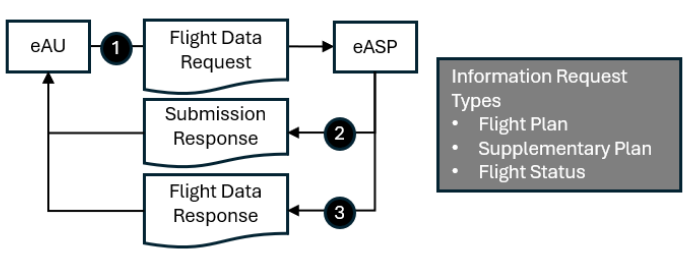


Figure 2: Flight Data Request Service Overview

6.4.1.3 There are three FF-ICE messages available under the flight data request service:

a) Flight Data Request Message;

b) Submission Response Message; and

c) Flight Data Response Message.

6.4.2 Flight Data Request Message

6.4.2.1 Information available for request by the eASPs should include the minimum set of data types as listed in ICAO Doc 9965 (flight plans, supplementary data, and flight status) as well as any additional information which the eASPs may choose to make available. eAUs may also enable eASPs to request relevant information concerning a flight. Request codes should be specified in the Requested Flight Data Item field of the Flight Data Request Message.

6.4.2.2 Access Control

6.4.2.2.1 In addition to the general requirements specified in Section 6.1.9, eASPs and eAUs should implement robust access control mechanisms to ensure that only authorized parties can receive the requested data, safeguarding the confidentiality and integrity of sensitive information. The following safeguards are recommended:

a) eAUs are limited to querying their own flights;

b) relevant eASPs should have full access to the eFPL and associated data;

c) adjacent eASPs (providers of airspaces not planned to be directly traversed by the flight but the boundaries of which are close to the flight trajectory) may be granted limited access to relevant eFPL for planning purposes; and

d) airport operators should have access to departures and arrivals pertinent to their operations.

6.4.2.3 Query Limits

6.4.2.3.1 The Flight Data Request Service is designed for querying information about individual flights, not for bulk data retrieval, in accordance with ICAO Doc 9965. eASPs and eAUs should publish request rate limit (i.e. the number of requests that can be made to the Flight Data Request Service within a specific period). Flight Data Requests that exceed the published request rate limit shall receive a Submission Response with status REJ and an appropriate explanation in **Table 5**, provided in section 6.4.2.6.2, indicating the rate limit violation.

6.4.2.4 Applicability Period

6.4.2.4.1 A flight data request pertaining to a specified eFPL is only valid from the time the eFPL is submitted to the time the flight is completed. A flight is completed when it has landed at the destination, diversion, or other alternate aerodrome.

6.4.2.4.2 An eASP may also support the submission of an information request for PFP data. This request will be valid from the time the PFP is submitted until the submission of the eFPL.

6.4.2.5 Submission Response Message

6.4.2.5.1 The general validation requirements in accordance with section 6.2.2.1 apply to the Submission Response Message criteria.

6.4.2.6 Specific Validation Requirements for Flight Data Request

6.4.2.6.1 In addition to the checks listed in paragraph 6.2.2.1, eASPs should perform flight association checks and validate the legitimacy of the request, ensuring that only authorized parties can access flight data.

6.4.2.6.2 **Table 5** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of “REJ”.

Table 5: FF-ICE Submission Response feedback for Flight Data Request Messages

Additional Checks for Flight Data Request Messages	
Checks	***Explanation Note***
Flight association	Same flight with different GUFI found Different flight with same GUFI found
Multiple flights matched	Multiple flights with the requested information: a) Aircraft ID1, dep, dest, EOBT, GUFI b) Aircraft ID1, dep, dest, EOBT, GUFI
Requested flight not found	Flight does not exist
No authorized access to the identified flight	No information available
Requested flight data items not supported by the eASP	Request not supported
Query Limit	Query Limit Exceeded

6.4.3 Flight Data Response Message

6.4.3.1 It is recommended that the following R/T be included within the Flight Data Response for the various requests:

a) Flight Plan Request: eASPs should include the Desired R/T representing the last filed R/T by eAU. This is based on the understanding that the requestor wants to see the route information that the eAU last submitted; and

b) Flight Status Request: eASPs should include the latest R/T (either Agreed R/T or Negotiating R/T) as per the latest Filing Status of the flight, if applicable. This is based on the understanding that the requestor wants to see the latest response (i.e. Filing Status) provided by the eASPs.

6.5 Notification Service

6.5.1 Introduction

6.5.1.1 The Notification Service enables eASPs to notify relevant eASPs, as identified through the flight plan, of significant flight events such as departure and arrival. While Notification Service is not a service mandated by ICAO Doc 4444 to be FF-ICE capable, it will likely be necessary to support the sunset of FPL2012 and the associated ATS messages. All ASPs in the APAC region shall implement the Notification Service according to the regional implementation timeline.

6.5.1.2 The Notification Service currently encompasses the full process of flight event notification through the sending of flight departure and arrival messages. **Figure 3** depicts the workflow and associated FF-ICE message exchanges, showing the interaction between FF-ICE participants throughout the flight notification process.

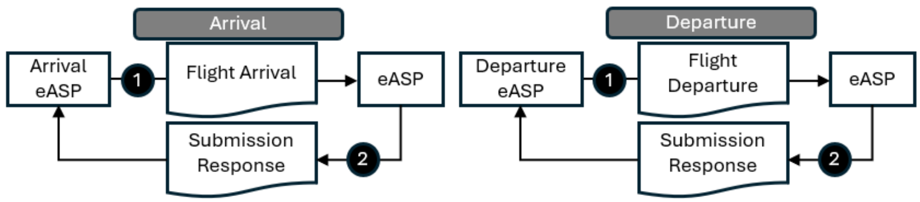


Figure 3: Notification Service Overview

6.5.1.3 There are three FF-ICE messages available under the Notification Service:

a) Flight Departure Message;

b) Flight Arrival Message; and

c) Submission Response Message.

6.5.2 Submission Response Message

6.5.2.1 In addition to the checks listed in paragraph 6.2.2.1, eASPs should perform flight association checks and timestamp validation checks to ensure that the arrival/departure time is not in the future and that the arrival time does not precede departure time in the case of the Arrival message. Additionally, the eASP should check to ensure that the originators of the Flight Departure/Flight Arrival Message are from the appropriate eASPs.

6.5.2.2 **Table 6** provides a sample template for eASPs to use within the explanation note for the various types of validation checks that might result in a Submission Response of “REJ”.

Table 6: FF-ICE Submission Response feedback for Flight Departure and Flight Arrival Messages

Additional Checks for Flight Departure and Flight Arrival Messages	
Checks	***Explanation Note***
Flight association	Same flight with different GUFI found Different flight with same GUFI found
Timestamp Check	Arrival/Departure time is in the future Arrival time is before departure time
Permission to send notification	No rights to send Arrival/Departure message

6.5.2.3 Upon receipt of a Submission Response indicating “REJ” status from Notification Service, the sender shall review the Submission Status Explanation to determine the cause of rejection. The sender shall make the necessary corrections to address the identified issues and re-submit the notification message, if applicable.

6.6 Planning Service

6.6.1 Introduction

6.6.1.1 The Planning Service is an optional service that enables collaborative decision-making between eAUs and eASPs by sharing informal flight plans well ahead of time via Preliminary Flight Plans, allowing improved demand prediction and optimal trajectory planning before the formal filing of flight plans. eASPs providing Planning Services shall publish the availability of the service in their AIP.

6.6.1.2 The Planning Service encompasses three primary processes:

a) PFP submission;

b) PFP updating; and

c) PFP cancellation.

6.6.1.3 **Figure 4** depicts the workflow and associated FF-ICE message exchanges for each process, showing the interaction between eAUs and eASPs throughout the PFP lifecycle.

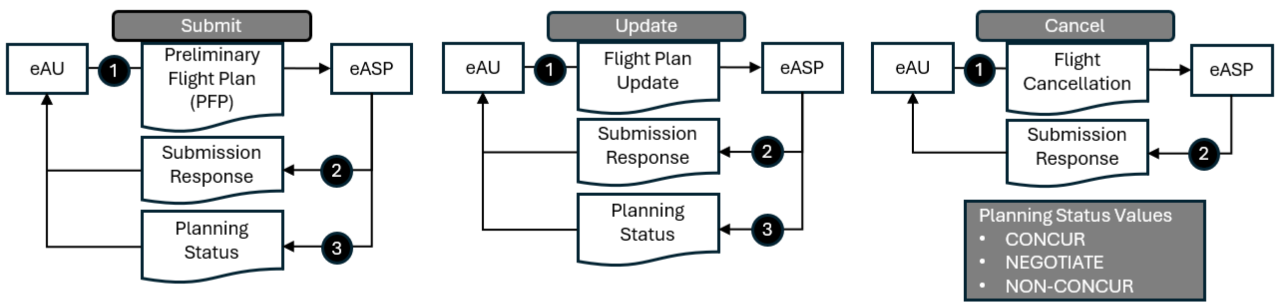


Figure 4: Planning Service Process Overview

6.6.1.4 There are five FF-ICE messages available under the Planning Service:

a) PFP Message;

b) Flight Plan Update Message;

c) Flight Cancellation Message;

d) Submission Response Message; and

e) Planning Status Message.

6.6.1.5 The processes under Planning Service are similar to those related to Filing Service, except that these processes take place in a timeframe designated before the submission of eFPL. This timeframe enables negotiations to take place with more advance notice.

6.6.2 Preliminary Flight Plan Message

6.6.2.1 PFPs are submitted by the eAUs as the first step under the Planning Service. Unlike eFPL which is submitted to all relevant eASPs, eAUs can choose to submit PFPs to select eASPs that they have designated for cooperative planning efforts. Typically, these eASPs have airspaces that are complex or regularly constrained. The PFPs are subjected to validation checks resulting in a Submission Response, and evaluation checks resulting in a Planning Status.

6.6.3 **PFP Cut-off Times**

6.6.3.1 The PFP cut-off times refer to the earliest and latest submission times for the PFP. The earliest submission time is dependent on eASPs' capability and the type of advance planning that could be conducted between the eASPs and eAUs. Meanwhile, the latest submission time should be determined by the time that the eFPL is due. The PFP expires when the eFPL is due. PFP expiry refers to the point at which a PFP can no longer be processed or updated by eASP. The due time of eFPL is determined by each eASP and shall comply with the latest submission timing as defined in ICAO Doc 4444 and any regional agreements. This will also be the time after which the PFP will not be accepted. The cut-off times should be published by eASPs in the AIPs.

6.6.3.2 After an eFPL has been submitted, a PFP can no longer be submitted for the same flight.

6.6.4 **Versioning**

6.6.4.1 As with eFPL, it is the responsibility of the eAUs to increase the versioning of the PFPs. Every new version or Flight Plan Update made to the PFP will increment the version by one.

6.6.5 **Submission Response Message**

6.6.5.1 The general validation requirements as per paragraph 6.2.2.1 apply to the Submission Response Message criteria.

6.6.6 **Specific Validation Requirements for PFPs**

6.6.6.1 In addition to the checks listed in paragraph 6.2.2.1, submission timeframe, existence of eFPL, versioning, and flight association check should be conducted for PFPs and Flight Plan Updates. eASPs may also implement additional checks based on local requirements, to ensure that route/trajectories filed by eAUs contain valid routes, fix names, and coordinates, including but not limited to:

a) trajectory syntactic checks; and

b) semantic checks.

6.6.6.2 **Table 7** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of "REJ".

Table 7: FF-ICE Submission Response feedback for Preliminary Flight Plans and Flight Plan Updates

Additional Checks for PFPs and Flight Plan Updates	
Checks	***Explanation Note***
Submission Timeframe	EOBT is outside allowable submission timeframe
Existence of eFPL	eFPL for the same flight has already been submitted
Versioning	A later version <Y> exists in the system
Flight association	Same flight with different GUFI found

	Different flight with same GUFI found
Route validation (Structure of route, lat/long of points, fix names)	Trajectory Info Error Invalid Route Structure Invalid Fix/waypoint

6.6.7 **Planning Status Message**

6.6.7.1 **Overview**

6.6.7.1.1 The Planning Status reflects the likelihood that the flight plan will be operationally acceptable if submitted as an eFPL. The evaluations conducted for the PFPs are therefore similar to those conducted for the eFPLs. eASPs provide feedback within the Planning Status to eAUs to identify the restrictions and constraints applicable to the flights.

6.6.7.1.2 In line with the evaluations conducted for eFPLs, eASPs should evaluate PFPs against restrictions managed by existing ATM systems, to ensure comprehensive evaluation of flight plan acceptability. Refer to section 6.3.6.1.2 for the recommended list.

6.6.7.2 **Planning Status Values**

6.6.7.2.1 eASPs retain flexibility in determining the specific criteria for each planning status based on their operational environment. However, the criteria for a "NON-CONCUR" Planning Status should be similar to the criteria for a "NOT ACCEPTABLE" Filing Status.

6.6.7.2.2 Similarly, the criteria for a "CONCUR" Planning Status should be similar to the criteria for an "ACCEPTABLE" Filing Status.

6.6.7.2.3 A third Planning Status of "NEGOTIATE" is also available. This Planning Status refers to any situation where the flight plan is likely to be accepted if filed, but the R/T details differ.

6.6.7.3 **Feedback Methods for Restrictions/Constraints**

6.6.7.3.1 When providing restrictions / constraints to eAUs within the Planning Status, eASPs should make use of methods similar to those detailed under the Filing Status, as outlined in Section 6.3.6.3.1.

6.6.7.3.2 eASPs should retain flexibility in determining their Planning Status feedback methods and content, except in the scenarios described in Section 6.3.6.4.1 which require pre-established responses to promote regional interoperability and consistent handling.

6.6.7.3.3 For the five Scenarios (as described in Section 6.3.6.4.1), the Planning Status should therefore be "NON-CONCUR" with a Negotiating R/T provided where applicable, as specified in the established requirements.

6.6.7.3.4 The regionally agreed-upon Planning Status response format and explanation templates for the respective scenarios are detailed in **Appendix C Table 10**. The explanation formats listed within the table shall be used together with the "NON-CONCUR" Planning Status value.

6.6.8 **Flight Plan Update Message**

6.6.8.1 Flight Plan Updates are submitted by eAUs to provide information regarding changes to the PFPs. These updates are subjected to similar validation and evaluation checks as the PFPs.

6.6.9 Flight Plan Update cut-off times

6.6.9.1 The submission of Flight Plan Update for PFP should be allowed from the time that the eAU submits a PFP to the time that the eFPL is due.

6.6.10 Flight Plan Update Threshold

6.6.10.1 Unlike the flight plan filing process, which operates in a mixed-mode environment, the Planning Service impacts only FF-ICE-capable stakeholders. For this reason, eAUs are advised to submit Flight Plan Update each time there is a change in PFP data. There is no legacy message equivalent to the PFP, meaning that the PFP update may be as frequent as allowed within the system's capabilities, without impact to non-FF-ICE-capable stakeholders.

6.6.11 Flight Cancellation

6.6.11.1 Specific Validation Requirements for Flight Cancellation

6.6.11.1.1 In addition to the general validation checks detailed in paragraph 6.2.2.1, eASPs should perform flight association checks and authenticate that the message originator has the authority to cancel the flight.

6.6.11.1.1.1 **Table 8** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of "REJ".

Table 8: FF-ICE Submission Response feedback for Flight Cancellation

Additional Checks for Flight Cancellation Messages	
Checks	***Explanation Note***
Flight association	Same flight with different GUFI found Different flight with same GUFI found
Authenticated User	No information available

6.7 Trial Service

6.7.1 Introduction

6.7.1.1 The Trial Service is an optional service that allows operators to evaluate "what-if" scenarios for both preliminary and filed flight plans, without affecting the actual flight plan data, enabling better flight planning and constraint resolution.

6.7.1.2 The Trial Service encompasses the process of evaluating alternative flight scenarios without affecting existing flight plans. **Figure 5** depicts the workflow and associated FF-ICE message exchanges, showing the interaction between eAUs and eASPs throughout the trial request and evaluation process.

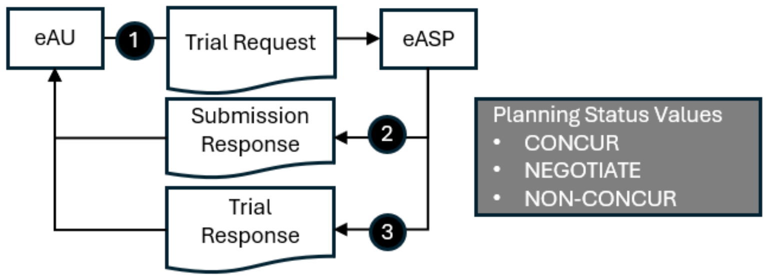


Figure 5: Trial Service Overview

6.7.1.3 There are three FF-ICE messages available under the Trial Service:

a) Trial Request Message;

b) Submission Response Message; and

c) Trial Response Message.

6.7.2 Trial Request Message

6.7.2.1 Trial Requests are submitted by the eAUs as the first step under the Trial Service. As with the PFPs, eAUs can choose to submit Trial Requests to selected eASPs with whom they wish to conduct the trials. Multiple Trial Requests can be submitted to the same eASP and these requests can be submitted even without the presence of PFPs/eFPLs. Trial Requests are subjected to validation checks resulting in a Submission Response and evaluation checks resulting in a Planning Status. Trial Requests shall be treated by the eASP as a separate, standalone transaction which has no impact on existing data.

6.7.2.2 Limits on Trial Request Frequency

6.7.2.2.1 eASPs may set limits on the maximum frequency of requests allowable within a specified period for each eAU to prevent system overload and ensure service availability for all users. These limitations should be published in the eASP's AIP.

6.7.2.3 Submission Response Message

6.7.2.3.1 The general validation requirements as per paragraph 6.2.2.1 apply to the Submission Response Message criteria.

6.7.2.4 Specific Validation Requirements for Trial Requests

6.7.2.4.1 In addition to the checks listed in paragraph 6.2.2.1, submission timeframe and request frequency checks should be conducted for Trial Requests. For submission timeframes, Trial Requests can be allowed up to route clearance delivery, allowing sufficient time to submit a Flight Plan Update arising from a positive Trial Response. This option is only available when Trial Requests are for a flight that is already provided as a PFP or eFPL. eASPs may also implement additional checks based on local requirements, to ensure that R/Ts filed by eAUs contain valid routes, fix names, and coordinates, including but not limited to:

a) trajectory syntactic checks; and

b) semantic checks.

6.7.2.4.2 **Table 9** provides a sample template for eASPs to use within the explanation note field for the various types of validation checks that might result in a Submission Response of "REJ".

Table 9: FF-ICE Submission Response feedback for Trial Requests

Additional Checks for Trial Requests	
Checks	***Explanation Note***
Submission Timeframe	Outside the allowable submission timeframe
Request Frequency	Frequency of Trial Requests has been exceeded
Route validation (Structure of route, lat/long of points, fix names)	Trajectory Info Error Invalid Route Structure Invalid Fix/waypoint

6.7.3 Trial Response Message

6.7.3.1 Planning Status Values

6.7.3.1.1 The Planning Status within the Trial Response Message reflects the likelihood that the flight plan will be operationally acceptable if submitted as a PFP or eFPL. The evaluations conducted for the Trial Requests are similar to those that are conducted for the PFPs.

6.7.3.1.2 However, as eAUs are allowed to submit multiple Trial Requests, it may not be practical for eASPs to consider all Trial Requests as actual traffic demand. It is therefore not expected for eASPs to provide flight specific constraints. For example, if a trial flight plan is expected to operate during the duration of an ATFM program, eASPs are expected to provide feedback to the eAUs that the flight will be caught in the ATFM program. A flight specific constraint need not be provided to the eAUs.

6.7.3.1.3 eASPs should publish the scope of evaluation performed for Trial Requests, in the AIP.

6.7.3.2 Feedback Methods for Restrictions/Constraints

6.7.3.2.1 When providing restrictions/constraints to eAUs within the Trial Response, eASPs should use methods similar to those used for the Planning Service. eASPs should similarly retain flexibility in determining their Trial Response feedback methods and content.

6.7.3.2.2 For the five Scenarios (as described in Section 6.3.6.4.1) which require regionally agreed-upon responses to ensure regional interoperability and consistent handling, the Trial Response shall contain a Planning Status of "NON-CONCUR". In addition, no flight specific constraints or R/Ts will be expected in the response.

6.7.3.2.3 The explanation within **Appendix C Table 10** can be used for relevant scenarios.

Note: eASPs should not include any flight-specific constraints or resource allocations, as Trial Requests are "what-if" scenarios that do not represent actual flight operations. The response should indicate general restriction applicability without reserving operational resources or assigning specific constraint values.

6.8 Message Delivery Assurance

6.8.1 Time-out for submitted messages

6.8.1.1 Time-outs are predefined waiting periods during which a system expects to receive a response from another system or user. If no response arrives within this window, the system marks the request as failed or expired. These time-out periods are deliberately set longer than the typical response time to account for various delays, such as system latency and network delays.

6.8.1.2 States should publish business-level time-out periods in their AIPs to provide operators with expected response times for FF-ICE services. These time-outs represent commitments for completing processes such as flight plan evaluation and trajectory assessment.

6.8.1.3 The time-out periods specified in the following sections are recommended business-level time-outs that eASPs should implement to ensure consistent service delivery across the region.

6.8.2 Submission Response

6.8.2.1 It is recommended that the timeout for the Submission Response message be set at one minute. If Submission Response is not received after one minute, the message originator should resubmit the original message (e.g. eFPL / Flight Plan Update / Flight Cancellation / PFP / Flight Departure / Flight Arrival / Flight Data Request etc).

6.8.3 Filing and Planning Status

6.8.3.1 For Filing Service, it is recommended that the timeout for Filing Status Message be set at one minute from the time the eAU receives a Submission Response of “ACK”. If the first Filing Status is not received one minute after receiving the Submission Response of “ACK”, eAUs may contact the eASPs. Filing Status Message is not expected if a Submission Response of “REJ” or “MAN” was received.

6.8.3.2 For Planning Service, if a re-evaluation process is provided, it is recommended that the timeout for Planning Status Message be set at one minute from the time the eAU receives a Submission Response of “ACK”. If the first Planning Status Message is not received one minute after receiving the Submission Response of “ACK”, eAUs may contact the eASPs. Planning Status Message is not expected if a Submission Response of “REJ” or “MAN” was received.

6.8.4 Trial Response and Flight Data Response

6.8.4.1 It is recommended that the timeout for Trial Response Message and Flight Data Response Message be set at one minute from the time the eAU receives a Submission Response of “ACK”. If the Trial Response or Flight Data Response is not received one minute after receiving the Submission Response of “ACK”, eAUs are expected to contact the eASPs. Trial Response Message or Flight Data Response Message are not expected if a Submission Response of “REJ” or “MAN” was received.

6.9 Publication Service

6.9.1 The Publication Service is an optional FF-ICE/R1 service used to provide flight information to authorized stakeholders. It is an event-based service that disseminates information whenever defined criteria are met.

6.9.2 Subscribers to this service may include a wide range of stakeholders from AUs to customs and immigration authorities, who may use the service to enhance situational awareness and adjust their operations based on the updated flight information received.

6.9.3 An eASP providing a Publication Service should ensure that the service is discoverable by potential subscribers, through the AIP or a SWIM service registry, for example. The eASP shall also ensure that appropriate access control is in place so that the subscribers can retrieve only the flight information relevant to their operations.

6.9.4 Given the nature of the Publication Service, it is recommended that its implementation uses a Publish/Subscribe message exchange pattern, with a push mechanism applied to improve service efficiency.

6.9.5 Currently, no specific FF-ICE message is defined for Publication Service. However, it is recommended that FIXM be used wherever possible, to exchange flight information through this service.

6.10 Re-evaluation Process

6.10.1 Re-evaluation is an optional process that an eASP may perform to determine whether a flight plan still complies with published restrictions or ATM constraints that may have been applied or modified since its last evaluation. Re-evaluation is provided as part of the Filing Service and Planning Service when implemented by an eASP. If implemented, reference should be made to ICAO Doc 9965.

6.10.2 The re-evaluation process is triggered by predefined factors, including:

a) Event trigger: an event affecting ATM configuration such as:

   i) airspace or airport conditions;

   ii) routing availability;

   iii) ATC constraints;

   iv) demand-capacity imbalance situations;

   v) meteorological constraints; and

b) Time trigger: a predefined interval that initiates the re-evaluation process, e.g. every 30 minutes.

   Note: the specific interval is to be determined by each eASP.

6.10.3 The re-evaluation process may continue until the aircraft has off-block. This may vary depending on ATM conditions. Cut-off times for specific ATM conditions are subject to national and/or regional agreement.

6.10.4 If, following a re-evaluation, the Filing Status (or Planning Status) changes, the eASP shall provide the eAU with the updated status and an explanation of the change as specified in Section 6.3.6.4.2.

6.11 Implementation Timeline for APAC

6.11.1 A phased approach to FF-ICE/R1 implementation with the following timeline is recommended for the APAC region:

a) 2030: commencement of technical tests and trials involving eAUs and cross-border eASP interactions.

b) 2031: begin operational tests to identify and resolve any issues.

c) 2032: full operationalization of three FF-ICE/R1 services (Filing Service, Flight Data Request Service and Notification Service).

6.11.2 This recommended timeline will ensure APAC States' readiness to support the sunset of FPL2012 in 2034. Note that SWIM implementation is a prerequisite for FF-ICE/R1 deployment, as FF-ICE services are built upon SWIM infrastructure and information exchange capabilities.

6.12 Implementation Monitoring

6.12.1 This Plan is a supplementary plan to the *Asia/Pacific ANP Volume III*, supporting the transition from current flight planning to FF-ICE operations. Implementation monitoring ensures harmonized regional deployment of FF-ICE capabilities and identifies areas requiring additional support or coordination.

6.12.2 APAC States should report their FF-ICE implementation status to the ICAO APAC Regional Office annually by 28 February. Implementation status will be examined by the APAC FF-ICE/R1 Implementation Task Force and presented at the Air Traffic Management Sub-Group (ATM/SG) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to measure, report, and advance regional implementation progress, and identify implementation challenges.

6.12.3 It is expected that the relevant FF-ICE experts in each APAC State will be responsible for detailed reporting using the *Regional FF-ICE Monitoring and Reporting Form* (**Appendix D**) and coordinate with their APAC Seamless ANS Reporting point of contact to ensure the accuracy of higher-level reporting and consistency between separate reporting levels.

6.13 Plan Update Cycle and Process

6.13.1 This Plan requires periodic updates to maintain alignment with updates to:

a) ICAO Doc 9965;

b) GANP, including ASBU framework restructuring;

c) Asia/Pacific ANP Volume III; and

d) any other relevant documents and APANPIRG Conclusions/Decisions.

6.13.2 This Plan is intended to be reviewed every three years following its initial implementation. Earlier or more frequent review and amendment may be conducted as recommended by the APAC FF-ICE/R1 Implementation Task Force and as agreed-upon by APANPIRG through the ATM/SG.

6.13.3 This Plan shall be reviewed and updated by the APAC FF-ICE Regional Implementation Plan Drafting Group to be established under the APAC FF-ICE/R1 Implementation Task Force. The drafting group will consist of subject matter experts (SMEs) nominated by APAC States and International Organizations.

6.14 Post Implementation Process

6.14.1 To ensure continuous improvement of FF-ICE operations, both in operational procedures and technical capabilities, close and routine coordination among stakeholders should be conducted on an annual basis. This coordination should focus on sharing and reviewing the collective performance of FF-ICE operations, as well as implementing improvements within the region. The APAC FF-ICE/R1 Implementation Task Force will serve as a platform for these activities.

6.14.2 The following indicators are recommended for monitoring, to assess the performance of FF-ICE operations within the region.

a) submission time of the first eFPL, compared to EOBT specified in the eFPL;

b) number of “REJ” Submission Response messages, along with their explanations;

c) number of “MAN” Submission Response messages, along with their explanations;

d) number of “NOT ACCEPTABLE” Filing Status messages, along with their explanations;

e) number of negotiations before achieving “ACCEPTABLE” Filing Status, including time elapsed from the first submission of eFPL to the “ACCEPTABLE” Filing Status;

f) number of flights departing with “NOT ACCEPTABLE” Filing Status; and

g) number of Flight Data Request transactions and type of information requested.

REFERENCED DOCUMENTS

Asia/Pacific A-CDM Implementation Plan

Asia/Pacific ANP Volume III

*Asia/Pacific Common SWIM Information S*ervices.

Asia/Pacific Plan for Collaborative Aeronautical Information Management (AIM), Version 4.0

Asia/Pacific Region ATM Contingency Plan

Asia/Pacific Regional Framework for Collaborative Air Traffic Flow Management

Asia/Pacific SWIM Technical Infrastructure Profiles Version 1.0

Conclusion from APANPIRG/35/4

Conclusion from APANPIRG/36/12

Conclusion from ATM/SG/13-5

ICAO Doc 4444 — *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)*

ICAO Doc 7910 — *Location Indicators*

ICAO Doc 8585 — *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services*

ICAO Doc 9854 — *Global Air Traffic Management Operational Concept (GATMOC)*

ICAO Doc 9883 — *Global Air Navigation Plan (GANP)*

ICAO Doc 9965 — *Manual on Flight and Flow Information for a Collaborative Environment (FF-ICE), Volume I (Concept) and Volume II (Implementation Guidance)*

ICAO Doc 9971 — *Manual on Collaborative Air Traffic Flow Management (ATFM)*

ICAO Doc 10039 — *Manual on the System Wide Information Management (SWIM)*

ICAO Doc 10169 — *Aviation Common Certificate Policy (ACCP)*

ICAO Doc 10199 — *Procedures for Air Navigation Services – Information Management (PANS-IM)*

ICAO Doc 10203 —*Manual on the System-wide Information Management (SWIM) Implementation*

ICAO Doc 10204 — *Manual on Aviation Information Security*

IETF RFC 9562 — *Universally Unique IDentifiers (UUIDs)*

IETF RFC 4122 — *A Universally Unique IDentifier (UUID) URN Namespace*

1434 ABBREVIATIONS AND ACRONYMS[1]

Abbreviation/Acronym	Expansion
ACC	Area Control Centre
A-CDM	Airport Collaborative Decision Making
AFS	Aeronautical Fixed Services
AFTN	Aeronautical Fixed Telecommunication Network
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIRM	ATM Information Reference Model
AIS	Aeronautical Information Services
AIXM	Aeronautical Information Exchange Model
ANP	Air Navigation Plan
ANS	Air Navigation Services
ANSP	Air Navigation Service Providers
AOBT	Actual Off-Block Time
APAC	Asia/Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
ASBU	Aviation System Block Upgrade
ASP	ATM Service Provider
ATC	Air Traffic Control
aASP	Non-FFICE Capable ATM Service Provider
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATM/SG	Air Traffic Management Sub-Group

[1] Refer to ICAO Doc 9965 for definition of terms

Abbreviation/Acronym	**Expansion**
ATS	Air Traffic Services
AU	Airspace User
aAU	An AU that is not capable of using mandatory FF-ICE services.
CHG	ATS Change Message
CLDT	Calculated Landing Time
CNL	ATS Cancel Message
CPL	Current Flight Plan
CTO	Calculated Time Over
CTOT	Calculated Take-Off Time
DLA	ATC Delay Message
eASP	An ASP that is not capable of providing the mandatory FF-ICE services.
eAU	An AU that is capable of using mandatory FF-ICE services.
eFPL	Filed flight plan exchanged using FF-ICE services
EOBT	Estimated Off-Block Time
ESP	Emergency Service Provider
ETO	Estimated Time Over
FF-ICE	Flight and Flow Information for a Collaborative Environment
FIR	Flight Information Region
FIXM	Flight Information Exchange Model
FPL	Filed flight plan exchanged using via aeronautical fixed services (AFS)
FQDN	Fully Qualified Domain Name
GSt	Ground Stop
GUFI	Globally Unique Flight Identifier
ICAO	International Civil Aviation Organization
IETF	Internet Engineering Task Force

Abbreviation/Acronym	Expansion
IWXXM	ICAO Meteorological Information Exchange Model
MEDEVAC	Medical Evacuation
MINIT	Minutes in Trail
MIT	Miles in Trail
OSF	Open Software Foundation
PFP	Preliminary Flight Plan
PKI	Public Key Infrastructure
R1	Release 1 (for pre-departure phase)
R2	Release 2 (for post-departure phase)
RFC	Request for Comments
RIF	Re-Clearance in Flight
RPL	Repetitive Flight Plan
R/T	Route/Trajectory
RVR	Runway Visual Range
SAR	Search and Rescue
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Hazards
SME	Subject Matter Expert
STAR	Standard Terminal Arrival Route
SWIM	System-wide Information Management
TAF	Terminal Area Forecast
TBO	Trajectory-based Operations
TLS	Transport Layer Security
UTC	Coordinated Universal Time
UUID	Universally Unique IDentifier

Abbreviation/Acronym	**Expansion**
WAF	Weather Avoidance Field

APPENDIX A FIXM MAPPING TO ATS

Translation of FF-ICE FIXM to ATS Messages is available on the FIXM website at https://docs.fixm.aero/#/ats-message-to-fixm-mapping/translating-ffice-fixm-messages-to-ats-messages

APPENDIX B MAPPING OF FIXM CORE 4.3.0 DATA ATTRIBUTES TO SUPPORT CROSS-BORDER ATFM INFORMATION EXCHANGE

Data Attribute	FIXM version 4.3.0 Core
EOBT	FlightType.departure.estimatedOffBlockTime = (EOBT)
ETO	FlightType.routeTrajectoryGroup.desired.element.point4D.time = (ETO) FlightType.routeTrajectoryGroup.desired.element.elementStartPoint = (point at which ETO is specified)
ELDT	FlightType.routeTrajectoryGroup.desired.element.point4D.time = (ELDT) FlightType.routeTrajectoryGroup.desired.element.point4D.pointProperty.propertyType = WHEELS_ON FlightType.routeTrajectoryGroup.desired.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.arrival.destinationAerodrome.locationIndicator
CTOT	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CTOT) FlightType.routeTrajectoryGroup.negotiating.element.point4D.pointProperty.propertyType = WHEELS_OFF FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.departure.aerodrome.locationIndicator
CTO	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CTO) FlightType.routeTrajectoryGroup.negotiating.element.constraint.level = (Altitude, Flight Level or Range) FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint = (point at which CTO is specified)
CLDT	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CLDT)

Data Attribute	FIXM version 4.3.0 Core
	FlightType.routeTrajectoryGroup.negotiating.element.point4D.pointProperty.propertyType = WHEELS_ON FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.arrival.destinationAerodrome.locationIndicator

APPENDIX C HARMONIZED FILING STATUS RESPONSES

Table 10: Harmonized Filing Status Responses for Identified ATFM Scenarios

Scenario	Who to feedback	Filing Status Value	Planning Status Value	Explanation through FF-ICE Message (Mandatory if NOT ACCEPTABLE)	Type of Trajectory	FIXM Elements to use	Type of Constraint (Level, Speed, Time)	Constraint. Description (Optional)	Constraint. Restriction Reference (Optional)	Checking Point
a) CTO/ CLDT imposed by eASPs	Initiating eASP	NOT ACCEPTABLE	NON CONCUR	REGUL <AAAACCCCCDDMMMVV>	Negotiating	ElementStartPoint for location Constraint.Time for time Constraint.Level/ Constraint.Speed if applicable	Time (Level, Speed if applicable)	REGCAUSE <XX XX>	REGUL <AAAACCCCCDDMMMVV>	ETO / ELDT against CTO /CLDT
b) Ground Stop imposed by Arrival eASPs	Initiating eASP / Arrival eASP	NOT ACCEPTABLE	NON CONCUR	GSt imposed on flights arriving into <WSSS> from <YYYY-MM-DDTHH:mm:ssZ> to <YYYY-MM-DDTHH:mm:ssZ>. Note: If available, *See NOTAM <XXX> / ADP <XXX> for details.*	NULL	-	-	-		- ELDT against restricted period
c) Flight level Restrictions	All relevant eASP	NOT ACCEPTABLE	NON CONCUR	<FL or altitude, FL or altitude> on route <XXXX> not available.	NULL	-	-	-		Flight Level on Point against restricted flight levels

Scenario	**Who to feedback**	**Filing Status Value**	**Planning Status Value**	**Explanation through FF-ICE Message (Mandatory if NOT ACCEPTABLE)**	**Type of Trajectory**	**FIXM Elements to use**	**Type of Constraint (Level, Speed, Time)**	**Constraint. Description (Optional)**	**Constraint. Restriction Reference (Optional)**	**Checking Point**
				Note: If available, *See NOTAM <XXX> for details.*						
d) Fix Balancing	All relevant eASP	NOT ACCEPTABLE	NON CONCUR	Fix <XXXXX> not available. Note: If available, *See NOTAM <XXX> for details.*	NULL	-	-	-		Flight Trajectory against restricted points
e) Re-routing	All relevant eASP	NOT ACCEPTABLE	NON CONCUR	Route <XXXXX> not available. Note: If available, *See NOTAM <XXX> for details.*	NULL	-	-	-		Flight Trajectory against restricted routes

APPENDIX D REGIONAL FF-ICE MONITORING AND REPORTING FORM

This form is designed to monitor the implementation status of Flight and Flow Information for a Collaborative Environment (FF-ICE) services and capabilities within the region. This form should be completed by States to report their progress in implementing FF-ICE in accordance with ICAO Doc 9965 and the *Asia/Pacific Regional FF-ICE/R1 Implementation Plan*.

States should complete this form annually by 28 February to track implementation progress.

Scoring System

Each element uses a three-level scoring system:

- **0%** = Not implemented or no progress
- **50%** = Partial implementation with gaps, manual intervention required, or development in progress
- **100%** = Full implementation in compliance with regional requirements

Reporting Form Element	Reporting Metrics	Expected Outcome/Guidance to States	Response
General			
Implementation of FIXM-based information exchange	0% - State has not implemented FIXM-based information exchange 50% - State has implemented FIXM-based capability but uses older version 100% - State has implemented FIXM-based capability with latest FIXM version (v4.3.0)	State should implement FIXM-based information exchange using FIXM version 4.3.0 for all FF-ICE messages	
Implementation of national FF-ICE procedures, in accordance with ICAO Doc 4444 and ICAO Doc 9965	0% - State has not developed any national FF-ICE procedures 50% - State is in process of developing and implementing its national FF-ICE procedures 100% - State has fully established and published FF-ICE procedures based on ICAO Doc 9965 that are adhered to by stakeholders	State should establish and publish procedures covering FF-ICE operations, communication, and stakeholder responsibilities	

Reporting Form Element	Reporting Metrices	Expected Outcome/Guidance to States	Response
Filing Service			
Implementation of Filing Service	0% - No Filing Service implementation 50% - Partial implementation with gaps (e.g. incomplete message set support, incomplete validation/ evaluation capability, manual intervention required) 100% - Full automated implementation with complete message set, validation and evaluation capability in compliance with this document	Filing Service is mandatory service for eASPs Full implementation should include: a) complete message set support b) automated validation and evaluation c) published validation and evaluation criteria in AIP	
Implementation of Filing Re-evaluation Process	0% - No re-evaluation process 50% - Partial re-evaluation (e.g. limited status change handling, re-evaluation only for selected restrictions, and/or procedures not fully established) 100% - Full re-evaluation with established procedures	State should establish and publish clear procedures for the re-evaluation process and handling of status changes	
Implementation of national procedures for Filing Service mixed mode operations to support both FF-ICE and FPL2012 message handling (FPL, CHG, DLA), in accordance with ICAO Doc 4444, ICAO Doc 9965 and regional plan	0% - No mixed mode procedures 100% - Full procedures established for handling both FF-ICE and FPL2012 formats with appropriate message dissemination	State should establish and publish clear procedures so that eAUs understand what messages to submit, how to submit them, and what to expect to receive based on their technical capabilities (FF-ICE or FPL2012)	
Flight Data Request Service			

Reporting Form Element	Reporting Metrices	Expected Outcome/Guidance to States	Response
Implementation of Flight Data Request Service	0% - No implementation 50% - Partial implementation with gaps (e.g. limited request types support, manual intervention required) 100% - Full automated implementation in compliance with this document	Flight Data Request Service is mandatory service for eASPs Full implementation should include automated support for all required request types (Flight Plan, Supplementary Plan and Flight Status)	
Implementation of national procedures for Flight Data Request Service mixed-mode operations to support both FF-ICE and FPL2012 message handling (RQP, RQS), in accordance with Doc 9965, Doc 4444 and regional plan	0% - No mixed mode procedures 100% - Full procedures established for handling both FF-ICE and FPL2012 formats with appropriate message dissemination	State should establish and publish clear procedures so that eAUs/eASPs understand what messages to submit, how to submit them, and what to expect to receive based on their technical capabilities (FF-ICE or FPL2012)	
Notification Service			
Implementation of Notification Service	0% - No implementation 50% - Partial implementation with gaps (e.g. limited event types, manual intervention required) 100% - Full automated implementation in compliance with this document	Notification Service is mandatory service for APAC. Full implementation should include automated support for departure and arrival notifications	
Implementation of local procedures for Notification Service mixed mode operations to support both FF-ICE and FPL2012 message handling (DEP, ARR), in accordance with ICAO Doc 4444, ICAO Doc 9965 and regional plan	0% - No mixed mode procedures 100% - Full procedures established for handling both FF-ICE and FPL2012 formats with appropriate message dissemination	State should establish and publish clear procedures so that parties understand the notifications they should expect to receive based on their technical capabilities (FF-ICE or FPL2012)	

Reporting Form Element	Reporting Metrices	Expected Outcome/Guidance to States	Response
Planning Service			
Implementation of Planning Service	0% - No Planning Service implementation 50% - Partial implementation with gaps (e.g. incomplete message set support, incomplete validation/evaluation capability, manual intervention required) 100% - Full automated implementation in compliance with this document	Planning Service is recommended for ASPs whose airspace is complex and/or regularly constrained Full implementation should include: a) complete message set support b) automated validation and evaluation c) published validation and evaluation criteria in AIP	
Implementation of Planning Re-evaluation Process	0% - No re-evaluation process 50% - Partial re-evaluation (limited status change handling, re-evaluation only for selected restrictions, and/or procedures not fully established) 100% - Full re-evaluation with established procedures	State should establish and publish clear procedures for the re-evaluation process and handling of status changes	
Trial Service			
Implementation of Trial Service	0% - No Trial Service implementation 100% - Full automated implementation in compliance with this document *Note: Partial implementation of trial service is not expected as manual intervention is not practical for potentially large number of "fire and forget" messages.*	Optional service allowing "what-if" evaluation of flight plan alternatives Full implementation should include automated processing of Trial Requests and responses.	

Reporting Form Element	Reporting Metrices	Expected Outcome/Guidance to States	Response
Publication Service			
Implementation of Publication Service	0% - No implementation 100% - Subscription options published and available through SWIM with clear procedures for information subscription	Optional service for disseminating flight information. State should publish available subscription options and clear procedures for stakeholders to subscribe through SWIM	

APPENDIX 3

APAC SWIM Hierarchical Architecture Test Plan

1. Test Objectives

This test for the CRV network environment verifies the connectivity between APAC SWIM EMS nodes (EEMS/GEMS) and adjacent nodes, along with the compliance, reliability and routing correctness of their message transmission. It is required to ensure successful full-process message delivery under the two core message interaction modes: asynchronous request-response and publish-subscribe. All test results shall comply with the APAC SWIM TI specifications, AMQP 1.0 protocol and relevant message format requirements.

2. Test Premises and Environment Preparation

The CRV network is activated; IP connectivity is available between adjacent EMS nodes involved in the test, meeting the cross-border connectivity configuration requirements.

All EMS nodes (EEMS/GEMS) are deployed; the AMQP 1.0 broker is running normally; the username, password and URI configurations comply with specifications; and the user's read/write access permissions for AMQP addresses are correctly configured.

EMS node information has been entered into the routing table, supporting static/dynamic routing; the binding relationship configuration between EEMSs and their corresponding superior GEMS is completed.

Test data is prepared, covering data formats such as FIXM, AIXM, IWXXM and ASTERIX that conform to the APAC_CATEGORY enumeration.

3. Multi-level Test Design

Level 1: Basic Network Connectivity Test for Adjacent EMS Nodes (Verify "Network Link Reachability Between Adjacent Nodes")

Test Content

Only verify the IP connectivity and port reachability of adjacent EMS nodes in the CRV network, and ensure no network-layer blockage between adjacent nodes (tests for non-adjacent nodes across regions are not involved).

Test Steps

1. Confirm adjacent node combinations: all EEMS bound superior GEMS connections and GEMS-to-GEMS connections (classified based on the actual deployed adjacent relationships).
2. For each group of adjacent nodes, execute the ping command from the initiating node and ping continuously for 100 times (e.g., EEMS → superior GEMS, GEMS → adjacent GEMS).
3. On the EEMS nodes, execute the telnet command to test the AMQP port of the connected GEMS and verify the establishment of TCP connections; similarly, on the GEMS nodes, test the AMQP port of adjacent EEMS/GEMS.
4. Use the route-trace tool to track the link of each group of adjacent nodes, confirm no routing interruption, and ensure the smoothness of the direct link between adjacent nodes.

Expected Results

The ping test success rate of all adjacent nodes is 100%, with average latency ≤ 50 ms and no packet loss.

Telnet connection to the AMQP port between adjacent nodes is successful, returning an AMQP protocol handshake response.

Adjacent nodes are directly connected, with no loops or interrupted nodes.

Test Focus

Focus on the effectiveness of network paths between adjacent nodes, laying a foundation for subsequent EMS layer connections and message transmission.

Level 2: Direct connectivity test between EMS (Verify "EMS layer reachability")

Test Content

Verify the effectiveness of AMQP connections between adjacent EEMS and GEMS, as well as between GEMS and GEMS, to ensure normal communication at the EMS layer.

Test Steps

1. Configure the superior GEMS for a specific EEMS and enter the AMQP URI (IP: Port) of the corresponding GEMS.
2. Initiate an AMQP connection request from this EEMS to connect to the superior GEMS and record the connection status.
3. Repeat Steps 1-2 to complete the following connection tests: connections between all EEMS and their corresponding superior GEMS, as well as between adjacent GEMS.
4. After the connection is established, maintain it for 30 minutes and monitor connection stability (no disconnection or reconnection).

Expected Results

The success rate of AMQP connection establishment between all adjacent EMS nodes is 100%, with no abnormal disconnection during the connection maintenance period.

There are no errors such as authentication failure or protocol incompatibility in the AMQP connection logs.

Test Focus

Verify the configuration effectiveness of the binding relationship between EEMS and their superior GEMS, as well as the direct connectivity between GEMS.

Level 3: Single Transmission Mode Message Sending Test (Verify "Basic Message Transmission")

Test Content

Verify the message sending compliance and success rate between adjacent nodes under the two transmission modes (Point to Point and Broadcast) respectively.

(1) Point to Point Mode Test

Test Steps

This test case addresses scenarios that require an explicit recipient ID, such as the submission of a filed flight plan.

1. SWIM message sender delivers SWIM message with an explicit recipient ID in the message metadata to connected EEMS;
2. EEMS delivers SWIM message with the destination EEMS to connected GEMS;
3. GEMS routes messages to the appropriate next-hop GEMS node;
4. The next-hop GEMS routes SWIM message to the destination EEMS;
5. The destination EEMS routes the message to the SWIM message receiver according to the recipient ID contained in the message metadata.

Expected Results

The message sending success rate reaches 99.9%.

Message format verification passed: addresses comply with lowercase requirements, message metadata are complete, and application attributes conform to APAC enumeration specifications.

(2) Broadcast Mode (Pub/Sub) Test

Test Steps

This test case address recipient-free scenarios such as meteorological information publication.

1. SWIM message sender publishes SWIM message with the recipient-free in the metadata;
2. EEMS publishes SWIM message to connected GEMS;
3. The GEMS publishes SWIM messages, and adjacent GEMSs subscribe to the Topic address to receive the messages;
4. The EEMS subscribes to the Topic address of the superior GEMS to receive SWIM messages and replicate messages to EEMS's own topic;
5. SWIM message receivers subscribe to the Topic address of the EEMS and consume SWIM messages.

Expected Results

The message reception success rate of all subscribers reaches 99.9%; the message content received by each node is consistent without loss or tampering.

Message format verification passed: addresses comply with lowercase requirements, message metadata are complete, and application attributes conform to APAC enumeration specifications.

Level 4: Mixed Multi-transmission Mode Test (Verify "Mode Compatibility")

Test Content

Run Point to Point and Broadcast (Pub/Sub) mode messages simultaneously to verify that there are no conflicts between the two modes and no confusion in message routing.

Test Steps

1. Execute all test steps of the Point to Point mode test specified in Level 3.
2. Execute all test steps of the Broadcast (Pub/Sub) mode test specified in Level 3 simultaneously.
3. Monitor the message sending, receiving, routing and system logs of both transmission modes in real time.

Expected Results

The message sending success rate is $\geq$ 99.9% in concurrent scenarios, with no message loss or misdelivery.

There are no conflicts between the address formats and routing logic of the two modes' messages, and no routing exception alarms in logs.

Level 5: Multi-node Collaborative Message Routing Test (Verify "Cross-node Routing")

Test Content

Simulate the real hierarchical architecture to verify multi-GEMS hop routing and end-to-end message transmission of EEMS - GEMS - GEMS - GEMS - EEMS (across non-adjacent nodes).

Test Steps

1. Ensure that messages traverse multiple GEMS nodes between the sender and the recipient.
2. Perform Level 4 testing.

Expected Results

The message sending success rate is ⩾ 99.9% in concurrent scenarios, with no message loss or misdelivery.

There are no conflicts between the address formats and routing logic of the two modes' messages, and no routing exception alarms in logs.

Level 6: Exception Scenario Fault Tolerance Test (Verify "Stability and Fault Tolerance")

Test Content

Simulate scenarios such as network interruption, node failure and message abnormality to verify the fault tolerance capability of EMS message transmission.

Test Cases

Exception Scenario	Test Steps	Expected Results
Adjacent node network temporary interruption (10s)	During multi-node routing test, interrupt the CRV connection between transit GEMS and target GEMS (adjacent relationship) for 10 seconds and then restore it.	After network recovery, messages are automatically re-transmitted without loss (success rate: 100%)
Message Timeout	When sending Point to Point messages, set TTL = 1000ms and deliberately block the receiver port	Timed out messages are automatically discarded without duplicate delivery; timeout alarms are recorded in logs
Duplicate Messages	Manually send 2 messages with the same MESSAGE_ID	The receiver performs deduplication and retains only 1 valid message
Non-Compliant Message Format	Send broadcast messages missing the APAC_CATEGORY field	The receiver rejects the messages, returns a format error response, and clearly marks the missing field in logs

Level 7: Topology Structure and Message Routing Adjustment Test (Verify "Adaptability to Topology/Routing Changes")

Test Content

In the CRV network environment, verify the normalcy of adjacent node connectivity, message transmission reliability and routing correctness after EMS node topology adjustments (node addition/decommissioning, adjacent node relationship modification) and message routing strategy adjustments (static routing update, dynamic routing switch, backup routing change). Ensure no connectivity interruption, message loss or routing disorder occur after topology and routing changes, so as to support the system's adaptability to topology iteration requirements in actual deployment.

Test Steps

1. EMS node topology adjustment: Add, decommission EMS nodes and modify adjacent node relation, and verify adjacent node connectivity.
2. Routing info update: modify routing dynamically or statically.

Expected Results

Node adjacent connectivity is normal and routing is correct. No interruption, message loss or routing disorder occurs.

4. Test Entry and Exit Criteria

(1) Test Entry Criteria

The CRV network has completed adjacent node deployment with correct node IP/port configurations, meeting bandwidth and latency requirements.

The AMQP broker of EMS nodes starts normally; routing tables and binding relationships between EEMS and GEMS have been configured completely.

Test data (message templates, node association information) is ready and complies with APAC SWIM specifications.

(2) Test Exit Criteria

The pass rate of all Levels' test cases is ≥ 99.9%, with no critical defects (e.g., connectivity failure, message loss, routing errors).

The compliance verification rate of message format reaches 100% (no violations in addresses, message headers, and application attributes).

The routing latency of cross-region multi-node meets expectations, with no performance bottlenecks in concurrent message processing.

In exception scenarios, EMS nodes have fault tolerance capability without system avalanche, data tampering or similar issues.

ATFM Ops Scenarios for APAC Common SWIM Information Services

1. Background

1.1. As the aviation community moves away from legacy point-to-point teletype messaging, System-Wide Information Management (SWIM) serves as the primary enabler for the digital exchange of aeronautical, flight, and meteorological information.

1.2. The exchange of tactical ATFM requirements, specifically **Calculated Take-Off Time (CTOT)**, and **Calculated Time Over (CTO)**, and one of the key A-CDM data elements supporting demand prediction, the **Target Take-Off Time (TTOT)**, is currently managed through a mix of legacy message formats and systems and emerging digital services. To ensure global interoperability and seamless transition to FF-ICE operating environment, these exchanges must be mapped to clear operational use cases within ICAO guidance materials and regionally operating procedures.

1.3. The exchange of CTO, CTOT, and TTOT is critical for the following operational reasons:

1.4. <u>Enabling Flexible Trajectory-Based Demand-Capacity Balancing (CTO)</u>: The exchange of CTO allows an ANSP to balance demand and capacity within their area of responsibility by metering traffic through a specific waypoint in their airspace or at the boundary of their Flight Information Region (FIR) rather than imposing ATFM control mechanism at the departure airport which may be outside their FIRs. This approach aligns with the spirit of FF-ICE, in which FF-ICE capable ATM service provider (eASP) provides ATM restriction/constraint impacting trajectory within their area to the FF-ICE capable airspace user (eAU), and the eAU is responsible for managing their trajectory to comply with the requirements. This approach provides greater flexibility for the AUs to determine how best to meet the DCB requirement while still honouring their business objectives.

1.5. <u>Balancing Demand and Capacity through an ATFM Measure Imposed at Departure Aerodrome (CTOT)</u>: While the move toward CTO is foreseeable in the future FF-ICE environment, there will be cases where a conventional Ground Delay Program (GDP) with the assignment of CTOT will still be used, e.g., in the case of domestic ATFM operations or in specific areas of cross-border ATFM operations with special arrangements among the ANSPs involved. In a GDP, CTOT is the primary constraint time issued to regulate departures of flights destined for congested or constrained airspace or arrival aerodrome. The sharing of CTOT with ANSP managing the

departure aerodrome ensures that the departure aerodrome holds the aircraft on the ground to smooth out traffic peaks before they enter the airborne network or going to the arrival aerodrome.

1.6. Enhancing Predictability via Airport Collaboration (TTOT): TTOT is derived from Airport-Collaborative Decision Making (A-CDM) processes and provides a more accurate picture of when an aircraft is expected to be ready for departure compared to the filed flight plan. Integrating A-CDM derived times such as TTOT into ATFM assists in enhancing ATFM's demand prediction, resulting in a more accurate, dynamic, and effective demand-capacity balancing initiatives..

1.7. The transition from legacy messages (such as Slot Allocation Messages - SAM) transmitted via AFTN/AMHS to modern Flight Information Exchange Model (FIXM) messages is driven by the need for global interoperability, data richness, and the implementation of SWIM.

1.8. There is a need to shift from existing SAM and related messages to ATFM FIXM messages due to the following reasons below:

1.8.1. Limitations of legacy AFTN/AMHS formats: Legacy teletype-based formats are rigid and often lack the flexibility to carry complex trajectory data required for modern ATFM.

1.8.2. Support for FF-ICE and global standardization (which FIXM will be used for exchanging flight-related information): Shifting ATFM and A-CDM information exchange to FIXM-based message formats ensures that APAC ATFM and A-CDM operations are aligned with global ICAO standards and are ready to support the operations in FF-ICE environment, as well as facilitating "global interoperability.

1.8.3. Handling of region-specific requirements via extensions: Shifting to FIXM allows the region to define specific data elements (such as those found in the APAC Regional FIXM Extension) in a structured, machine-readable format (XML/GML) that legacy teletype-based messages cannot easily support.

2. Operational Scenarios

2.1. The three parameters cited represent different phases within a flight trajectory:

2.1.1. TTOT (Target Take-Off Time): Generated by A-CDM system, representing the expected time a flight is expected to depart from the departure aerodrome considering factors including the airspace user's TOBT (Target Off-Block Time) and departure sequencing requirements.

2.1.2. CTOT (Calculated Take-Off Time): Generated by the ATFM system to manage traffic into constrained or congested airspace or arrival aerodrome by controlling the departure (take-off) time of the flight from the departure aerodrome.

2.1.3. CTO (Calculated Time Over): Generated by the ATFM system to manage traffic into constrained or congested airspace by controlling the time the flight is expected to cross a specific waypoint in an airspace.

2.2. Operational Use Cases for ATFM FIXM messages to be exchanged using Flight-Specific ATFM Measure Service and ATFM/A-CDM Integration Service (ref. Business Functionality of APAC Common SWIM Information Services, version 1.0) are elaborated below:

2.2.1. Cross-Border A-CDM data exchange: Using SWIM to provide timely cross-border TTOT updates from A-CDM airports to airport operators or ANSP. This enables more accurate demand prediction, allowing for more optimised CTOT/CTO allocation and more appropriate delay assignment, reducing unnecessary buffering and ground delay.

2.2.2. Cross-Border Metering between Adjacent ANSPs: Sharing a CTO, especially between two adjacent Air Navigation Service Providers (ANSPs) enables traffic metering through early speed adjustments in the cruise phase, rather than ad-hoc holding by the downstream ANSP which are more costly, less environmentally friendly, and introduces additional workload on ATCOs.

2.2.3. Expanding the scope of ATFM measure: Conventional ATFM measure such as a GDP targets management of pre-departure flights. With the inclusion of CTO issuance, the scope of ATFM measure could be expanded to include airborne flights. AUs could contribute to overall traffic management through trajectory adjustments during cruise phase to meet with the required CTO. This could reduce ground delays as ATFM delays are spread across a wider flight profile range.

2.2.4. Dynamic Collaborative-Decision Making Process: Enabling ANSPs and AUs to view ATFM information in real-time and perform timely negotiations as information are exchanged.

3. ATFM FIXM Messages Identified

3.1. In order to achieve the above ops scenarios, five different messages were identified, namely (1) FIXM TTOT Allocation, (2) FIXM CTOT Allocation, (3) FIXM CTOT Cancellation, (4) FIXM CTO Allocation and (5) FIXM CTO Cancellation.

3.2. The FIXM TTOT, CTOT and CTO Allocation messages allow the system to exchange TTOT, CTOT or CTO values (respectively) when made available as well as providing the revision to them. Note that the revision to TTOT, CTOT, and CTO can be distributed using the "Allocation" messages by replacing the existing time values. Recipient systems should be able to differentiate between an initial allocation and a revision.

3.3. The FIXM CTOT and CTO Cancellation messages allow the system to remove the CTOT or CTO values usually sent after an ATFM program is cancelled.

S/N	Message	Details	Timeout	Comments	Message Exchange Pattern
1	FIXM TTOT Allocation	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	
2	FIXM CTOT Allocation	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	
3	FIXM CTOT Cancellation	Mandatory (after ATFM program is canceled)	N/A	After GDP is canceled, or the assigned CTOT no longer applies to the flight, this message has to be published.	
4	FIXM CTO Allocation	Mandatory (after ATFM program ran)	N/A	After the ATFM measure is run or revised, dependent on individual configuration condition	

				set on when to be sent out, this message has to be published.	
5	FIXM CTO Cancellation	Mandatory (after ATFM program is canceled)	N/A	After the ATFM measure is canceled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4. Mapping of ATFM FIXM Messages to APAC Common SWIM Information Service

4.1. Business functionality of the information service: **Flight-Specific ATFM Measure Service**

4.1.1. Scenario: Dissemination of CTOT Allocation by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.1.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTOT Allocation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Allocation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.2. Scenario: Dissemination of CTOT Cancellation by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.2.1. Business Completion Criteria:_Initiating ATFMU disseminates FIXM CTOT Cancellation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Cancellation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program is cancelled)	N/A	After GDP is cancelled, or the assigned CTOT no longer applies to the flight, this message has to be published.	

4.1.3. Scenario: **Dissemination of CTO Allocation** by Initiating ATFMU to Facilitating ATFMU and AU

4.1.3.1. Business Completion Criteria:_Initiating ATFMU disseminates FIXM CTO Allocation Message to Facilitating ATFMU and AU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Allocation to Facilitating ATFMU and AU	Mandatory (after ATFM measure ran)	N/A	After ATFM measure is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.4. Scenario: Dissemination of CTO Cancellation by Initiating ATFMU to Facilitating ATFMU and Facilitating ATFMU and AU

4.1.4.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTO Cancellation Message to Facilitating ATFMU and AU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Cancellation to Facilitating ATFMU and AU	Mandatory (after ATFM measure cancelled)	N/A	After ATFM measure is cancelled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4.2. Business functionality of the information service: **ATFM/A-CDM Integration Service**

4.2.1. Scenario: Dissemination of TTOT Allocation by departure eASP/ATFMU

4.2.1.1. Business Completion Criteria: Departure eASP/ATFMU disseminates FIXM TTOT Allocation to relevant eASPs/ATFMU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Departure eASP/ATFMU sends FIXM TTOT Allocation to relevant eASPs/ATFMUs	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	

Appendix A1

ATFM Messaged Data Attributes

Data Field	Core/Ext	FIXM CTOT Allocation	FIXM CTOT Cancellation	FIXM CTO Allocation	FIXM CTO Cancellation	FIXM TTOT Allocation
GUFI	Core	Optional (FIXM/ eFPL)	Optional (FIXM/ eFPL)	Optional (FIXM/ eFPL)	Optional (FIXM/ eFPL)	Optional (FIXM/ eFPL)
ACID	Core	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ADEP	Core	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
ADES	Core	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
EOBD	Core	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
EOBT	Core	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
CTOT	Core	Mandatory				
CTO	Core			Mandatory		
Flight Level	Core			Optional		
TaxiTime	Ext	Mandatory		Optional		
REGCAUSE	Ext	Mandatory		Mandatory		
REGUL	Ext	Optional		Optional		
REASON	Ext	Optional		Optional		
COMMENT	Ext	Optional		Optional		
TIBT	Ext					Optional
TOBT	Ext					Optional
TSAT	Ext					Optional
TTOT	Ext					Mandatory

Appendix B1

ATFM Messaged Data Attributes Mapping based on FIXM version 4.3

Data Attributes	
CTOT	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CTOT) FlightType.routeTrajectoryGroup.negotiating.element.point4D.pointProperty.propertyType = WHEELS_OFF FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.departure.aerodrome.locationIndicator
CTO	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CTO) FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint = (point at which CTO is specified)
Flight Level (FL)	FlightType.routeTrajectoryGroup.negotiating.element.constraint.level.level.flightLevel = (FL at the constraint point)
TaxiTime	FlightType.departure.extension.taxiTime = (TaxiTime)
REGCAUSE	
- ATFM Measure Code	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationCause.atfmMeasureCode = (ATFM Measure Code)
- ATFM Measure Location	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationCause.atfmMeasureLocation = (ATFM Measure Location)
- IATA Delay Code	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationCause.iataDelayCode = (IATA Delay Code)
REGUL	4 char = constraint area; 5 char = constraint location; 5 char = DDMMM; 2 char = version number
- Effective Date	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationId.effectiveDate = (Effective Date)
- Version	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationId.version = (Version)
- Constraint Area	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationId.constraintArea = (Constraint Area)
- Constraint Location	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.regulationId.constraintLocation = (Constraint Location)
REASON	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.reason = (REASON)
COMMENT	FlightType.routeTrajectoryGroup.negotiating.element.constraint.extension.comment = (COMMENT)
TTOT	FlightType.departure.extension.targetTakeOffTime = (TTOT)

Data Attributes	
EOBT	FlightType.departure.estimatedOffBlockTime = (EOBT)
ETO	FlightType.routeTrajectoryGroup.desired.element.point4D.time = (ETO) FlightType.routeTrajectoryGroup.desired.element.elementStartPoint = (point at which ETO is specified)
ELDT	FlightType.routeTrajectoryGroup.desired.element.point4D.time = (ELDT) FlightType.routeTrajectoryGroup.desired.element.point4D.pointProperty.propertyType = WHEELS_ON

	FlightType.routeTrajectoryGroup.desired.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.arrival.destinationAerodrome.locationIndicator
EIBT	FlightType.routeTrajectoryGroup.desired.element.point4D.time = (EIBT) FlightType.routeTrajectoryGroup.desired.element.point4D.pointProperty.propertyType = IN_BLOCKS FlightType.routeTrajectoryGroup.desired.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.arrival.destinationAerodrome.locationIndicator
CLDT	FlightType.routeTrajectoryGroup.negotiating.element.constraint.time.timeSpecification.timeValue = (CLDT) FlightType.routeTrajectoryGroup.negotiating.element.point4D.pointProperty.propertyType = WHEELS_ON FlightType.routeTrajectoryGroup.negotiating.element.elementStartPoint.aerodromReferencePoint.locationIndicator = FlightType.arrival.destinationAerodrome.locationIndicator

Appendix C1

ATFM Messages Templates based on FIXM version 4.3

Filename: /ApacAtfmAcdmMessage.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3"
elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>Define the metadata of information to be used for exchange ATFM and A-CDM in APAC region</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../../core/flight/Flight.xsd"/>
	<xs:element name="ApacAtfmAcdmMessage" type="apacatfmacdm:ApacAtfmAcdmMessageType">
		<xs:annotation>
			<xs:documentation>This ApacAtfmAcdmMessage element is the entry point to the APAC ATFM A-CDM
application.</xs:documentation>
		</xs:annotation>
	</xs:element>
	<xs:simpleType name="ApacAtfmAcdmMessageTypeType">
		<xs:annotation>
			<xs:documentation>The list of available APAC ATFM A-CDM message type.</xs:documentation>
		</xs:annotation>
		<xs:restriction base="xs:string">
			<xs:enumeration value="FIXM_CTO_ALLOCATION"/>
			<xs:enumeration value="FIXM_CTO_CANCELLATION"/>
			<xs:enumeration value="FIXM_CTOT_ALLOCATION"/>
			<xs:enumeration value="FIXM_CTOT_CANCELLATION"/>
			<xs:enumeration value="FIXM_TTOT_ALLOCATION"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmMessageType">
		<xs:annotation>
			<xs:documentation>The message for delivering ATFM A-CDM information.</xs:documentation>
		</xs:annotation>
```

```
		<xs:sequence>
			<xs:element name="type" type="apacatfmacdm:ApacAtfmAcdmMessageTypeType" minOccurs="0" maxOccurs="1"/>
			<xs:element name="flight" type="fx:FlightType" minOccurs="0" maxOccurs="1"/>
		</xs:sequence>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/ApacAtfmAcdmApacExtension.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/ext/apac/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>Helper schema intended to gather all APAC ATFM A-CDM template schemas for the APAC Extension package
namespace into a single import.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./calculatedTakeOffTimeAllocation/apacextension/ApacAtfmAcdmCtotAllocation_ApacExtension.xsd"/>
	<xs:include schemaLocation="./calculatedTimeOverAllocation/apacextension/ApacAtfmAcdmCtoAllocation_ApacExtension.xsd"/>
	<xs:include schemaLocation="./targetTakeOffTimeAllocation/apacextension/ApacAtfmAcdmTtotAllocation_ApacExtension.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/ApacAtfmAcdmBase.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/base/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>Helper schema intended to gather all APAC ATFM A-CDM template schemas for the Base package namespace into a
single import.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./calculatedTakeOffTimeAllocation/base/ApacAtfmAcdmCtotAllocation_Base.xsd"/>
	<xs:include schemaLocation="./calculatedTimeOverAllocation/base/ApacAtfmAcdmCtoAllocation_Base.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/ApacAtfmAcdmFlight.xsd

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>Helper schema intended to gather all APAC ATFM A-CDM template schemas for the Flight package namespace into a
single import.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./calculatedTakeOffTimeAllocation/flight/ApacAtfmAcdmCtotAllocation_Flight.xsd"/>
	<xs:include schemaLocation="./calculatedTakeOffTimeCancellation/flight/ApacAtfmAcdmCtotCancellation_Flight.xsd"/>
	<xs:include schemaLocation="./calculatedTimeOverAllocation/flight/ApacAtfmAcdmCtoAllocation_Flight.xsd"/>
	<xs:include schemaLocation="./calculatedTimeOverCancellation/flight/ApacAtfmAcdmCtoCancellation_Flight.xsd"/>
	<xs:include schemaLocation="./targetTakeOffTimeAllocation/flight/ApacAtfmAcdmTtotAllocation_Flight.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/ApacAtfmAcdmMessageTemplates.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:apac="http://www.fixm.aero/ext/apac/4.3"
xmlns:fb="http://www.fixm.aero/base/4.3" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>APAC ATFM A-CDM Message Templates</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="./ApacAtfmAcdmBase.xsd"/>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./ApacAtfmAcdmFlight.xsd"/>
	<xs:import namespace="http://www.fixm.aero/ext/apac/4.3" schemaLocation="./ApacAtfmAcdmApacExtension.xsd"/>
	<xs:include
schemaLocation="./calculatedTakeOffTimeAllocation/apacatfmacdmmessage/ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessage.xsd"/>
	<xs:include
schemaLocation="./calculatedTakeOffTimeCancellation/apacatfmacdmmessage/ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessage.xsd"/>
	<xs:include
schemaLocation="./calculatedTimeOverAllocation/apacatfmacdmmessage/ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessage.xsd"/>
	<xs:include
schemaLocation="./calculatedTimeOverCancellation/apacatfmacdmmessage/ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessage.xsd"/>
	<xs:include
schemaLocation="./targetTakeOffTimeAllocation/apacatfmacdmmessage/ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```

**Filename:
/apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/apacatfmacdmmessage/ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessag
e.xsd**


```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified"
version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message template for the ApacAtfmAcdmMessage
package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../flight/ApacAtfmAcdmCtotAllocation_Flight.xsd"/>
	<xs:include schemaLocation="../../../ApacAtfmAcdmMessage.xsd"/>
	<xs:simpleType name="ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessageTypeType">
		<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageTypeType">
			<xs:enumeration value="FIXM_CTOT_ALLOCATION"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessageType">
		<xs:complexContent>
			<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageType">
				<xs:sequence>
					<xs:element name="type"
type="apacatfmacdm:ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessageTypeType" minOccurs="1" maxOccurs="1"/>
					<xs:element name="flight" type="fx:ApacAtfmAcdmCtotAllocation_FlightType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/apacextension/ApacAtfmAcdmCtotAllocation_ApacExtension.xsd


```xml
<?xml version="1.0" encoding="utf-8"?>
```

```
<xs:schema targetNamespace="http://www.fixm.aero/ext/apac/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message for the ApacExtension package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../extensions/apac/Apac.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtotAllocation_ApacDepartureType">
		<xs:complexContent>
			<xs:restriction base="apac:ApacDepartureType">
				<xs:sequence>
					<xs:element name="taxiTime" type="fb:DurationType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtotAllocation_ApacRouteTrajectoryConstraintType">
		<xs:complexContent>
			<xs:restriction base="apac:ApacRouteTrajectoryConstraintType">
				<xs:sequence>
					<xs:element name="comment" type="fb:CharacterStringType" minOccurs="0" maxOccurs="1"/>
					<xs:element name="reason" type="fb:CharacterStringType" minOccurs="0" maxOccurs="1"/>
					<xs:element name="regulationCause" type="apac:ApacRegulationCauseType" minOccurs="1" maxOccurs="1"/>
					<xs:element name="regulationId" type="apac:ApacRegulationIdType" minOccurs="0" maxOccurs="2000"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/base/ApacAtfmAcdmCtotAllocation_Base.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/base/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
```

```xml
		<xs:documentation>A Calculated Take-Off Time Allocation message template for the Base package.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="./ApacAtfmAcdmCtotAllocation_RangesAndChoices.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/base/ApacAtfmAcdmCtotAllocation_RangesAndChoices.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/base/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>This package contains combinations and choices comprised of various measure elements.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="../../../../../core/base/Types.xsd"/>
	<xs:include schemaLocation="../../../../../core/base/RangesAndChoices.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtotAllocation_TimeChoiceType">
		<xs:complexContent>
			<xs:restriction base="fb:TimeChoiceType">
				<xs:choice>
					<xs:element name="value" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A specific time value.</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:choice>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/CalculatedTakeOffTimeAllocation.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" elementFormDefault="qualified" version="1.0.0">
```

```
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="./base/ApacAtfmAcdmCtotAllocation_Base.xsd"/>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./flight/ApacAtfmAcdmCtotAllocation_Flight.xsd"/>
	<xs:import namespace="http://www.fixm.aero/ext/apac/4.3"
schemaLocation="./apacextension/ApacAtfmAcdmCtotAllocation_ApacExtension.xsd"/>
	<xs:include schemaLocation="./apacatfmacdmmessage/ApacAtfmAcdmCtotAllocation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/ApacAtfmAcdmCtotAllocation_Flight.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message for the Flight package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="./flightdata/ApacAtfmAcdmCtotAllocation_FlightData.xsd"/>
	<xs:include schemaLocation="./departure/ApacAtfmAcdmCtotAllocation_Departure.xsd"/>
	<xs:include schemaLocation="./arrival/ApacAtfmAcdmCtotAllocation_Arrival.xsd"/>
	<xs:include schemaLocation="./flightroutetrajectory/ApacAtfmAcdmCtotAllocation_FlightRouteTrajectory.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/arrival/ApacAtfmAcdmCtotAllocation_Arrival.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message Arrival template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/arrival/Arrival.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtotAllocation_ArrivalType">
		<xs:complexContent>
```

```
                <xs:restriction base="fx:ArrivalType">
                    <xs:sequence>
                        <xs:element name="destinationAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
                            <xs:annotation>
                                <xs:documentation>The aerodrome of intended landing. [ICAO Doc 4444 - extracted from the
definition of Destination Alternate]
This is the aerodrome at which the flight is scheduled to arrive. [FIXM]</xs:documentation>
                            </xs:annotation>
                        </xs:element>
                    </xs:sequence>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/departure/ApacAtfmAcdmCtotAllocation_Departure.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
    <xs:annotation>
        <xs:documentation>A Calculated Take-Off Time Allocation message Departure template.</xs:documentation>
    </xs:annotation>
    <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
    <xs:include schemaLocation="../../../../../../core/flight/departure/Departure.xsd"/>
    <xs:complexType name="ApacAtfmAcdmCtotAllocation_DepartureType">
        <xs:complexContent>
            <xs:restriction base="fx:DepartureType">
                <xs:sequence>
                    <xs:choice minOccurs="1" maxOccurs="1">
                        <xs:element name="departureAerodrome" type="fb:AerodromeReferenceType" minOccurs="1"
maxOccurs="1">
                            <xs:annotation>
                                <xs:documentation>The aerodrome from which the flight departs.
[FIXM]</xs:documentation>
                            </xs:annotation>
```

```
							</xs:element>
						</xs:choice>
						<xs:choice minOccurs="1" maxOccurs="1">
							<xs:element name="estimatedOffBlockTime" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1">
								<xs:annotation>
									<xs:documentation>The estimated time at which the aircraft will commence movement associated with departure. [ICAO Doc 4444]</xs:documentation>
								</xs:annotation>
							</xs:element>
						</xs:choice>
						<xs:element name="extension" type="fb:DepartureExtensionType" minOccurs="1" maxOccurs="1">
							<xs:annotation>
								<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
							</xs:annotation>
						</xs:element>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/flightdata/ApacAtfmAcdmCtotAllocation_FlightData.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message FlightData template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../flightroutetrajectory/ApacAtfmAcdmCtotAllocation_RouteTrajectory.xsd"/>
	<xs:include schemaLocation="../arrival/ApacAtfmAcdmCtotAllocation_Arrival.xsd"/>
	<xs:include schemaLocation="../departure/ApacAtfmAcdmCtotAllocation_Departure.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightdata/FlightData.xsd"/>
```

```xml
<xs:complexType name="ApacAtfmAcdmCtotAllocation_FlightType">
	<xs:complexContent>
		<xs:restriction base="fx:FlightType">
			<xs:sequence>
				<xs:element name="arrival" type="fx:ApacAtfmAcdmCtotAllocation_ArrivalType" minOccurs="1" maxOccurs="1"/>
				<xs:element name="departure" type="fx:ApacAtfmAcdmCtotAllocation_DepartureType" minOccurs="1" maxOccurs="1"/>
				<xs:element name="flightIdentification" type="fx:ApacAtfmAcdmCtotAllocation_FlightIdentificationType" minOccurs="1" maxOccurs="1"/>
				<xs:element name="routeTrajectoryGroup" type="fx:ApacAtfmAcdmCtotAllocation_RouteTrajectoryGroupContainerType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotAllocation_FlightIdentificationType">
	<xs:complexContent>
		<xs:restriction base="fx:FlightIdentificationType">
			<xs:sequence>
				<xs:element name="aircraftIdentification" type="fb:AircraftIdentificationType" minOccurs="1" maxOccurs="1">
					<xs:annotation>
						<xs:documentation>A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications. [ICAO Doc 4444]</xs:documentation>
					</xs:annotation>
				</xs:element>
				<xs:choice minOccurs="0" maxOccurs="1">
					<xs:element name="gufi" type="fb:GloballyUniqueFlightIdentifierType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A single reference for FF-ICE information pertinent to a flight that is unique globally. [ICAO Doc 9965]
This is a reference that uniquely identifies a specific flight and is independent of any particular system. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
```

</xs:choice>
</xs:sequence>
</xs:restriction>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotAllocation_RouteTrajectoryGroupContainerType">
<xs:complexContent>
<xs:restriction base="fx:RouteTrajectoryGroupContainerType">
<xs:sequence>
<xs:element name="negotiating" type="fx:ApacAtfmAcdmCtot_RouteTrajectoryGroupType" minOccurs="1" maxOccurs="1"/>
</xs:sequence>
</xs:restriction>
</xs:complexContent>
</xs:complexType>
</xs:schema>

Filename:
/apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtotAllocation_Constraints.xsd

<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
<xs:annotation>
<xs:documentation>A Calculated Take-Off Time Allocation message Constraint template.</xs:documentation>
</xs:annotation>
<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../base/ApacAtfmAcdmCtotAllocation_Base.xsd"/>
<xs:include schemaLocation="../../../../../core/flight/flightroutetrajectory/Constraints.xsd"/>
<xs:complexType name="ApacAtfmAcdmCtotAllocation_RouteTrajectoryConstraintType">
<xs:complexContent>
<xs:restriction base="fx:RouteTrajectoryConstraintType">
<xs:sequence>
<xs:element name="extension" type="fb:RouteTrajectoryConstraintExtensionType" minOccurs="1" maxOccurs="1">
<xs:annotation>

```xml
					<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
				</xs:annotation>
			</xs:element>
			<xs:element name="time" type="fx:ApacAtfmAcdmCtotAllocation_TimeConstraintType" minOccurs="1" maxOccurs="1"/>
		</xs:sequence>
	</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotAllocation_TimeConstraintType">
	<xs:complexContent>
		<xs:restriction base="fx:TimeConstraintType">
			<xs:sequence>
				<xs:element name="timeSpecification" type="fb:ApacAtfmAcdmCtotAllocation_TimeChoiceType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtotAllocation_FlightRouteTrajectory.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message FlightRouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./ApacAtfmAcdmCtotAllocation_Constraints.xsd"/>
	<xs:include schemaLocation="./ApacAtfmAcdmCtotAllocation_RouteTrajectory.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtotAllocation_RouteTrajectory.xsd


```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Allocation message RouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../base/ApacAtfmAcdmCtotAllocation_Base.xsd"/>
	<xs:include schemaLocation="ApacAtfmAcdmCtotAllocation_Constraints.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightroutetrajectory/RouteTrajectory.xsd"/>
	<xs:simpleType name="ApacAtfmAcdmCtot_TrajectoryPointPropertyTypeType">
		<xs:restriction base="fx:TrajectoryPointPropertyTypeType">
			<xs:enumeration value="WHEELS_OFF"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmCtot_RouteTrajectoryElementType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryElementType">
				<xs:sequence>
					<xs:element name="constraint" type="fx:ApacAtfmAcdmCtotAllocation_RouteTrajectoryConstraintType" minOccurs="1" maxOccurs="1"/>
					<xs:element name="elementStartPoint" type="fb:SignificantPointChoiceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A specified geographical location used in defining the flight route or expanded route. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
					<xs:element name="extension" type="fb:RouteTrajectoryElementExtensionType" minOccurs="0" maxOccurs="2000" nillable="true">
						<xs:annotation>
							<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
						</xs:annotation>
```

```
					</xs:element>
					<xs:element name="point4D" type="fx:ApacAtfmAcdmCtot_TrajectoryPoint4DType" minOccurs="1" 
maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtot_RouteTrajectoryGroupType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryGroupType">
				<xs:sequence>
					<xs:element name="element" type="fx:ApacAtfmAcdmCtot_RouteTrajectoryElementType" minOccurs="1" 
maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtot_TrajectoryPoint4DType">
		<xs:complexContent>
			<xs:restriction base="fx:TrajectoryPoint4DType">
				<xs:sequence>
					<xs:element name="pointProperty" type="fx:ApacAtfmAcdmCtot_TrajectoryPointPropertyType" minOccurs="1" 
maxOccurs="2000"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtot_TrajectoryPointPropertyType">
		<xs:complexContent>
			<xs:restriction base="fx:TrajectoryPointPropertyType">
				<xs:sequence>
					<xs:element name="propertyType" type="fx:ApacAtfmAcdmCtot_TrajectoryPointPropertyTypeType" 
minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
```

```
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/apacatfmacdmmessage/ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessage.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified"
version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message template for the ApacAtfmAcdmMessage
package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../flight/ApacAtfmAcdmCtotCancellation_Flight.xsd"/>
	<xs:include schemaLocation="../../../ApacAtfmAcdmMessage.xsd"/>
	<xs:simpleType name="ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessageTypeType">
		<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageTypeType">
			<xs:enumeration value="FIXM_CTOT_CANCELLATION"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessageType">
		<xs:complexContent>
			<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageType">
				<xs:sequence>
					<xs:element name="type"
type="apacatfmacdm:ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessageTypeType" minOccurs="1" maxOccurs="1"/>
					<xs:element name="flight" type="fx:ApacAtfmAcdmCtotCancellation_FlightType" minOccurs="1"
maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/CalculatedTakeOffTimeCancellation.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./flight/ApacAtfmAcdmCtotCancellation_Flight.xsd"/>
	<xs:include schemaLocation="./apacatfmacdmmessage/ApacAtfmAcdmCtotCancellation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/ApacAtfmAcdmCtotCancellation_Flight.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message for the Flight package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="./flightdata/ApacAtfmAcdmCtotCancellation_FlightData.xsd"/>
	<xs:include schemaLocation="./departure/ApacAtfmAcdmCtotCancellation_Departure.xsd"/>
	<xs:include schemaLocation="./arrival/ApacAtfmAcdmCtotCancellation_Arrival.xsd"/>
	<xs:include schemaLocation="./flightroutetrajectory/ApacAtfmAcdmCtotCancellation_FlightRouteTrajectory.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/arrival/ApacAtfmAcdmCtotCancellation_Arrival.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message Arrival template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
```

```xml
	<xs:include schemaLocation="../../../../../../core/flight/arrival/Arrival.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtotCancellation_ArrivalType">
		<xs:complexContent>
			<xs:restriction base="fx:ArrivalType">
				<xs:sequence>
					<xs:element name="destinationAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>The aerodrome of intended landing. [ICAO Doc 4444 - extracted from the
definition of Destination Alternate]
This is the aerodrome at which the flight is scheduled to arrive. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/departure/ApacAtfmAcdmCtotCancellation_Departure.xsd


```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message Departure template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/departure/Departure.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtotCancellation_DepartureType">
		<xs:complexContent>
			<xs:restriction base="fx:DepartureType">
				<xs:sequence>
					<xs:choice minOccurs="1" maxOccurs="1">
						<xs:element name="departureAerodrome" type="fb:AerodromeReferenceType" minOccurs="1"
maxOccurs="1">
							<xs:annotation>
```

```
                                        <xs:documentation>The aerodrome from which the flight departs.
[FIXM]</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                            </xs:choice>
                            <xs:choice minOccurs="1" maxOccurs="1">
                                <xs:element name="estimatedOffBlockTime" type="fb:DateTimeUtcType" minOccurs="1"
maxOccurs="1">
                                    <xs:annotation>
                                        <xs:documentation>The estimated time at which the aircraft will commence movement
associated with departure. [ICAO Doc 4444]</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                            </xs:choice>
                        </xs:sequence>
                    </xs:restriction>
                </xs:complexContent>
        </xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/flightdata/ApacAtfmAcdmCtotCancellation_FlightData.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
    <xs:annotation>
        <xs:documentation>A Calculated Take-Off Time Cancellation message FlightData template.</xs:documentation>
    </xs:annotation>
    <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
    <xs:include schemaLocation="../flightroutetrajectory/ApacAtfmAcdmCtotCancellation_RouteTrajectory.xsd"/>
    <xs:include schemaLocation="../arrival/ApacAtfmAcdmCtotCancellation_Arrival.xsd"/>
    <xs:include schemaLocation="../departure/ApacAtfmAcdmCtotCancellation_Departure.xsd"/>
    <xs:include schemaLocation="../../../../../../core/flight/flightdata/FlightData.xsd"/>
    <xs:complexType name="ApacAtfmAcdmCtotCancellation_FlightType">
        <xs:complexContent>
            <xs:restriction base="fx:FlightType">
```

```xml
					<xs:sequence>
						<xs:element name="arrival" type="fx:ApacAtfmAcdmCtotCancellation_ArrivalType" minOccurs="1"
maxOccurs="1"/>
						<xs:element name="departure" type="fx:ApacAtfmAcdmCtotCancellation_DepartureType" minOccurs="1"
maxOccurs="1"/>
						<xs:element name="flightIdentification" type="fx:ApacAtfmAcdmCtotCancellation_FlightIdentificationType"
minOccurs="1" maxOccurs="1"/>
						<xs:element name="routeTrajectoryGroup"
type="fx:ApacAtfmAcdmCtotCancellation_RouteTrajectoryGroupContainerType" minOccurs="1" maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
		<xs:complexType name="ApacAtfmAcdmCtotCancellation_FlightIdentificationType">
			<xs:complexContent>
				<xs:restriction base="fx:FlightIdentificationType">
					<xs:sequence>
						<xs:element name="aircraftIdentification" type="fb:AircraftIdentificationType" minOccurs="1" maxOccurs="1">
							<xs:annotation>
								<xs:documentation>A group of letters, figures or a combination thereof which is either identical to,
or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air
traffic services communications. [ICAO Doc 4444]</xs:documentation>
							</xs:annotation>
						</xs:element>
						<xs:choice minOccurs="0" maxOccurs="1">
							<xs:element name="gufi" type="fb:GloballyUniqueFlightIdentifierType" minOccurs="1" maxOccurs="1">
								<xs:annotation>
									<xs:documentation>A single reference for FF-ICE information pertinent to a flight that is
unique globally. [ICAO Doc 9965]
This is a reference that uniquely identifies a specific flight and is independent of any particular system. [FIXM]</xs:documentation>
								</xs:annotation>
							</xs:element>
						</xs:choice>
					</xs:sequence>
				</xs:restriction>
```

```
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtotCancellation_RouteTrajectoryGroupContainerType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryGroupContainerType">
				<xs:sequence>
					<xs:element name="negotiating" type="fx:ApacAtfmAcdmCtotCancellation_RouteTrajectoryGroupType"
minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/flightroutetrajectory/ApacAtfmAcdmCtotCancellation_FlightRouteTrajectory.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message FlightRouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./ApacAtfmAcdmCtotCancellation_RouteTrajectory.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTakeOffTimeCancellation/flight/flightroutetrajectory/ApacAtfmAcdmCtotCancellation_RouteTrajectory.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Take-Off Time Cancellation message RouteTrajectory template.</xs:documentation>
	</xs:annotation>
```

```
<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
<xs:include schemaLocation="../../../../../../core/flight/flightroutetrajectory/RouteTrajectory.xsd"/>
<xs:simpleType name="ApacAtfmAcdmCtotCancellation_TrajectoryPointPropertyTypeType">
	<xs:restriction base="fx:TrajectoryPointPropertyTypeType">
		<xs:enumeration value="WHEELS_OFF"/>
	</xs:restriction>
</xs:simpleType>
<xs:complexType name="ApacAtfmAcdmCtotCancellation_RouteTrajectoryElementType">
	<xs:complexContent>
		<xs:restriction base="fx:RouteTrajectoryElementType">
			<xs:sequence>
				<xs:element name="elementStartPoint" type="fb:SignificantPointChoiceType" minOccurs="1" maxOccurs="1">
					<xs:annotation>
						<xs:documentation>A specified geographical location used in defining the flight route or expanded route. [FIXM]</xs:documentation>
					</xs:annotation>
				</xs:element>
				<xs:element name="extension" type="fb:RouteTrajectoryElementExtensionType" minOccurs="0" maxOccurs="2000" nillable="true">
					<xs:annotation>
						<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
					</xs:annotation>
				</xs:element>
				<xs:element name="point4D" type="fx:ApacAtfmAcdmCtotCancellation_TrajectoryPoint4DType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotCancellation_RouteTrajectoryGroupType">
	<xs:complexContent>
		<xs:restriction base="fx:RouteTrajectoryGroupType">
			<xs:sequence>
```

```
				<xs:element name="element" type="fx:ApacAtfmAcdmCtotCancellation_RouteTrajectoryElementType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotCancellation_TrajectoryPoint4DType">
	<xs:complexContent>
		<xs:restriction base="fx:TrajectoryPoint4DType">
			<xs:sequence>
				<xs:element name="pointProperty" type="fx:ApacAtfmAcdmCtotCancellation_TrajectoryPointPropertyType" minOccurs="1" maxOccurs="2000"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtotCancellation_TrajectoryPointPropertyType">
	<xs:complexContent>
		<xs:restriction base="fx:TrajectoryPointPropertyType">
			<xs:sequence>
				<xs:element name="propertyType" type="fx:ApacAtfmAcdmCtotCancellation_TrajectoryPointPropertyTypeType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/apacatfmacdmmessage/ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessage.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="1.0.0">
```

```
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message template for the ApacAtfmAcdmMessage package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../flight/ApacAtfmAcdmCtoAllocation_Flight.xsd"/>
	<xs:include schemaLocation="../../../ApacAtfmAcdmMessage.xsd"/>
	<xs:simpleType name="ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessageTypeType">
		<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageTypeType">
			<xs:enumeration value="FIXM_CTO_ALLOCATION"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessageType">
		<xs:complexContent>
			<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageType">
				<xs:sequence>
					<xs:element name="type" type="apacatfmacdm:ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessageTypeType"
minOccurs="1" maxOccurs="1"/>
					<xs:element name="flight" type="fx:ApacAtfmAcdmCtoAllocation_FlightType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/apacextension/ApacAtfmAcdmCtoAllocation_ApacExtension.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/ext/apac/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message for the ApacExtension package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../extensions/apac/Apac.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_ApacDepartureType">
		<xs:complexContent>
			<xs:restriction base="apac:ApacDepartureType">
```

```
                    <xs:sequence>
                        <xs:element name="taxiTime" type="fb:DurationType" minOccurs="1" maxOccurs="1"/>
                    </xs:sequence>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>
        <xs:complexType name="ApacAtfmAcdmCtoAllocation_ApacRouteTrajectoryConstraintType">
            <xs:complexContent>
                <xs:restriction base="apac:ApacRouteTrajectoryConstraintType">
                    <xs:sequence>
                        <xs:element name="comment" type="fb:CharacterStringType" minOccurs="0" maxOccurs="1"/>
                        <xs:element name="reason" type="fb:CharacterStringType" minOccurs="0" maxOccurs="1"/>
                        <xs:element name="regulationCause" type="apac:ApacRegulationCauseType" minOccurs="1" maxOccurs="1"/>
                        <xs:element name="regulationId" type="apac:ApacRegulationIdType" minOccurs="0" maxOccurs="2000"/>
                    </xs:sequence>
                </xs:restriction>
            </xs:complexContent>
        </xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/base/ApacAtfmAcdmCtoAllocation_Base.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/base/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
        <xs:annotation>
            <xs:documentation>A Calculated Time Over Allocation message template for the Base package.</xs:documentation>
        </xs:annotation>
        <xs:include schemaLocation="../../../../../core/base/Base.xsd"/>
        <xs:include schemaLocation="./ApacAtfmAcdmCtoAllocation_RangesAndChoices.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/base/ApacAtfmAcdmCtoAllocation_RangesAndChoices.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/base/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
```

```xml
	<xs:annotation>
		<xs:documentation>This package contains combinations and choices comprised of various measure elements.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="../../../../../core/base/Types.xsd"/>
	<xs:include schemaLocation="../../../../../core/base/Measures.xsd"/>
	<xs:include schemaLocation="../../../../../core/base/RangesAndChoices.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_FlightLevelOrAltitudeOrRangeChoiceType">
		<xs:complexContent>
			<xs:restriction base="fb:FlightLevelOrAltitudeOrRangeChoiceType">
				<xs:choice>
					<xs:element name="flightLevel" type="fb:FlightLevelType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>Flight Level specification.</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:choice>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_TimeChoiceType">
		<xs:complexContent>
			<xs:restriction base="fb:TimeChoiceType">
				<xs:choice>
					<xs:element name="value" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A specific time value.</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:choice>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/CalculatedTimeOverAllocation.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3"
xmlns:fb="http://www.fixm.aero/base/4.3">
    <xs:annotation>
        <xs:documentation>A Calculated Time Over Allocation message template.</xs:documentation>
    </xs:annotation>
    <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="./base/ApacAtfmAcdmCtoAllocation_Base.xsd"/>
    <xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./flight/ApacAtfmAcdmCtoAllocation_Flight.xsd"/>
    <xs:import namespace="http://www.fixm.aero/ext/apac/4.3"
schemaLocation="./apacextension/ApacAtfmAcdmCtoAllocation_ApacExtension.xsd"/>
    <xs:include schemaLocation="./apacatfmacdmmessage/ApacAtfmAcdmCtoAllocation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/ApacAtfmAcdmCtoAllocation_Flight.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
    <xs:annotation>
        <xs:documentation>A Calculated Time Over Allocation message for the Flight package.</xs:documentation>
    </xs:annotation>
    <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
    <xs:include schemaLocation="./flightdata/ApacAtfmAcdmCtoAllocation_FlightData.xsd"/>
    <xs:include schemaLocation="./departure/ApacAtfmAcdmCtoAllocation_Departure.xsd"/>
    <xs:include schemaLocation="./arrival/ApacAtfmAcdmCtoAllocation_Arrival.xsd"/>
    <xs:include schemaLocation="./flightroutetrajectory/ApacAtfmAcdmCtoAllocation_FlightRouteTrajectory.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/arrival/ApacAtfmAcdmCtoAllocation_Arrival.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
    <xs:annotation>
        <xs:documentation>A Calculated Time Over Allocation message Arrival template.</xs:documentation>
    </xs:annotation>
```

```
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/arrival/Arrival.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_ArrivalType">
		<xs:complexContent>
			<xs:restriction base="fx:ArrivalType">
				<xs:sequence>
					<xs:element name="destinationAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>The aerodrome of intended landing. [ICAO Doc 4444 - extracted from the
definition of Destination Alternate]
This is the aerodrome at which the flight is scheduled to arrive. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/departure/ApacAtfmAcdmCtoAllocation_Departure.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message Departure template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/departure/Departure.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_DepartureType">
		<xs:complexContent>
			<xs:restriction base="fx:DepartureType">
				<xs:sequence>
					<xs:choice minOccurs="1" maxOccurs="1">
						<xs:element name="departureAerodrome" type="fb:AerodromeReferenceType" minOccurs="1"
maxOccurs="1">
```

```
                                    <xs:annotation>
                                        <xs:documentation>The aerodrome from which the flight departs.
[FIXM]</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                            </xs:choice>
                            <xs:choice minOccurs="1" maxOccurs="1">
                                <xs:element name="estimatedOffBlockTime" type="fb:DateTimeUtcType" minOccurs="1"
maxOccurs="1">
                                    <xs:annotation>
                                        <xs:documentation>The estimated time at which the aircraft will commence movement
associated with departure. [ICAO Doc 4444]</xs:documentation>
                                    </xs:annotation>
                                </xs:element>
                            </xs:choice>
                            <xs:element name="extension" type="fb:DepartureExtensionType" minOccurs="0" maxOccurs="1">
                                <xs:annotation>
                                    <xs:documentation>An extension hook for attaching extension (non-core)
classes.</xs:documentation>
                                </xs:annotation>
                            </xs:element>
                        </xs:sequence>
                    </xs:restriction>
                </xs:complexContent>
        </xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/flightdata/ApacAtfmAcdmCtoAllocation_FlightData.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
        <xs:annotation>
                <xs:documentation>A Calculated Time Over Allocation message FlightData template.</xs:documentation>
        </xs:annotation>
        <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
```

```
	<xs:include schemaLocation="../flightroutetrajectory/ApacAtfmAcdmCtoAllocation_RouteTrajectory.xsd"/>
	<xs:include schemaLocation="../arrival/ApacAtfmAcdmCtoAllocation_Arrival.xsd"/>
	<xs:include schemaLocation="../departure/ApacAtfmAcdmCtoAllocation_Departure.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightdata/FlightData.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_FlightType">
		<xs:complexContent>
			<xs:restriction base="fx:FlightType">
				<xs:sequence>
					<xs:element name="arrival" type="fx:ApacAtfmAcdmCtoAllocation_ArrivalType" minOccurs="1" 
maxOccurs="1"/>
					<xs:element name="departure" type="fx:ApacAtfmAcdmCtoAllocation_DepartureType" minOccurs="1" 
maxOccurs="1"/>
					<xs:element name="flightIdentification" type="fx:ApacAtfmAcdmCtoAllocation_FlightIdentificationType" 
minOccurs="1" maxOccurs="1"/>
					<xs:element name="routeTrajectoryGroup" 
type="fx:ApacAtfmAcdmCtoAllocation_RouteTrajectoryGroupContainerType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_FlightIdentificationType">
		<xs:complexContent>
			<xs:restriction base="fx:FlightIdentificationType">
				<xs:sequence>
					<xs:element name="aircraftIdentification" type="fb:AircraftIdentificationType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A group of letters, figures or a combination thereof which is either identical to, 
or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air 
traffic services communications. [ICAO Doc 4444]</xs:documentation>
						</xs:annotation>
					</xs:element>
					<xs:choice minOccurs="0" maxOccurs="1">
						<xs:element name="gufi" type="fb:GloballyUniqueFlightIdentifierType" minOccurs="1" maxOccurs="1">
							<xs:annotation>
```

```
						<xs:documentation>A single reference for FF-ICE information pertinent to a flight that is unique globally. [ICAO Doc 9965]
This is a reference that uniquely identifies a specific flight and is independent of any particular system. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:choice>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtoAllocation_RouteTrajectoryGroupContainerType">
	<xs:complexContent>
		<xs:restriction base="fx:RouteTrajectoryGroupContainerType">
			<xs:sequence>
				<xs:element name="negotiating" type="fx:ApacAtfmAcdmCtoAllocation_RouteTrajectoryGroupType" minOccurs="1" maxOccurs="1"/>
			</xs:sequence>
		</xs:restriction>
	</xs:complexContent>
</xs:complexType>
</xs:schema>
```

Filename:
/apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtoAllocation_Constraints.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message Constraint template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../base/ApacAtfmAcdmCtoAllocation_Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightroutetrajectory/Constraints.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_LevelConstraintType">
		<xs:complexContent>
			<xs:restriction base="fx:LevelConstraintType">
```

```
					<xs:sequence>
						<xs:element name="level" type="fb:ApacAtfmAcdmCtoAllocation_FlightLevelOrAltitudeOrRangeChoiceType"
minOccurs="1" maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
		<xs:complexType name="ApacAtfmAcdmCtoAllocation_RouteTrajectoryConstraintType">
			<xs:complexContent>
				<xs:restriction base="fx:RouteTrajectoryConstraintType">
					<xs:sequence>
						<xs:element name="extension" type="fb:RouteTrajectoryConstraintExtensionType" minOccurs="1" maxOccurs="1"
nillable="true">
							<xs:annotation>
								<xs:documentation>An extension hook for attaching extension (non-core)
classes.</xs:documentation>
							</xs:annotation>
						</xs:element>
						<xs:element name="level" type="fx:ApacAtfmAcdmCtoAllocation_LevelConstraintType" minOccurs="0"
maxOccurs="1"/>
						<xs:element name="time" type="fx:ApacAtfmAcdmCtoAllocation_TimeConstraintType" minOccurs="1"
maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
		<xs:complexType name="ApacAtfmAcdmCtoAllocation_TimeConstraintType">
			<xs:complexContent>
				<xs:restriction base="fx:TimeConstraintType">
					<xs:sequence>
						<xs:element name="timeSpecification" type="fb:ApacAtfmAcdmCtoAllocation_TimeChoiceType" minOccurs="1"
maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
```

```
	</xs:complexType>
</xs:schema>
```


Filename:
/apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtoAllocation_FlightRouteTrajectory.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message FlightRouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./ApacAtfmAcdmCtoAllocation_Constraints.xsd"/>
	<xs:include schemaLocation="./ApacAtfmAcdmCtoAllocation_RouteTrajectory.xsd"/>
</xs:schema>
```


Filename:
/apacatfmacdmmessagetemplates/calculatedTimeOverAllocation/flight/flightroutetrajectory/ApacAtfmAcdmCtoAllocation_RouteTrajectory.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Allocation message RouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../base/ApacAtfmAcdmCtoAllocation_Base.xsd"/>
	<xs:include schemaLocation="ApacAtfmAcdmCtoAllocation_Constraints.xsd"/>
	<xs:include schemaLocation="../../../../../core/flight/flightroutetrajectory/RouteTrajectory.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoAllocation_RouteTrajectoryElementType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryElementType">
				<xs:sequence>
					<xs:element name="constraint" type="fx:ApacAtfmAcdmCtoAllocation_RouteTrajectoryConstraintType"
minOccurs="1" maxOccurs="1"/>
					<xs:element name="elementStartPoint" type="fb:SignificantPointChoiceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
```

```
                        <xs:documentation>A specified geographical location used in defining the flight route or expanded
route. [FIXM]</xs:documentation>
                    </xs:annotation>
                </xs:element>
                <xs:element name="extension" type="fb:RouteTrajectoryElementExtensionType" minOccurs="0"
maxOccurs="2000" nillable="true">
                    <xs:annotation>
                        <xs:documentation>An extension hook for attaching extension (non-core)
classes.</xs:documentation>
                    </xs:annotation>
                </xs:element>
            </xs:sequence>
        </xs:restriction>
    </xs:complexContent>
</xs:complexType>
<xs:complexType name="ApacAtfmAcdmCtoAllocation_RouteTrajectoryGroupType">
    <xs:complexContent>
        <xs:restriction base="fx:RouteTrajectoryGroupType">
            <xs:sequence>
                <xs:element name="element" type="fx:ApacAtfmAcdmCtoAllocation_RouteTrajectoryElementType"
minOccurs="1" maxOccurs="1"/>
            </xs:sequence>
        </xs:restriction>
    </xs:complexContent>
</xs:complexType>
</xs:schema>
```


**Filename:
/apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/apacatfmacdmmessage/ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessage.xsd**


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified"
version="1.0.0">
    <xs:annotation>
```

```xml
			<xs:documentation>A Calculated Time Over Cancellation message template for the ApacAtfmAcdmMessage package.</xs:documentation>
		</xs:annotation>
		<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../flight/ApacAtfmAcdmCtoCancellation_Flight.xsd"/>
		<xs:include schemaLocation="../../../ApacAtfmAcdmMessage.xsd"/>
		<xs:simpleType name="ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessageTypeType">
			<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageTypeType">
				<xs:enumeration value="FIXM_CTO_CANCELLATION"/>
			</xs:restriction>
		</xs:simpleType>
		<xs:complexType name="ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessageType">
			<xs:complexContent>
				<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageType">
					<xs:sequence>
						<xs:element name="type"
type="apacatfmacdm:ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessageTypeType" minOccurs="1" maxOccurs="1"/>
						<xs:element name="flight" type="fx:ApacAtfmAcdmCtoCancellation_FlightType" minOccurs="1"
maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/CalculatedTimeOverCancellation.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3"
xmlns:fb="http://www.fixm.aero/base/4.3">
		<xs:annotation>
			<xs:documentation>A Calculated Time Over Cancellation message template.</xs:documentation>
		</xs:annotation>
		<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./flight/ApacAtfmAcdmCtoCancellation_Flight.xsd"/>
		<xs:include schemaLocation="./apacatfmacdmmessage/ApacAtfmAcdmCtoCancellation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/ApacAtfmAcdmCtoCancellation_Flight.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Cancellation message for the Flight package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="./flightdata/ApacAtfmAcdmCtoCancellation_FlightData.xsd"/>
	<xs:include schemaLocation="./departure/ApacAtfmAcdmCtoCancellation_Departure.xsd"/>
	<xs:include schemaLocation="./arrival/ApacAtfmAcdmCtoCancellation_Arrival.xsd"/>
	<xs:include schemaLocation="./flightroutetrajectory/ApacAtfmAcdmCtoCancellation_FlightRouteTrajectory.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/arrival/ApacAtfmAcdmCtoCancellation_Arrival.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Cancellation message Arrival template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/arrival/Arrival.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoCancellation_ArrivalType">
		<xs:complexContent>
			<xs:restriction base="fx:ArrivalType">
				<xs:sequence>
					<xs:element name="destinationAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>The aerodrome of intended landing. [ICAO Doc 4444 - extracted from the
definition of Destination Alternate]
This is the aerodrome at which the flight is scheduled to arrive. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:sequence>
```

```
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/departure/ApacAtfmAcdmCtoCancellation_Departure.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Cancellation message Departure template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/departure/Departure.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoCancellation_DepartureType">
		<xs:complexContent>
			<xs:restriction base="fx:DepartureType">
				<xs:sequence>
					<xs:choice minOccurs="1" maxOccurs="1">
						<xs:element name="departureAerodrome" type="fb:AerodromeReferenceType" minOccurs="1"
maxOccurs="1">
							<xs:annotation>
								<xs:documentation>The aerodrome from which the flight departs.
[FIXM]</xs:documentation>
							</xs:annotation>
						</xs:element>
					</xs:choice>
					<xs:choice minOccurs="1" maxOccurs="1">
						<xs:element name="estimatedOffBlockTime" type="fb:DateTimeUtcType" minOccurs="1"
maxOccurs="1">
							<xs:annotation>
								<xs:documentation>The estimated time at which the aircraft will commence movement
associated with departure. [ICAO Doc 4444]</xs:documentation>
							</xs:annotation>
						</xs:element>
```

```
                </xs:choice>
            </xs:sequence>
        </xs:restriction>
    </xs:complexContent>
</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/flightdata/ApacAtfmAcdmCtoCancellation_FlightData.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
    <xs:annotation>
        <xs:documentation>A Calculated Time Over Cancellation message FlightData template.</xs:documentation>
    </xs:annotation>
    <xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
    <xs:include schemaLocation="../flightroutetrajectory/ApacAtfmAcdmCtoCancellation_RouteTrajectory.xsd"/>
    <xs:include schemaLocation="../arrival/ApacAtfmAcdmCtoCancellation_Arrival.xsd"/>
    <xs:include schemaLocation="../departure/ApacAtfmAcdmCtoCancellation_Departure.xsd"/>
    <xs:include schemaLocation="../../../../../../core/flight/flightdata/FlightData.xsd"/>
    <xs:complexType name="ApacAtfmAcdmCtoCancellation_FlightType">
        <xs:complexContent>
            <xs:restriction base="fx:FlightType">
                <xs:sequence>
                    <xs:element name="arrival" type="fx:ApacAtfmAcdmCtoCancellation_ArrivalType" minOccurs="1" maxOccurs="1"/>
                    <xs:element name="departure" type="fx:ApacAtfmAcdmCtoCancellation_DepartureType" minOccurs="1" maxOccurs="1"/>
                    <xs:element name="flightIdentification" type="fx:ApacAtfmAcdmCtoCancellation_FlightIdentificationType" minOccurs="1" maxOccurs="1"/>
                    <xs:element name="routeTrajectoryGroup" type="fx:ApacAtfmAcdmCtoCancellation_RouteTrajectoryGroupContainerType" minOccurs="1" maxOccurs="1"/>
                </xs:sequence>
            </xs:restriction>
        </xs:complexContent>
    </xs:complexType>
```

```xml
	<xs:complexType name="ApacAtfmAcdmCtoCancellation_FlightIdentificationType">
		<xs:complexContent>
			<xs:restriction base="fx:FlightIdentificationType">
				<xs:sequence>
					<xs:element name="aircraftIdentification" type="fb:AircraftIdentificationType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications. [ICAO Doc 4444]</xs:documentation>
						</xs:annotation>
					</xs:element>
					<xs:choice minOccurs="0" maxOccurs="1">
						<xs:element name="gufi" type="fb:GloballyUniqueFlightIdentifierType" minOccurs="1" maxOccurs="1">
							<xs:annotation>
								<xs:documentation>A single reference for FF-ICE information pertinent to a flight that is unique globally. [ICAO Doc 9965]
This is a reference that uniquely identifies a specific flight and is independent of any particular system. [FIXM]</xs:documentation>
							</xs:annotation>
						</xs:element>
					</xs:choice>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmCtoCancellation_RouteTrajectoryGroupContainerType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryGroupContainerType">
				<xs:sequence>
					<xs:element name="negotiating" type="fx:ApacAtfmAcdmCtoCancellation_RouteTrajectoryGroupType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/flightroutetrajectory/ApacAtfmAcdmCtoCancellation_FlightRouteTrajectory.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Cancellation message FlightRouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:include schemaLocation="./ApacAtfmAcdmCtoCancellation_RouteTrajectory.xsd"/>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/calculatedTimeOverCancellation/flight/flightroutetrajectory/ApacAtfmAcdmCtoCancellation_RouteTrajectory.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Calculated Time Over Cancellation message RouteTrajectory template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightroutetrajectory/RouteTrajectory.xsd"/>
	<xs:complexType name="ApacAtfmAcdmCtoCancellation_RouteTrajectoryElementType">
		<xs:complexContent>
			<xs:restriction base="fx:RouteTrajectoryElementType">
				<xs:sequence>
					<xs:element name="elementStartPoint" type="fb:SignificantPointChoiceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A specified geographical location used in defining the flight route or expanded
route. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
```

```
						<xs:element name="extension" type="fb:RouteTrajectoryElementExtensionType" minOccurs="0" maxOccurs="2000" nillable="true">
							<xs:annotation>
								<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
							</xs:annotation>
						</xs:element>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
		<xs:complexType name="ApacAtfmAcdmCtoCancellation_RouteTrajectoryGroupType">
			<xs:complexContent>
				<xs:restriction base="fx:RouteTrajectoryGroupType">
					<xs:sequence>
						<xs:element name="element" type="fx:ApacAtfmAcdmCtoCancellation_RouteTrajectoryElementType" minOccurs="1" maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/apacatfmacdmmessage/ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessage.xsd


```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema" xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Target Take-Off Time Allocation message template for the ApacAtfmAcdmMessage package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="../flight/ApacAtfmAcdmTtotAllocation_Flight.xsd"/>
	<xs:include schemaLocation="../../../ApacAtfmAcdmMessage.xsd"/>
```

```
	<xs:simpleType name="ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessageTypeType">
		<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageTypeType">
			<xs:enumeration value="FIXM_TTOT_ALLOCATION"/>
		</xs:restriction>
	</xs:simpleType>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessageType">
		<xs:complexContent>
			<xs:restriction base="apacatfmacdm:ApacAtfmAcdmMessageType">
				<xs:sequence>
					<xs:element name="type"
type="apacatfmacdm:ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessageTypeType" minOccurs="1" maxOccurs="1"/>
					<xs:element name="flight" type="fx:ApacAtfmAcdmTtotAllocation_FlightType" minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/apacextension/ApacAtfmAcdmTtotAllocation_ApacExtension.xsd

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/ext/apac/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apac="http://www.fixm.aero/ext/apac/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Target Take-Off Time Allocation message for the ApacExtension package.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../extensions/apac/Apac.xsd"/>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_ApacArrivalType">
		<xs:complexContent>
			<xs:restriction base="apac:ApacArrivalType">
				<xs:sequence>
					<xs:element name="targetInBlockTime" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1"
nillable="true"/>
				</xs:sequence>
			</xs:restriction>
```

```xml
			</xs:complexContent>
		</xs:complexType>
		<xs:complexType name="ApacAtfmAcdmTtotAllocation_ApacDepartureType">
			<xs:complexContent>
				<xs:restriction base="apac:ApacDepartureType">
					<xs:sequence>
						<xs:element name="targetOffBlockTime" type="fb:DateTimeUtcType" minOccurs="0" maxOccurs="1"/>
						<xs:element name="targetStartupApprovalTime" type="fb:DateTimeUtcType" minOccurs="0" maxOccurs="1"/>
						<xs:element name="targetTakeOffTime" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1"/>
					</xs:sequence>
				</xs:restriction>
			</xs:complexContent>
		</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/flight/ApacAtfmAcdmTtotAllocation_Flight.xsd


```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" elementFormDefault="qualified" version="4.3.0">
		<xs:annotation>
			<xs:documentation>A Target Take-Off Time Allocation message for the Flight package.</xs:documentation>
		</xs:annotation>
		<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../core/base/Base.xsd"/>
		<xs:include schemaLocation="./flightdata/ApacAtfmAcdmTtotAllocation_FlightData.xsd"/>
		<xs:include schemaLocation="./departure/ApacAtfmAcdmTtotAllocation_Departure.xsd"/>
		<xs:include schemaLocation="./arrival/ApacAtfmAcdmTtotAllocation_Arrival.xsd"/>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/flight/arrival/ApacAtfmAcdmTtotAllocation_Arrival.xsd


```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
		<xs:annotation>
			<xs:documentation>A Target Take-Off Time Allocation message Arrival template.</xs:documentation>
		</xs:annotation>
```

```xml
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/arrival/Arrival.xsd"/>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_ArrivalType">
		<xs:complexContent>
			<xs:restriction base="fx:ArrivalType">
				<xs:sequence>
					<xs:element name="destinationAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>The aerodrome of intended landing. [ICAO Doc 4444 - extracted from the
definition of Destination Alternate]
This is the aerodrome at which the flight is scheduled to arrive. [FIXM]</xs:documentation>
						</xs:annotation>
					</xs:element>
					<xs:element name="extension" type="fb:ArrivalExtensionType" minOccurs="0" maxOccurs="1" nillable="true">
						<xs:annotation>
							<xs:documentation>An extension hook for attaching extension (non-core)
classes.</xs:documentation>
						</xs:annotation>
					</xs:element>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/flight/departure/ApacAtfmAcdmTtotAllocation_Departure.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="1.0.0">
	<xs:annotation>
		<xs:documentation>A Target Take-Off Time Allocation message Departure template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/departure/Departure.xsd"/>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_DepartureType">
```

```
				<xs:complexContent>
					<xs:restriction base="fx:DepartureType">
						<xs:sequence>
							<xs:choice minOccurs="1" maxOccurs="1">
								<xs:element name="departureAerodrome" type="fb:AerodromeReferenceType" minOccurs="1" maxOccurs="1">
									<xs:annotation>
										<xs:documentation>The aerodrome from which the flight departs. [FIXM]</xs:documentation>
									</xs:annotation>
								</xs:element>
							</xs:choice>
							<xs:choice minOccurs="1" maxOccurs="1">
								<xs:element name="estimatedOffBlockTime" type="fb:DateTimeUtcType" minOccurs="1" maxOccurs="1">
									<xs:annotation>
										<xs:documentation>The estimated time at which the aircraft will commence movement associated with departure. [ICAO Doc 4444]</xs:documentation>
									</xs:annotation>
								</xs:element>
							</xs:choice>
							<xs:element name="extension" type="fb:DepartureExtensionType" minOccurs="1" maxOccurs="1">
								<xs:annotation>
									<xs:documentation>An extension hook for attaching extension (non-core) classes.</xs:documentation>
								</xs:annotation>
							</xs:element>
						</xs:sequence>
					</xs:restriction>
				</xs:complexContent>
			</xs:complexType>
</xs:schema>
```


Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/flight/flightdata/ApacAtfmAcdmTtotAllocation_FlightData.xsd


```
<?xml version="1.0" encoding="utf-8"?>
```

```
<xs:schema targetNamespace="http://www.fixm.aero/flight/4.3" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:fx="http://www.fixm.aero/flight/4.3" xmlns:fb="http://www.fixm.aero/base/4.3" elementFormDefault="qualified" version="4.3.0">
	<xs:annotation>
		<xs:documentation>A Target Take-Off Time Allocation message FlightData template.</xs:documentation>
	</xs:annotation>
	<xs:import namespace="http://www.fixm.aero/base/4.3" schemaLocation="../../../../../../core/base/Base.xsd"/>
	<xs:include schemaLocation="../arrival/ApacAtfmAcdmTtotAllocation_Arrival.xsd"/>
	<xs:include schemaLocation="../departure/ApacAtfmAcdmTtotAllocation_Departure.xsd"/>
	<xs:include schemaLocation="../../../../../../core/flight/flightdata/FlightData.xsd"/>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_FlightType">
		<xs:complexContent>
			<xs:restriction base="fx:FlightType">
				<xs:sequence>
					<xs:element name="arrival" type="fx:ApacAtfmAcdmTtotAllocation_ArrivalType" minOccurs="1"
maxOccurs="1"/>
					<xs:element name="departure" type="fx:ApacAtfmAcdmTtotAllocation_DepartureType" minOccurs="1"
maxOccurs="1"/>
					<xs:element name="flightIdentification" type="fx:ApacAtfmAcdmTtotAllocation_FlightIdentificationType"
minOccurs="1" maxOccurs="1"/>
				</xs:sequence>
			</xs:restriction>
		</xs:complexContent>
	</xs:complexType>
	<xs:complexType name="ApacAtfmAcdmTtotAllocation_FlightIdentificationType">
		<xs:complexContent>
			<xs:restriction base="fx:FlightIdentificationType">
				<xs:sequence>
					<xs:element name="aircraftIdentification" type="fb:AircraftIdentificationType" minOccurs="1" maxOccurs="1">
						<xs:annotation>
							<xs:documentation>A group of letters, figures or a combination thereof which is either identical to,
or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air
traffic services communications. [ICAO Doc 4444]</xs:documentation>
						</xs:annotation>
					</xs:element>
					<xs:choice minOccurs="0" maxOccurs="1">
```

```xml
                <xs:element name="gufi" type="fb:GloballyUniqueFlightIdentifierType" minOccurs="1" maxOccurs="1">
                    <xs:annotation>
                        <xs:documentation>A single reference for FF-ICE information pertinent to a flight that is
unique globally. [ICAO Doc 9965]
This is a reference that uniquely identifies a specific flight and is independent of any particular system. [FIXM]</xs:documentation>
                    </xs:annotation>
                </xs:element>
            </xs:choice>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>
</xs:schema>
```

Filename: /apacatfmacdmmessagetemplates/targetTakeOffTimeAllocation/TargetTakeOffTimeAllocation.xsd

```xml
<?xml version="1.0" encoding="utf-8"?>
<xs:schema targetNamespace="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:apacatfmacdm="http://www.fixm.aero/app/apacatfmacdm/1.0" xmlns:fx="http://www.fixm.aero/flight/4.3"
xmlns:fb="http://www.fixm.aero/base/4.3">
  <xs:annotation>
    <xs:documentation>A Target Take-Off Time Allocation message template.</xs:documentation>
  </xs:annotation>
  <xs:import namespace="http://www.fixm.aero/flight/4.3" schemaLocation="./flight/ApacAtfmAcdmTtotAllocation_Flight.xsd"/>
  <xs:import namespace="http://www.fixm.aero/ext/apac/4.3"
schemaLocation="./apacextension/ApacAtfmAcdmTtotAllocation_ApacExtension.xsd"/>
  <xs:include schemaLocation="./apacatfmacdmmessage/ApacAtfmAcdmTtotAllocation_ApacAtfmAcdmMessage.xsd"/>
</xs:schema>
```

APAC SWIM Governance Agreement (Draft)

Article 1 – Purpose

1.1 This Agreement establishes the APAC SWIM implementation framework and defines the governance structure, roles, responsibilities, and obligations of stakeholders participating in SWIM within the Asia/Pacific Region.

1.2 The objective of this framework is to ensure the secure, standardized, and interoperable exchange of aeronautical, flight, and meteorological information among ATM stakeholders.

Article 2 – Scope

2.1 This Agreement applies to all stakeholders participating in APAC SWIM, including States, Air Navigation Service Providers (ANSPs), aircraft operators, airport operators, meteorological service providers, and other members of the ATM community.

2.2 The framework covers:

a) the exchange of SWIM-enabled information services;
b) the use of agreed information models and technical standards;
c) governance, policy, and operational coordination at the regional level.

Article 3 – Definitions

3.1 For the purposes of this Agreement:

“APAC SWIM” means the regional framework for the standardized, secure, and interoperable exchange of information among ATM stakeholders in the APAC Region.

“Originator” means the entity responsible for generating and maintaining data.

“Information Service Provider” means the entity that provides SWIM-enabled services based on data from one or more originators.

“Information Service Consumer” means the entity that uses SWIM services.

“Technical Infrastructure Provider” means the entity responsible for providing and maintaining SWIM technical infrastructure.

Article 4 – ROLES AND RESPONSIBILITIES

4.1 Originator

4.1 1 The Originator shall:
a) ensure the accuracy, integrity, and completeness of the data it provides;

b) maintain ownership and accountability for the data;
c) define usage conditions and constraints associated with the data.

4.2 Information Service Provider

4.2.1 The Information Service Provider shall:
a) provide services in accordance with agreed standards and specifications;
b) ensure service availability, reliability, and integrity;
c) comply with conditions defined by the Originator;
d) maintain service descriptions in the agreed registry.

4.3 Information Service Consumer

4.3.1 The Information Service Consumer shall:
a) use SWIM services in accordance with agreed policies and usage conditions;
b) ensure appropriate use of the information received;
c) comply with applicable security and access control requirements.

4.4 Technical Infrastructure Provider

4.4.1 The Technical Infrastructure Provider shall:
a) provide and maintain SWIM infrastructure components, including messaging and connectivity services;
b) ensure system availability, performance, and security;
c) support interoperability across participating stakeholders.

Article 5 – GOVERNANCE STRUCTURE

5.1 Regional SWIM Board

5.1.1 The Regional SWIM Board shall:
a) establish regional SWIM policies and strategic direction;
b) approve standards and specifications;
c) oversee implementation of the framework;
d) resolve cross-border coordination issues;
e) ensure alignment with ICAO global provisions.

5.2 Technical Steering Group

5.2.1 The Technical Steering Group shall:
a) develop and maintain technical specifications;
b) ensure harmonization of standards across the region;
c) manage version control of information exchange models;
d) support implementation activities.

5.3 Operations Committee

5.3.1 The Operations Committee shall:
a) coordinate operational implementation of SWIM services;
b) monitor service performance and usage;

c) facilitate cooperation among stakeholders;
d) address operational issues arising from SWIM deployment.

Article 6 – STANDARDS AND SPECIFICATIONS

6.1 All stakeholders shall implement SWIM services in accordance with agreed standards and specifications.

6.2 The following shall be applied:
a) ICAO information exchange models (AIXM, FIXM, IWXXM);
b) APAC-specific extensions (e.g. FIXM APAC Extensions);
c) SWIM technical infrastructure profiles;
d) service description and discovery specifications (e.g. SDS, SMXS).

Article 7 – POLICIES

7.1 Data Sharing

7.1.1 Stakeholders shall share information in accordance with agreed policies, ensuring consistency, integrity, and timeliness.

7.2 Access Control and Security

7.2.1 Access to SWIM services shall be subject to authentication and authorization in accordance with agreed security policies.

7.2.2 Stakeholders shall ensure the protection of data against unauthorized access, modification, or disclosure.

7.3 Service Usage

7.3.1 All services shall be used in accordance with defined usage conditions and applicable regulations.

Article 8 – SERVICE LIFECYCLE MANAGEMENT

8.1 All SWIM services shall follow an agreed lifecycle consisting of:
a) design and specification;
b) development and testing;
c) operational deployment;
d) maintenance and evolution;
e) retirement.

8.2 Changes to services shall be managed through an agreed change management process.

Article 9 – COMPLIANCE

9.1 All participating stakeholders shall comply with this Agreement and associated specifications.

9.2 Non-compliance shall be reported to the Regional SWIM Board, which may take appropriate action.

Article 10 – COST AND RESOURCE CONSIDERATIONS

10.1 Each participating stakeholder shall be responsible for its own costs associated with the implementation and operation of APAC SWIM, unless otherwise agreed.

10.2 Cost-sharing arrangements, where applicable, shall be determined through separate agreements among concerned stakeholders.

Article 11 – ENTRY INTO FORCE

11.1 This Agreement shall take effect upon endorsement by APANPIRG.

Annexes (Recommended Structure, TBD)

Annex A: Technical Implementation Profile
Annex B: Security Policy Framework
Annex C: SLA Template
Annex D: Data Classification Guidelines
Annex E: ・・・・

-End-

ATFM Ops Scenarios for APAC Common SWIM Information Services

1. Background

1.1. As the aviation community moves away from legacy point-to-point teletype messaging, System-Wide Information Management (SWIM) serves as the primary enabler for the digital exchange of aeronautical, flight, and meteorological information.

1.2. The exchange of tactical ATFM requirements, specifically **Calculated Take-Off Time (CTOT)**, and **Calculated Time Over (CTO)**, and one of the key A-CDM data elements supporting demand prediction, the **Target Take-Off Time (TTOT)**, is currently managed through a mix of legacy message formats and systems and emerging digital services. To ensure global interoperability and seamless transition to FF-ICE operating environment, these exchanges must be mapped to clear operational use cases within ICAO guidance materials and regionally operating procedures.

1.3. The exchange of CTO, CTOT, and TTOT is critical for the following operational reasons:

1.4. <u>Enabling Flexible Trajectory-Based Demand-Capacity Balancing (CTO)</u>: The exchange of CTO allows an ANSP to balance demand and capacity within their area of responsibility by metering traffic through a specific waypoint in their airspace or at the boundary of their Flight Information Region (FIR) rather than imposing ATFM control mechanism at the departure airport which may be outside their FIRs. This approach aligns with the spirit of FF-ICE, in which FF-ICE capable ATM service provider (eASP) provides ATM restriction/constraint impacting trajectory within their area to the FF-ICE capable airspace user (eAU), and the eAU is responsible for managing their trajectory to comply with the requirements. This approach provides greater flexibility for the AUs to determine how best to meet the DCB requirement while still honouring their business objectives.

1.5. <u>Balancing Demand and Capacity through an ATFM Measure Imposed at Departure Aerodrome (CTOT)</u>: While the move toward CTO is foreseeable in the future FF-ICE environment, there will be cases where a conventional Ground Delay Program (GDP) with the assignment of CTOT will still be used, e.g., in the case of domestic ATFM operations or in specific areas of cross-border ATFM operations with special arrangements among the ANSPs involved. In a GDP, CTOT is the primary constraint time issued to regulate departures of flights destined for congested or constrained airspace or arrival aerodrome. The sharing of CTOT with ANSP managing the

departure aerodrome ensures that the departure aerodrome holds the aircraft on the ground to smooth out traffic peaks before they enter the airborne network or going to the arrival aerodrome.

1.6. Enhancing Predictability via Airport Collaboration (TTOT): TTOT is derived from Airport-Collaborative Decision Making (A-CDM) processes and provides a more accurate picture of when an aircraft is expected to be ready for departure compared to the filed flight plan. Integrating A-CDM derived times such as TTOT into ATFM assists in enhancing ATFM's demand prediction, resulting in a more accurate, dynamic, and effective demand-capacity balancing initiatives..

1.7. The transition from legacy messages (such as Slot Allocation Messages - SAM) transmitted via AFTN/AMHS to modern Flight Information Exchange Model (FIXM) messages is driven by the need for global interoperability, data richness, and the implementation of SWIM.

1.8. There is a need to shift from existing SAM and related messages to ATFM FIXM messages due to the following reasons below:

1.8.1. Limitations of legacy AFTN/AMHS formats: Legacy teletype-based formats are rigid and often lack the flexibility to carry complex trajectory data required for modern ATFM.

1.8.2. Support for FF-ICE and global standardization (which FIXM will be used for exchanging flight-related information): Shifting ATFM and A-CDM information exchange to FIXM-based message formats ensures that APAC ATFM and A-CDM operations are aligned with global ICAO standards and are ready to support the operations in FF-ICE environment, as well as facilitating "global interoperability.

1.8.3. Handling of region-specific requirements via extensions: Shifting to FIXM allows the region to define specific data elements (such as those found in the APAC Regional FIXM Extension) in a structured, machine-readable format (XML/GML) that legacy teletype-based messages cannot easily support.

2. Operational Scenarios

2.1. The three parameters cited represent different phases within a flight trajectory:

2.1.1. TTOT (Target Take-Off Time): Generated by A-CDM system, representing the expected time a flight is expected to depart from the departure aerodrome considering factors including the airspace user's TOBT (Target Off-Block Time) and departure sequencing requirements.

2.1.2. CTOT (Calculated Take-Off Time): Generated by the ATFM system to manage traffic into constrained or congested airspace or arrival aerodrome by controlling the departure (take-off) time of the flight from the departure aerodrome.

2.1.3. CTO (Calculated Time Over): Generated by the ATFM system to manage traffic into constrained or congested airspace by controlling the time the flight is expected to cross a specific waypoint in an airspace.

2.2. Operational Use Cases for ATFM FIXM messages to be exchanged using Flight-Specific ATFM Measure Service and ATFM/A-CDM Integration Service (ref. Business Functionality of APAC Common SWIM Information Services, version 1.0) are elaborated below:

2.2.1. Cross-Border A-CDM data exchange: Using SWIM to provide timely cross-border TTOT updates from A-CDM airports to airport operators or ANSP. This enables more accurate demand prediction, allowing for more optimised CTOT/CTO allocation and more appropriate delay assignment, reducing unnecessary buffering and ground delay.

2.2.2. Cross-Border Metering between Adjacent ANSPs: Sharing a CTO, especially between two adjacent Air Navigation Service Providers (ANSPs) enables traffic metering through early speed adjustments in the cruise phase, rather than ad-hoc holding by the downstream ANSP which are more costly, less environmentally friendly, and introduces additional workload on ATCOs.

2.2.3. Expanding the scope of ATFM measure: Conventional ATFM measure such as a GDP targets management of pre-departure flights. With the inclusion of CTO issuance, the scope of ATFM measure could be expanded to include airborne flights. AUs could contribute to overall traffic management through trajectory adjustments during cruise phase to meet with the required CTO. This could reduce ground delays as ATFM delays are spread across a wider flight profile range.

2.2.4. Dynamic Collaborative-Decision Making Process: Enabling ANSPs and AUs to view ATFM information in real-time and perform timely negotiations as information are exchanged.

3. ATFM FIXM Messages Identified

3.1. In order to achieve the above ops scenarios, five different messages were identified, namely (1) FIXM TTOT Allocation, (2) FIXM CTOT Allocation, (3) FIXM CTOT Cancellation, (4) FIXM CTO Allocation and (5) FIXM CTO Cancellation.

3.2. The FIXM TTOT, CTOT and CTO Allocation messages allow the system to exchange TTOT, CTOT or CTO values (respectively) when made available as well as providing the revision to them. Note that the revision to TTOT, CTOT, and CTO can be distributed using the "Allocation" messages by replacing the existing time values. Recipient systems should be able to differentiate between an initial allocation and a revision.

3.3. The FIXM CTOT and CTO Cancellation messages allow the system to remove the CTOT or CTO values usually sent after an ATFM program is cancelled.

S/N	Message	Details	Timeout	Comments	Message Exchange Pattern
1	FIXM TTOT Allocation	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	
2	FIXM CTOT Allocation	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	
3	FIXM CTOT Cancellation	Mandatory (after ATFM program is canceled)	N/A	After GDP is canceled, or the assigned CTOT no longer applies to the flight, this message has to be published.	
4	FIXM CTO Allocation	Mandatory (after ATFM program ran)	N/A	After the ATFM measure is run or revised, dependent on individual configuration condition	

				set on when to be sent out, this message has to be published.	
5	FIXM CTO Cancellation	Mandatory (after ATFM program is canceled)	N/A	After the ATFM measure is canceled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4. Mapping of ATFM FIXM Messages to APAC Common SWIM Information Service

4.1. Business functionality of the information service: **Flight-Specific ATFM Measure Service**

4.1.1. Scenario: Dissemination of CTOT Allocation by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.1.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTOT Allocation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Allocation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.2. Scenario: Dissemination of CTOT Cancellation by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.2.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTOT Cancellation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Cancellation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program is cancelled)	N/A	After GDP is cancelled, or the assigned CTOT no longer applies to the flight, this message has to be published.	

4.1.3. Scenario: **Dissemination of CTO Allocation** by Initiating ATFMU to Facilitating ATFMU and AU

4.1.3.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTO Allocation Message to Facilitating ATFMU and AU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Allocation to Facilitating ATFMU and AU	Mandatory (after ATFM measure ran)	N/A	After ATFM measure is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.4. Scenario: Dissemination of CTO Cancellation by Initiating ATFMU to Facilitating ATFMU and Facilitating ATFMU and AU

4.1.4.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTO Cancellation Message to Facilitating ATFMU and AU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Cancellation to Facilitating ATFMU and AU	Mandatory (after ATFM measure cancelled)	N/A	After ATFM measure is cancelled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4.2. Business functionality of the information service: **ATFM/A-CDM Integration Service**

4.2.1. Scenario: Dissemination of TTOT Allocation by departure eASP/ATFMU

4.2.1.1. Business Completion Criteria: Departure eASP/ATFMU disseminates FIXM TTOT Allocation to relevant eASPs/ATFMU. No business confirmation needed.

S/N	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Departure eASP/ATFMU sends FIXM TTOT Allocation to relevant eASPs/ATFMUs	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	

Guidance Material for Business Functionality of APAC Common SWIM Information Services

Developed by: SWIM Task Force (Task 6)

Purpose

- This Guidance Material has been developed to assist relevant APANPIRG Subsidiary Groups (e.g. MET/IE, SURICG, AAITF, FF-ICE Ad Hoc Group, ATFM SG) in specifying the relevant information associated with the high-level definition of planned APAC Common SWIM Information Services
  - Version 1 of the APAC Common SWIM Information Services has recently been published on the ICAO APAC eDocs site as per Decision APANPIRG/36/11:

    https://www.icao.int/sites/default/files/APAC/Documents/edocs/CNS/APAC-Common-SWIM-Information-Services.pdf
  - The purpose of list of APAC Common SWIM Information Services (including associated priorities) is to provide States/Administrations with **guidance on anticipated services** to **support their planning and implementation** of SWIM
    - Listed Information Services are expected to be at different levels of maturity, i.e. are not expected to be fully matured prior to being added to the list as an indicative roadmap for the Information Service
    - It is not intended to be overly prescriptive
      - This information will be captured in the Information Service Definitions (ISD)

Version Maintenance

- The latest published version of the Common APAC SWIM Information Services is available on the ICAO APAC eDocs site (CNS section)
- Between published versions, SWIM TF maintains an updated working version of Information Services to capture inputs from the APANPIRG Subsidiary Groups as they occur
  - APANPIRG Subsidiary Groups are recommended to regularly review/update the APAC Common SWIM Information Services document each time they meet, and to provide updates to SWIM TF as necessary to maintain the currency of the list relevant to their information domain (e.g. Aeronautical Information, Flight information, Meteorological information)
  - Between published versions, SWIM TF will update the working list at SWIM TF meetings based on inputs from Subsidiary Groups
    - The latest working version will be available following finalisation of each SWIM TF Report

Categories

- The Categories associated with the Business Functionality of APAC Common SWIM Information Services are:
  - Business Functionality of the information service
  - Brief description of the service
  - Type of information to be exchanged
  - Information exchange model / Message type
  - Message exchange pattern
  - Priority
- Guidance on each Category is provided in the following slides

Business functionality of the information service

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **What the Information Service is called**
  - **Wherever possible**, this should **align with Information Services that are being implemented globally,** defining APAC regional variations only where needed
    - e.g. FF-ICE filing service
  - It may be prudent (even advisable) to define **different information services** where the **same information** is provided in the payload, but which may serve a **different business need** (i.e. be utilised by different consumers of the information services at a different rate or have a different Quality of Service)
    - E.g. An information service providing surveillance data to support the provision of aircraft separation could be expected to be defined separately to an information service providing surveillance data to support ATFM purposes, as the business usage differs between the two information services

Brief description of the service (1)

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **Plain text description of the information service**
  - Includes **Intended usage** of the information service
    - Includes indication (where relevant) of the intended service consumers and/or associated business need
  - Includes **Identification of** (and link to) the **latest reference document** (where one exists)
    - Provides insight/clarity on how the intended information service is aligning with global or regional concepts/implementations
      - E.g. For FF-ICE filing service, **ICAO Doc 9965 (Manual on FF-ICE)**
      - E.g. for Surveillance data only sharing service, **Guidance Materials for the sharing of surveillance data in SWIM** developed by SURSG
    - As maturity increases over time, the document reference will change
      - **Goal** is to reference the relevant Information Service Description (ISD) once developed

Brief description of the service (2)

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **Plain text description of the information service**
  - The description of the information service should include proposed timeframe for implementation
    - Note: proposed implementation timing may be moved to a separate column in a future update of the table
  - The description of the information service should ***not*** include:
    - Proposed timeframe for implementation (this is proposed to be captured in a future update to the table)
    - Reference to the Information Exchange Model (e.g. FIXM)
    - Information to be exchanged (captured in the “information to be exchanged” column)

Type of information to be exchanged

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **The information that will be exchanged as part of the information service**
  - Describes the information in general terms only (rather than individual data elements)
    - E.g. Surveillance data with DAPs, Basic flight plan information (without trajectory), etc.
  - The ISD (once developed) will specify all mandatory and optional fields
    - Subsidiary groups may need to separately develop this additional granularity if the information service has not already been defined elsewhere
  - Timeframes for transitioning information types should not be included

Information exchange model / message type

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **The information exchange model (or message type) employed by the payload of the information service**
  - Identifies standard Exchange Models (FIXM, IWXXM, AIXM)
    - E.g. (FIXM, IWXXM, AIXM)
  - Where the content within the payload comes from another message type or data format, this can be identified
    - E.g. Surveillance data: JSON or RAW (derived from ASTERIX Cat 21)
  - Version / associated extensions of the Exchange Model is not required
  - If not yet known or confirmed, "TBD" is acceptable

Message exchange pattern (1)

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **The type of information that will be exchanged as part of the information service**
  - **At least one of**:
    - Request/Reply (**Req/Rep**), **including type if known** (see additional information on following slides)
      - Synchronous Request/Reply (**Sync R/R**)
      - Asynchronous Request/Reply (**Async R/R**)
    - Fire and Forget (**One-way**)
    - Publish/Subscribe (**Pub/Sub**)
  - If multiple MEPs are possible, identify which are mandatory or optional
    - E.g. Pub/Sub and Sync R/R
    - E.g. Req/Rep (mand), Req/Rep (opt), etc.
  - **“TBD” to be used where MEP is not yet known**

Fire and Forget vs. Publish / Subscribe

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

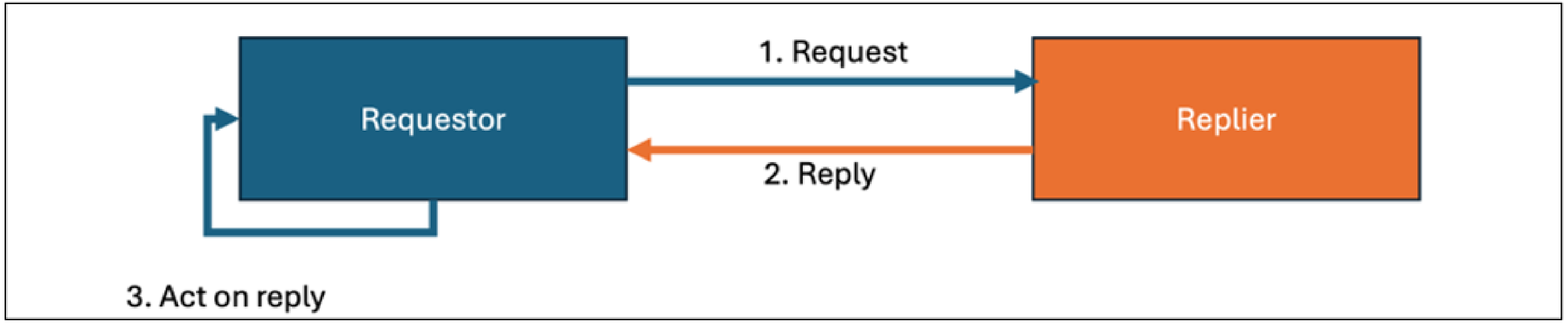
From the ICAO Manual on the SWIM Implementation (Doc 10203):

- For the **One-way ("Fire and Forget") MEP**, *the consumer initiates a message to an information service without expecting any response from the information service. This MEP is particularly useful at the lower application layer, where immediate message responses are not required;*
- For the **Publish/Subscribe MEP**, *the consumer initiates a subscription request to an information service. The subscription may be capable of providing details (such as through a filtering parameter) on the information being subscribed*
- The P/S MEP can be either a 'push' or a 'pull' mechanism:
  - For the 'push' mechanism, this requires that the consumer can receive messages at any time, and is not restricted from completing other operations while waiting for the Information Service to respond
  - For the 'pull' mechanism, this requires the Information Service to keep necessary updates available to the consumer, and that the consumer sends requests to the information service to receive the updates

Synchronous Request-Reply

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

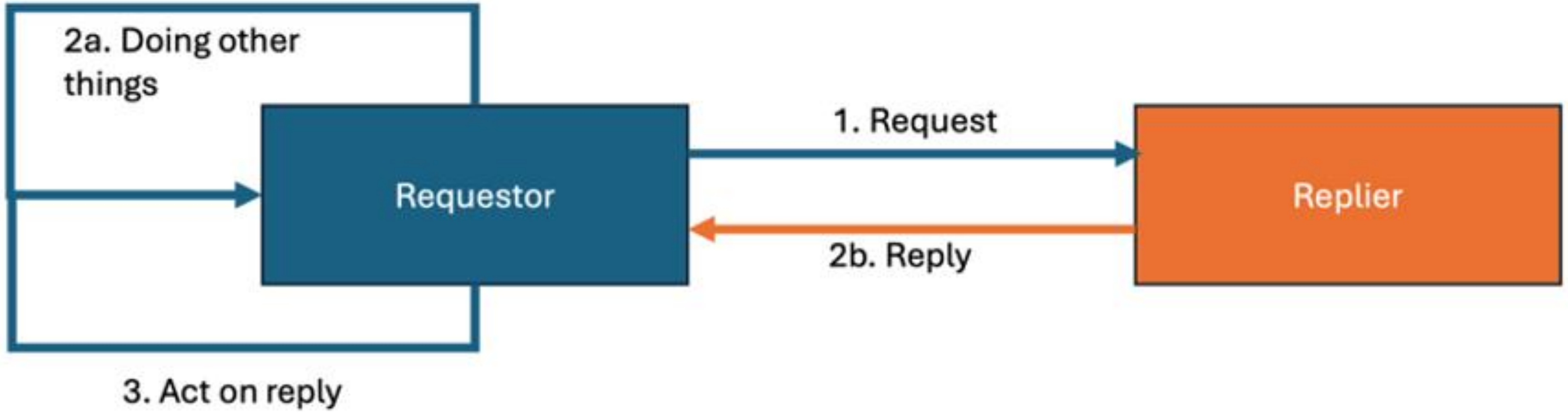
In Doc. 10203, **synchronous** R/R MEP is defined as – *The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer requests*



Asynchronous Request-Reply

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

In Doc. 10203, **asynchronous** R/R MEP is defined as – *The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests*



Synchronous vs. Asynchronous Request-Reply

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

Index	Synchronous	Asynchronous
Time Coupling	Both requester and replier are available at the same time.	Requester sends a request and continues its process; replier can send the response later when available.
Space Coupling	Requester needs to know the exact service endpoint (protocol, address, API).	Requester sends to a known endpoint, but response may arrive via callback, polling, or correlation ID; looser coupling in response handling.
Reliability Handling	Retries and error handling happen at requestor side.	Retries and correlation of delayed responses must be managed at the requester side (e.g., matching reply with original request).
Use Cases	• Low latency expected • Both parties are available • Immediate response interaction	• Replier may not be immediate • Deferred or background processing acceptable
Typical Scenarios	• User Authentication • User Interface Interactions • Database Read and Immediate Write	• Order processing with delayed confirmation • Flight plan filing with later validation • Weather data request with queued response • Batch data processing

– Additional guidance can be found in “**Draft Guidance Material REQ REP MEP in Asia**” provided as an attachment to this presentation (**Attachment A2**)

– If in doubt:
  - Specify Req/Rep only
  - Leave as TBD

Priority (1) / (2) / (3)

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)

- **Either 1, 2 or 3 as determined by:**
  - Priority (1): Recommended for region-wide implementation for region-wide benefits
  - Priority (2): Recommended for implementation as much as practicable
  - Priority (3): Additional information services without common regional requirements and not included as a part of common regional information services

- *Note: It has been proposed to separate applicability (region-wide vs. as needed by a subset of States) and desired timeframe into separate columns, however any change to table columns will be formally communicated to Subsidiary Groups separately*

Example update

Note: this is not an actual update, it has been provided to indicate *potential* updates to FF-ICE Common APAC SWIM Information Services content that would align with this Guidance Material

Example – FF-ICE Information Services - Current

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)
APAC Common SWIM Flight Information Services					
GUFI service	GUFI (Globally Unique Flight Identifier) generation and provision	GUFI	FIXM	Req/Reply	1
FF-ICE filing service	Provides a means to submit, update or cancel flight plans through a SWIM-based interface using FIXM.	Flight plan for registration, update or cancellation	FIXM	Req/Reply Pub/Sub	1
FF-ICE publication service	Provides harmonised sharing of flight plan information in a global standard supporting common situation awareness.	Flight information for publication	FIXM	Pub/Sub	2
FF-ICE trial service	Allows operators to test the effect of a potential change in a flight plan prior to committing to the change.	Proposed changes in a flight plan	FIXM	Req/Reply	2
FF-ICE flight data request service	Allows an operator to request the current status of a flight plan, or an ANSP can request an operator to submit the latest version of their flight plan.	Current status of a flight plan, a copy of flight plan or supplementary plan	FIXM	Req/Reply	1
FF-ICE notification service	Provides notification of a change in flight state, such as Departure (DEP) and Arrival (ARR) Air Traffic Service (ATS) messages.	ARR, DEP messages	FIXM	Req/Reply Pub/Sub	1
FF-ICE planning service	Allows operators to submit preliminary flight plans for early Air Traffic Flow Management (ATFM) planning and to obtain feedback regarding restrictions/constraints affecting the flight.	Preliminary flight plan for early ATFM planning	FIXM	Req/Reply Pub/Sub	2

Example – FF-ICE Information Services – *Potential* updates

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority (1) / (2) / (3)
FF-ICE filing service	Provides a means for Airspace Users to submit, update or cancel flight plans ~~through a SWIM-based interface using FIXM.~~ Reference: ICAO Doc 9965 (Manual on FF-ICE) Target Implementation timeframe 2034	Full ~~F~~flight plan with trajectory~~for registration, update or cancellation~~	FIXM	~~Req/Reply~~ Async R/R and Pub/Sub	1
FF-ICE publication service	Provides ~~harmonised sharing of~~ flight plan information in a ~~global~~ standard format supporting common situation awareness. Reference: ICAO Doc 9965 (Manual on FF-ICE)	~~Flight information for publication~~Full Flight Plan with trajectory (latest agreed)	FIXM	Pub/Sub	2
FF-ICE trial service	Allows operators to test the effect of a potential change in a flight plan prior to committing to the change. Reference: ICAO Doc 9965 (Manual on FF-ICE)	Proposed changes in a flight plan	FIXM	~~Req/Reply~~ Sync R/R and Async R/R	2
FF-ICE flight data request service	Allows an operator to request the current status of a flight plan, or an ANSP can request an operator to submit the latest version of their flight plan. Reference: ICAO Doc 9965 (Manual on FF-ICE) Target Implementation timeframe 2034	Current status of a flight plan, ~~or~~a copy of full flight plan, or supplementary plan	FIXM	~~Req/Reply~~ Sync R/R and Async R/R	1
FF-ICE notification service	Provides notification of a change in flight state, such as Departure (DEP) and Arrival (ARR) Air Traffic Service (ATS) messages. Reference: ICAO Doc 9965 (Manual on FF-ICE)	~~ARR, DEP messages~~Movement information (e.g. ARR, DEP)	FIXM	~~Req/Reply~~ Pub/Sub and Sync R/R and Async R/R	1
FF-ICE planning service	Allows operators to submit preliminary flight plans for early Air Traffic Flow Management (ATFM) planning and to obtain feedback regarding restrictions/constraints affecting the flight. Reference: ICAO Doc 9965 (Manual on FF-ICE)	Preliminary full flight plan with trajectory ~~for early ATFM planning~~	FIXM	~~Req/Reply~~ Async R/R and Pub/Sub	2

Suggested Improvements?

- **SWIM TF is open to improving usability/clarity of information within the table of APAC Common SWIM Information Services prior to publishing the next version**
- **For the next version, SWIM TF is already considering a proposal:**
  - To replace "Priority" column with:
    - Applicability: region-wide (to achieve anticipated benefits) vs. as needed (to meet local needs), and
    - Desired implementation timeframe (e.g. immediate (before 2030), medium (2030-2035), longer term)
- **SWIM TF invites Subsidiary Groups to provide suggestions ahead of SWIM TF/11 in May 2026 for consideration for incorporation into the next version**
  - SWIM TF thanks you in advance for any suggestions

Suggested Improvements – FF-ICE/4

- **FF-ICE/4 (16-18 March 2026) has additionally recommended the following:**
  1. **Subsidiary Groups should focus on defining business rules and business process completion criteria for Information Services. FF-ICE/4 recommended SWIM TF should undertake the determination of the appropriate Message Exchange Patterns (MEPs) for each business process, as SWIM TF possesses the relevant technical expertise**
  2. **FF-ICE/4 noted that comprehensive operational scenarios, including operational requirements and business process completion criteria, are essential. Accordingly, such scenarios, where required, should be provided as an appendix to the Business Functionality of APAC Common SWIM Information Services document. A reference to the appendix should also be included in the 'Brief description of the service' column, as illustrated below:**

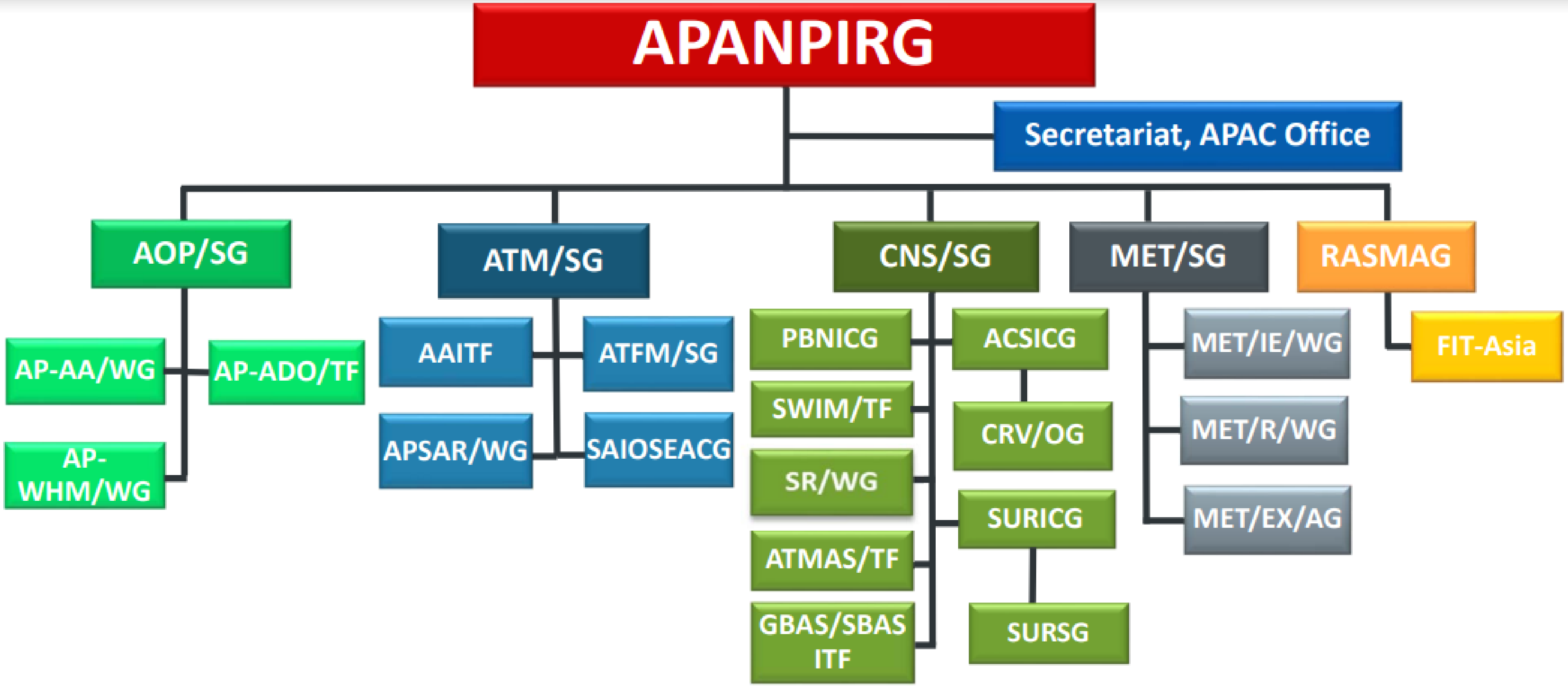
Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Priority of ~~Recommended sService in iInitial APAC Common SWIM IS~~ (1) / (2) / (3)
FF-ICE filing service	Provides a means to submit, update or cancel flight plans through a SWIM-based interface using FIXM. Appendix A: Filing Scenario	Flight plan for registration, update or cancellation	FIXM	Appendix A	1

SWIM TF to fill in

Appendix A: Filing Scenario

	Message	Details	Timeout	Comments	Message Exchange Pattern
1	eAU send eFPL (FFP) to eASP	Mandatory	N/A	-	
2	eASP returns Submission Response (SR) #1 to eAU	Mandatory (after eFPL received)	1 minute	eASPs validate message format and basic rules. SR ACK: Validation passed SR REJ: Validation failed SR MAN: Manual Processing needed	
3	eASP returns Submission Response (SR) #2 to eAU	Conditional (only if SR#1 = MAN)	Variable (manual processing time)	Any subsequent SR is provided after manual intervention of eFPL (after SR MAN)	

Reference



AOP/SG	-	Aerodrome Operations and Planning Sub Group
AP-AA/WG	-	APAC Aerodrome Assistance Working Group
AP-ADO/TF	-	APAC Aerodrome Design and Operations Task Force
AP-WHM/WG	-	APAC Wildlife Hazard Management Working Group

ATM/SG	-	ATM Sub Group
AAITF	-	AIS - AIM Implementation Task Force
APSAR/WG	-	APAC Search and Rescue Working Group
ATFM/SG	-	ATFM Steering Group
SAIOSEACG	-	South Asia Indian Ocean and South East Asia ATM Coordination Group

CNS/SG	-	CNS Sub Group
PBNICG	-	PBN Implementation Coordination Group
SWIM/TF	-	System-Wide Information Management Task Force
SR/WG	-	Spectrum Review Working Group
ATMAS/TF	-	ATM Automation System Task Force
GBAS/SBAS ITF	-	GBAS/SBAS Implementation Task Force
ACSICG	-	Aeronautical Communication Services Implementation Coordination Group
• CRV/OG	-	Common Regional Virtual Private Network (VPN) Operations Group
SURICG	-	Surveillance Implementation Coordination Group
• SURSG	-	Surveillance Study Group

MET/SG	-	Meteorology Sub Group
MET/IE/WG	-	Meteorological Information Exchange Working Group
MET/R/WG	-	Meteorological Requirements Working Group
MET/EX/AG	-	Meteorological Exercises Advisory Group

RASMAG	-	Regional Airspace Safety Monitoring Advisory Group
• FIT-ASIA	-	FANS Interoperability Team-Asia

Guidance Materials for Request and Reply Message Exchange Pattern in Asia/Pacific SWIM

May 2026

SWIM Implementation Pioneer Ad-hoc Group (SIPG)

Table of Contents

1. Introduction

1.1. Background

1.1.1. SWIM Implementation Pioneer Ad-hoc Group (SIPG)

The establishment of SIPG was decided at the SWIM TF/7 in 2023, and its Terms of Reference (TOR) was endorsed by the SWIM TF/? under the **“”**. Following SIPG’s TOR, the initial objective of the SIPG was to implement a seed/prototype version of the Asia/Pacific SWIM within 2024 as a means of kickstarting SWIM adoption in the region. Based on the initial objectives SIPG, SIPG built protype version of Asia/Pacific SWIM and supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial in Hong Kong, China, from 28 to 29 May 2024

After the supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial, there were still needs for an expert group that can provide technical work for SWIM implementation in the Asia/Pacific region, and the SIPG continues its work in response to the need. In line with this, the SIPG defined sub-tasks to further materialize the implementation of SWIM in the Asia/Pacific region, and the sub-tasks, which are currently identified and in progress by the end of Dec 2026, as of Sep. 2025, are as below:

- Task 1: Requirements and Functionalities of the Edge EMS and Gateway EMS
- Task 2: New proposed hierarchical architecture review
- **Task 3: Guidance for the Sync Req/Rep and Async Req/Rep Message Exchange Pattern**
- Task 4:
- Task 5 : SWIM Technical Infrastructure Integration
- Task 6: SWIM Security Requirements and Implementation
- Task 7: SWIM Registry Requirements and Implementation
- Task 8:
- Task 9: APAC SWIM Integration Testing
- Task 10: Performance Testing SWIM TI
- Task 11: Regional SWIM TI Operationalization Guidance Material

1.1.2. Limitation of the Previous SWIM Efforts in the Asia/Pacific Region

There have been various efforts for the implementation of SWIM in the Asia/Pacific region. These efforts are not only about the establishment of regional implementation guidance or standardization, but also implementation of regional SWIM prototype, and demonstrations. However, regarding the demonstration and technical efforts for message delivery, these efforts were mostly depended on an Enterprise Messaging System (EMS) using Publish and Subscribe (Pub/Sub) Message Exchange Pattern (MEP), as mentioned in “APPROACH TO GLOBAL API GATEWAY FOR WEB SERVICE (SWIM TF/10 – WP/18)”.

A MEP refers to the fundamental interaction mechanism that defines how messages are exchanged between heterogeneous systems. There are a few mechanisms to enable MEP such as Pub/Sub, Request and Reply (R/R), and Fire and Forget. And, ICAO SWIM Implementation document (Doc. 10203) identified this mechanism for MEP in the SWIM. However, given the current emphasis on the regional SWIM prototype architecture using an EMS which the SIPG is developing in the APAC region, the primary issue is to discuss how the Request/Reply MEP should be implemented.

1.2.Guidance Materials

Guidance materials (i.e. this document) is one of the deliverables of Task 3 under SIPG. Republic of Korea, Australia, China, Hong Kong China, India, Japan, Fiji, Singapore, Thailand, Malaysia, USA, New Zealand. CANSO have volunteered and contributed to producing this document.

1.3. Purpose of the Document

This document provides guidance for R/R MEP in the Asia/Pacific region, and it covers business and technical aspect of R/R MEP including FF-ICE/R1 based a data flow and use-case diagram, with the purpose of ensuring continuous and coherent implementation of the R/R MEP to SWIM platform in harmonized and interoperable within the region.

2. Operational Concept

This chapter introduces the operational concept of the R/R MEP. It describes the definition of the R/R MEP, identifies the core components of the R/R MEP, including participants, synchronization mechanisms, and supporting elements.

2.1. Definition of R/R MEP

The R/R MEP is a communication model where a requester sends a request message to a replier, which then processes the message and returns a reply.

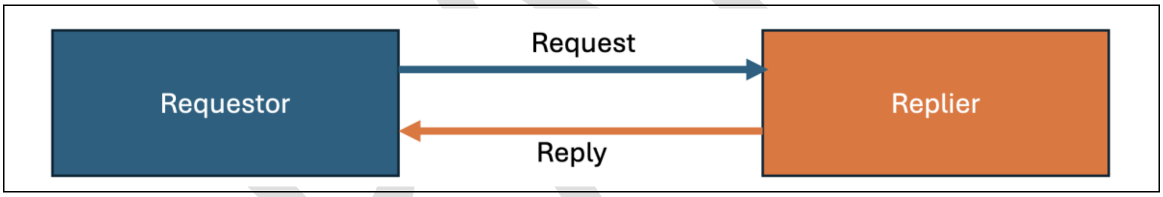


Figure X. Diagram

2.2. Components of R/R MEP

The components of R/R MEP could be distinguished as follows:

Core Participants

- **Requester:** The requester asks for something via a request; it could be simply considered as Create, Read, Update, Delete (CRUD) operation
- **Replier:** The replier processes the request and return a message in reply

Synchronization Mechanisms

- **Synchronous:** The requestor waits for the response before continuing its operation
- **Asynchronous:** The requestor's control flow is released after the request is sent, and the response is handled later, perhaps via a callback or another mechanism.

Supporting Elements

- **Payload:** it defines the actual contents of the message being exchanged. This could be Extensible Markup Language (XML), JavaScript Object Notation (JSON)
- **Transportation and Protocol Binding:** it defines how the R/R is implemented. This could be Hyper Text Transfer Protocol/Representational State Transfer (HTTP/REST), Simple

Object Access Protocol (SOAP), Advanced Messaging Queue Protocol (AMQP), Message Queuing Telemetry Transport (MQTT)

- **Error and Exception Handling:** it provides mechanism to manage any other errors or exceptions such as failures, timeouts, and invalid requests
- **Security and Policy Enforcement**: it provides authentication, authorization, encryption, compression, logging mechanism

3. R/R MEP in SWIM

This chapter provides the conceptual framework of R/R MEP within the SWIM environment. It identifies the role of R/R MEP at the global level, and in the Asia/Pacific region, explains how the R/R MEP operates under different synchronization mechanisms, Furthermore, it provides comparison between synchronous and asynchronous R/R MEP, points out possible confusion part and clarifies them.

3.1.R/R MEP in the Global Level

ICAO SWIM Implementation Document (Doc. 10203) defined MEP including synchronous and asynchronous R/R as follows:

5.3.2.4.2 ***Message exchange patterns***

5.3.2.4.2.1 Several types of message exchange patterns (MEPs) are expected to be supported within a SWIM environment, including synchronous request/reply, asynchronous request/reply, one-way ("fire-and-forget") and publish/subscribe. The MEP used in any given exchange is directed by the information service provider to meet information service objectives. These MEPs include:

a) **Synchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer requests;

b) **Asynchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests;

c) **One-way ("fire-and-forget"):** The consumer initiates a message to an information service without expecting any response from the information service. This MEP is particularly useful at the lower application layer, where immediate message responses are not required;

d) **Publish/subscribe (P/S):** The consumer initiates a subscription request to an information service. The subscription may be capable of providing details (such as through a filtering parameter) on the information being subscribed to:

1) in the case of a P/S with a push mechanism, the information service sends necessary updates (publish) to the consumer, in accordance with the subscription. This MEP requires that the consumer can receive messages at any time. However, the consumer is not restricted from completing other operations while waiting for the information service to respond; and

2) in the case of a P/S with a pull mechanism, the information service would keep necessary updates available to the consumer, in accordance with the subscription. This MEP requires that the consumer send requests to the information service to receive the updates.

Figure X. Diagram

3.2. R/R MEP in the Asia/Pacific Region

ICAO APAC SWIM Implementation Guidance Document (IGD, Working Draft) defines MEP including R/R as follows:

3.3.2 Standards for Resource-oriented Interface

3.3.2.1 RESTful API

The following table makes reference to RESTful API related standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3 Standards for Method-oriented Interface

3.3.3.1 OGC WCS

The Open Geospatial Consortium (OGC) has developed a number of Web Common Service (WCS) standards that define services for accessing and manipulating geospatial data in a web environment, such as aeronautical information and meteorologic information. The following table makes reference to some of the key WCS standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3.2 SOAP

As most users have not applied SOAP to current web applications, this standard is not recommended for the development of SWIM services. The following table makes reference to SOAP related standards and specifications required for supporting the service bindings of SOAP applications.

4.1 Functional Capabilities

The SWIM TI functional capabilities described in this section are common features widely supported by mainstream Commercial Off The Shelf (COTS) systems and services. Implementing a SWIM TI that supports all these capabilities is recommended. The SWIM TI functional capabilities can be grouped into three categories as follows:

Table 8. SWIM TI Functional Capabilities

Capability	Description	Related Technology
Messaging	This capability employs technologies that enable information exchange using various access methods (e.g., publish/subscribe, request/reply).	- Message brokers: such as Apache Kafka, RabbitMQ, ActiveMQ.

Figure X. Diagram

Note: This section is intended for the business experts group of the ICAO APAC region to explain why this document does not select SOAP as one of the candidate technologies to be explored, despite the fact that Eurocontrol's SWIM implementation uses SOAP for R/R MEP.

4. Mechanism

This chapter outlines the mechanism of the R/R MEP. It explains the difference between synchronous and asynchronous interactions, compares their characteristics, and highlights common points of confusion. It also clarifies how R/R MEP should be understood from a business perspective to support consistent implementation in the Asia/Pacific SWIM environment.

4.1.Synchronous R/R MEP

In ICAO SWIM Implementation Document, synchronous R/R MEP is defined as – *The consumer initiates a request to an information service; the service processes the request and generate a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer request*

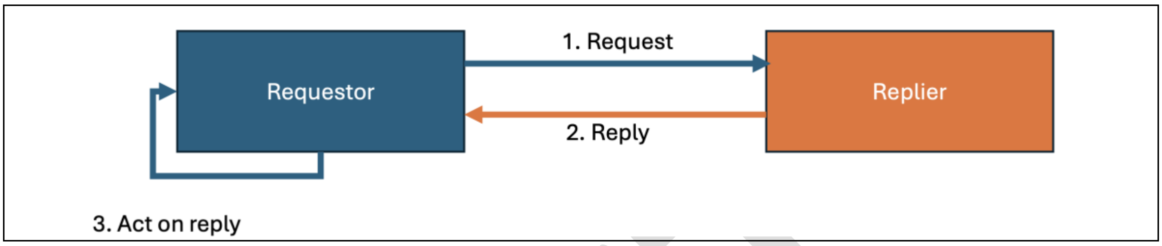


Figure X. Diagram

4.2.Asynchronous R/R MEP

In ICAO SWIM Implementation Document, synchronous R/R MEP is defined as – *The consumer. initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests*

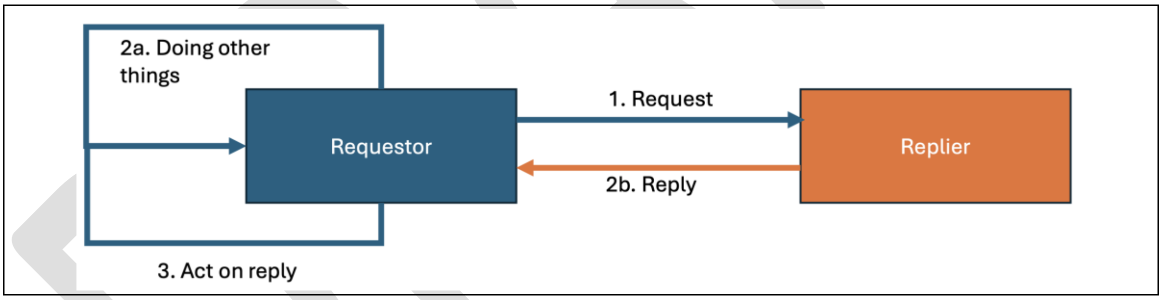


Figure X. Diagram

4.3. Comparison of Synchronous and Asynchronous R/R MEP

Comparison of synchronous and asynchronous R/R MEP is as follows:

Index	Synchronous	Asynchronous
Time Coupling	Both requester and replier are available at the same time.	Requester sends a request and continues its process; replier can send the response later when available.
Space Coupling	Requester needs to know the exact service endpoint (protocol, address, API).	Requester sends to a known endpoint, but response may arrive via callback, polling, or correlation ID; looser coupling in response handling.
Reliability Handling	Retries and error handling happen at requestor side.	Retries and correlation of delayed responses must be managed at the

		requester side (e.g., matching reply with original request).
Use Cases	• Low latency expected • Both parties are available • Immediate response interaction	• Replier may not be immediate • Deferred or background processing acceptable
Typical Scenarios	• User Authentication • User Interface Interactions • Database Read and Immediate Write	• Order processing with delayed confirmation • Flight plan filing with later validation • Weather data request with queued response • Batch data processing

Table X. Table

4.4. Confusion between Synchronous and Asynchronous R/R MEP

In real-world implementations, confusion often arises when distinguishing between synchronous and asynchronous Request/Reply (R/R) patterns, especially in cases where a service returns an immediate acknowledgment (e.g., Status code without payload) but the actual business result (e.g., Payload) is provided later.

This confusion was raised at the SWIM TF/10 – Approach to Global API Gateway for SWIM Web Services (WP/01) and SIPG WS/2 - *Request-Reply Message Exchange Pattern (SP/09).*

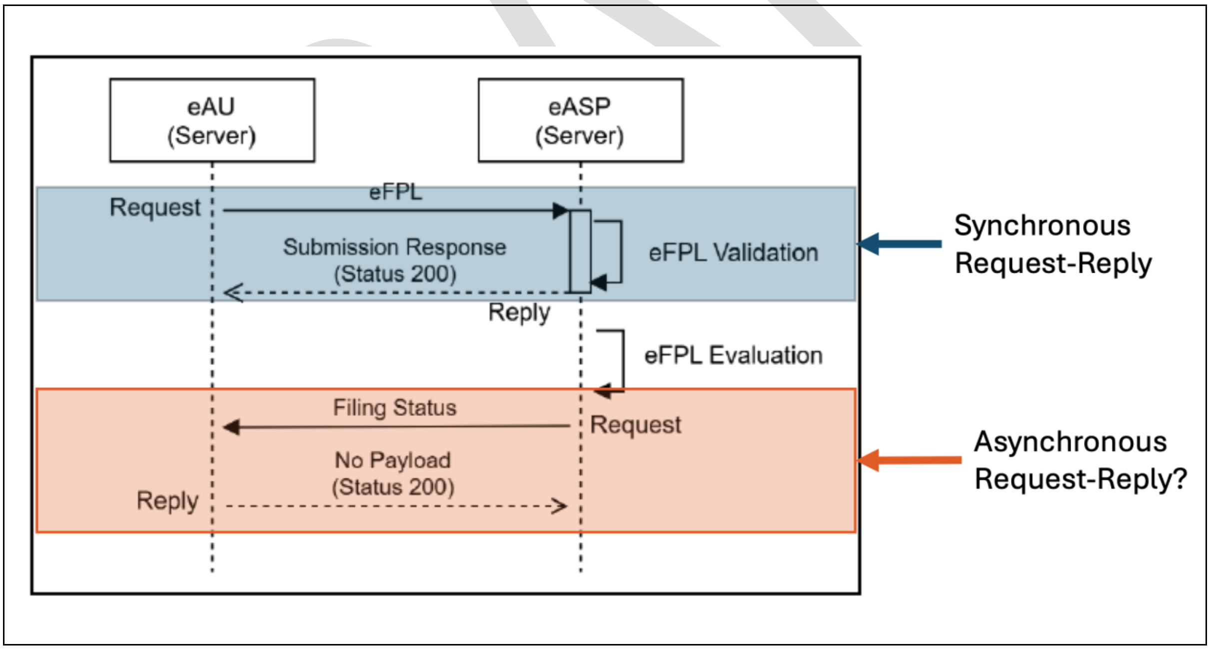


Diagram X. Diagram

From a **technical perspective**, when a requester sends a message and immediately receives a system-level response (e.g., status code with no payload), this exchange may be classified as **synchronous**. The requester technically obtains a reply within the same transaction, even if that reply does not contain the final outcome of the request.

From a **business perspective**, however, the true result of the request (e.g., validation outcome, processing status, or evaluation result) is delivered at a later stage. The requester must therefore rely on additional asynchronous mechanisms—such as callbacks, notifications, or correlation with a subsequent message—to complete the intended business process. In such cases, the service behavior is effectively **asynchronous**, because the requester cannot proceed with its operational workflow until the deferred reply is received.

This duality highlights that:

- At the **technical-level**, an immediate acknowledgment can be interpreted as synchronous.
- At the **business-level**, the process may still be asynchronous if the final response is decoupled from the initial request.

To make it clear and reduce the nuisance triggered by the confusion mentioned above, when designing or documenting R/R MEP in SWIM, it is important to clearly differentiate between **technical-level of synchronization** and **business-level of synchronization**, to avoid misinterpretation and ensure consistent implementation across different systems and stakeholders.

4.5. Clarification of Synchronous and Asynchronous R/R MEP

To resolve the confusion described in the previous section, it is necessary to establish a clear basis for distinguishing between synchronous and asynchronous R/R MEP.

From a **technical perspective**, any immediate acknowledgment could be appeared as a synchronous, since the requester receives a response without delay. However, this does not always reflect the completion of the underlying business process.

Therefore, for the purpose of SWIM implementation in the Asia/Pacific region, the classification of R/R MEP shall be **defined from the business perspective**:

- If the requester can complete its intended **business operation** immediately upon receiving the reply, the interaction is considered **Synchronous R/R**.
- If the requester must wait for an additional message or deferred processing result in order to complete its **business operation**, the interaction is considered **Asynchronous R/R**.

Classification	Case/Description	Technology
Synchronous Response	**ACK + Final Result Payload** *Returns an acknowledgment together with the final result (payload).* *No further response is expected.)*	**HTTP-based Synchronous R/R** *HTTP 200 OK + payload result*
Asynchronous Response	**ACK + Partial / Meta Payload** *Returns an acknowledgment along with some meta information or partial result (payload).* *The result will be delivered later through the same or a different channel.*	**- HTTP-based Asynchronous R/R** *HTTP 200 Accepted → HTTP later callback* **- AMQP-based Asynchronous R/R** *AMQP ACK (Accepted) → asynchronous reply via reply-to queue with matching correlation-id* **- Hybrid Asynchronous R/R** *HTTP 202 Accepted → final result via MQ (reply queue)*
	ACK Only Simply acknowledges that the request has been accepted The actual result will be sent asynchronously via a designated reply mechanism (e.g., callback endpoint, reply queue, topic, or event).	

By adopting this **business-oriented definition**, system designers and stakeholders can avoid misinterpretation caused by protocol-level acknowledgments and instead align the classification of R/R MEP with operational reality. This ensures that the design of SWIM services, including error handling, correlation mechanisms, and user expectations, is consistent with the actual business workflows they are intended to support.

Table X provides examples that bridge the business and technical perspectives of **asynchronous** R/R MEP. It highlights that a transaction may appear synchronous at the protocol level, yet still behave asynchronously from a business process standpoint.

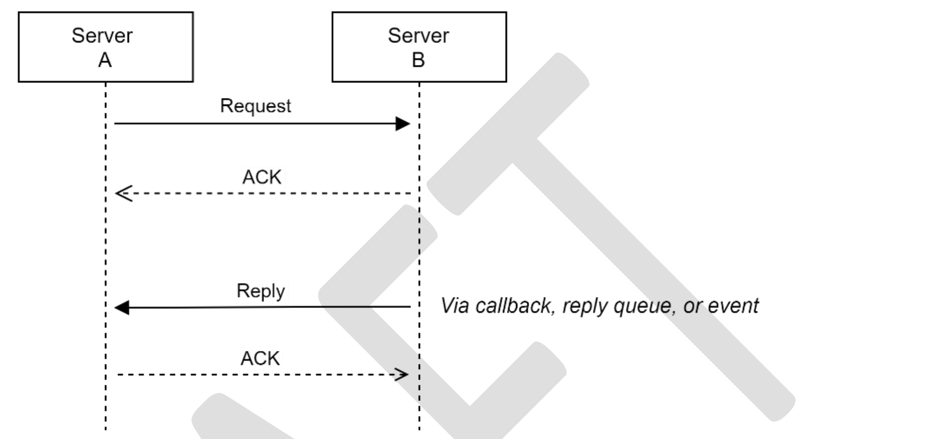
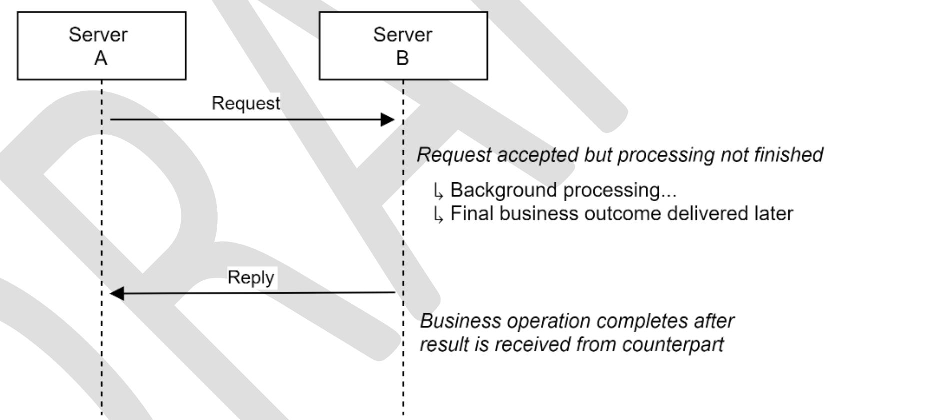
Asynchronous R/R in technical aspect	
Asynchronous R/R in business aspect	

Table X. Table

5. Implementation

This chapter explains practical methods that could be adopted to implement the R/R MEP in the SWIM environment. It describes technical options for both synchronous and asynchronous interactions, evaluates their suitability for Asia/Pacific SWIM, and provides regional approach.

5.1. Implementation of Synchronous R/R MEP

Synchronous R/R interactions can be effectively implemented using lightweight, stateless web service technologies as follows:

a. REST API (HTTP/HTTPS)
- A requester sends an HTTP request (e.g., GET, POST, or DELETE) and waits for an immediate reply from counterpart
- The response includes both status code (e.g., HTTP status code 200 - OK, HTTP status code 400 - Bad Request) and, a payload (e.g., JSON, XML)
- RESTfAPI represents the de-facto for synchronous R/R interactions in the ICT industry
- This approach aligns with the APAC SWIM regional strategy, as REST is widely supported, interoperable, and well-suited for cross-domain information exchange

b. SOAP (HTTP/HTTPS)
- SOAP provides a rigid XML-based messaging protocol and was historically used for enterprise-level synchronous R/R.
- However, as stated in previous chapters, although SOAP also could be enabled using HTTP/HTTPS, unlike REST, SOAP is not recommended to use due to its complexity, high overhead, and limited scalability due to its constraints as follows:
  - Only XML is supported, other data format like JSON is not supported
  - Requires WSDL (Web Services Description Language) for service definitions, which adds complexity at the initial setting;
  - SOAP's components such as envelop have an overhead, but a bandwidth of CRV is one of the major issues in the Asia/Pacific region;

c. Other Protocol Bindings
- While synchronous R/R can also be implemented over other protocols (e.g., gRPC, GraphQL, even AMQP), these remain optional and are not stated at the IGD at the regional level.

5.2.Implementation of Asynchronous R/R MEP

Asynchronous R/R interaction is not directly related to whether processing can be completed instantly or not, or whether replies must be deferred. Implementation options could be as follows:

a. REST API (HTTP/HTTPS) with Asynchronous Callback
- A requester sends an HTTP request and receives an immediate acknowledgment (status code).
- The actual business result is delivered later via an HTTP callback endpoint provided by the requester. This solution (a) is the callback mechanism that is limited to HTTP/HTTPS-based endpoints;
- This requires correlation mechanisms to match replies with original requests.

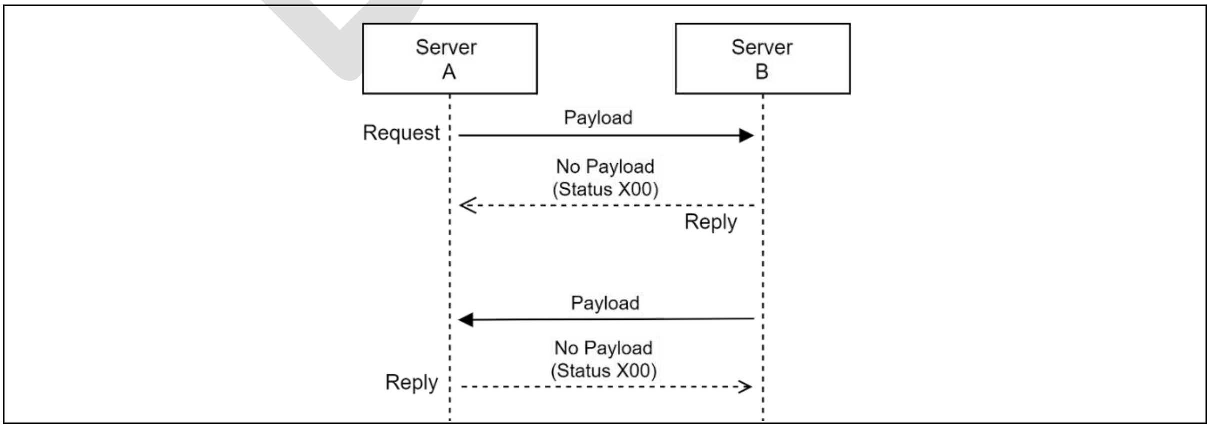


Diagram X. Diagram

b. REST API (HTTP/HTTPS) with Polling
- The requester periodically polls the service to check the status of its request.
- While simple, polling may cause inefficiencies in bandwidth usage and should be applied only for services with low response frequency.

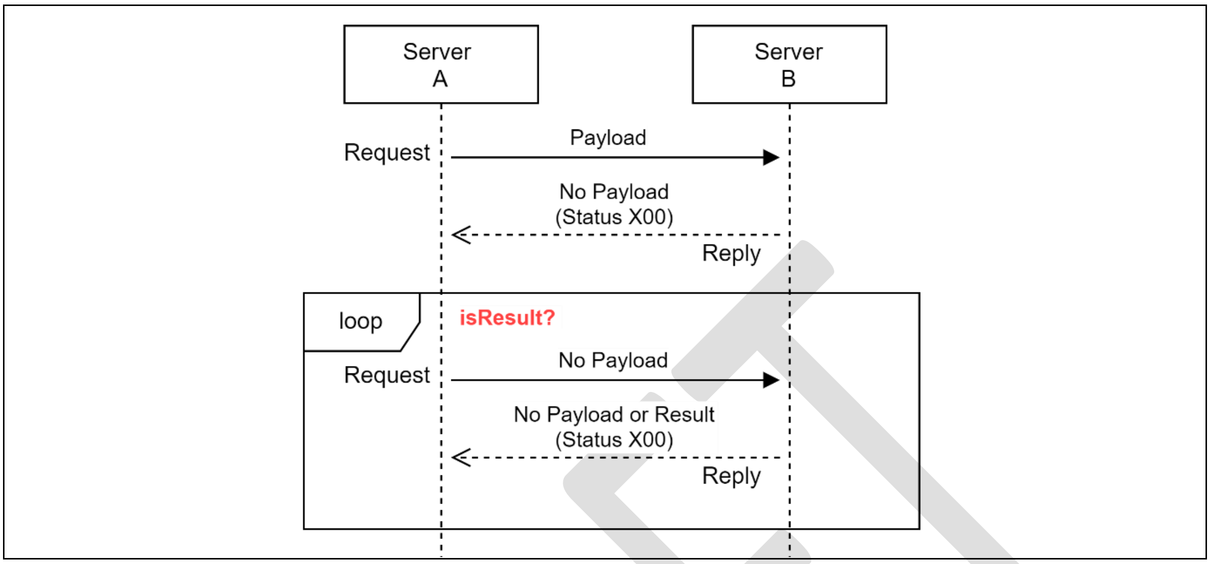


Diagram X. Diagram

c. Message Queue
- AMQP or MQTT can be used to implement asynchronous R/R interactions in distributed environments.
- AMQP properties (e.g., correlation-id, reply-to) must be configured to send request a query, and the message broker uses or creates shared or exclusive queue to handle the R/R MEP.
- Counterpart processes a request query, generates a corresponding reply using the same correlation-id, and returns it to the queue or topic specified in the reply-to property.

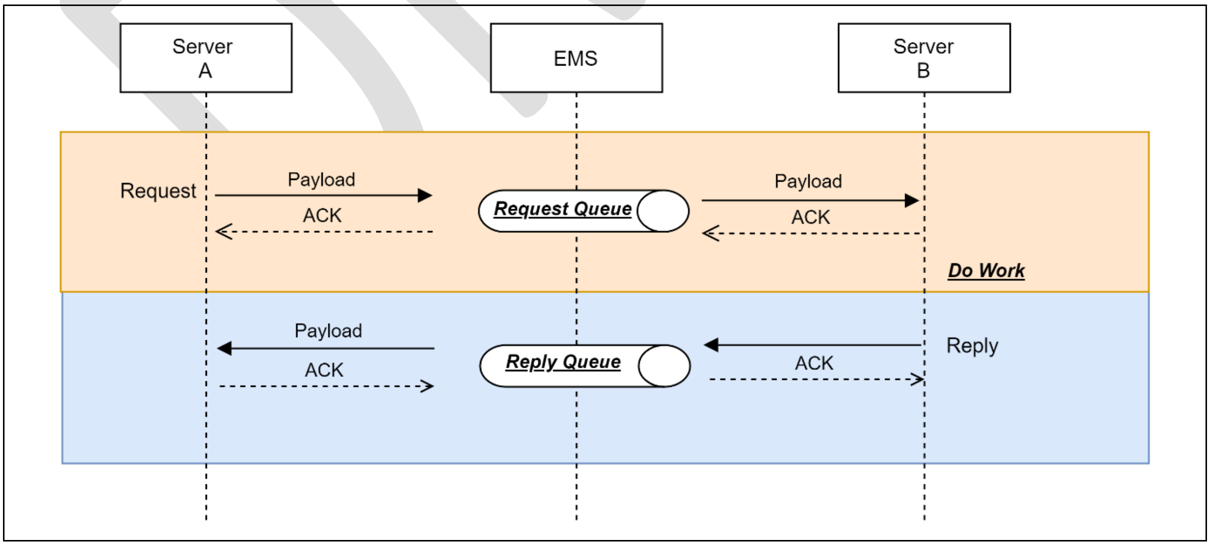


Diagram X. Diagram

d. REST API–Message Queue Bridge

- Most modern message brokers provide a REST API interface. A gateway service, either built into the broker or deployed as a standalone component, performs protocol conversion between AMQP and HTTP.
- This provides a REST API interface externally while using asynchronous message queue–based message delivery internally. Internal message delivery is the same as described in the (c)

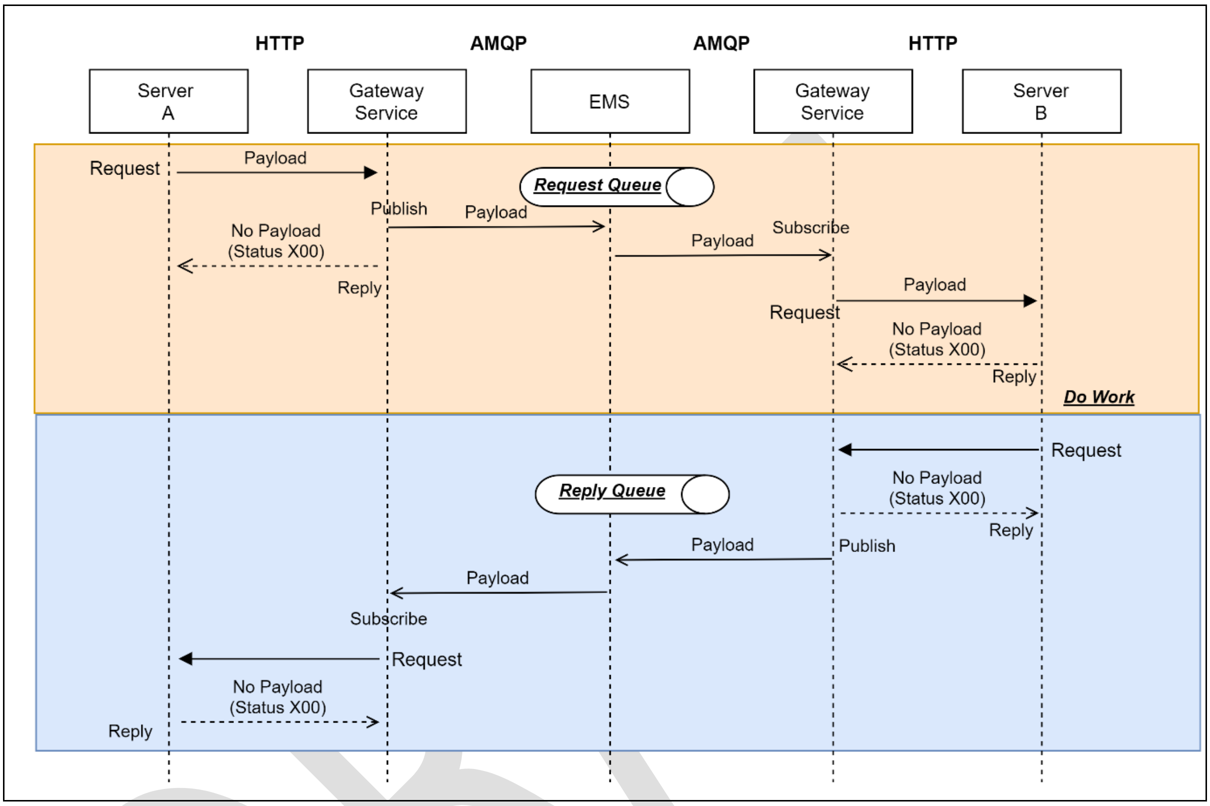


Diagram X. Diagram

a. Synchronous REST with Asynchronous Event Delivery using Message Queue

- This pattern is asynchronous R/R MEP implementation of Network Manager (NM), Eurocontrol. The pattern is composed of two parts:
  - Synchronous part: The server sends HTTP request, and the counterpart returns reply. If the status of the information reply is OK, the server extracts the information on how to consume the asynchronous reply message, the pattern continues with the asynchronous part
  - Asynchronous part: The server connects to the broker and consumes the asynchronous reply message
- This pattern allows integration of REST API with asynchronous processing workflows using message queue

Click link to see more about asynchronous R/R MEP of NM, Eurocontrol - [NM Release Notes]

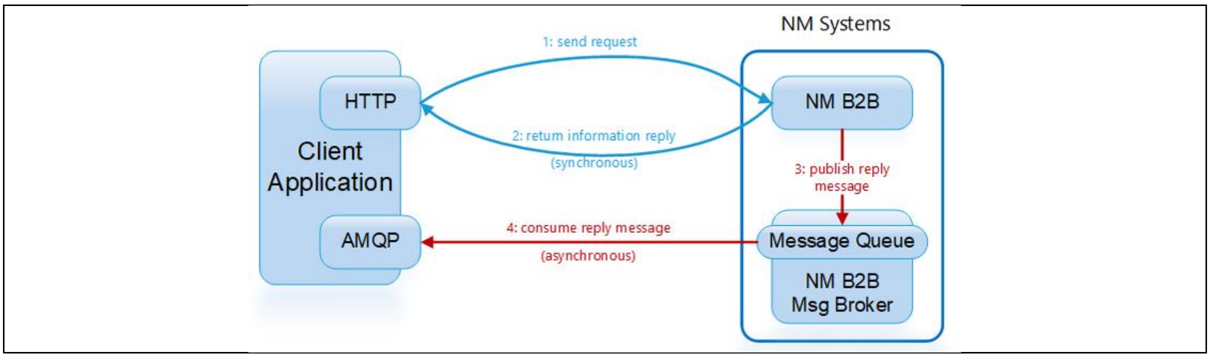


Diagram X. Eurocontrol Network Manager 26.0 Release Note ed.5

5.3.Approach on Implementation of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following implementation approaches could be explored and adopted to ensure harmonization and interoperability among diverse stakeholders:

Synchronous R/R MEP – REST API via HTTP/HTTPS

For synchronous Request/Reply MEP, ***REST API via HTTP/HTTPS*** could be considered

Appendix X shows the sequence diagram of synchronous R/R MEP using REST API via HTTP/HTTPS

Asynchronous R/R MEP – REST API via HTTP/HTTPS with Asynchronous Callback

For asynchronous interactions, **1) *REST API* with asynchronous callback, 2) Message Queue 3) Synchronous REST API with Asynchronous Event Delivery using Message Queue** could be considered.

Appendix X shows the sequence diagram of 1) REST API via HTTP/HTTPS with asynchronous callback, 2) Message Queue-based Asynchronous R/R via AMQP, MQTT

In some cases, to support its business operation, information exchange may involve a combination of **Synchronous R/R MEP**, **Asynchronous R/R MEP**, and **P/S MEP** patterns. However, this document doesn't describe it in detail.

6. Regional R/R MEP Architecutre

This chapter outlines the topology of the R/R MEP. Specifically, it explains which R/R MEP solutions could be considered, and what architecture could be used to deploy those products or solutions to enable both synchronous and asynchronous R/R MEP within the region.

6.1.Introduction of R/R MEP Solution

a. Forward/Reverse Proxy
   - A forward proxy acts on behalf of an internal resource (e.g., client, server, or system), managing outbound requests to an external resource (e.g., client, server, or system) to provide capabilities such as access control, caching, and monitoring.
   - A reverse proxy acts on behalf of an external resource (e.g., client, server, or system), managing inbound requests to internal resource (e.g., client, server, or system) to security, load balancing, and routing, while hiding internal system details.
   - Comparison of forward and reverse proxy is as follows:

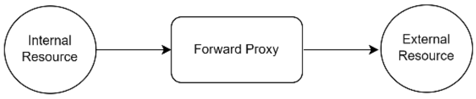
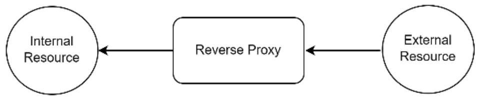
Aspect	Forward Proxy	Reverse Proxy
Diagram		
Traffic Direction	Handles outbound requests from internal resource to external resource	Handles inbound requests from external resource to internal resource
Visibility	Hides the internal resource's identity from external resource	Hides the internal resource's identity to external resource

Table X. Table

- Forward and reverse proxy supports OSI 3rd, 4th, and 7th layer protocols such as HTTP, Web-socket, TCP, UDP, IP. Main focus of forward and reverse proxy is message routing.

b. API Gateway
   - An API Gateway (GW) is built on top of a reverse proxy, primarily supporting HTTP and providing advanced API management capabilities. The main difference between an API GW and a reverse proxy lies in how policies are applied and managed from an API management perspective.

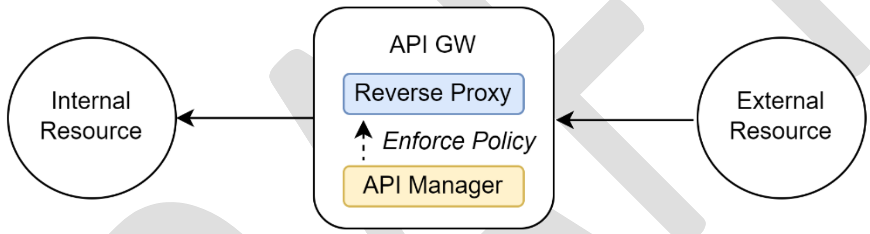


Diagram X. Diagram

6.2.Candidate Architecture using API GW or Forward/Reverse Proxy

This section describes candidate architectures that could be applicated for synchronous and asynchronous R/R MEP using REST API (HTTP)

a. Full Mesh Architecture
   - Same as Decentralized Approach of EMS interconnectivity architecture presented in WP05,SWIM/TF8. A service interacts with its own Edge API GW, and the Edge API GW directly forwards the request to another Edge API GW.

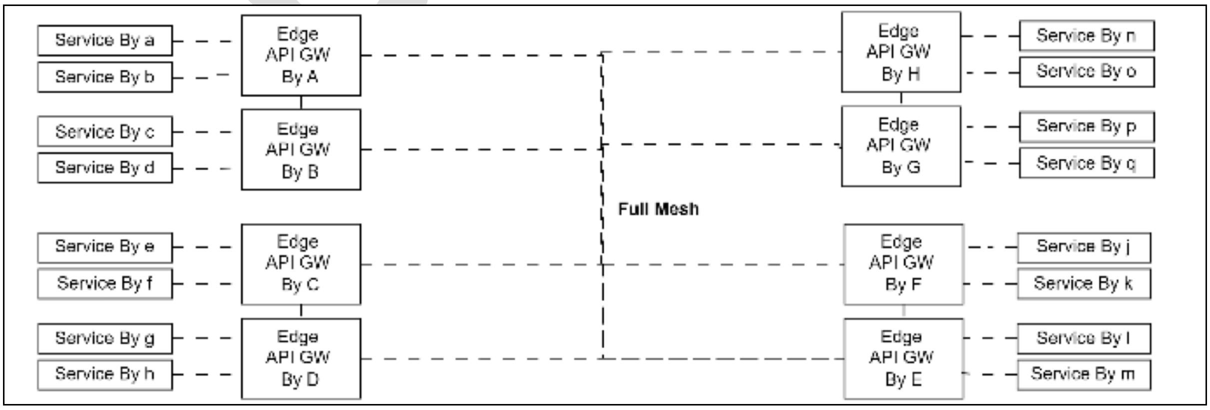


Diagram X. Diagram

b. Centralized Architecture

- Same as Centralized Approach of EMS interconnectivity architecture presented in WP05, SWIM/TF8 API GW acts as a single-entry point for all services between member states

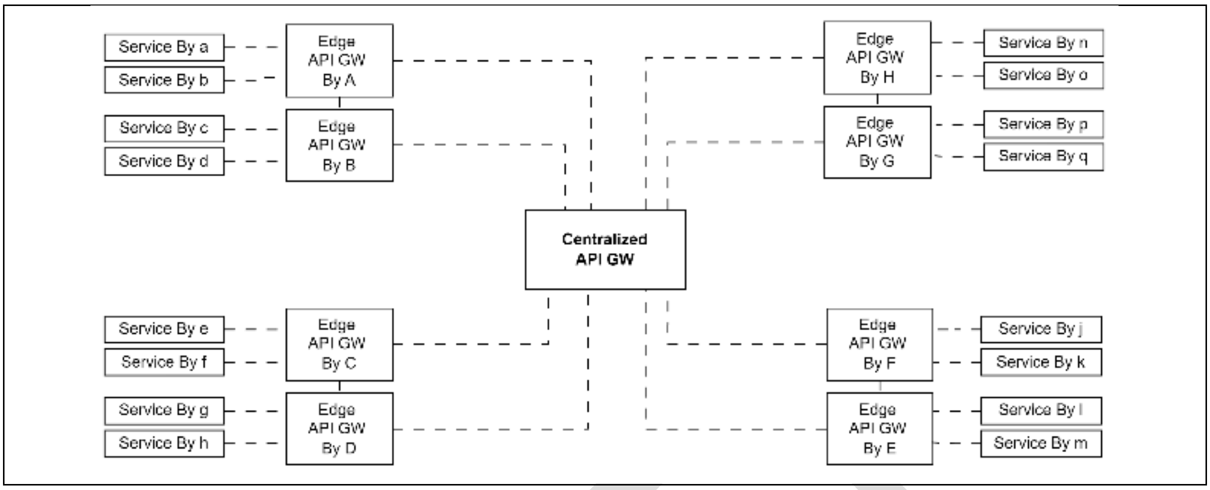


Diagram X. Diagram

c. Hierarchical Architecture
   - Same as Hierarchy Approach of EMS interconnectivity architecture presented in WP05, SWIM/TF8. Edge API GW interacts with Regional API GW, which handle routing within sub-community or forward requests to other sub-community.

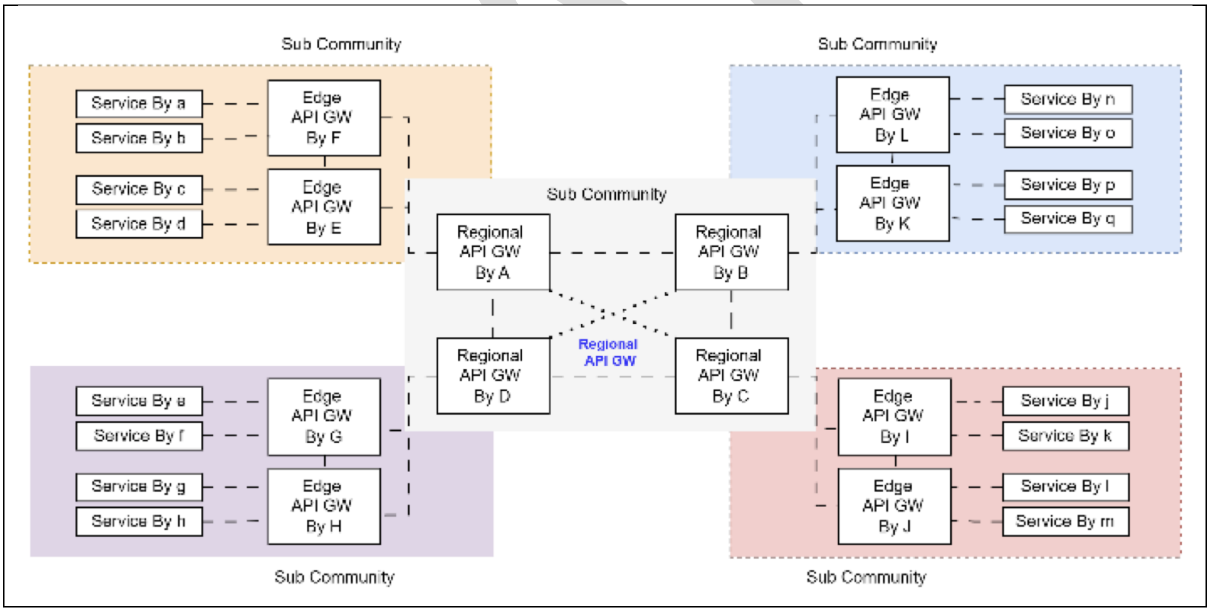


Diagram X. Diagram

d. Two-layered Hierarchical Architecture
   - Same as Modified Hierarchy Approach of EMS interconnectivity architecture. presented in SP07 SIPG/WS8. Two-layer hierarchical API GW architecture with a clustered regional layer

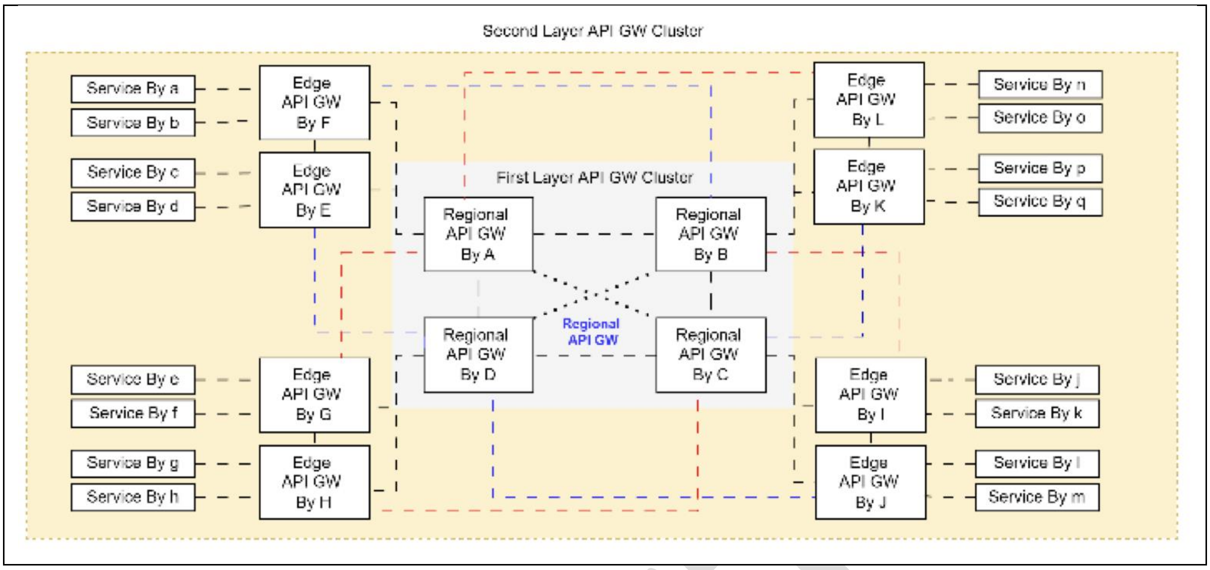


Diagram X. Diagram

Comparison of candidate architectures is as follows:

Architecture	Pros	Cons
Full Mesh	- Low dependency between API GWs - Easy to implement - High Sovereign	- All API GW should be ready for cross-border data exchange (e.g., bridge to SOAP for European region - API GW should be able to get connected with all API GW interested - All API GW should be updated when there is a policy/configuration change
Centralized	- Simple communication - Easy to configure policy	- Low Sovereign - Centralized API GW is SPOF
Hierarchical	- Efficient for cross border data exchange - A configuration change could be affected to only regional API GWs	- Regional API GW is SPOF
Two Layered Hierarchical	- Higher Fault tolerance - Better HA and scalability	- Hight cost for maintenance - Management Complexity

6.3.Candidate Architecture using Message Broker (AMQP)

This section describes the candidate architecture that could be applicable to synchronous and asynchronous R/R MEP using Message Broker (AMQP).

As modified hierarchy approach of EMS interconnectivity architecture, presented in SP07 SIPG/WS8 is information backbone for P/S MEP in the region. To enable synchronous and asynchronous R/R MEP using Message Broker (AMQP), same architecture is better to be used.

As of Oct. 25, Implementation of two layered hierarchical architecture (i.e., APAC SWIM P/S MEP architecture) is in progress under SIPG Task 1 and Task2.

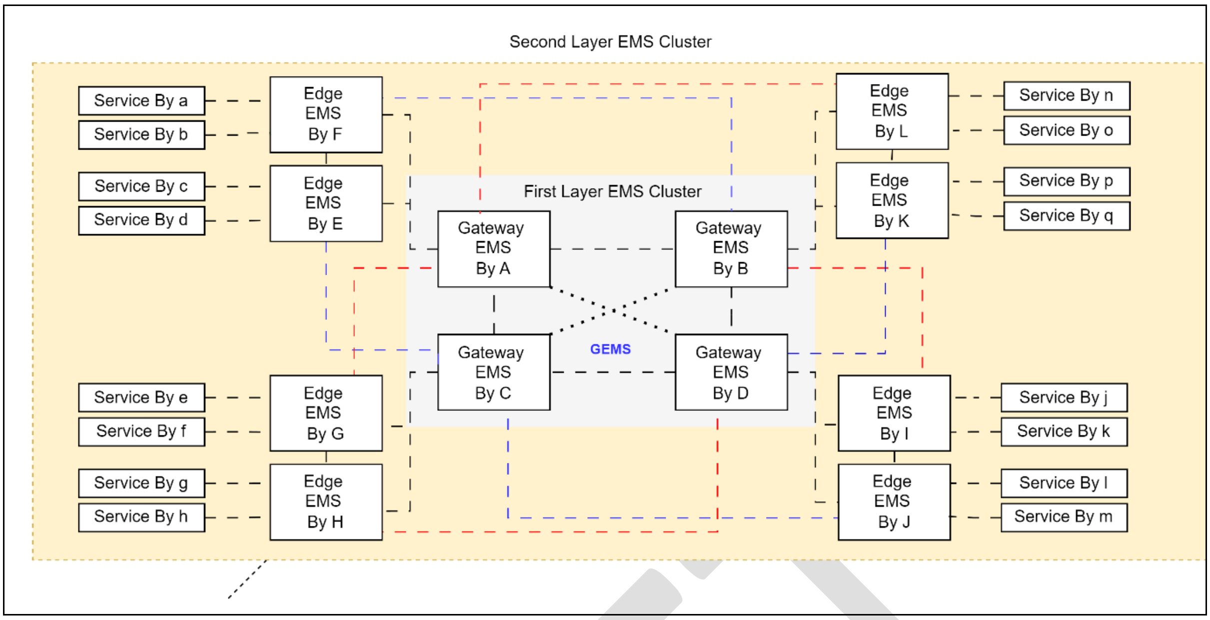


Diagram X. Diagram

6.4.Approach on Topology in Support of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following solution and architecture could be explored in support of R/R MEP in the region before adoption.

For synchronous Request/Reply MEP*, **1) API GW + Full Mesh Architecture** or **2) API GW + Two Layered Hierarchical Architecture** could be considered*

For asynchronous Request/Reply MEP*, **1) API GW + Full Mesh Architecture** or **2) API GW + Two Layered Hierarchical Architecture**, and **3) Message Broker + Two Layered Hierarchical Architecture (i.e., APAC SWIM P/S MEP Architecture (co-use))** could be considered*

7. Routing Mechanism

This chapter introduces routing mechanisms for R/R MEP. In R/R interactions, a message sent by a requester must be delivered to the correct replier through the API GW or message broker. Therefore, routing mechanism plays a critical role in ensuring that requests are directed to the right service and that responses are returned correctly. There are many different routing mechanisms for R/R MEP such as Path-based Routing, Content-based Routing, Header-based Routing, Policy-based Routing, and so on, but this chapter only describes Path-based Routing, and Contents-based Routing. They are mentioned as they represent the most fundamental and widely applicable approaches. These two mechanisms provide a clear contrast between simplicity and flexibility: Path-based routing offers transparency and ease of configuration, while Content-based routing enables dynamic and context-driven service delivery. This could be mapped with message routing for Topic and Queue in Pub/Sub MEP.

7.1. Routing Mechanisms

7.1.1. Path Based Routing

Path-based routing is the simplest and most commonly used routing mechanism. In this approach, the Uniform Resource Identifier (URI) path or topic within the HTTP or AMQP request determines the destination of the message.

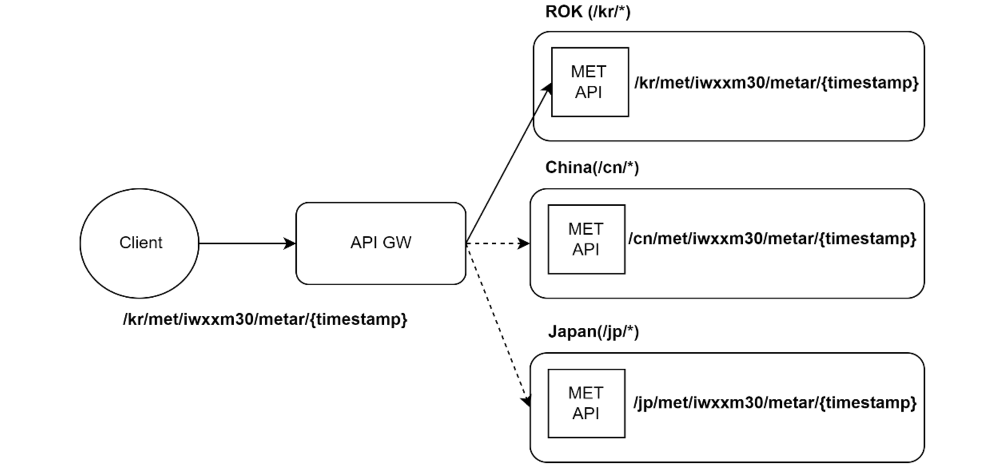
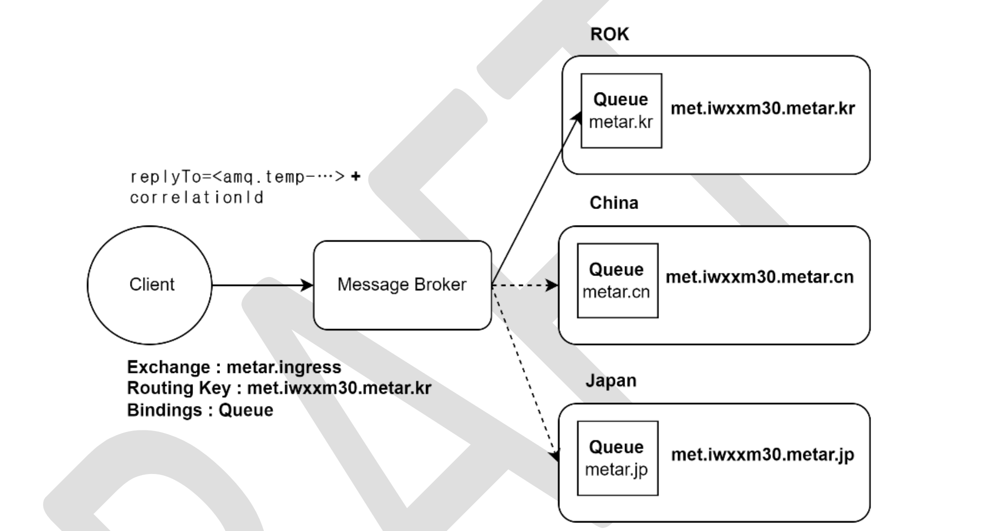
HTTP-based R/R MEP	
AMQP-based R/R MEP	

Diagram X. Diagram

a. **Mechanism:** The requester specifies the region, service name, or function within the routing path or topic naming structure (e.g., (HTTP) /kr/met/iwxxm30, /jp/met/iwxxm30, or (AMQP) met.iwxxm30.metar.kr).

b. **Advantages:**

- Easy to implement and configure
- High clarity and transparency, since routing is explicitly defined in the URL
- Works well with both HTTP-based gateways and messaging systems that support topic-based or header-based routing.

c. **Disadvantages (Consideration):**

- Need to have commonly agreed naming convention for the routing path and topic
- Front-facing path routing structure (e.g., URL or topic schema) need to be carefully designed; backend endpoints remain abstracted from requestor

7.1.2. Contents Based Routing

Content-based routing provides more flexibility by making routing decisions based on the message content (headers, parameters, or payload), rather than just the routing path or topic.

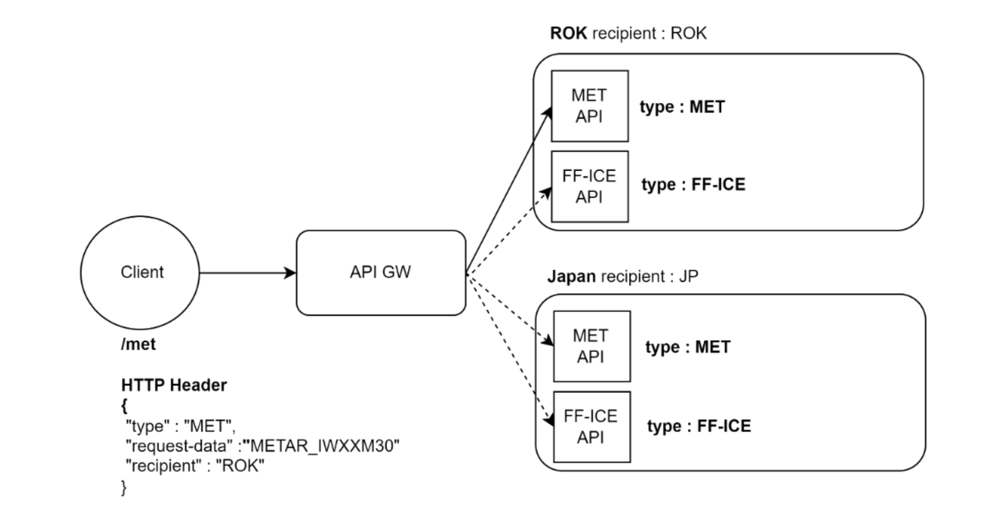
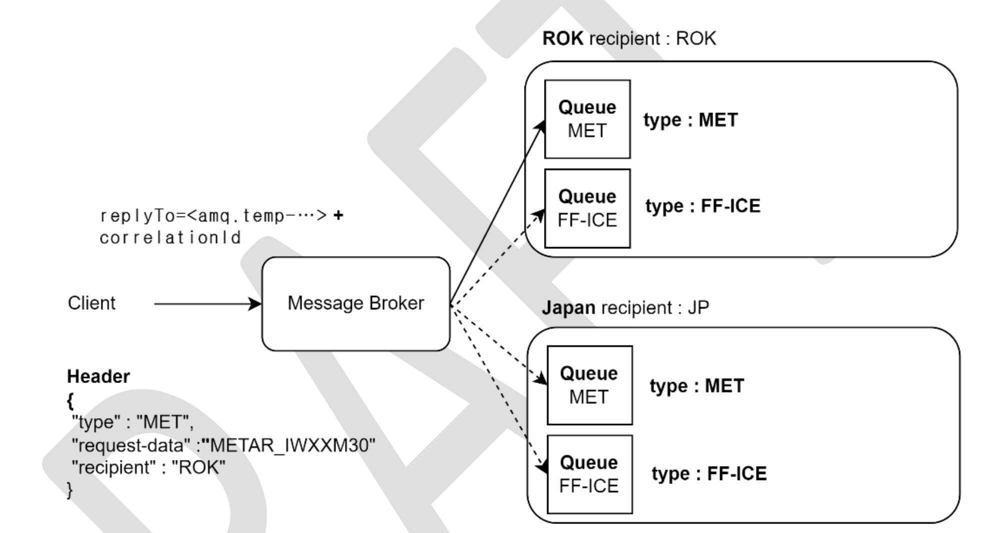
HTTP-based R/R MEP	
AMQP-based R/R MEP	

Diagram X. Diagram

a. **Mechanism:** The requester sends a generic request while including additional routing information in headers or message body (e.g., type, request-data, and recipient). The API GW or message broker inspects the content and dynamically determines the correct destination.

b. **Advantages:**

- High flexibility in handling dynamic services
- Decouples clients from internal routing logic; clients only need to know the front-facing service address, not the exact backend service.
- Supports complex service ecosystems where routing depends on data attributes (e.g., airspace ID, flight identifier)

c. **Disadvantages (Consideration):**

- More complex to configure and manage.
- Potential security risks such as injection attacks (e.g., malicious payloads in headers or message body) must be carefully mitigated through validation, sanitization, and strict policy enforcement.

- Inspection of the full message body is generally not permitted under ICAO provisions (e.g., Annex 15). Therefore, routing decisions should primarily rely on HTTP or AMQP headers or query parameters, rather than deep inspection of the payload.
- Routing decisions should therefore rely on standardized HTTP or AMQP headers or query parameters, rather than payload inspection.
- A commonly agreed set of routing-related headers should be established at the regional level to ensure consistency.

7.2.Approach on Routing Mechanism of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following routing mechanism could be explored:

Path- or Topic-Based Routing (PBR)

Path-Based Routing is both applicable to HTTP-based API GW and AMQP-based message broker more consistent with the principles of REST API or topic design architecture

8. Any Other Considerations

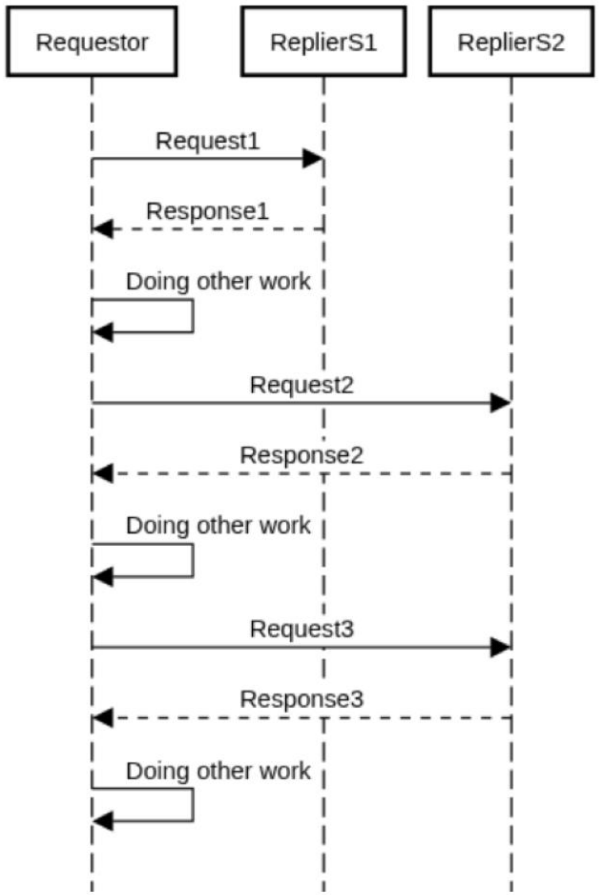
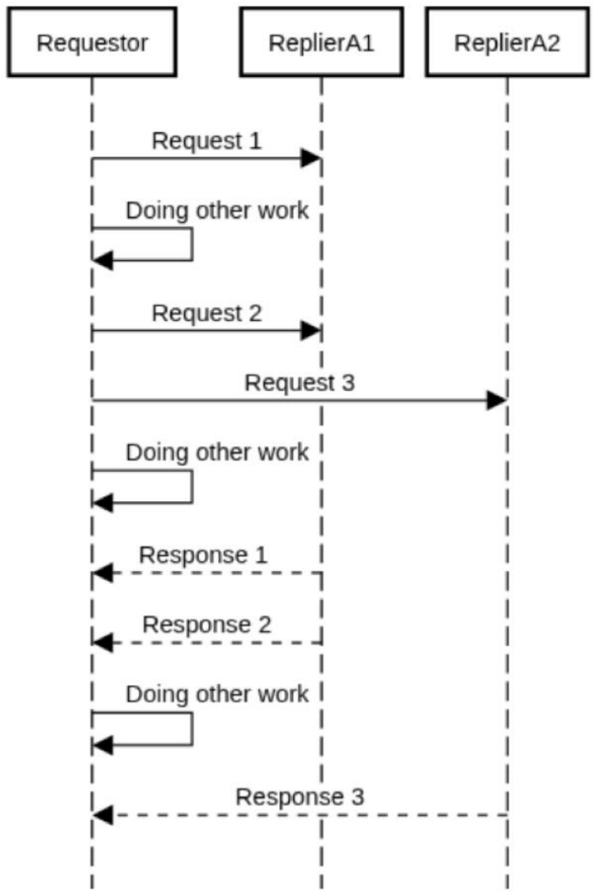
This document proposes approaches to implementing R/R MEP in the APAC region. Proof of Concept (POC) will be conducted to evaluate and select specific technologies after the POC is completed.

This document does not consider interoperability of R/R MEP between regions; this will be addressed in a later phase.

It also does not define the requirements for the API Gateway or the message broker to enable R/R MEP; these will be defined in a separate document.

9. Annexes

9.1.Annex 1 – Synchronous and Asynchronous R/R Data Flow Diagram

Synchronous R/R	Asynchronous R/R
	

9.2.Annex 2 – Applicability of Synchronous and Asynchronous R/R MEP to FF-ICE Service

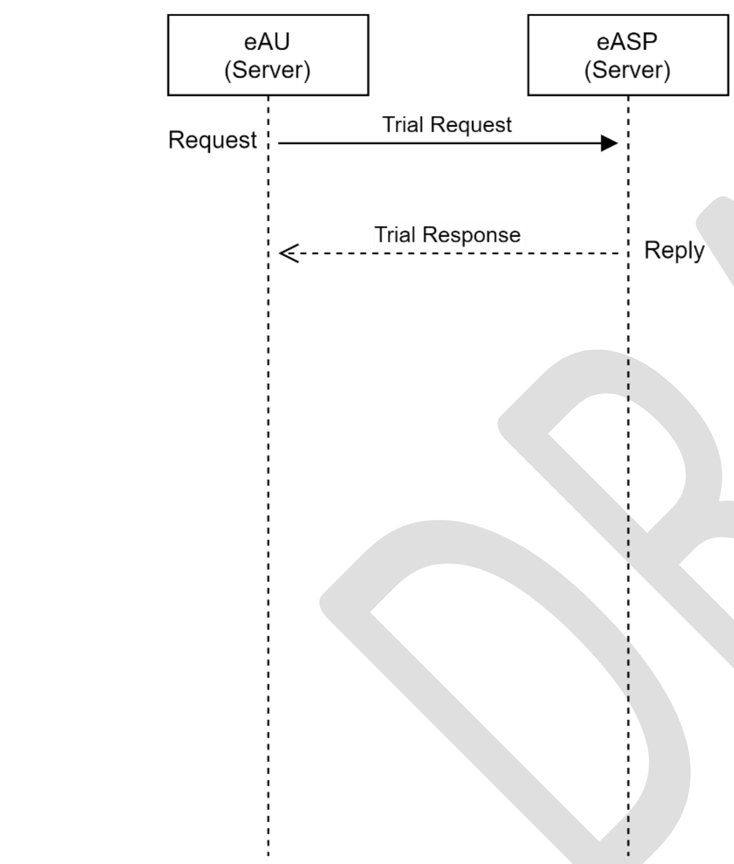
Service	MEP	Synchronous R/R	Asynchronous R/R	Note
GUFI Service	R/R	O	O	
FF-ICE Filing Service	P/S, R/R	X	O	Separate messages ought to be responded from replier (Submission Response + Filing Status)
FF-ICE Data Publication Service	P/S	-	-	
FF-ICE Trial Service	R/R	O	O	
FF-ICE Flight Data Request Service	R/R	O	O	
FF-ICE Notification	P/S, R/R	O	O	
FF-ICE Planning Service	P/S, R/R	X	O	Separate messages ought to be responded from replier (Submission Response + Planning Status)

* FF-ICE services mentioned above are defined in the APAC SWIM Common Services (APAC Common SWIM Information Services, WP11, SWIM TF/10)

9.3. Annex 3 – FF-ICE Service Data Flow Diagrams of Synchronous and Asynchronous R/R MEP

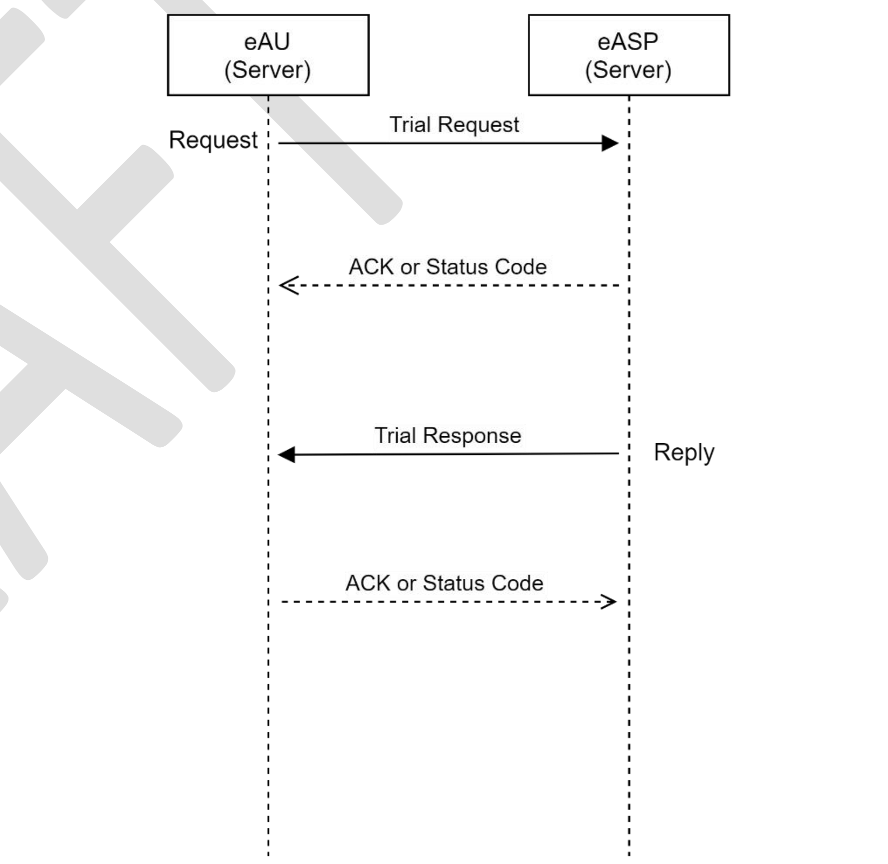
- FF-ICE Trial Service

Synchronous R/R (HTTP)



* API GW and Message Broker are not Depicted

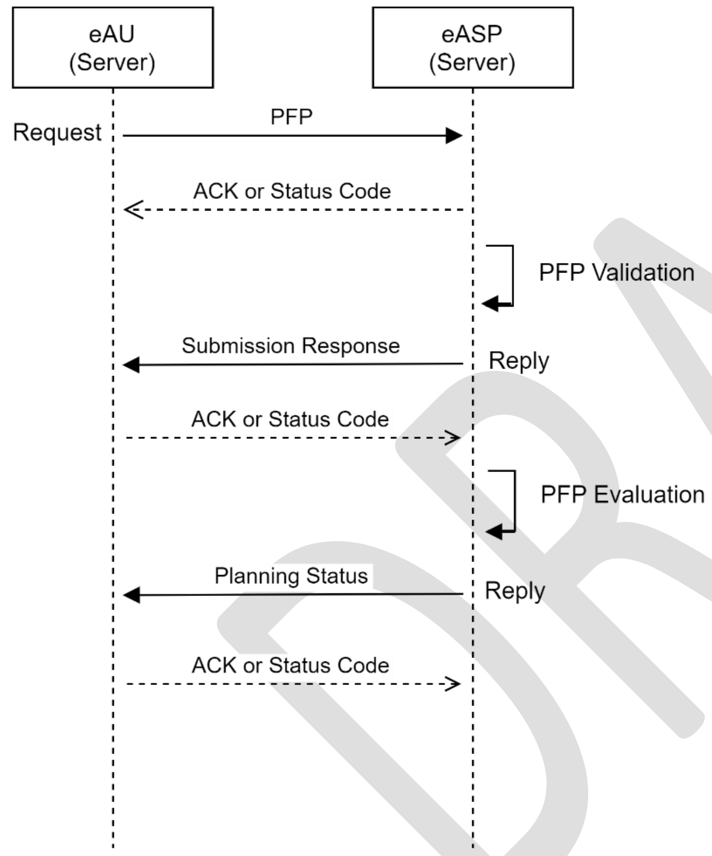
Asynchronous R/R (HTTP or AMQP)



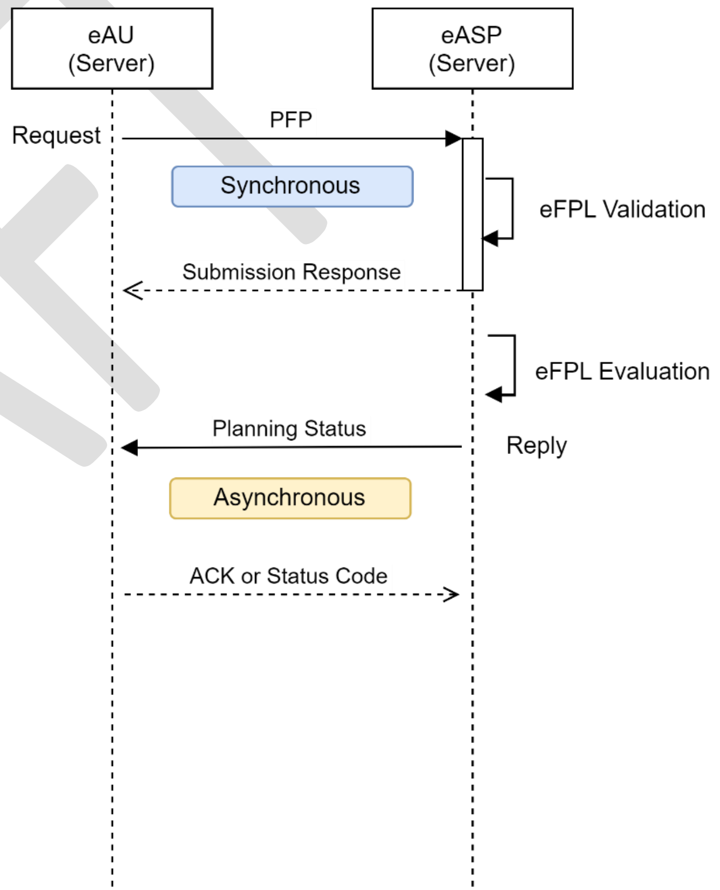
* API GW and Message Broker are not Depicted

- FF-ICE Planning Service

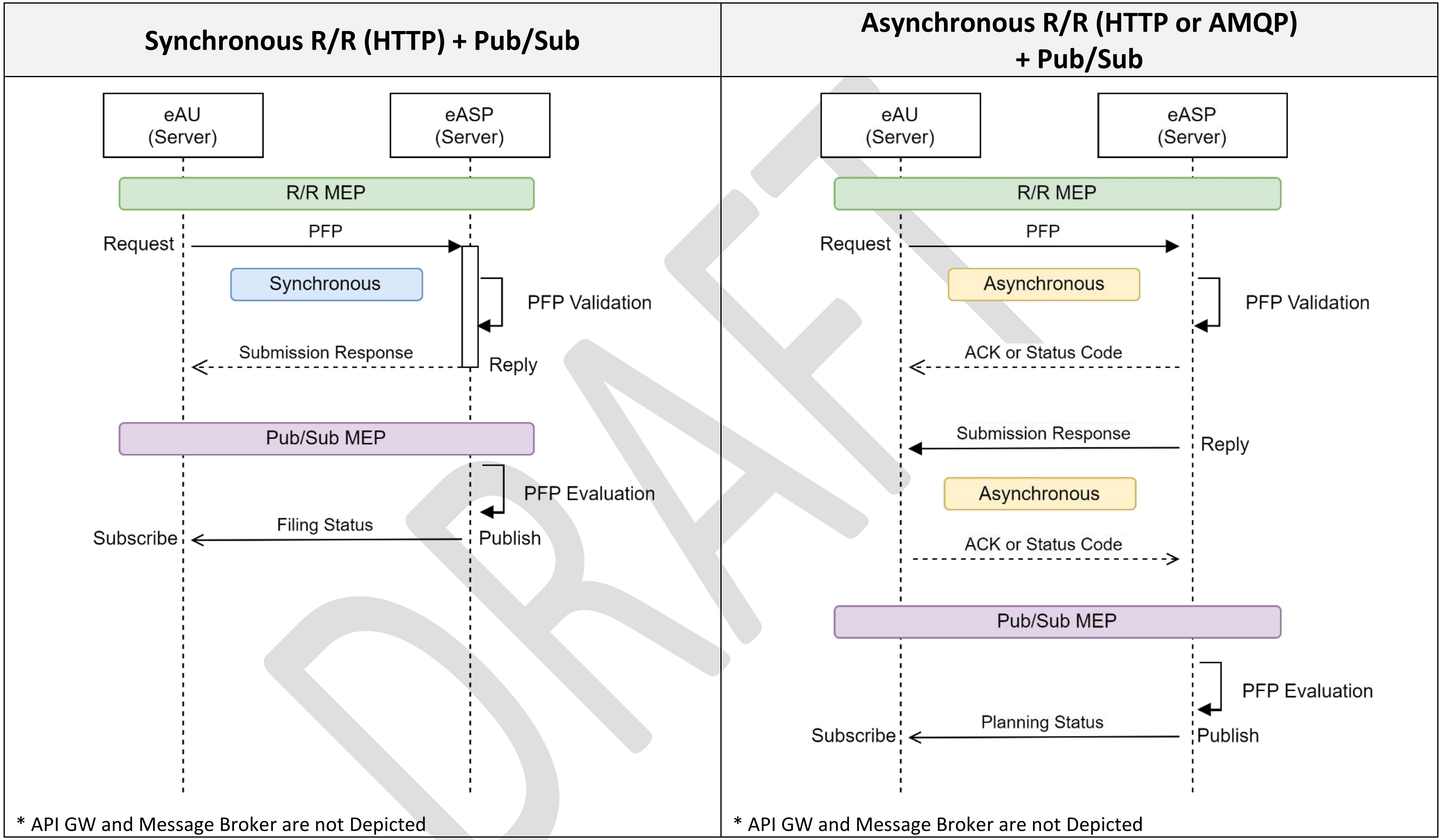
Asynchronous R/R (HTTP or AMQP)	Synchronous R/R (HTTP) + Asynchronous R/R (HTTP or AMQP)



* API GW and Message Broker are not Depicted



* API GW and Message Broker are not Depicted


Synchronous R/R (HTTP) + Pub/Sub
eAU (Server)
eASP (Server)
R/R MEP
Request
PFP
Synchronous
PFP Validation
Submission Response
Reply
Pub/Sub MEP
PFP Evaluation
Filing Status
Subscribe
Publish
* API GW and Message Broker are not Depicted
Asynchronous R/R (HTTP or AMQP) + Pub/Sub
eAU (Server)
eASP (Server)
R/R MEP
Request
PFP
Asynchronous
PFP Validation
ACK or Status Code
Submission Response
Reply
Asynchronous
ACK or Status Code
Pub/Sub MEP
PFP Evaluation
Planning Status
Subscribe
Publish
* API GW and Message Broker are not Depicted

Business Functionality of APAC Common SWIM Information Services
(Reviewed by FF-ICE/4, SURSG/5, SURICG/11, ATFM & A-CDM/SG/16, MET/IE WG/24, AAITF/21)

Second Version (May 2026)

Purpose.– This list of APAC Common SWIM Information Services, including associated priorities, provides States/Administrations with guidance on anticipated services to support their planning and implementation of SWIM.

Notes.– "Applicability": expected to be implemented "region-wide" in order to achieve the anticipated benefits, vs. "as needed" to meet the needs for a subset of the region
– "Desired implementation timeframe": Immediate (before 2030), Medium-term (2030-2035), Long-term (beyond 2035)
– "Maturity": "All elements defined" vs. "All elements not defined" (to be further refined)
("Applicability", "Desired Implementation Timeframe" and "Maturity" are yet to be reviewed by the Subsidiary Groups)

Business functionality of the information service	**Brief description of the service**	**Type of information to be exchanged**	**Information exchange model / Message type**	**Message exchange pattern**	**Applicability**	**Desired implement-ation timeframe**	**Maturity**
APAC Common SWIM Aeronautical Information Services							
Airspace management service	Exchanges of airspace status information between ASM Support System and Air Traffic Control (ATC) System. The sharing of airspace availability and airspace structure in real-time will contribute to a more efficient execution of the flight as information impacting the trajectory will be exchanged.	Availability or activation/deactivation or temporarily change of airspace, restricted area, danger area, search and rescue regions	AIXM	Pub/Sub or Req Reply			
Airspace feature service	Provides the characteristics of the three-dimensional airspace, described as horizontal projection with vertical limits, and their relevance to air traffic.	FIR/UIR boundaries, waypoints, enroute ATS routes, SIDs and STARs, navaids, procedures, and other airspace not limited to restricted area, prohibited	AIXM	Pub/Sub or Req Reply			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
		area, danger area, search and rescue regions (Remarks – Other data published in the AIP may be included)					
Aerodrome feature service	Provides current and/or planned airport layout features, such as aerodrome mapping data, runway, taxiway, passenger facilities.	Runways, movement areas, aerodrome services, navaids, instrument landing systems, Aerodrome location, communication facilities (frequencies)	AIXM	Pub/Sub or Req Reply			
Runway Condition Report service	Provides runway surface conditions and contaminants (least to most slippery) that are directly correlated to aircraft take-off and landing performance.	Global Reporting Format (GRF) for runway surface conditions	AIXM	Pub/Sub or Req/Reply			
Digital NOTAM distribution service	Provides aeronautical information in accordance with the Digital NOTAM Specification, such as runway closure.	Digital NOTAM (e.g. Special activity airspace (SAA) NOTAMs, or other types of NOTAMs)	AIXM	Pub/Sub or Req Reply			
ATIS distribution service	Provides continuous and automated broadcast of recorded aeronautical information in airport and terminal areas.	Current weather conditions, runway in use, available approaches, and other data relevant to arriving and departing aircraft, specific ATC procedures, and any airport construction activity that could affect taxi planning	TBD	Pub/Sub			
Search and rescue service	Allows Rescue Coordination Centres (RCCs) to exchange information with neighbouring RCCs and ATS units for coordination during SAR operations.	Search and rescue regions, Registered aircraft operator details and contacts, ICAO Autonomous Distress Tracking (ADT) data, Location of Aircraft in	TBD	Pub/Sub			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
		Distress Repository (LADR) data, ICAO OPS CTRL database contact information, SAR Unit (SRU) location and capability data					
APAC Common SWIM Flight Information Services							
GUFI service	GUFI (Globally Unique Flight Identifier) generation and provision	GUFI	FIXM	Req/Reply			
FF-ICE filing service	Provides a means to submit, update or cancel flight plans through a SWIM-based interface using FIXM. Appendix A: Filing Service Scenarios	Flight plan for registration, update or cancellation	FIXM	Appendix A			
FF-ICE publication service	Provides harmonised sharing of flight plan information in a global standard supporting common situation awareness.	Flight information for publication	FIXM	Pub/Sub			
FF-ICE trial service	Allows operators to test the effect of a potential change in a flight plan prior to committing to the change. Appendix A: Trial Service Scenarios	Proposed changes in a flight plan	FIXM	Appendix A			
FF-ICE flight data request service	Allows an operator to request the current status of a flight plan, or an ANSP can request an operator to submit the latest version of their flight plan. Appendix A: Flight Data Request Service Scenarios	Current status of a flight plan, a copy of flight plan or supplementary plan	FIXM	Appendix A			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
FF-ICE notification service	Provides notification of a change in flight state, such as Departure (DEP) and Arrival (ARR) Air Traffic Service (ATS) messages. Appendix A: Notification Service Scenarios	ARR, DEP messages	FIXM	Appendix A			
FF-ICE planning service	Allows operators to submit preliminary flight plans for early Air Traffic Flow Management (ATFM) planning and to obtain feedback regarding restrictions/constraints affecting the flight. Appendix A: Planning Service Scenarios	Preliminary flight plan for early ATFM planning	FIXM	Appendix A			
ADP Distribution Service	Supports publication and distribution of ATFM Daily Plan (ADP), based on information included in the APAC ADP Exchange Procedure1. The published ADP is designed to inform for stakeholders on upcoming demand/capacity constraints and possible ATFM measures.	Refer to ADP template	FLXM[2]?	Pub/Sub			
Flight-Specific ATFM Measure Service	Supports notification of information related to "flight-specific" ATFM measures, i.e. measures whose control mechanisms apply to a single flight. An example is the Ground Delay Program (GDP), whose control mechanism is a Calculated Take-Off Time (CTOT), or an ATFM measure for	CTOT, CTO, CLDT, and fields currently included in APAC AFTN/AMHS-Based ICD for ATFM[3]	FIXM	Appendix B			

[1] The ADP template included herein is not updated. The new ADP template had been agreed by the AMNAC group and included into the AMNAC COP v6.1, Appendix D, and was proposed to the ATFM/SG/15 (Apr-May 2025). The meeting agreed that the Secretariat will update the ADP Exchange Procedure to include the new template, which has already been supplied by AMNAC core team post-meeting.
[2] FLXM: Flow Information Exchange Model
[3] Based on the conclusion from ATFM/SG/15, an amendment to this ICD will be proposed in which a more structured use of REGUL and REGCAUSE fields will be introduced. This proposal is expected to be tabled at the upcoming CNS/SG meeting.

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
	airborne flight, whose control mechanism is a Calculated Time Over (CTO). Recipients of this information should take actions to comply with the ATFM measure contained herein. Appendix B: ATFM Operational Scenarios						
Flow-Specific ATFM Measure Service	Supports notification of information related to "flow-specific" ATFM measures, i.e. measures whose control mechanisms apply to a "group of flights" on a particular traffic flow. An example is the Minutes-in-Trail (MINIT) requirement applied on an eastbound traffic using A1 from VT*, VV* to RK*. Recipients of this information should take actions to comply with the ATFM measure contained herein.[4]	Spacing parameters for MINIT, MIT; Departure intervals for MDI; Alternate routes for Re-Routing; Flight level allocation for Level Capping	TBD	Pub/Sub			
ATFM/A-CDM Integration Service	Supports exchanges of flight-specific ATFM measure information and A-CDM milestone parameters among stakeholders, including arrival/departure ATFM units, airspace users, and airport operators, to integrate A-CDM process with ATFM operations. Appendix B: ATFM Operational Scenarios	ATFM measure information: CTOT A-CDM departure planning information: TOBT, TTOT, TSAT	FIXM	Appendix B			
APAC Common SWIM Meteorological Information Services							

[4] Common operating procedure for this group of ATFM measures (e.g., MINIT, MIT, MDI, Re-Route, Level Capping) has not been developed for the APAC region yet, and should be developed before finalizing the information service to support the operations.

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
FOR AERODROME							
METAR/SPECI service	Provides of IWXXM-formatted METAR/SPECI product specified in ICAO Annex 3.	Provision of the existing Annex 3 product via an information service	IWXXM	Pub/Sub Req/Reply			
TAF service	Provides of IWXXM-formatted TAF product specified in ICAO Annex 3.		IWXXM	Pub/Sub Req/Reply			
Aerodrome Meteorological Observation Information Service	Provides continuous observations of weather parameters at an aerodrome. Advanced meteorological SWIM (MET-SWIM) service being developed by MET Panel.	To be introduced as recommended practice in Annex 3 (Amd 84) in Nov 2030 tentatively (Note: Level of standardisation needs to be considered, as different aerodrome information services may be required for different use cases.)	IWXXM	Pub/Sub or Req/Reply			
Aerodrome Meteorological Forecast Information Service	Provides information of the expected meteorological conditions, including probability, at an airport during a specified period. Advanced meteorological SWIM (MET-SWIM) service being developed by MET Panel.		IWXXM	Pub/Sub or Req/Reply			
FOR ENROUTE							
SIGMET service	Provides IWXXM-formatted SIGMET product specified in ICAO Annex 3.	SIGMETs for thunderstorm, tropical cyclone, turbulence, icing, mountain wave, duststorm, sandstorm, volcanic ash and radioactive cloud	IWXXM	Pub/Sub Req/Reply			
AIRMET service	Provides IWXXM-formatted AIRMET product specified in ICAO Annex 3.	Provision of the existing Annex 3 product via an information service	IWXXM	Pub/Sub Req/Reply			
Tropical Cyclone Advisory service	Provides IWXXM-formatted Tropical Cyclone Advisory product specified in ICAO Annex 3. (Designated provider: States with Tropical Cyclone Advisory Centre)		IWXXM	Pub/Sub Req/Reply			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
Volcanic Ash Advisory service	Provides IWXXM-formatted Volcanic Ash Advisory product specified in ICAO Annex 3. (Designated provider: States with Volcanic Ash Advisory Centre)		IWXXM	Pub/Sub Req/Reply			
Space Weather Advisory service	Provides IWXXM-formatted Space Weather Advisory product specified in ICAO Annex 3. (Designated provider: States with Space Weather Advisory Centre)		IWXXM	Pub/Sub Req/Reply			
Volcano Observatory Notice for Aviation (VONA) service	Provides of IWXXM-formatted VONA specified in ICAO Annex 3. Provision of VONA is a recommended practice in Annex 3 (Amd 82). (Designated provider: States with a designated State Volcano Observatory)		IWXXM	Pub/Sub Req/Reply			
Quantitative volcanic ash concentration information (QVA) service	Provides detailed information of significant volcanic ash in the atmosphere, including probabilities of ash concentration thresholds over space and time. Advanced meteorological SWIM (MET-SWIM) service being developed by MET Panel. (Designated provider: States with Volcanic Ash Advisory Centre (VAAC))	QVA gridded forecasts including probabilities, and IWXXM QVA objects. A recommended practice for significant ash clouds in Annex 3 (Amd 82) for VAACs in a position to do so from Nov 2025, and for all VAACs from Nov 2026.	Gridded data (e.g. NetCDF), IWXXM	Pub/Sub Req/Reply			
WAFC (World Area Forecast Centres) gridded forecast service	Provides global gridded weather forecasts. (Designated provider: WAFCs (UK and US))	Global gridded forecasts of CB, icing, turbulence, upper winds, upper-air temperatures and humidity, flight level and temperature of tropopause, and direction, speed and flight level of maximum wind	Gridded data in GRIB2	Pub/Sub Req/Reply			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
WAFC significant weather (SIGWX) forecast service	Provides global WAFC SIGWX data sets with coverage expressed in polygons. (Designated provider: WAFCs (UK and US))	Significant weather forecast such as tropical cyclone, turbulence, icing, etc.	IWXXM	Pub/Sub ~~or~~ Req/Reply			
Special Air Report (ARS) service	Provides reports of special observations made by aircraft when they encounter special weather phenomena, such as moderate/severe turbulence or icing. (Note: Currently there is no plan to implement this information service at MET Panel)	Special aircraft observations of weather phenomena as specified in Annex 3, including turbulence, icing, mountain wave, thunderstorms, duststorm, sandstorm, volcanic cloud, volcanic activity / eruption	TBD	Pub/Sub or Req/Reply			
MET derived from Mode S DAPs service	Provides upper air winds and temperatures derived from Mode S Downlinked Aircraft Parameters (DAPs) (e.g. true airspeed, ground speed, magnetic heading, true track angle) and facilitates exchange of derived winds and temperatures among MET service providers.	Upper air winds and temperatures derived from Mode S DAPS	TBD	Pub/Sub or Req/Reply			
Satellite image service	Provides satellite observational information.	Satellite derived MET information (e.g. significant convection)	Gridded format (e.g. NetCDF) and image format	Req/Reply			
Weather radar image service	Provides two- or three-dimensional radar observational information.	Weather radar reflectivity to visualise the intensity of convection	Gridded format (e.g. NetCDF) and image format	Req/Reply			
APAC Common SWIM Surveillance Information Services							
Surveillance data only sharing service	Provides surveillance data of aircraft. (Reference: Guidance Material for the Sharing of Surveillance Data in SWIM)	latitude, longitude, flight level, ground speed (optional), magnetic heading (optional), target	ASTERIX Cat 21 (payload in JSON or RAW format)	Pub/Sub			

Business functionality of the information service	Brief description of the service	Type of information to be exchanged	Information exchange model / Message type	Message exchange pattern	Applicability	Desired implement-ation timeframe	Maturity
		identification, target address, mode 3/A code (optional), date, time of message reception for position, quality indicators, SAC, SIC					
Surveillance data with flight plan information sharing service	Provides surveillance data of aircraft with flight plan information. (Reference: Guidance Material for the Sharing of Surveillance Data in SWIM)	globally unique flight identifier, aircraft identification, departure aerodrome, destination aerodrome, aircraft type (optional), wake turbulence category (optional), latitude, longitude, flight level, ground speed (optional), magnetic heading (optional), target identification, target address, mode 3/A code (optional), date, time of message reception for position, quality indicators, SAC, SIC	ASTERIX Cat 21+FPL (payload in JSON format) Or ASTERIX Cat 21+FPL (FPL contained in message header and Cat 21 payload in RAW format)	Pub/Sub			

APPENDICES

Purpose

These appendices provide detailed operational scenarios for SWIM Information Services that require further description than can be achieved in the main Business Functionality for APAC Common SWIM Information Services table. The additional detail may be associated with varying requirements and business completion criteria, or where the behaviour of the service may depend on the operational scenario, therefore requiring a more granular analysis.

Scenario Steps Table

Operational scenarios detailed in the appendices should follow the format of a Scenario Steps table. The table below specifies and elaborates the fields in the Scenarios Steps table, as well as indicates who is responsible for completing each field.

Fields	**Description**	**Responsibility**
Step	Sequential identifier for each message exchange within the scenario	Domain Expert Group
Message	Specific message type, e.g. FF-ICE message type, with sender and recipient identification (e.g., "eAU sends Filed Flight Plan to eASP", "eASP returns Submission Response to eAU")	Domain Expert Group
Message Requirements	Message requirement classification and prerequisite conditions that must be satisfied prior to message transmission • Mandatory - Message must be sent/received in all instances of the scenario without exception • Conditional - Message must be sent/received when specific triggering conditions are met, but is not required when those conditions do not occur	Domain Expert Group
Business Timeout	Maximum acceptable time duration for message response from an operational perspective. The message originator is expected to contact the recipient if no response is received within the timeout period.	Domain Expert Group
Comments	Additional operational context, processing requirements, or business rule specifications that inform technical implementation	Domain Expert Group
Message Exchange Pattern	A template that describes relationships of multiple messages exchanged between interacting components to accomplish a single complete information exchange.	SWIM TF

APPENDIX A

Purpose

This appendix provides detailed operational scenarios for FF-ICE Flight Information Services, with the corresponding recommended MEP by the SWIM Task Force. Each FF-ICE service could contain multiple operational scenarios that have varying requirements and business completion criteria. Hence, technical specifications cannot be defined at the FF-ICE service level. They require more granular scenario-based analysis.

Scope and Application

Five of the six FF-ICE/R1 services are covered. Publication Service is not included as it requires a straightforward Pub/Sub MEP. For each of the 5 FF-ICE/R1 services, the possible operational scenarios were identified. Within each operational scenario, the business completion criteria and a table containing the scenario steps, message exchanges, actors involved, message requirements and business timeouts were detailed. With this information, the SWIM TF recommended the corresponding MEP.

Role Delineation

- Domain Expert Groups: The FF-ICE Ad-Hoc Group defined the operational scenarios and business completion criteria based on operational requirements
- SWIM Task Force: Determined appropriate technical specifications and Message Exchange Patterns based on the clearly defined business requirements provided

Business Completion Criteria Definition

- **Business Completion Criteria —** The point at which the relevant actor can consider their operational procedure for the specific flight to be complete and proceed with subsequent flight operations for that specific flight. This is defined by specific message receipts by the relevant actor.
    - *Format: [Actor] receives/sends [Message Type] [with specific status/condition when applicable]*

FILING SERVICE SCENARIOS

Scenario 1: Submission of Filed Flight Plan (eFPL) by eAU

Business Completion Criteria:

- eAU receives Filing Status with ACCEPTABLE or NOT ACCEPTABLE status indication; or
- eAU receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Filed Flight Plan (eFPL) to eASP	Mandatory	N/A	Initial flight plan submission	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following eFPL reception)	1 minute following eFPL submission	Message format validation and basic rule compliance check **ACK**: Flight plan received and stored on file **REJ**: Flight plan rejected and not stored on file **MAN**: Manual intervention required	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved and proceed to Filing Status); or • REJ (manual processing failed)	
4	eASP returns Filing Status (FS) to eAU	Conditional (when SR = ACK)	1 minute following SR "ACK"	Operational evaluation against ATM configuration and applicable restrictions/constraints	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
				ACCEPTABLE: Complies with requirements **NOT ACCEPTABLE:** Does not comply with requirements **PENDING:** Not yet evaluated	
5	eASP returns Filing Status(es) to eAU	Conditional (when previous FS = PENDING or triggered by re-evaluation process)	Variable	Additional Filing Status messages sent when: 1) Initial status was PENDING and eASP subsequently completed flight plan evaluation, or 2) Re-evaluation of eFPL detects changes in ATM restrictions/constraints affecting flight plan acceptability	

Scenario 2: Submission of Flight Plan Update (FPU) by eAU

Business Completion Criteria:

- eAU receives Filing Status with ACCEPTABLE or NOT ACCEPTABLE status indication; or
- eAU receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Flight Plan Update (FPU)	Mandatory	N/A	Modification to existing flight plan data via update message	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following FPU reception)	1 minute following FPU submission	Message format validation and basic rule compliance check **ACK**: Update processed successfully, flight plan modified	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
				REJ: Update failed, flight plan unchanged **MAN**: Manual intervention required	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing): • ACK (manual processing resolved and proceed to Filing Status); or • REJ (manual processing failed)	
4	eASP returns Filing Status (FS) to eAU	Conditional (when SR = ACK)	1 minute following SR "ACK"	Operational evaluation against ATM configuration and applicable restrictions/constraints **ACCEPTABLE:** Complies with requirements **NOT ACCEPTABLE:** Does not comply with requirements **PENDING:** Not yet evaluated	
5	eASP returns Filing Status(es) to eAU	Conditional (when previous FS = PENDING or triggered by re-evaluation process)	Variable	Additional Filing Status messages sent when: 1) Initial status was PENDING and eASP subsequently completed flight plan evaluation, or 2) Re-evaluation of FPU detects changes in ATM restrictions/constraints affecting flight plan acceptability	

Scenario 3: Submission of Flight Cancellation (FC) by eAU

Business Completion Criteria:

- eAU receives Submission Response with ACK or REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Flight Cancellation (FC) to eASP	Mandatory	N/A	Termination of flight plan and associated GUFI operational use	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following Flight Cancellation message reception)	1 minute following FC submission	Message format validation and basic rule compliance check **ACK**: Cancellation processed successfully, flight plan cancelled **REJ**: Cancellation failed, flight plan remains active **MAN**: Manual intervention required, flight plan remains active	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved, cancellation successful); or • REJ (manual processing and cancellation failed)	

PLANNING SERVICE SCENARIOS

Scenario 1: Submission of Preliminary Flight Plan (PFP) by eAU

Business Completion Criteria:

- eAU receives Planning Status with CONCUR, NEGOTIATE, OR NON-CONCUR status indication; or
- eAU receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Preliminary Flight Plan (PFP) to eASP	Mandatory	N/A	Initial preliminary flight plan submission for collaborative decision making	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following PFP reception)	1 minute following PFP submission	Message format validation and basic rule compliance check **ACK**: Preliminary Flight plan received and stored on file **REJ**: Preliminary Flight plan rejected and not stored on file **MAN**: Manual intervention required	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved and proceed to Planning Status); or • REJ (manual processing failed)	
4	eASP returns Planning Status (PS) to eAU	Conditional (when SR = ACK)	1 minute following SR "ACK" if re-	Planning evaluation against ATM configuration and applicable restrictions/constraints.	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
			evaluation process is provided	**CONCUR:** Complies with requirements **NEGOTIATE:** Would be accepted if filed, but eASP proposes modifications/constraints or identifies differences from desired route/trajectory **NON-CONCUR:** Does not comply with requirements	
5	eASP returns Planning Status(es) to eAU	Conditional (when re-evaluation process detects changes)	Variable	Additional Planning Status messages sent when re-evaluation detects changes in ATM restrictions/constraints affecting preliminary flight plan acceptability	

Scenario 2: Submission of Flight Plan Update (FPU) by eAU

Business Completion Criteria:

- eAU receives Planning Status with CONCUR, NEGOTIATE, OR NON-CONCUR status indication; or
- eAU receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Flight Plan Update (FPU) for PFP to eASP	Mandatory	N/A	Modification to existing preliminary flight plan data via update message	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following FPU reception)	1 minute following FPU submission	Message format validation and basic rule compliance check **ACK**: Update processed successfully, preliminary flight plan modified	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
				REJ: Update failed, preliminary flight plan unchanged **MAN**: Manual intervention required	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved and proceed to Planning Status); or • REJ (manual processing failed)	
4	eASP returns Planning Status (PS) to eAU	Conditional (when SR = ACK)	1 minute following SR "ACK"	Planning evaluation against ATM configuration and applicable restrictions/constraints. **CONCUR:** Complies with requirements **NEGOTIATE:** Would be accepted if filed, but eASP proposes modifications/constraints or identifies differences from desired route/trajectory **NON-CONCUR:** Does not comply with requirements	
5	eASP returns Planning Status(es) to eAU	Conditional (when re-evaluation process detects changes)	Variable	Additional Planning Status messages sent when re-evaluation detects changes in ATM restrictions/constraints affecting preliminary flight plan acceptability	

Scenario 3: Submission of Flight Cancellation (FC) by eAU

Business Completion Criteria:

- eAU receives Submission Response with ACK or REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Flight Cancellation (FC) to eASP	Mandatory	N/A	Termination of preliminary flight plan and associated GUFI operational use	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following Flight Cancellation message reception)	1 minute following FC submission	Message format validation and basic rule compliance check **ACK**: Cancellation processed successfully, preliminary flight plan cancelled **REJ**: Cancellation failed, preliminary flight plan remains active **MAN**: Manual intervention required, preliminary flight plan remains active	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved, cancellation successful); or • REJ (manual processing and cancellation failed)	

NOTIFICATION SERVICE SCENARIOS

Scenario 1: Dissemination of Flight Departure (FD) Notification by Departure eASP

Business Completion Criteria:

- Departure eASPs receives Submission Response with ACK or REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Departure eASP sends Flight Departure (FD) to relevant eASP(s)	Mandatory	N/A	Notification of actual departure event (equivalent to DEP message)	
2	Receiving eASP returns Submission Response (SR) to departure eASP	Mandatory (following departure message reception)	1 minute following dissemination of FD	Message format validation and basic rule compliance check **ACK:** Departure notification successful **REJ:** Departure notification failed **MAN:** Manual intervention required	
3	Receiving eASP returns subsequent Submission Response(s) to departure eASP	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (departure notification successful); or • REJ (departure notification failed)	

Scenario 2: Dissemination of Flight Arrival (FA) Notification by Arrival eASP

Business Completion Criteria:

- Arrival eASPs receives Submission Response with ACK or REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Arrival eASP sends Flight Arrival (FA) to relevant eASP(s)	Mandatory	N/A	Notification of actual arrival event (equivalent to ARR message)	
2	Receiving eASP returns Submission Response (SR) to arrival eASP	Mandatory (following arrival message reception)	1 minute following dissemination of FA	Message format validation and basic rule compliance check **ACK:** Arrival notification successful **REJ:** Arrival notification failed **MAN:** Manual intervention required	
3	Receiving eASP returns subsequent Submission Response(s) to arrival eASP	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual processing. Response can be • MAN (manual processing ongoing); • ACK (arrival notification successful); or • REJ (arrival notification failed)	

TRIAL SERVICE SCENARIOS

Scenario 1: Submission of Trial Request (TRQ) by eAU

Business Completion Criteria:

- eAU receives Trial Response with CONCUR, NEGOTIATE, or NON-CONCUR; or
- eAU receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU sends Trial Request(s) (TRQ) to eASP	Mandatory	N/A	Multiple independent requests can be sent simultaneously without waiting for responses. These "what-if" requests allow evaluation of flight plan alternatives without creating new flight plans or modifying existing flight plans. eASPs may limit number/frequency of requests.	
2	eASP returns Submission Response (SR) to eAU	Mandatory (following each trial request reception)	1 minute following TRQ submission	Message format validation and basic rule compliance check **ACK**: Trial request processed and will be evaluated **REJ**: Trial request rejected **MAN**: Manual intervention required	
3	eASP returns subsequent Submission Response(s) to eAU	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual intervention. Response can be	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
				• MAN (manual processing ongoing); • ACK (manual processing resolved and proceed to Trial Response); or • REJ (manual processing failed)	
4	eASP returns Trial Response (TRP) to eAU	Conditional (when SR = ACK)	1 minute following SR "ACK"	Evaluation against ATM configuration and applicable restrictions/constraints. . **CONCUR**: Complies with requirements **NEGOTIATE**: Would be accepted if submitted as eFPL or PFPs, but eASP proposes modifications/constraints or identifies differences from desired route/trajectory **NON-CONCUR**: Does not comply with requirements	

FLIGHT DATA REQUEST SERVICE SCENARIOS

Scenario 1: Submission of Flight Data Request (FDRQ) by eAU/eASP

Business Completion Criteria:

- Requestor (eAU/eASP) receives Flight Data Response; or
- Requestor (eAU/eASP) receives Submission Response with REJ status indication

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	eAU or eASP sends Flight Data Request (FDRQ) to eASP or eAU	Mandatory	N/A	Request for flight plan data, supplementary data, or flight status. Additional flight information may be provided, subjected to eAUs/eASPs implementation	
2	Receiving party returns Submission Response (SR) to message originator	Mandatory (following each flight data request reception)	1 minute from submission of FDRQ	Message format validation and basic rule compliance check **ACK**: Flight data request processed and flight information will be provided **REJ**: Flight data request rejected (invalid format, unauthorized access, or data not found etc.) **MAN**: Manual intervention required	
3	Receiving party returns subsequent Submission Response(s)	Conditional (only when previous SR = MAN)	Variable (dependent on manual processing duration)	Additional Submission Responses will be sent after manual intervention. Response can be • MAN (manual processing ongoing); • ACK (manual processing resolved and proceed to Flight Data Response); or	

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
				• REJ (manual processing failed)	
4	Receiving party returns Flight Data Response (FDRP)	Conditional (when SR = ACK)	1 minute following SR "ACK"	Requested flight information provided. No response expected from recipient of Flight Data Response	

APPENDIX B

ATFM Operational Scenarios for APAC Common SWIM Information Services

1. Background

1.1. As the aviation community moves away from legacy point-to-point teletype messaging, System-Wide Information Management (SWIM) serves as the primary enabler for the digital exchange of aeronautical, flight, and meteorological information.

1.2. The exchange of tactical ATFM requirements, specifically **Calculated Take-Off Time (CTOT)**, and **Calculated Time Over (CTO)**, and one of the key A-CDM data elements supporting demand prediction, the **Target Take-Off Time (TTOT)**, is currently managed through a mix of legacy message formats and systems and emerging digital services. To ensure global interoperability and seamless transition to FF-ICE operating environment, these exchanges must be mapped to clear operational use cases within ICAO guidance materials and regionally operating procedures.

1.3. The exchange of CTO, CTOT, and TTOT is critical for the following operational reasons:

1.4. <u>Enabling Flexible Trajectory-Based Demand-Capacity Balancing (CTO)</u>: The exchange of CTO allows an ANSP to balance demand and capacity within their area of responsibility by metering traffic through a specific waypoint in their airspace or at the boundary of their Flight Information Region (FIR) rather than imposing ATFM control mechanism at the departure airport which may be outside their FIRs. This approach aligns with the spirit of FF-ICE, in which FF-ICE capable ATM service provider (eASP) provides ATM restriction/constraint impacting trajectory within their area to the FF-ICE capable airspace user (eAU), and the eAU is responsible for managing their trajectory to comply with the requirements. This approach provides greater flexibility for the AUs to determine how best to meet the DCB requirement while still honouring their business objectives.

1.5. <u>Balancing Demand and Capacity through an ATFM Measure Imposed at Departure Aerodrome (CTOT)</u>: While the move toward CTO is foreseeable in the future FF-ICE environment, there will be cases where a conventional Ground Delay Program (GDP) with the assignment of CTOT will still be used, e.g., in the case of domestic ATFM operations or in specific areas of cross-border ATFM operations with special arrangements among the ANSPs involved. In a GDP, CTOT is the primary constraint time issued to regulate departures of flights destined for congested or constrained airspace or arrival aerodrome. The sharing of CTOT with ANSP managing the

departure aerodrome ensures that the departure aerodrome holds the aircraft on the ground to smooth out traffic peaks before they enter the airborne network or going to the arrival aerodrome.

1.6. Enhancing Predictability via Airport Collaboration (TTOT): TTOT is derived from Airport-Collaborative Decision Making (A-CDM) processes and provides a more accurate picture of when an aircraft is expected to be ready for departure compared to the filed flight plan. Integrating A-CDM derived times such as TTOT into ATFM assists in enhancing ATFM's demand prediction, resulting in a more accurate, dynamic, and effective demand-capacity balancing initiatives.

1.7. The transition from legacy messages (such as Slot Allocation Messages - SAM) transmitted via AFTN/AMHS to modern Flight Information Exchange Model (FIXM) messages is driven by the need for global interoperability, data richness, and the implementation of SWIM.

1.8. There is a need to shift from existing SAM and related messages to ATFM FIXM messages due to the following reasons below:

1.8.1. Limitations of legacy AFTN/AMHS formats: Legacy teletype-based formats are rigid and often lack the flexibility to carry complex trajectory data required for modern ATFM.

1.8.2. Support for FF-ICE and global standardization (which FIXM will be used for exchanging flight-related information): Shifting ATFM and A-CDM information exchange to FIXM-based message formats ensures that APAC ATFM and A-CDM operations are aligned with global ICAO standards and are ready to support the operations in FF-ICE environment, as well as facilitating "global interoperability.

1.8.3. Handling of region-specific requirements via extensions: Shifting to FIXM allows the region to define specific data elements (such as those found in the APAC Regional FIXM Extension) in a structured, machine-readable format (XML/GML) that legacy teletype-based messages cannot easily support.

2. Operational Scenarios

2.1. The three parameters cited represent different phases within a flight trajectory:

2.1.1. TTOT (Target Take-Off Time): Generated by A-CDM system, representing the expected time a flight is expected to depart from the departure aerodrome considering factors including the airspace user's TOBT (Target Off-Block Time) and departure sequencing requirements.

2.1.2. CTOT (Calculated Take-Off Time): Generated by the ATFM system to manage traffic into constrained or congested airspace or arrival aerodrome by controlling the departure (take-off) time of the flight from the departure aerodrome.

2.1.3. CTO (Calculated Time Over): Generated by the ATFM system to manage traffic into constrained or congested airspace by controlling the time the flight is expected to cross a specific waypoint in an airspace.

2.2. Operational Use Cases for ATFM FIXM messages to be exchanged using Flight-Specific ATFM Measure Service and ATFM/A-CDM Integration Service (ref. Business Functionality of APAC Common SWIM Information Services, version 1.0) are elaborated below:

2.2.1. <u>Cross-Border A-CDM data exchange</u>: Using SWIM to provide timely cross-border TTOT updates from A-CDM airports to airport operators or ANSP. This enables more accurate demand prediction, allowing for more optimised CTOT/CTO allocation and more appropriate delay assignment, reducing unnecessary buffering and ground delay.

2.2.2. <u>Cross-Border Metering between Adjacent ANSPs</u>: Sharing a CTO, especially between two adjacent Air Navigation Service Providers (ANSPs) enables traffic metering through early speed adjustments in the cruise phase, rather than ad-hoc holding by the downstream ANSP which are more costly, less environmentally friendly, and introduces additional workload on ATCOs.

2.2.3. <u>Expanding the scope of ATFM measure</u>: Conventional ATFM measure such as a GDP targets management of pre-departure flights. With the inclusion of CTO issuance, the scope of ATFM measure could be expanded to include airborne flights. AUs could contribute to overall traffic management through trajectory adjustments during cruise phase to meet with the required CTO. This could reduce ground delays as ATFM delays are spread across a wider flight profile range.

2.2.4. Dynamic Collaborative-Decision Making Process: Enabling ANSPs and AUs to view ATFM information in real-time and perform timely negotiations as information are exchanged.

3. ATFM FIXM Messages Identified

3.1. In order to achieve the above ops scenarios, five different messages were identified, namely (1) FIXM TTOT Allocation, (2) FIXM CTOT Allocation, (3) FIXM CTOT Cancellation, (4) FIXM CTO Allocation and (5) FIXM CTO Cancellation.

3.2. The FIXM TTOT, CTOT and CTO Allocation messages allow the system to exchange TTOT, CTOT or CTO values (respectively) when made available as well as providing the revision to them. Note that the revision to TTOT, CTOT, and CTO can be distributed using the "Allocation" messages by replacing the existing time values. Recipient systems should be able to differentiate between an initial allocation and a revision.

3.3. The FIXM CTOT and CTO Cancellation messages allow the system to remove the CTOT or CTO values usually sent after an ATFM program is cancelled.

Step	Message	Details	Business Timeout	Comments	Message Exchange Pattern
1	FIXM TTOT Allocation	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	
2	FIXM CTOT Allocation	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	
3	FIXM CTOT Cancellation	Mandatory (after ATFM program is canceled)	N/A	After GDP is canceled, or the assigned CTOT no longer applies to the flight, this message has to be published.	
4	FIXM CTO Allocation	Mandatory (after ATFM program ran)	N/A	After the ATFM measure is run or revised, dependent on individual configuration condition	

				set on when to be sent out, this message has to be published.	
5	FIXM CTO Cancellation	Mandatory (after ATFM program is canceled)	N/A	After the ATFM measure is canceled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4. Mapping of ATFM FIXM Messages to APAC Common SWIM Information Service

4.1. Business functionality of the information service: **Flight-Specific ATFM Measure Service**

4.1.1. Scenario: <u>Dissemination of CTOT Allocation</u> by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.1.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTOT Allocation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Allocation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program ran)	N/A	After a GDP is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.2. Scenario: <u>Dissemination of CTOT Cancellation</u> by Initiating ATFMU to Facilitating ATFMU, AU, and other relevant stakeholders

4.1.2.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTOT Cancellation Message to Facilitating ATFMU, AU, and other relevant stakeholders. No business confirmation needed.

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTOT Cancellation to Facilitating ATFMUs, AUs, and other relevant stakeholders	Mandatory (after ATFM program is cancelled)	N/A	After GDP is cancelled, or the assigned CTOT no longer applies to the flight, this message has to be published.	

4.1.3. Scenario: **Dissemination of CTO Allocation** by Initiating ATFMU to Facilitating ATFMU and AU

4.1.3.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTO Allocation Message to Facilitating ATFMU and AU. No business confirmation needed.

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Allocation to Facilitating ATFMU and AU	Mandatory (after ATFM measure ran)	N/A	After ATFM measure is run or revised, dependent on individual configuration condition set on when to be sent out, this message has to be published.	

4.1.4. Scenario: Dissemination of CTO Cancellation by Initiating ATFMU to Facilitating ATFMU and Facilitating ATFMU and AU

4.1.4.1. Business Completion Criteria: Initiating ATFMU disseminates FIXM CTO Cancellation Message to Facilitating ATFMU and AU. No business confirmation needed.

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Initiating ATFMU sends FIXM CTO Cancellation to Facilitating ATFMU and AU	Mandatory (after ATFM measure cancelled)	N/A	After ATFM measure is cancelled, or the assigned CTO no longer applies to the flight, this message has to be published.	

4.2. Business functionality of the information service: **ATFM/A-CDM Integration Service**

4.2.1. Scenario: Dissemination of TTOT Allocation by departure eASP/ATFMU

4.2.1.1. Business Completion Criteria: Departure eASP/ATFMU disseminates FIXM TTOT Allocation to relevant eASPs/ATFMU. No business confirmation needed.

Step	Message	Message Requirements	Business Timeout	Comments	Message Exchange Pattern
1	Departure eASP/ATFMU sends FIXM TTOT Allocation to relevant eASPs/ATFMUs	Mandatory (when TTOT is available)	N/A	For all departure flights with TTOT, ANSPs will publish.	

Guidance Materials for Request and Reply Message Exchange Pattern in Asia/Pacific SWIM

May 2026

SWIM Implementation Pioneer Ad-hoc Group (SIPG)

Table of Contents

1. Introduction

1.1. Background

1.1.1. SWIM Implementation Pioneer Ad-hoc Group (SIPG)

The establishment of SIPG was decided at the SWIM TF/7 in 2023, and its Terms of Reference (TOR) was endorsed by the SWIM TF/? under the **“”**. Following SIPG’s TOR, the initial objective of the SIPG was to implement a seed/prototype version of the Asia/Pacific SWIM within 2024 as a means of kickstarting SWIM adoption in the region. Based on the initial objectives SIPG, SIPG built protype version of Asia/Pacific SWIM and supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial in Hong Kong, China, from 28 to 29 May 2024

After the supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial, there were still needs for an expert group that can provide technical work for SWIM implementation in the Asia/Pacific region, and the SIPG continues its work in response to the need. In line with this, the SIPG defined sub-tasks to further materialize the implementation of SWIM in the Asia/Pacific region, and the sub-tasks, which are currently identified and in progress by the end of Dec 2026, as of Sep. 2025, are as below:

- Task 1: Requirements and Functionalities of the Edge EMS and Gateway EMS
- Task 2: New proposed hierarchical architecture review
- **Task 3: Guidance for the Sync Req/Rep and Async Req/Rep Message Exchange Pattern**
- Task 4:
- Task 5 : SWIM Technical Infrastructure Integration
- Task 6: SWIM Security Requirements and Implementation
- Task 7: SWIM Registry Requirements and Implementation
- Task 8:
- Task 9: APAC SWIM Integration Testing
- Task 10: Performance Testing SWIM TI
- Task 11: Regional SWIM TI Operationalization Guidance Material

1.1.2. Limitation of the Previous SWIM Efforts in the Asia/Pacific Region

There have been various efforts for the implementation of SWIM in the Asia/Pacific region. These efforts are not only about the establishment of regional implementation guidance or standardization, but also implementation of regional SWIM prototype, and demonstrations. However, regarding the demonstration and technical efforts for message delivery, these efforts were mostly depended on an Enterprise Messaging System (EMS) using Publish and Subscribe (Pub/Sub) Message Exchange Pattern (MEP), as mentioned in “APPROACH TO GLOBAL API GATEWAY FOR WEB SERVICE (SWIM TF/10 – WP/18)”.

A MEP refers to the fundamental interaction mechanism that defines how messages are exchanged between heterogeneous systems. There are a few mechanisms to enable MEP such as Pub/Sub, Request and Reply (R/R), and Fire and Forget. And, ICAO SWIM Implementation document (Doc. 10203) identified this mechanism for MEP in the SWIM. However, given the current emphasis on the regional SWIM prototype architecture using an EMS which the SIPG is developing in the APAC region, the primary issue is to discuss how the Request/Reply MEP should be implemented.

1.2.Guidance Materials

Guidance materials (i.e. this document) is one of the deliverables of Task 3 under SIPG. Republic of Korea, Australia, China, Hong Kong China, India, Japan, Fiji, Singapore, Thailand, Malaysia, USA, New Zealand. CANSO have volunteered and contributed to producing this document.

1.3. Purpose of the Document

This document provides guidance for R/R MEP in the Asia/Pacific region, and it covers business and technical aspect of R/R MEP including FF-ICE/R1 based a data flow and use-case diagram, with the purpose of ensuring continuous and coherent implementation of the R/R MEP to SWIM platform in harmonized and interoperable within the region.

2. Operational Concept

This chapter introduces the operational concept of the R/R MEP. It describes the definition of the R/R MEP, identifies the core components of the R/R MEP, including participants, synchronization mechanisms, and supporting elements.

2.1. Definition of R/R MEP

The R/R MEP is a communication model where a requester sends a request message to a replier, which then processes the message and returns a reply.

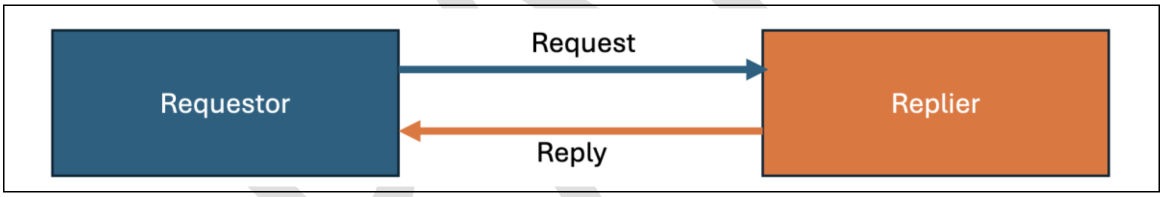


Figure X. Diagram

2.2. Components of R/R MEP

The components of R/R MEP could be distinguished as follows:

Core Participants

- **Requester:** The requester asks for something via a request; it could be simply considered as Create, Read, Update, Delete (CRUD) operation
- **Replier:** The replier processes the request and return a message in reply

Synchronization Mechanisms

- **Synchronous:** The requestor waits for the response before continuing its operation
- **Asynchronous:** The requestor's control flow is released after the request is sent, and the response is handled later, perhaps via a callback or another mechanism.

Supporting Elements

- **Payload:** it defines the actual contents of the message being exchanged. This could be Extensible Markup Language (XML), JavaScript Object Notation (JSON)
- **Transportation and Protocol Binding:** it defines how the R/R is implemented. This could be Hyper Text Transfer Protocol/Representational State Transfer (HTTP/REST), Simple

Object Access Protocol (SOAP), Advanced Messaging Queue Protocol (AMQP), Message Queuing Telemetry Transport (MQTT)

- **Error and Exception Handling:** it provides mechanism to manage any other errors or exceptions such as failures, timeouts, and invalid requests
- **Security and Policy Enforcement**: it provides authentication, authorization, encryption, compression, logging mechanism

3. R/R MEP in SWIM

This chapter provides the conceptual framework of R/R MEP within the SWIM environment. It identifies the role of R/R MEP at the global level, and in the Asia/Pacific region, explains how the R/R MEP operates under different synchronization mechanisms, Furthermore, it provides comparison between synchronous and asynchronous R/R MEP, points out possible confusion part and clarifies them.

3.1.R/R MEP in the Global Level

ICAO SWIM Implementation Document (Doc. 10203) defined MEP including synchronous and asynchronous R/R as follows:

5.3.2.4.2 ***Message exchange patterns***

5.3.2.4.2.1 Several types of message exchange patterns (MEPs) are expected to be supported within a SWIM environment, including synchronous request/reply, asynchronous request/reply, one-way ("fire-and-forget") and publish/subscribe. The MEP used in any given exchange is directed by the information service provider to meet information service objectives. These MEPs include:

a) **Synchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer requests;

b) **Asynchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests;

c) **One-way ("fire-and-forget"):** The consumer initiates a message to an information service without expecting any response from the information service. This MEP is particularly useful at the lower application layer, where immediate message responses are not required;

d) **Publish/subscribe (P/S):** The consumer initiates a subscription request to an information service. The subscription may be capable of providing details (such as through a filtering parameter) on the information being subscribed to:

1) in the case of a P/S with a push mechanism, the information service sends necessary updates (publish) to the consumer, in accordance with the subscription. This MEP requires that the consumer can receive messages at any time. However, the consumer is not restricted from completing other operations while waiting for the information service to respond; and

2) in the case of a P/S with a pull mechanism, the information service would keep necessary updates available to the consumer, in accordance with the subscription. This MEP requires that the consumer send requests to the information service to receive the updates.

Figure X. Diagram

3.2.R/R MEP in the Asia/Pacific Region

ICAO APAC SWIM Implementation Guidance Document (IGD, Working Draft) defines MEP including R/R as follows:

3.3.2 Standards for Resource-oriented Interface

3.3.2.1 RESTful API

The following table makes reference to RESTful API related standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3 Standards for Method-oriented Interface

3.3.3.1 OGC WCS

The Open Geospatial Consortium (OGC) has developed a number of Web Common Service (WCS) standards that define services for accessing and manipulating geospatial data in a web environment, such as aeronautical information and meteorologic information. The following table makes reference to some of the key WCS standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3.2 SOAP

As most users have not applied SOAP to current web applications, this standard is not recommended for the development of SWIM services. The following table makes reference to SOAP related standards and specifications required for supporting the service bindings of SOAP applications.

4.1 Functional Capabilities

The SWIM TI functional capabilities described in this section are common features widely supported by mainstream Commercial Off The Shelf (COTS) systems and services. Implementing a SWIM TI that supports all these capabilities is recommended. The SWIM TI functional capabilities can be grouped into three categories as follows:

Table 8. SWIM TI Functional Capabilities

Capability	Description	Related Technology
Messaging	This capability employs technologies that enable information exchange using various access methods (e.g., publish/subscribe, request/reply).	- Message brokers: such as Apache Kafka, RabbitMQ, ActiveMQ.

Figure X. Diagram

Note: This section is intended for the business experts group of the ICAO APAC region to explain why this document does not select SOAP as one of the candidate technologies to be explored, despite the fact that Eurocontrol's SWIM implementation uses SOAP for R/R MEP.

4. Mechanism

This chapter outlines the mechanism of the R/R MEP. It explains the difference between synchronous and asynchronous interactions, compares their characteristics, and highlights common points of confusion. It also clarifies how R/R MEP should be understood from a business perspective to support consistent implementation in the Asia/Pacific SWIM environment.

4.1.Synchronous R/R MEP

In ICAO SWIM Implementation Document, synchronous R/R MEP is defined as – *The consumer initiates a request to an information service; the service processes the request and generate a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer request*

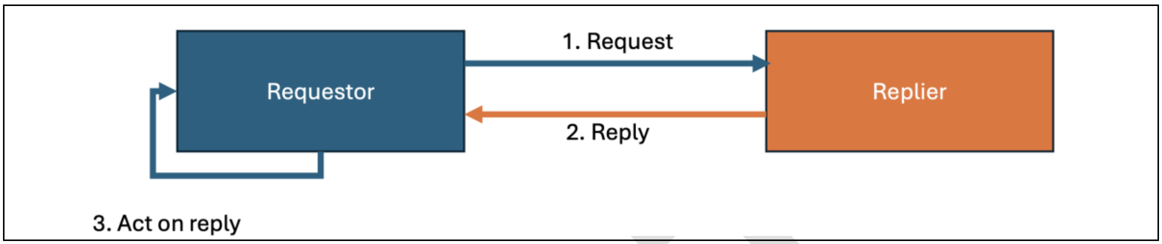


Figure X. Diagram

4.2.Asynchronous R/R MEP

In ICAO SWIM Implementation Document, synchronous R/R MEP is defined as – *The consumer. initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests*

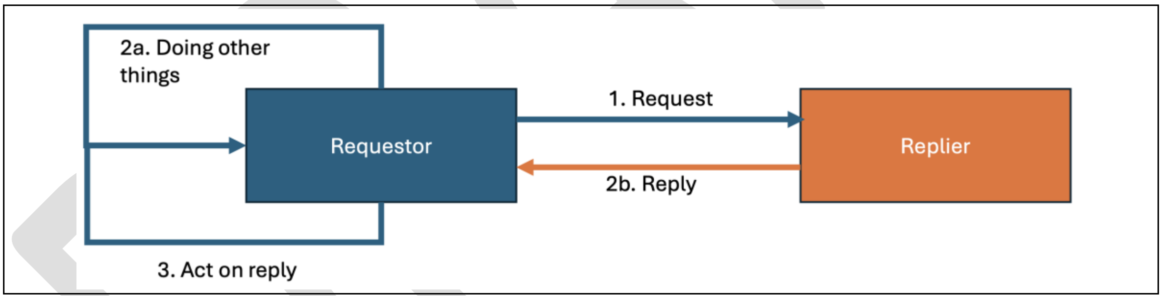


Figure X. Diagram

4.3. Comparison of Synchronous and Asynchronous R/R MEP

Comparison of synchronous and asynchronous R/R MEP is as follows:

Index	Synchronous	Asynchronous
Time Coupling	Both requester and replier are available at the same time.	Requester sends a request and continues its process; replier can send the response later when available.
Space Coupling	Requester needs to know the exact service endpoint (protocol, address, API).	Requester sends to a known endpoint, but response may arrive via callback, polling, or correlation ID; looser coupling in response handling.
Reliability Handling	Retries and error handling happen at requestor side.	Retries and correlation of delayed responses must be managed at the

		requester side (e.g., matching reply with original request).
Use Cases	• Low latency expected • Both parties are available • Immediate response interaction	• Replier may not be immediate • Deferred or background processing acceptable
Typical Scenarios	• User Authentication • User Interface Interactions • Database Read and Immediate Write	• Order processing with delayed confirmation • Flight plan filing with later validation • Weather data request with queued response • Batch data processing

Table X. Table

4.4. Confusion between Synchronous and Asynchronous R/R MEP

In real-world implementations, confusion often arises when distinguishing between synchronous and asynchronous Request/Reply (R/R) patterns, especially in cases where a service returns an immediate acknowledgment (e.g., Status code without payload) but the actual business result (e.g., Payload) is provided later.

This confusion was raised at the SWIM TF/10 – Approach to Global API Gateway for SWIM Web Services (WP/01) and SIPG WS/2 - *Request-Reply Message Exchange Pattern (SP/09).*

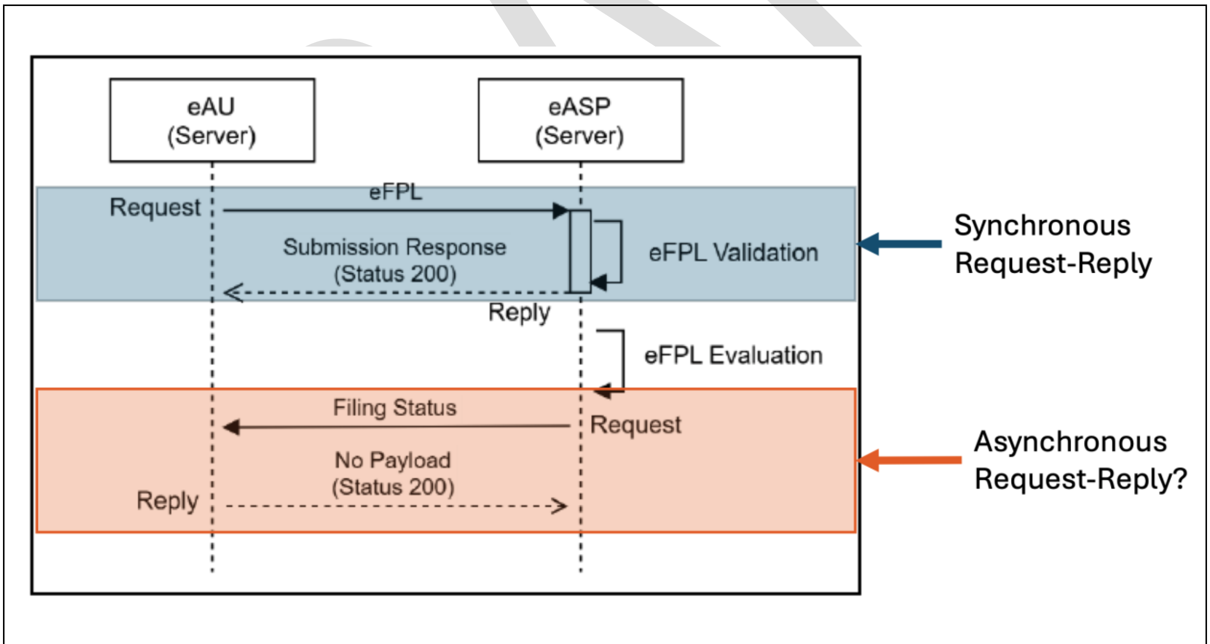


Diagram X. Diagram

From a **technical perspective**, when a requester sends a message and immediately receives a system-level response (e.g., status code with no payload), this exchange may be classified as **synchronous**. The requester technically obtains a reply within the same transaction, even if that reply does not contain the final outcome of the request.

From a **business perspective**, however, the true result of the request (e.g., validation outcome, processing status, or evaluation result) is delivered at a later stage. The requester must therefore rely on additional asynchronous mechanisms—such as callbacks, notifications, or correlation with a subsequent message—to complete the intended business process. In such cases, the service behavior is effectively **asynchronous**, because the requester cannot proceed with its operational workflow until the deferred reply is received.

This duality highlights that:

- At the **technical-level**, an immediate acknowledgment can be interpreted as synchronous.
- At the **business-level**, the process may still be asynchronous if the final response is decoupled from the initial request.

To make it clear and reduce the nuisance triggered by the confusion mentioned above, when designing or documenting R/R MEP in SWIM, it is important to clearly differentiate between **technical-level of synchronization** and **business-level of synchronization**, to avoid misinterpretation and ensure consistent implementation across different systems and stakeholders.

4.5. Clarification of Synchronous and Asynchronous R/R MEP

To resolve the confusion described in the previous section, it is necessary to establish a clear basis for distinguishing between synchronous and asynchronous R/R MEP.

From a **technical perspective**, any immediate acknowledgment could be appeared as a synchronous, since the requester receives a response without delay. However, this does not always reflect the completion of the underlying business process.

Therefore, for the purpose of SWIM implementation in the Asia/Pacific region, the classification of R/R MEP shall be **defined from the business perspective**:

- If the requester can complete its intended **business operation** immediately upon receiving the reply, the interaction is considered **Synchronous R/R**.
- If the requester must wait for an additional message or deferred processing result in order to complete its **business operation**, the interaction is considered **Asynchronous R/R**.

Classification	Case/Description	Technology
Synchronous Response	**ACK + Final Result Payload** *Returns an acknowledgment together with the final result (payload).* *No further response is expected.)*	**HTTP-based Synchronous R/R** *HTTP 200 OK + payload result*
Asynchronous Response	**ACK + Partial / Meta Payload** *Returns an acknowledgment along with some meta information or partial result (payload).* *The result will be delivered later through the same or a different channel.*	**- HTTP-based Asynchronous R/R** *HTTP 200 Accepted → HTTP later callback* **- AMQP-based Asynchronous R/R** *AMQP ACK (Accepted) → asynchronous reply via reply-to queue with matching correlation-id* **- Hybrid Asynchronous R/R** *HTTP 202 Accepted → final result via MQ (reply queue)*
	ACK Only Simply acknowledges that the request has been accepted The actual result will be sent asynchronously via a designated reply mechanism (e.g., callback endpoint, reply queue, topic, or event).	

By adopting this **business-oriented definition**, system designers and stakeholders can avoid misinterpretation caused by protocol-level acknowledgments and instead align the classification of R/R MEP with operational reality. This ensures that the design of SWIM services, including error handling, correlation mechanisms, and user expectations, is consistent with the actual business workflows they are intended to support.

Table X provides examples that bridge the business and technical perspectives of **asynchronous** R/R MEP. It highlights that a transaction may appear synchronous at the protocol level, yet still behave asynchronously from a business process standpoint.

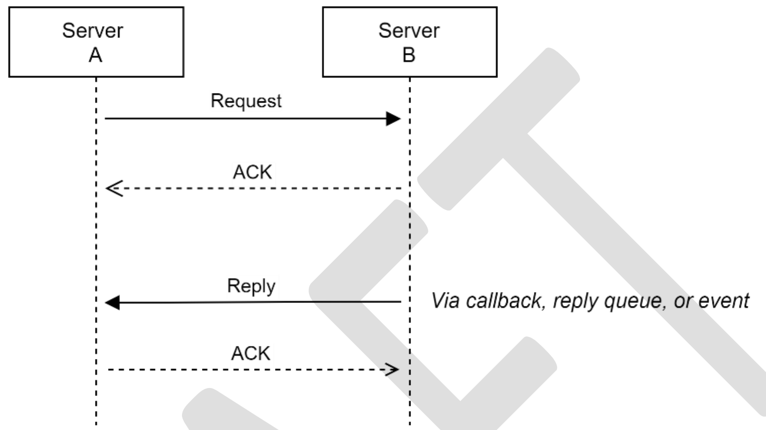
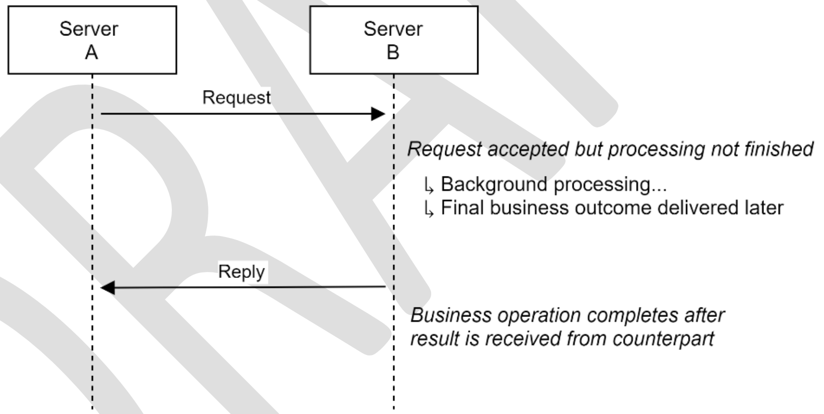
Asynchronous R/R in technical aspect	
Asynchronous R/R in business aspect	

Table X. Table

5. Implementation

This chapter explains practical methods that could be adopted to implement the R/R MEP in the SWIM environment. It describes technical options for both synchronous and asynchronous interactions, evaluates their suitability for Asia/Pacific SWIM, and provides regional approach.

5.1. Implementation of Synchronous R/R MEP

Synchronous R/R interactions can be effectively implemented using lightweight, stateless web service technologies as follows:

a. REST API (HTTP/HTTPS)
- A requester sends an HTTP request (e.g., GET, POST, or DELETE) and waits for an immediate reply from counterpart
- The response includes both status code (e.g., HTTP status code 200 - OK, HTTP status code 400 - Bad Request) and, a payload (e.g., JSON, XML)
- RESTfAPI represents the de-facto for synchronous R/R interactions in the ICT industry
- This approach aligns with the APAC SWIM regional strategy, as REST is widely supported, interoperable, and well-suited for cross-domain information exchange

b. SOAP (HTTP/HTTPS)
- SOAP provides a rigid XML-based messaging protocol and was historically used for enterprise-level synchronous R/R.
- However, as stated in previous chapters, although SOAP also could be enabled using HTTP/HTTPS, unlike REST, SOAP is not recommended to use due to its complexity, high overhead, and limited scalability due to its constraints as follows:
  - Only XML is supported, other data format like JSON is not supported
  - Requires WSDL (Web Services Description Language) for service definitions, which adds complexity at the initial setting;
  - SOAP's components such as envelop have an overhead, but a bandwidth of CRV is one of the major issues in the Asia/Pacific region;

c. Other Protocol Bindings
- While synchronous R/R can also be implemented over other protocols (e.g., gRPC, GraphQL, even AMQP), these remain optional and are not stated at the IGD at the regional level.

5.2.Implementation of Asynchronous R/R MEP

Asynchronous R/R interaction is not directly related to whether processing can be completed instantly or not, or whether replies must be deferred. Implementation options could be as follows:

a. REST API (HTTP/HTTPS) with Asynchronous Callback
- A requester sends an HTTP request and receives an immediate acknowledgment (status code).
- The actual business result is delivered later via an HTTP callback endpoint provided by the requester. This solution (a) is the callback mechanism that is limited to HTTP/HTTPS-based endpoints;
- This requires correlation mechanisms to match replies with original requests.

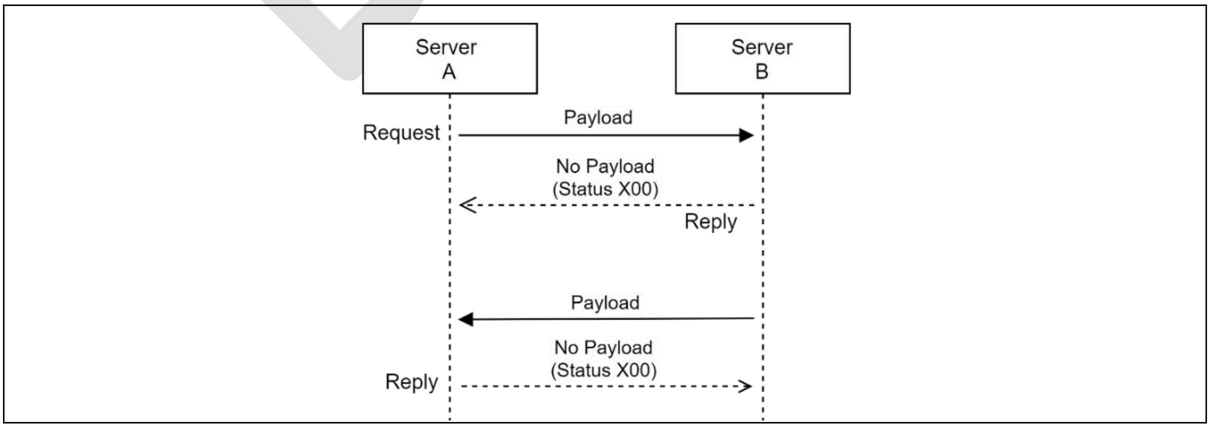


Diagram X. Diagram

b. REST API (HTTP/HTTPS) with Polling
- The requester periodically polls the service to check the status of its request.
- While simple, polling may cause inefficiencies in bandwidth usage and should be applied only for services with low response frequency.

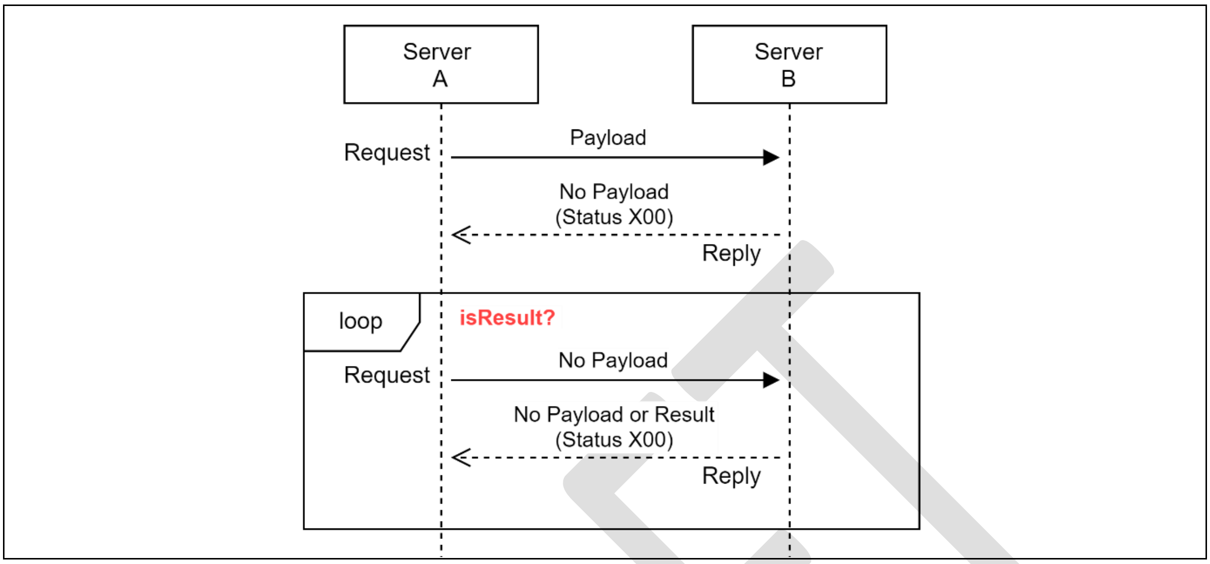


Diagram X. Diagram

c. Message Queue
- AMQP or MQTT can be used to implement asynchronous R/R interactions in distributed environments.
- AMQP properties (e.g., correlation-id, reply-to) must be configured to send request a query, and the message broker uses or creates shared or exclusive queue to handle the R/R MEP.
- Counterpart processes a request query, generates a corresponding reply using the same correlation-id, and returns it to the queue or topic specified in the reply-to property.

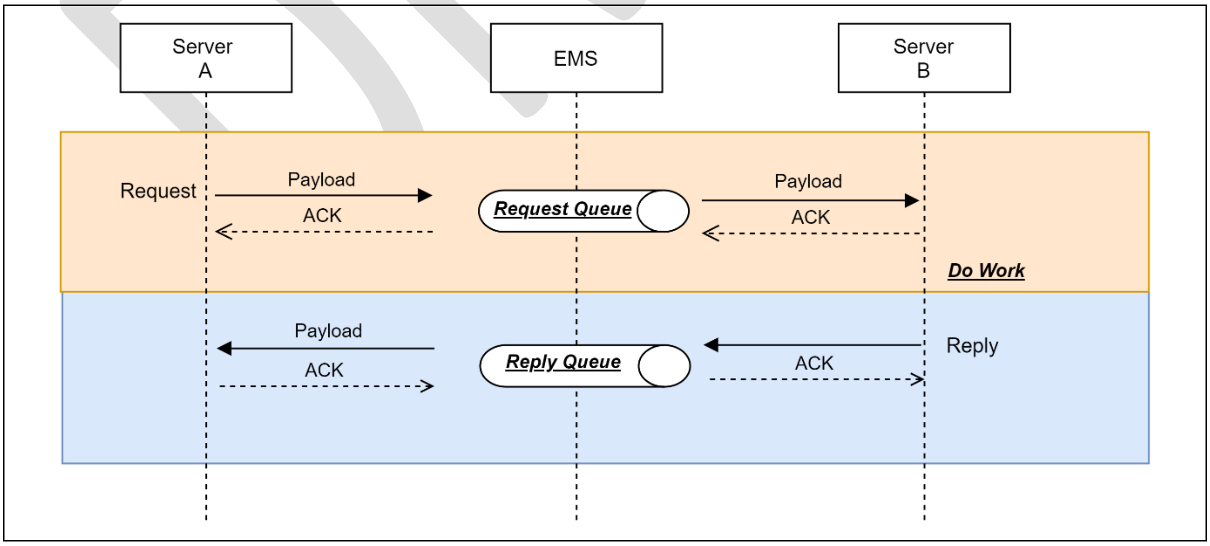


Diagram X. Diagram

d. REST API–Message Queue Bridge

- Most modern message brokers provide a REST API interface. A gateway service, either built into the broker or deployed as a standalone component, performs protocol conversion between AMQP and HTTP.
- This provides a REST API interface externally while using asynchronous message queue–based message delivery internally. Internal message delivery is the same as described in the (c)

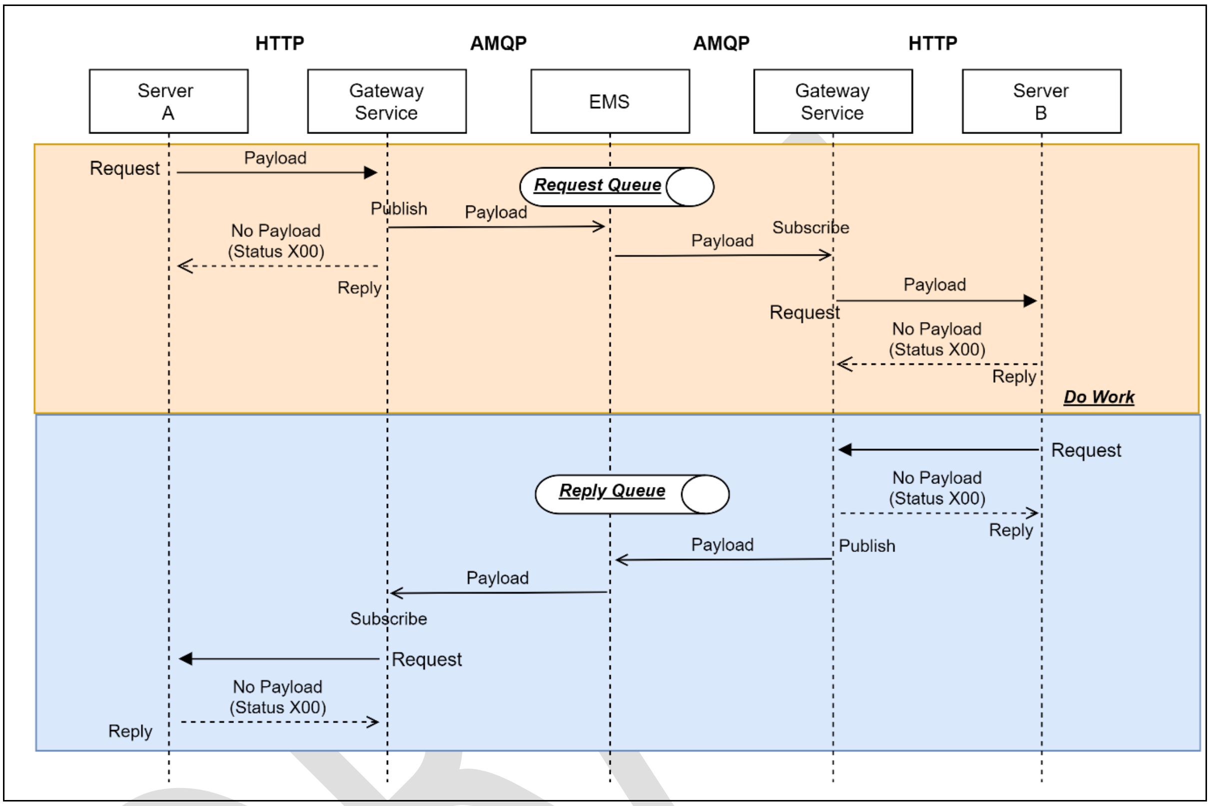


Diagram X. Diagram

a. Synchronous REST with Asynchronous Event Delivery using Message Queue

- This pattern is asynchronous R/R MEP implementation of Network Manager (NM), Eurocontrol. The pattern is composed of two parts:
  - Synchronous part: The server sends HTTP request, and the counterpart returns reply. If the status of the information reply is OK, the server extracts the information on how to consume the asynchronous reply message, the pattern continues with the asynchronous part
  - Asynchronous part: The server connects to the broker and consumes the asynchronous reply message
- This pattern allows integration of REST API with asynchronous processing workflows using message queue

Click link to see more about asynchronous R/R MEP of NM, Eurocontrol - [NM Release Notes]

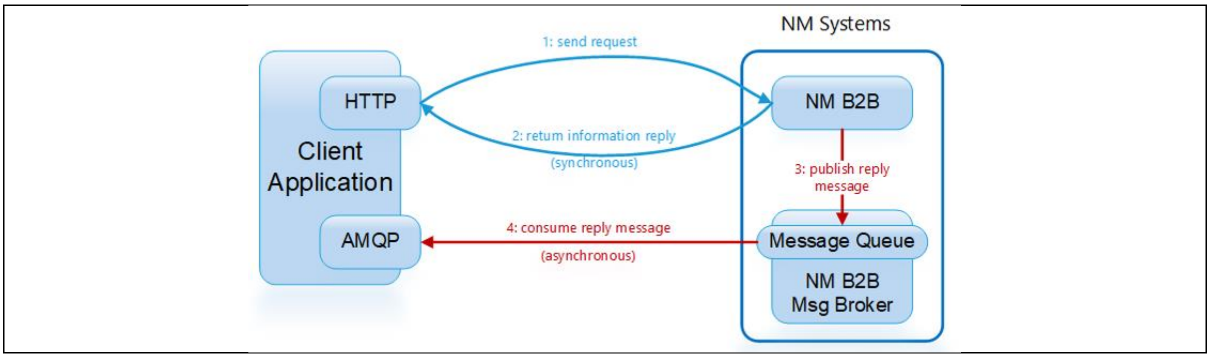


Diagram X. Eurocontrol Network Manager 26.0 Release Note ed.5

5.3.Approach on Implementation of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following implementation approaches could be explored and adopted to ensure harmonization and interoperability among diverse stakeholders:

Synchronous R/R MEP – REST API via HTTP/HTTPS

For synchronous Request/Reply MEP, ***REST API via HTTP/HTTPS*** could be considered

Appendix X shows the sequence diagram of synchronous R/R MEP using REST API via HTTP/HTTPS

Asynchronous R/R MEP – REST API via HTTP/HTTPS with Asynchronous Callback

For asynchronous interactions, **1) *REST API* with asynchronous callback, 2) Message Queue 3) Synchronous REST API with Asynchronous Event Delivery using Message Queue** could be considered.

Appendix X shows the sequence diagram of 1) REST API via HTTP/HTTPS with asynchronous callback, 2) Message Queue-based Asynchronous R/R via AMQP, MQTT

In some cases, to support its business operation, information exchange may involve a combination of **Synchronous R/R MEP**, **Asynchronous R/R MEP**, and **P/S MEP** patterns. However, this document doesn't describe it in detail.

6. Regional R/R MEP Architecutre

This chapter outlines the topology of the R/R MEP. Specifically, it explains which R/R MEP solutions could be considered, and what architecture could be used to deploy those products or solutions to enable both synchronous and asynchronous R/R MEP within the region.

6.1.Introduction of R/R MEP Solution

a. Forward/Reverse Proxy
  - A forward proxy acts on behalf of an internal resource (e.g., client, server, or system), managing outbound requests to an external resource (e.g., client, server, or system) to provide capabilities such as access control, caching, and monitoring.
  - A reverse proxy acts on behalf of an external resource (e.g., client, server, or system), managing inbound requests to internal resource (e.g., client, server, or system) to security, load balancing, and routing, while hiding internal system details.
  - Comparison of forward and reverse proxy is as follows:

Aspect	Forward Proxy	Reverse Proxy
Diagram	Internal Resource → Forward Proxy → External Resource	Internal Resource ← Reverse Proxy ← External Resource
Traffic Direction	Handles outbound requests from internal resource to external resource	Handles inbound requests from external resource to internal resource
Visibility	Hides the internal resource's identity from external resource	Hides the internal resource's identity to external resource

Table X. Table

- Forward and reverse proxy supports OSI 3rd, 4th, and 7th layer protocols such as HTTP, Web-socket, TCP, UDP, IP. Main focus of forward and reverse proxy is message routing.

b. API Gateway
   - An API Gateway (GW) is built on top of a reverse proxy, primarily supporting HTTP and providing advanced API management capabilities. The main difference between an API GW and a reverse proxy lies in how policies are applied and managed from an API management perspective.

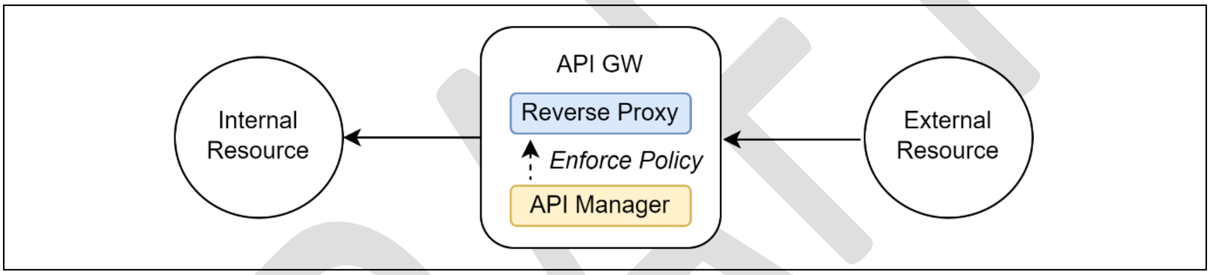


Diagram X. Diagram

6.2. Candidate Architecture using API GW or Forward/Reverse Proxy

This section describes candidate architectures that could be applicated for synchronous and asynchronous R/R MEP using REST API (HTTP)

a. Full Mesh Architecture
   - Same as Decentralized Approach of EMS interconnectivity architecture presented in WP05,SWIM/TF8. A service interacts with its own Edge API GW, and the Edge API GW directly forwards the request to another Edge API GW.

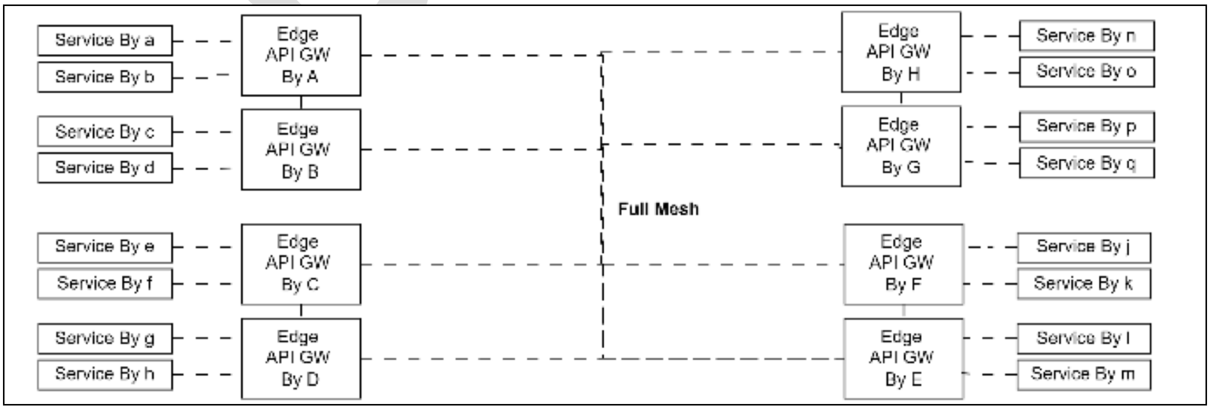


Diagram X. Diagram

b. Centralized Architecture

- Same as Centralized Approach of EMS interconnectivity architecture presented in WP05, SWIM/TF8 API GW acts as a single-entry point for all services between member states

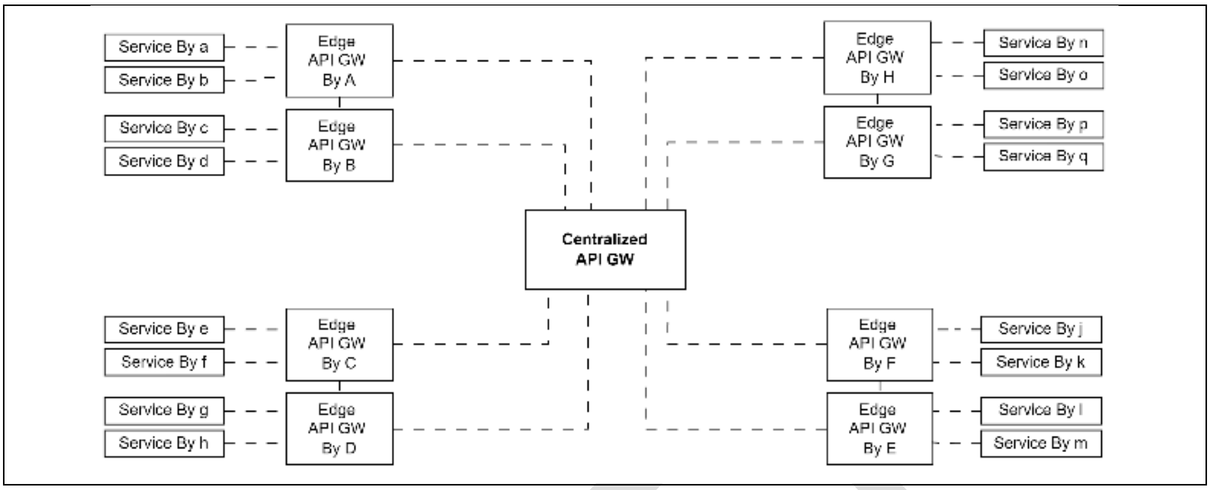


Diagram X. Diagram

c. Hierarchical Architecture

- Same as Hierarchy Approach of EMS interconnectivity architecture presented in WP05, SWIM/TF8. Edge API GW interacts with Regional API GW, which handle routing within sub-community or forward requests to other sub-community.

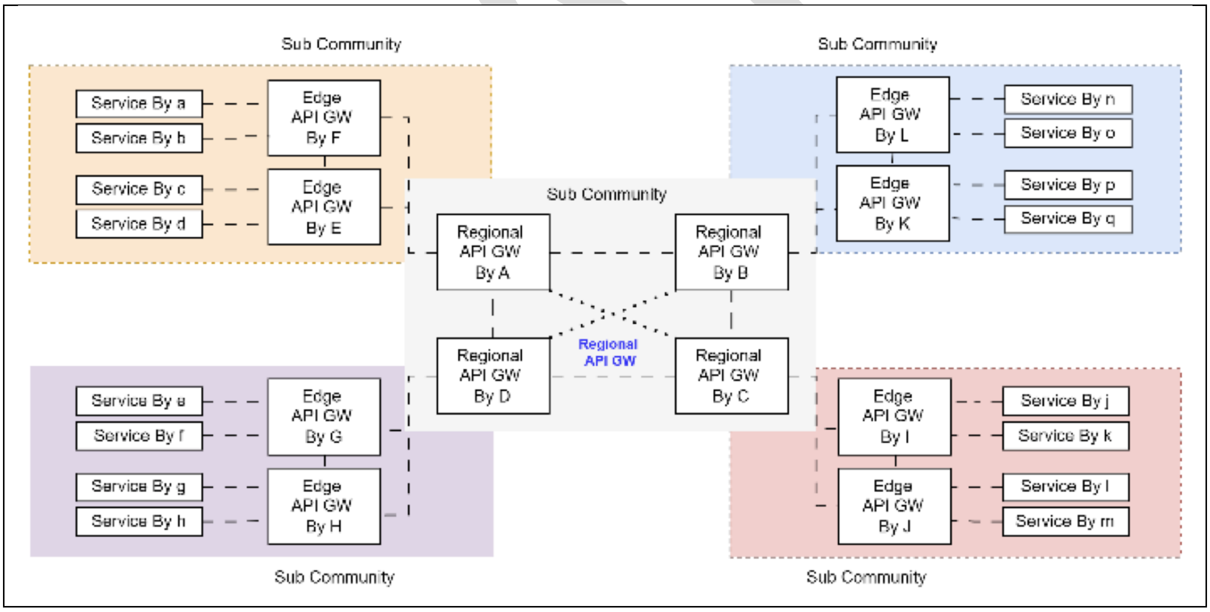


Diagram X. Diagram

d. Two-layered Hierarchical Architecture

- Same as Modified Hierarchy Approach of EMS interconnectivity architecture. presented in SP07 SIPG/WS8. Two-layer hierarchical API GW architecture with a clustered regional layer

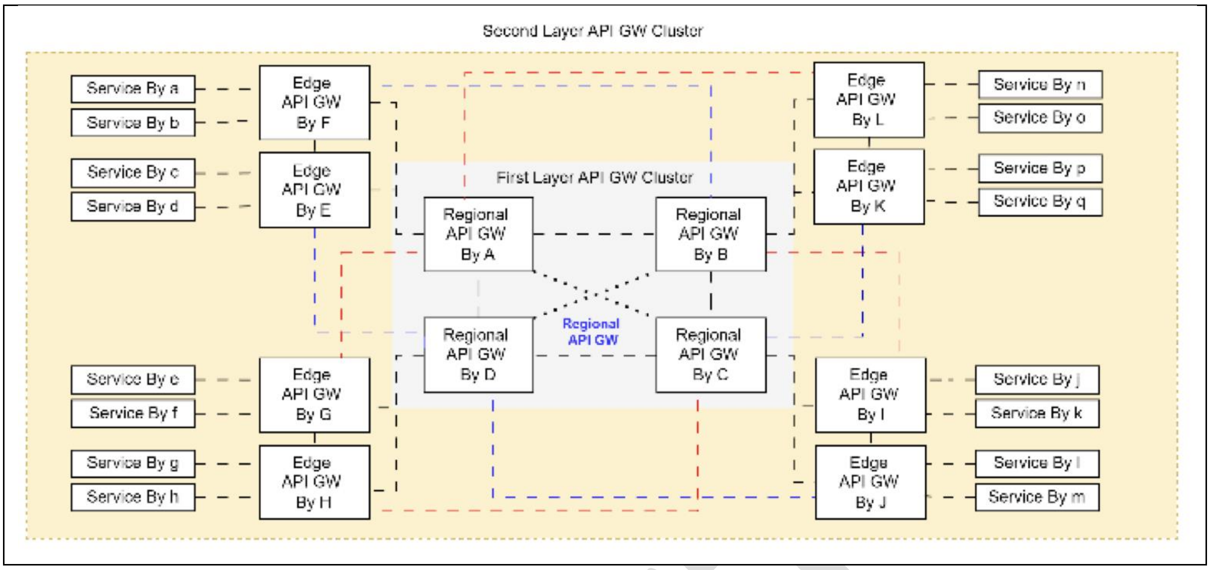


Diagram X. Diagram

Comparison of candidate architectures is as follows:

Architecture	Pros	Cons
Full Mesh	- Low dependency between API GWs - Easy to implement - High Sovereign	- All API GW should be ready for cross-border data exchange (e.g., bridge to SOAP for European region - API GW should be able to get connected with all API GW interested - All API GW should be updated when there is a policy/configuration change
Centralized	- Simple communication - Easy to configure policy	- Low Sovereign - Centralized API GW is SPOF
Hierarchical	- Efficient for cross border data exchange - A configuration change could be affected to only regional API GWs	- Regional API GW is SPOF
Two Layered Hierarchical	- Higher Fault tolerance - Better HA and scalability	- Hight cost for maintenance - Management Complexity

6.3.Candidate Architecture using Message Broker (AMQP)

This section describes the candidate architecture that could be applicable to synchronous and asynchronous R/R MEP using Message Broker (AMQP).

As modified hierarchy approach of EMS interconnectivity architecture, presented in SP07 SIPG/WS8 is information backbone for P/S MEP in the region. To enable synchronous and asynchronous R/R MEP using Message Broker (AMQP), same architecture is better to be used.

As of Oct. 25, Implementation of two layered hierarchical architecture (i.e., APAC SWIM P/S MEP architecture) is in progress under SIPG Task 1 and Task2.

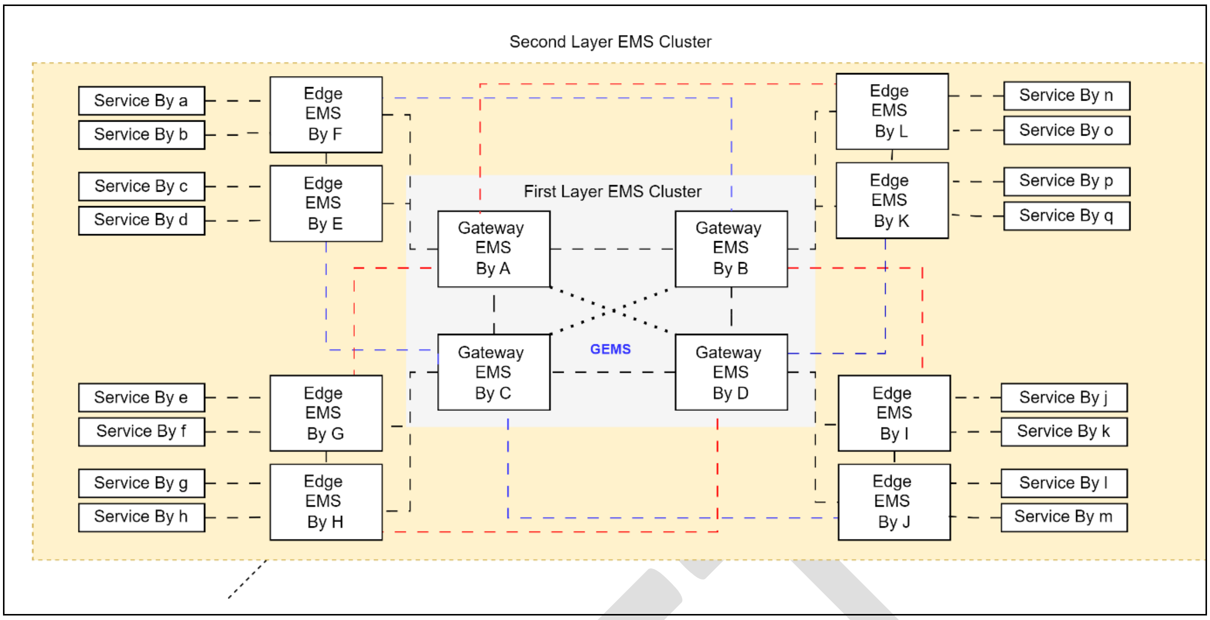


Diagram X. Diagram

6.4. Approach on Topology in Support of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following solution and architecture could be explored in support of R/R MEP in the region before adoption.

For synchronous Request/Reply MEP***, 1) API GW + Full Mesh Architecture*** *or* ***2) API GW + Two Layered Hierarchical Architecture*** *could be considered*

For asynchronous Request/Reply MEP***, 1) API GW + Full Mesh Architecture*** *or* ***2) API GW + Two Layered Hierarchical Architecture****, and* ***3) Message Broker + Two Layered Hierarchical Architecture (i.e., APAC SWIM P/S MEP Architecture (co-use))*** *could be considered*

7. Routing Mechanism

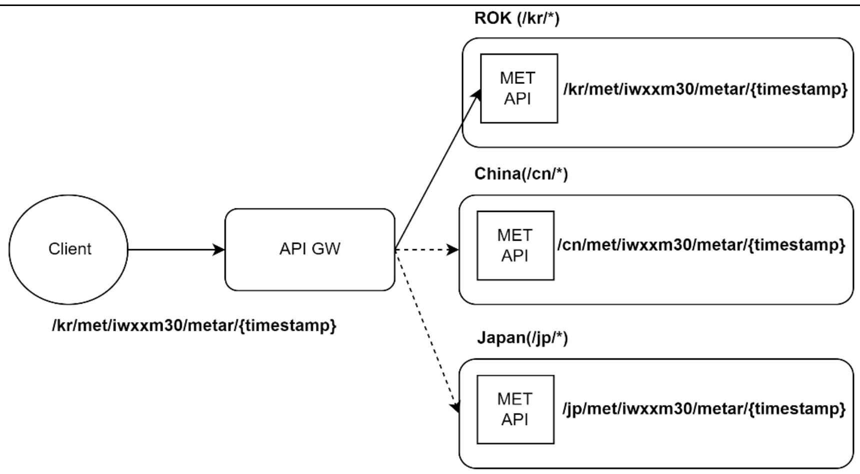
This chapter introduces routing mechanisms for R/R MEP. In R/R interactions, a message sent by a requester must be delivered to the correct replier through the API GW or message broker. Therefore, routing mechanism plays a critical role in ensuring that requests are directed to the right service and that responses are returned correctly. There are many different routing mechanisms for R/R MEP such as Path-based Routing, Content-based Routing, Header-based Routing, Policy-based Routing, and so on, but this chapter only describes Path-based Routing, and Contents-based Routing. They are mentioned as they represent the most fundamental and widely applicable approaches. These two mechanisms provide a clear contrast between simplicity and flexibility: Path-based routing offers transparency and ease of configuration, while Content-based routing enables dynamic and context-driven service delivery. This could be mapped with message routing for Topic and Queue in Pub/Sub MEP.

7.1. Routing Mechanisms

7.1.1. Path Based Routing

Path-based routing is the simplest and most commonly used routing mechanism. In this approach, the Uniform Resource Identifier (URI) path or topic within the HTTP or AMQP request determines the destination of the message.

HTTP-based R/R MEP



AMQP-based R/R MEP

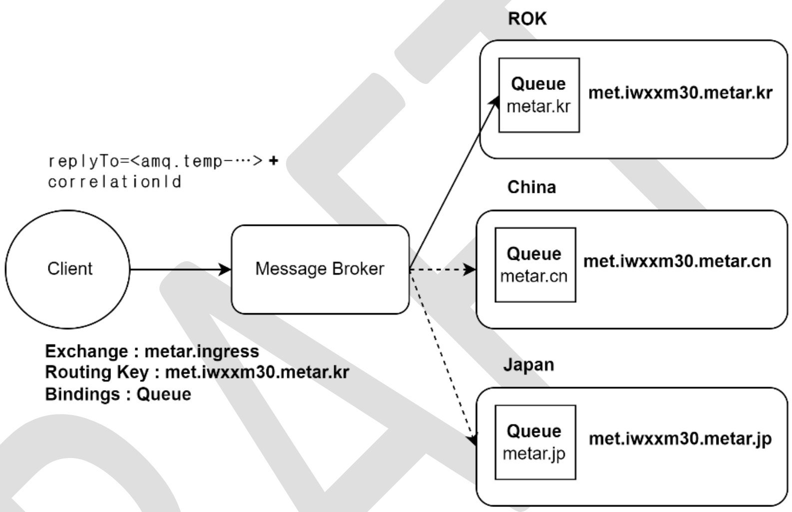


Diagram X. Diagram

a. **Mechanism:** The requester specifies the region, service name, or function within the routing path or topic naming structure (e.g., (HTTP) /kr/met/iwxxm30, /jp/met/iwxxm30, or (AMQP) met.iwxxm30.metar.kr).

b. **Advantages:**

- Easy to implement and configure
- High clarity and transparency, since routing is explicitly defined in the URL
- Works well with both HTTP-based gateways and messaging systems that support topic-based or header-based routing.

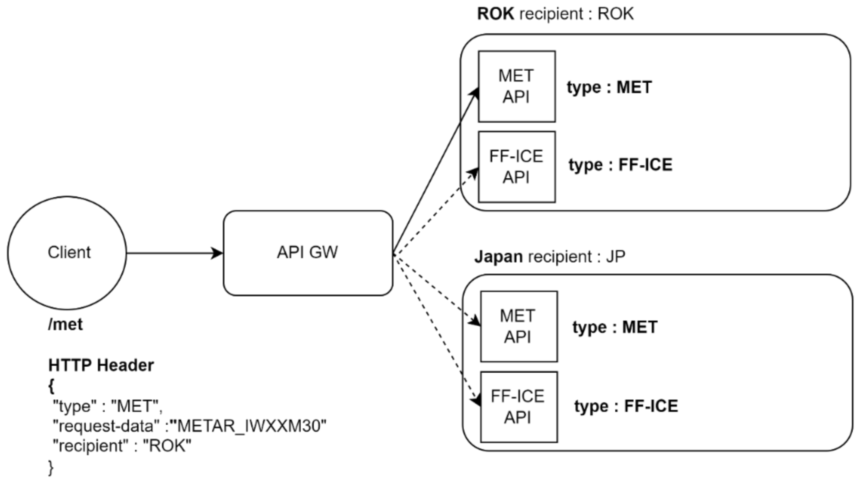
c. **Disadvantages (Consideration):**

- Need to have commonly agreed naming convention for the routing path and topic
- Front-facing path routing structure (e.g., URL or topic schema) need to be carefully designed; backend endpoints remain abstracted from requestor

7.1.2. Contents Based Routing

Content-based routing provides more flexibility by making routing decisions based on the message content (headers, parameters, or payload), rather than just the routing path or topic.

HTTP-based R/R MEP



AMQP-based R/R MEP

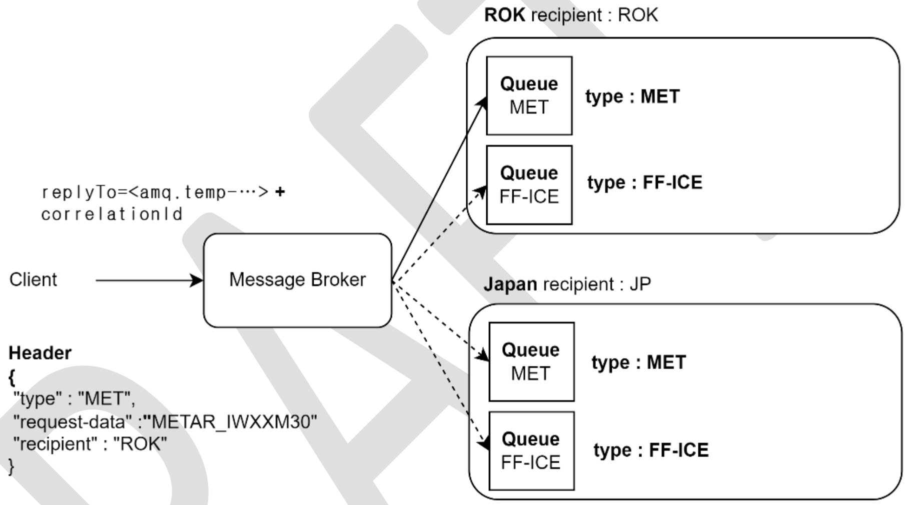


Diagram X. Diagram

a. **Mechanism:** The requester sends a generic request while including additional routing information in headers or message body (e.g., type, request-data, and recipient). The API GW or message broker inspects the content and dynamically determines the correct destination.

b. **Advantages:**

- High flexibility in handling dynamic services
- Decouples clients from internal routing logic; clients only need to know the front-facing service address, not the exact backend service.
- Supports complex service ecosystems where routing depends on data attributes (e.g., airspace ID, flight identifier)

c. **Disadvantages (Consideration):**

- More complex to configure and manage.
- Potential security risks such as injection attacks (e.g., malicious payloads in headers or message body) must be carefully mitigated through validation, sanitization, and strict policy enforcement.

- Inspection of the full message body is generally not permitted under ICAO provisions (e.g., Annex 15). Therefore, routing decisions should primarily rely on HTTP or AMQP headers or query parameters, rather than deep inspection of the payload.
- Routing decisions should therefore rely on standardized HTTP or AMQP headers or query parameters, rather than payload inspection.
- A commonly agreed set of routing-related headers should be established at the regional level to ensure consistency.

7.2.Approach on Routing Mechanism of R/R MEP in Asia/Pacific Region

For the Asia/Pacific SWIM environment, the following routing mechanism could be explored:

Path- or Topic-Based Routing (PBR)

Path-Based Routing is both applicable to HTTP-based API GW and AMQP-based message broker more consistent with the principles of REST API or topic design architecture

8. Any Other Considerations

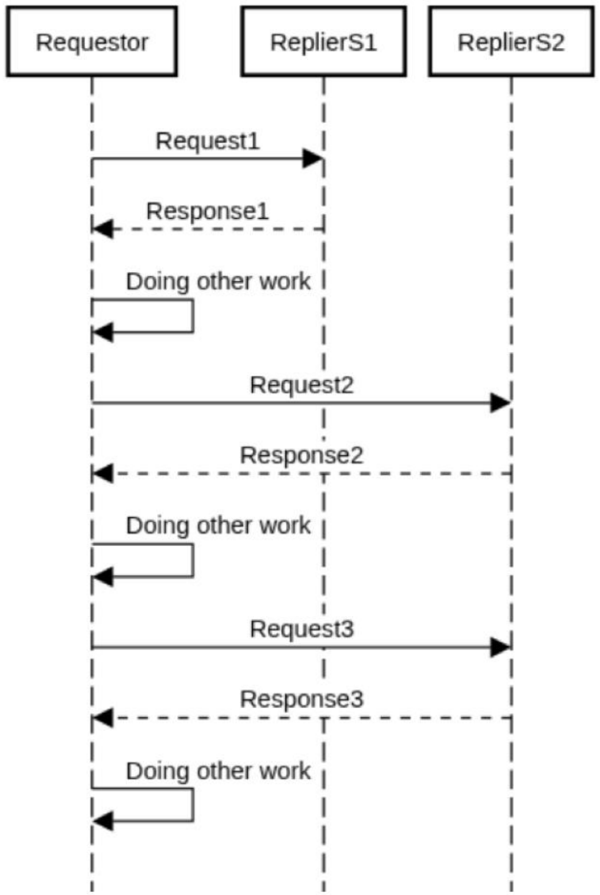
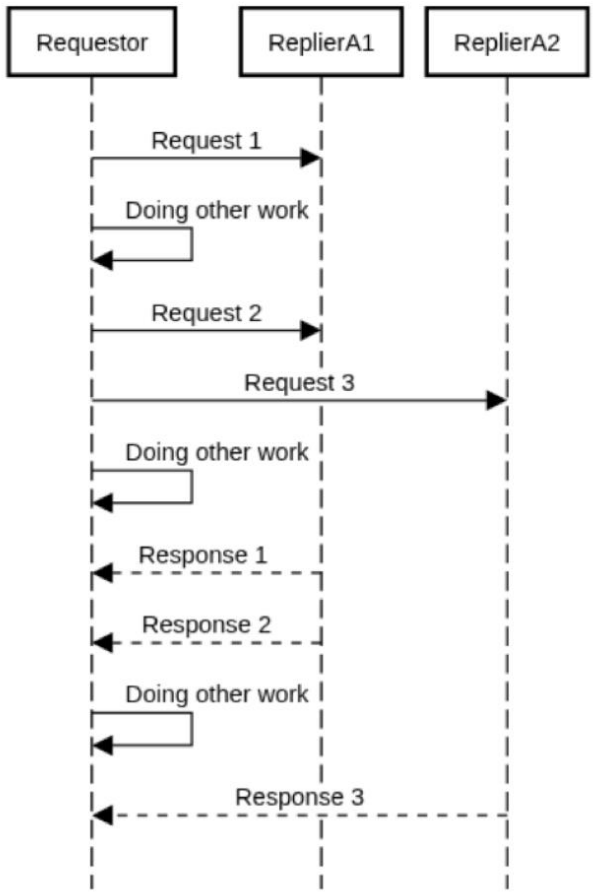
This document proposes approaches to implementing R/R MEP in the APAC region. Proof of Concept (POC) will be conducted to evaluate and select specific technologies after the POC is completed.

This document does not consider interoperability of R/R MEP between regions; this will be addressed in a later phase.

It also does not define the requirements for the API Gateway or the message broker to enable R/R MEP; these will be defined in a separate document.

9. Annexes

9.1. Annex 1 – Synchronous and Asynchronous R/R Data Flow Diagram

Synchronous R/R	Asynchronous R/R
	

9.2.Annex 2 – Applicability of Synchronous and Asynchronous R/R MEP to FF-ICE Service

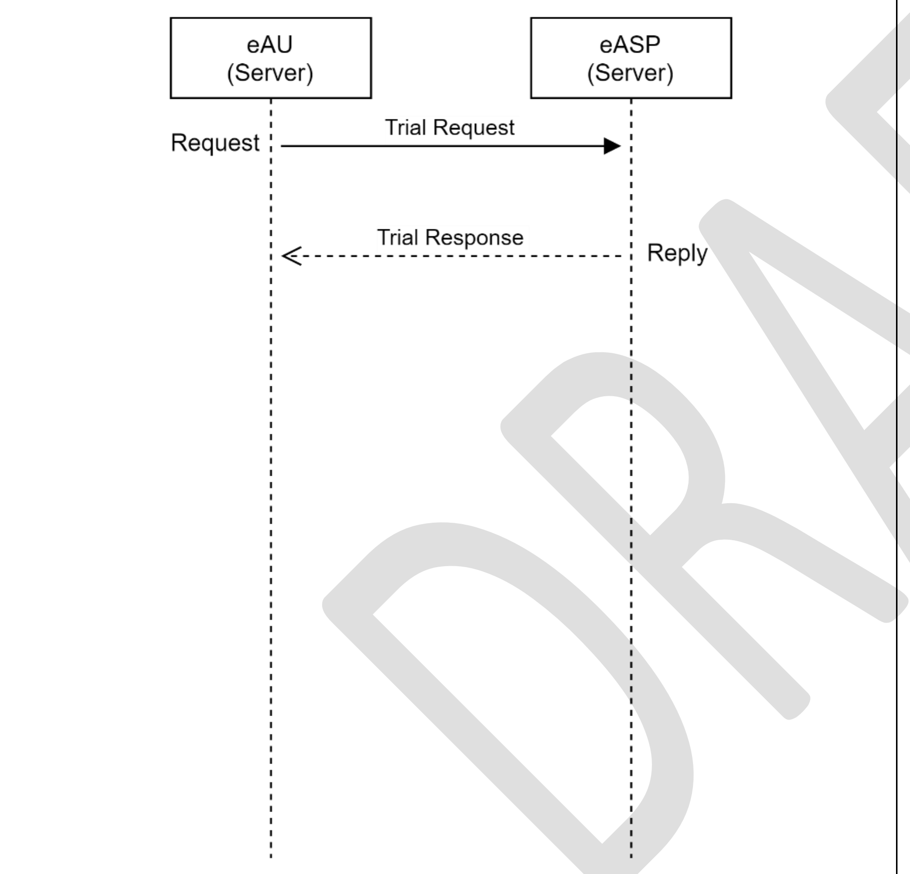
Service	MEP	Synchronous R/R	Asynchronous R/R	Note
GUFI Service	R/R	O	O	
FF-ICE Filing Service	P/S, R/R	X	O	Separate messages ought to be responded from replier (Submission Response + Filing Status)
FF-ICE Data Publication Service	P/S	-	-	
FF-ICE Trial Service	R/R	O	O	
FF-ICE Flight Data Request Service	R/R	O	O	
FF-ICE Notification	P/S, R/R	O	O	
FF-ICE Planning Service	P/S, R/R	X	O	Separate messages ought to be responded from replier (Submission Response + Planning Status)

* FF-ICE services mentioned above are defined in the APAC SWIM Common Services (APAC Common SWIM Information Services, WP11, SWIM TF/10)

9.3. Annex 3 – FF-ICE Service Data Flow Diagrams of Synchronous and Asynchronous R/R MEP

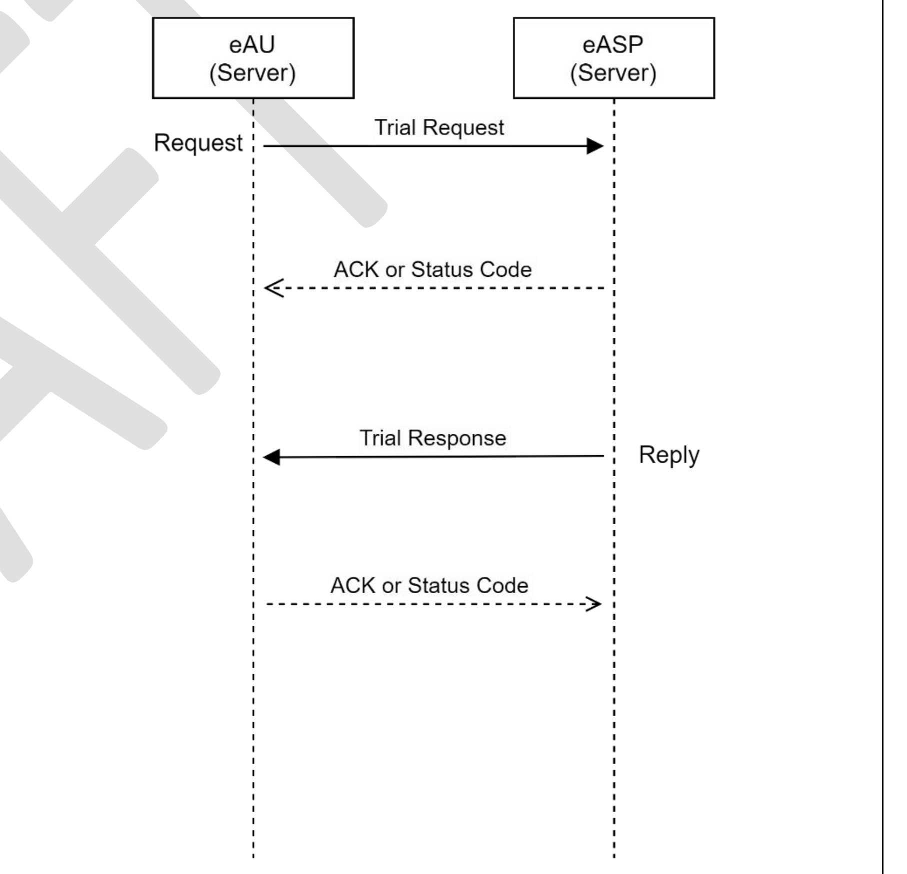
- FF-ICE Trial Service

Synchronous R/R (HTTP)



* API GW and Message Broker are not Depicted

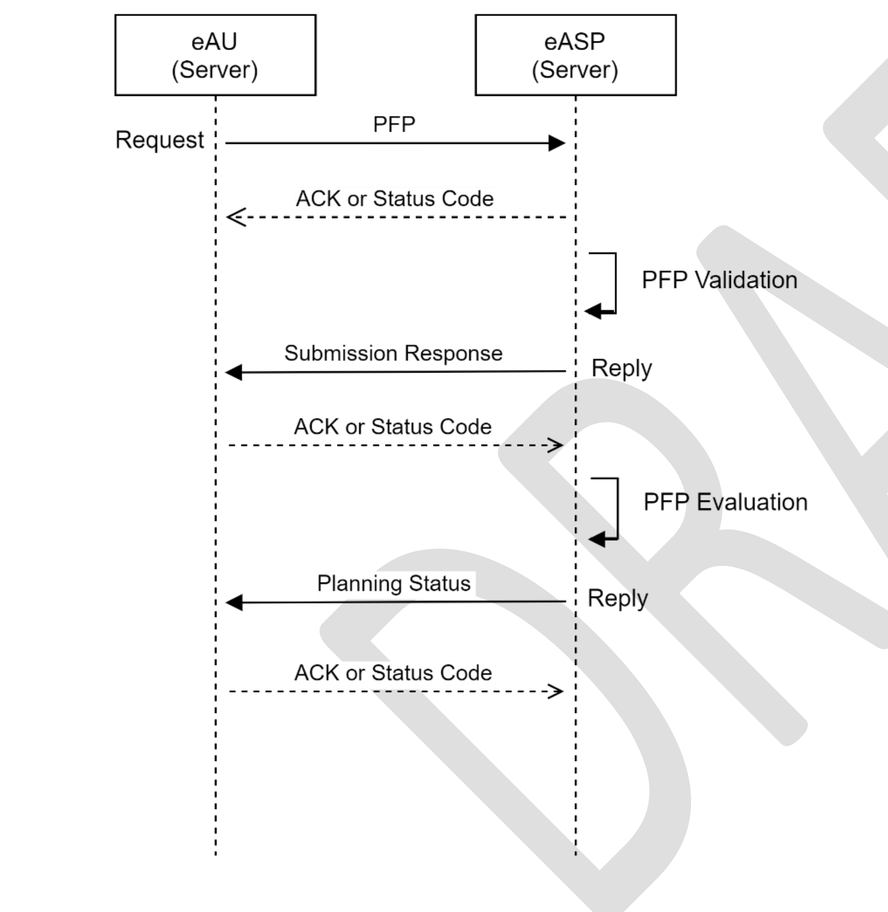
Asynchronous R/R (HTTP or AMQP)



* API GW and Message Broker are not Depicted

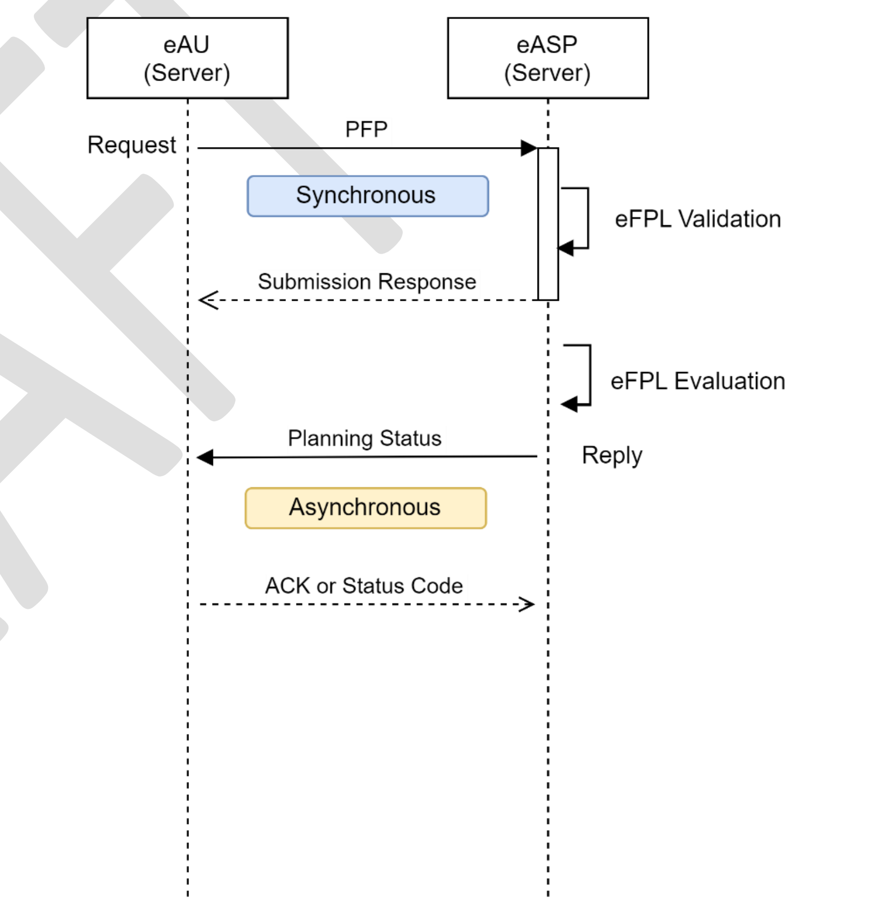
- FF-ICE Planning Service

Asynchronous R/R (HTTP or AMQP)

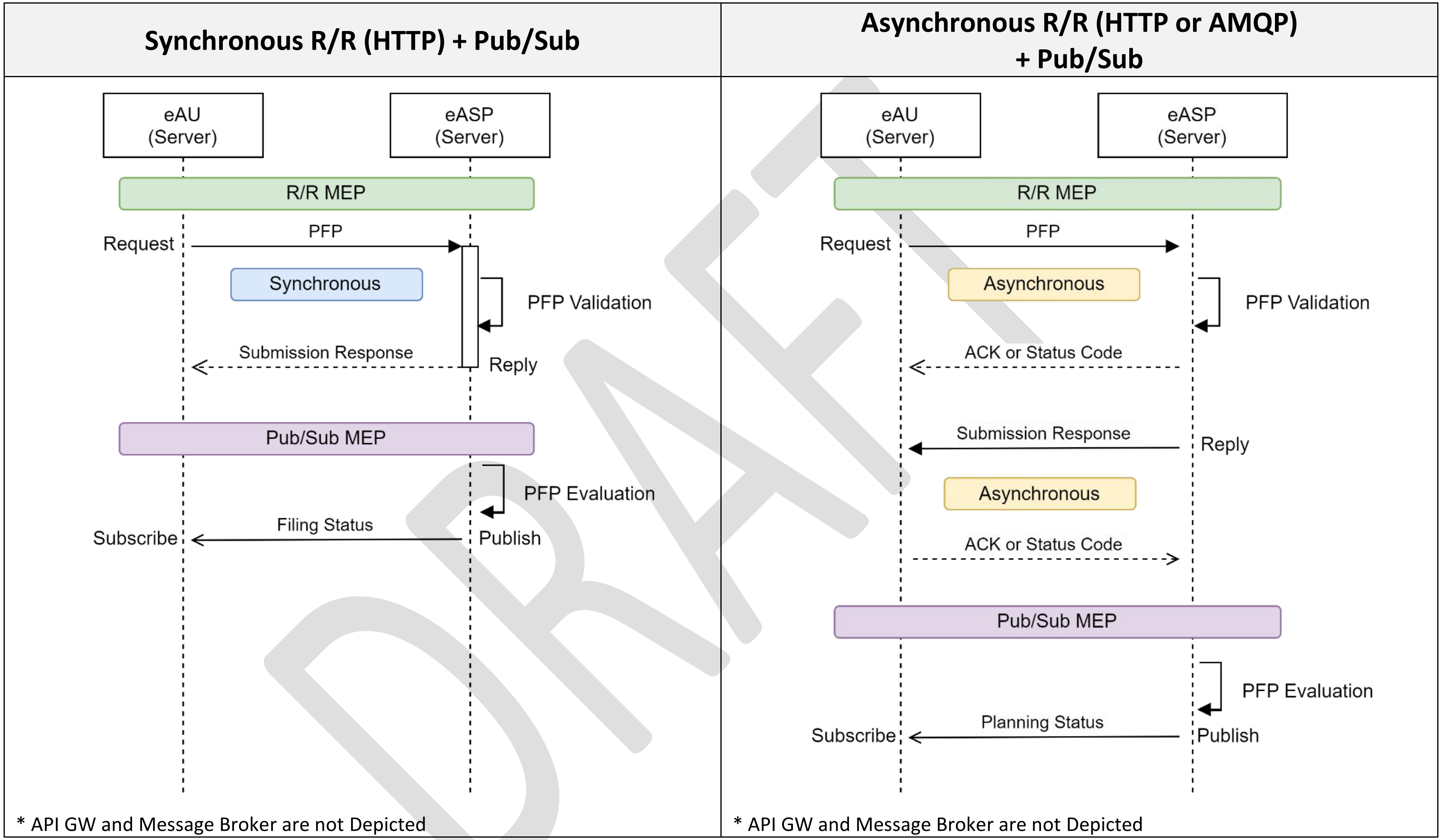


* API GW and Message Broker are not Depicted

Synchronous R/R (HTTP) +
Asynchronous R/R (HTTP or AMQP)



* API GW and Message Broker are not Depicted


Synchronous R/R (HTTP) + Pub/Sub
eAU (Server)
eASP (Server)
R/R MEP
Request
PFP
Synchronous
PFP Validation
Submission Response
Reply
Pub/Sub MEP
PFP Evaluation
Filing Status
Subscribe
Publish
* API GW and Message Broker are not Depicted
Asynchronous R/R (HTTP or AMQP) + Pub/Sub
eAU (Server)
eASP (Server)
R/R MEP
Request
PFP
Asynchronous
PFP Validation
ACK or Status Code
Submission Response
Reply
Asynchronous
ACK or Status Code
Pub/Sub MEP
PFP Evaluation
Planning Status
Subscribe
Publish
* API GW and Message Broker are not Depicted

Guidance Materials for REST-ful API Structuring and Naming in Asia/Pacific SWIM (Working Draft v2)

Apr. 2026

SWIM Implementation Pioneer Ad-hoc Group (SIPG)

Table of Contents

1. Introduction

1.1. Background

1.1.1. SWIM Implementation Pioneer Ad-hoc Group (SIPG)

The establishment of SIPG was decided at the SWIM TF/7 in 2023, and its Terms of Reference (TOR) was endorsed by the SWIM TF/? under the **“”**. Following SIPG’s TOR, the initial objective of the SIPG was to implement a seed/prototype version of the Asia/Pacific SWIM within 2024 as a means of kickstarting SWIM adoption in the region. Based on the initial objectives SIPG, SIPG built a protype version of Asia/Pacific SWIM and supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial in Hong Kong, China, from 28 to 29 May 2024

After the supported SWIM Demonstration over CRV and surveillance data sharing in the SWIM trial, there were still needs for an expert group that can provide technical work for SWIM implementation in the Asia/Pacific region, and the SIPG continues its work in response to the need. In line with this, the SIPG defined sub-tasks to further materialize the implementation of SWIM in the Asia/Pacific region, and the sub-tasks, which are currently identified and in progress by the end of Dec 2026, as of Sep. 2025, are as below:

- Task 1: Requirements and Functionalities of the Edge EMS and Gateway EMS
- Task 2: New proposed hierarchical architecture review
- **Task 3: Guidance for the Sync Req/Rep and Async Req/Rep Message Exchange Pattern**
- Task 4:
- Task 5 : SWIM Technical Infrastructure Integration
- Task 6: SWIM Security Requirements and Implementation
- Task 7: SWIM Registry Requirements and Implementation
- Task 8:
- Task 9: APAC SWIM Integration Testing
- Task 10: Performance Testing SWIM TI
- Task 11: Regional SWIM TI Operationalization Guidance Material

1.1.2. Previous Achievement of Task 3, SIPG

Task 3 of SIPG developed “Guidance Materials for Request and Reply(R/R) Message Exchange Pattern(MEP) in Asia/Pacific SWIM” with the purpose of ensuring continuous and coherent implementation of the R/R MEP in the SWIM platform in a harmonized and interoperable manner within the region. The draft edition of the guidance material was released and presented at the FF-ICE Ad-hoc/3 held in Dec. 2025.

1.1.3. Limitation of Guidance Materials for Request and Reply Message Exchange Pattern in Asia/Pacific SWIM

While the document provides an overview of the R/R Message Exchange Pattern, including its operational concept, mechanisms, implementation considerations, topology, and routing mechanism, it does not specify detailed implementation guidance.

Specifically, for the synchronous R/R MEP, the document introduces Path-Based Routing (PBR) and designates it as the routing mechanism for Asia/Pacific SWIM; however, detailed descriptions of how PBR should be implemented are not provided.

1.2.Guidance Materials

Guidance material for REST(ful) API URI Structuring and Naming (i.e. this document) in the Asia/Pacific SWIM is one of the deliverables of Task 3 under SIPG. Republic of Korea, Australia, China, Hong Kong China, India, Japan, Fiji, Singapore, Thailand, Malaysia, USA, New Zealand. CANSO have volunteered and contributed to producing this document.

1.3. Purpose of the Document

This document provides guidance on the structuring and naming of REST API Uniform Resource Identifier (URI) for the R/R MEP in the Asia/Pacific region. It describes the principles for designing hierarchical URI structures, defining consistent naming conventions, and applying Path-Based Routing (PBR) to support synchronous R/R MEP in Asia/Pacific SWIM. The purpose of this document is to ensure a consistent, coherent, and harmonized implementation of the synchronous R/R MEP across the Asia/Pacific region, thereby enabling interoperability among SWIM stakeholders.

2. R/R MEP in SWIM

This chapter provides the conceptual framework of R/R MEP within the SWIM environment. It identifies the role of R/R MEP at the global level, and in the Asia/Pacific region, explains how the R/R MEP operates under different synchronization mechanisms, Furthermore, it provides comparison between synchronous and asynchronous R/R MEP, points out possible confusion part and clarifies them.

2.1.R/R MEP in the Global Level

ICAO SWIM Implementation Document (Doc. 10203) defined MEP including synchronous and asynchronous R/R as follows:

5.3.2.4.2 ***Message exchange patterns***

5.3.2.4.2.1 Several types of message exchange patterns (MEPs) are expected to be supported within a SWIM environment, including synchronous request/reply, asynchronous request/reply, one-way ("fire-and-forget") and publish/subscribe. The MEP used in any given exchange is directed by the information service provider to meet information service objectives. These MEPs include:

a) **Synchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. The consumer waits for the information service to provide a response. During this waiting period, the consumer cannot send or receive any other requests or responses. This pattern is specifically applicable to information services that can quickly execute and respond to consumer requests;

b) **Asynchronous request/reply:** The consumer initiates a request to an information service; the service processes the request and generates a reply to the consumer. However, the consumer is not restricted from performing other operations while waiting for the information service's response. This MEP requires that the consumer be able to receive messages at any time and correlate them with prior requests;

c) **One-way ("fire-and-forget"):** The consumer initiates a message to an information service without expecting any response from the information service. This MEP is particularly useful at the lower application layer, where immediate message responses are not required;

d) **Publish/subscribe (P/S):** The consumer initiates a subscription request to an information service. The subscription may be capable of providing details (such as through a filtering parameter) on the information being subscribed to:

1) in the case of a P/S with a push mechanism, the information service sends necessary updates (publish) to the consumer, in accordance with the subscription. This MEP requires that the consumer can receive messages at any time. However, the consumer is not restricted from completing other operations while waiting for the information service to respond; and

2) in the case of a P/S with a pull mechanism, the information service would keep necessary updates available to the consumer, in accordance with the subscription. This MEP requires that the consumer send requests to the information service to receive the updates.

Figure 2. Definition of MEP in the SWIM Document

2.2.R/R MEP in the Asia/Pacific Region

ICAO APAC SWIM Implementation Guidance Document (IGD, Working Draft) defines MEP including R/R as follows:

3.3.2 Standards for Resource-oriented Interface

3.3.2.1 RESTful API

The following table makes reference to RESTful API related standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3 Standards for Method-oriented Interface

3.3.3.1 OGC WCS

The Open Geospatial Consortium (OGC) has developed a number of Web Common Service (WCS) standards that define services for accessing and manipulating geospatial data in a web environment, such as aeronautical information and meteorologic information. The following table makes reference to some of the key WCS standards and specifications required for supporting the service or infrastructure bindings of SWIM TI.

3.3.3.2 SOAP

As most users have not applied SOAP to current web applications, this standard is not recommended for the development of SWIM services. The following table makes reference to SOAP related standards and specifications required for supporting the service bindings of SOAP applications.

4.1 Functional Capabilities

The SWIM TI functional capabilities described in this section are common features widely supported by mainstream Commercial Off The Shelf (COTS) systems and services. Implementing a SWIM TI that supports all these capabilities is recommended. The SWIM TI functional capabilities can be grouped into three categories as follows:

Table 8. SWIM TI Functional Capabilities

Capability	Description	Related Technology
Messaging	This capability employs technologies that enable information exchange using various access methods (e.g., publish/subscribe, request/reply).	- Message brokers: such as Apache Kafka, RabbitMQ, ActiveMQ.

Figure 3. R/R MEP Related Description in the ICAO APAC SWIM IGD

Note: This section is intended for the business experts' group of the ICAO APAC region to explain why this document does not select SOAP as one of the candidate technologies to be explored, despite the fact that Eurocontrol's SWIM implementation uses SOAP for R/R MEP.

3. Overview of RESTful API

This chapter introduces the concept of a Representational State Transfer (RESTful) API. It describes the definition of the RESTful API, identifies core components, and explains the differences between RESTful API and non-RESTful API.

3.1. Definition of RESTful API

RESTful API is a widely adopted architectural style for web services in the modern ICT industry as a de facto standard. This architectural style defines a resource-oriented approach in which resources are identified by hierarchical Uniform Resource Locator (URL) using HTTP. RESTful API is a robust enabler of synchronous R/R MEP.

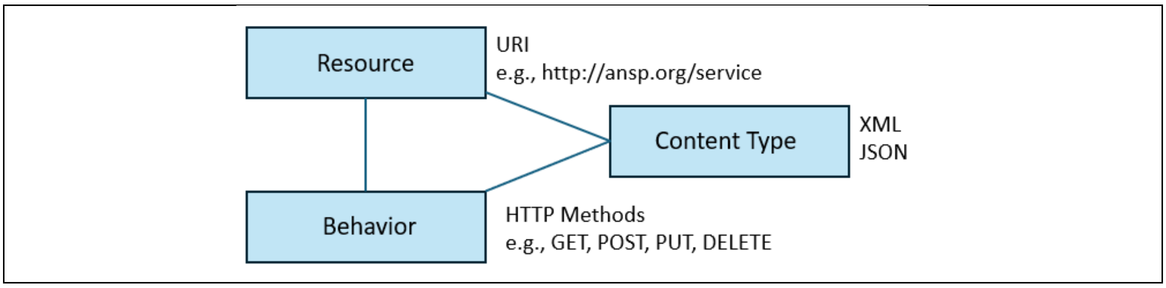


Figure 1. Concept of REST

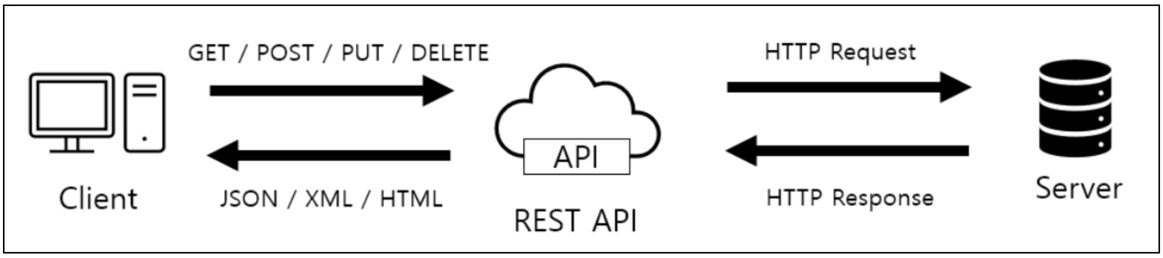


Figure 2. Basic RESTful API Interaction

3.2.Difference between REST and RESTful

The terms REST and RESTful are frequently used interchangeably in practice, despite having distinct meanings. Section 3.2 clarifies the definition of the term of REST and RESTful.

- **REST:** it refers to a <u>conceptual architectural style</u> that defines principles and constraints to design web services. It provides common guidelines for resource identification, interaction, and communication between clients and servers.
- **RESTful:** it refers to the <u>practical implementation</u> of REST principles through implementation of services or applications. A RESTful service strictly follows REST

constraints, such as resource-oriented URI design, use of standard HTTP methods, stateless communication, and uniform interfaces.

3.3. Components of RESTful API

Commonly used methods and components of RESTful API are as follows:

Methods

Methods	Description	CRUD Operation
POST	Create a new resource	CREATE
GET	Retrieve a resource representation	READ
PUT	Update or replace an existing resource	UPDATE
DELETE	Delete an existing resource	DELETE

** Note: Other methods (e.g., PATCH) defined in RFC 9110 and 5789 are also available as required*

Components

- **Resource:** it represents a entity or object exposed by the service instance. it is defined by a Uniform Resource Identifier (URI).
- **Behavior:** it defines the actions that are expressed based on HTTP methods (e.g., GET, POST, PUT, DELETE, and etc) on a resource. It describes interaction between a client and server (i.e., resource).
- **Message**: it is the actual payload delivered through request or response exchanged between the client and server. It contains metadata and payload (e.g., header, data)

3.4.Difference between RESTful API and non-RESTful API

Understanding the difference between RESTful APIs and non-RESTful APIs is essential to correctly understand its and avoid misinterpretation of implementation. This section is to clarify the differences between RESTful and non-RESTful APIs and distinguish their differences.

Category	RESTful API	Non-RESTful API
Architectural Approach	Resource-oriented architecture based on REST principles	Operation-oriented or procedure-based architecture
Conceptual Basis	REST architectural style and constraints	RPC or message-oriented service models
Resource Identification	Resources are identified using hierarchical URIs (e.g. /a/b/c)	Operations or services are identified by method or endpoint names
Use of HTTP Methods	Standard HTTP methods (GET, POST, PUT, DELETE) are used to represent operations	HTTP is often used as a transport only, typically relying on POST
State Management	Stateless interaction model	Often stateful, with server-side session or context management
Message Exchange Pattern	Request/Reply based on resource manipulation	Remote Procedure Call (RPC) or message-based invocation
Data Representation	Lightweight formats such as JSON or XML	XML-based messages with strict schemas

Service Description	Optional or lightweight (e.g. OpenAPI, WADL)	Formal service description (e.g. WSDL)
Service Registry	Not required	Often relies on service registries (e.g. UDDI)
Required Technology Stack	Minimal, HTTP-based	Requires additional middleware and WS-* stack
Scalability and Flexibility	High scalability and loose coupling	Relatively lower scalability due to tight coupling
Typical Use Cases	Data-centric services and UI-oriented applications	Transaction-oriented and enterprise integration services
Current Challenges	Lack of strict standardization across implementations	Complex usage and heavyweight protocols

4. URI Structuring and Naming

This chapter outlines URI structuring and naming. It describes why URI structuring and naming are required, and what needs to be considered.

4.1.Rationale for URI Structuring and Naming

In the Asia/Pacific SWIM environment, service instances using RESTful API are expected to be exposed through API GWs deployed at regional and local levels. API GWs are responsible for routing of requests from the service consumer to the appropriate service provider.

In such an environment, Path-based Routing (PBR) provides consistent and predictable URI structures to ensure that requests are delivered to the correct destination.

REST is a set of architectural principles, but it does not mandate strict rules for URI structuring or naming in the aspect of implementation. As a result, if there is no common convention for URI structuring and naming, different implementations may adopt inconsistent URI patterns, which can lead to interoperability issues, increased routing complexity, and operational inefficiencies when integrating services at a regional scale.

To address these challenges, this chapter defines common conventions and standardized URI structures to be applied across the Asia/Pacific region. These conventions aim to support harmonized routing through API GWs, promote consistent service identification, and facilitate interoperable implementation of the synchronous R/R MEP in the SWIM environment.

4.2. Consideration for URI Structuring and Naming

While primarily intended for the Asia/Pacific region, the URI structuring and naming guidance in this document has been developed with future cross-regional interoperability in mind.

The proposed URI structure is intended to be extensible and adaptable, so that it may support service interactions not only within the Asia/Pacific region but also across regions as SWIM implementation matures at the global level.

To develop this document, commonly adopted IT industry best practices and widely recognized standards have been taken into account, including REST architectural principles, established API design patterns, and relevant international and ICAO specifications.

By aligning regional conventions with de facto industry practices and applicable standards, this guidance aims to minimize divergence from global implementational use case in the ICT industry while addressing the specific operational and routing requirements of the Asia/Pacific SWIM environment.

4.3. URI Naming Conventions and Reference Standards

Industry Best Practices (De-jure)

The following industrial best practices are applied to ensure consistency and readability of URIs:

- URI path segments shall be lowercase;
- Multi-word path elements shall use hyphen-separated lowercase;
- Where names originally contain spaces (e.g. organization or service provider names), spaces shall be replaced with hyphens (-);
- Where version originally contain period (.) (e.g. x.y.z), shall only use major (vX) for URI path and specify exact version in the header;
- Underscores (_) and CamelCase shall not be used in URI path segments;
- Reserved characters, spaces, and special characters shall not be used; and
- Plural nouns should be used for collection resources where applicable (e.g. /services, /resources

Reference Standards (De-jure)

The following international and regional standards are referenced to ensure harmonization and interoperability:

- ISO 3166-1 alpha-3: Used for the identification of States or territories to ensure globally consistent country codes;

Any Other Consideration

Alignment with the Topic Naming Convention being developed under SIPG Task 2 is expected to be required.

4.4. URI Structure and Path Element Definition

4.4.1. General URI Structure

```
http://{api-gateway-host}:{api-gateway-port}
/{region-code}
/{country-or-jurisdiction-code}
/{service-provider}
/{service-name}
/{service-version}
/{resource}
?{query-parameters}
```

* Query parameters may be used to specify filtering criteria, selection options, or other non-identifying parameters. Their use does not violate REST principles and is commonly applied in RESTful APIs.

4.4.2. Description of URI Path Element

Path Element	Description	M/O	Example
{api-gateway-host}	Hostname or IP address of the API Gateway that provides a common entry point for service access	-	-
{api-gateway-port}	Network port on which the API Gateway listens for incoming requests	-	-
{region-code}	ICAO regional identifier (e.g. APAC) used to support regional-level routing and governance	M	apac
{country-or-jurisdiction-code}	{country-code} : Country or territory identifier based on ISO 3166-1 alpha-3 {jurisdiction code} : Registered jurisdictional or regional routing namespace used when the service is provided under a regional, multinational, or centrally managed SWIM environment where a single State or territory code is not applicable. Topic Naming Convention > Country Code	M	kor jpn sgp - Eurocontrol
{service-provider}	Identifier of the organization or entity providing the service Topic Naming Convention > Organization	M	atmo - nm
{service-name}	Name of the exposed resource or service Topic Naming Convention > System Name	M	gufi-service
{service-version}	Version identifier of the service (e.g. vX) Specific version of the service SHALL be explicitly indicated in the HTTP headers. GET /gufi-service/validate Host : example.aero Accept : application/json **API-Version : 1.1.1** Topic Naming Convention > Version	M	v1
{resource} <service-defined-path>	A relative URI (Uniform Resource Identifiers) to an individual endpoint. {resource} could have hierarchical path (i.e., service-defined-path) depending on service (e.g., /a/b/c/) Topic Naming Convention > System Specific Topic Hierarchy	M	Validate

* M: Mandatory, O: Optional

4.5. URI Structure Example

4.5.1. Decentralized Environment (e.g., APAC)

```
http://{api-gateway-host}:{api-gateway-port}
/apac
/kor
/atmo
/gufi-service
/v1
/validate
?gufi= ce204411-1558-458b-9346-562f53b73740
```

4.5.2. Centralized Environment (e.g., Eurocontrol)

```
http://{api-gateway-host}:{api-gateway-port}
/eur
/eurocontrol
/nm
/gufi-service
/v1
/validate
?gufi= ce204411-1558-458b-9346-562f53b73740
```

* In a centralized SWIM environment, such as Europe, "eurocontrol" may be used as a {jurisdiction code}, rather than a {country-code}.

5. Path-Based Routing Scenarios using URI Structure

This chapter describes path-based routing scenario of GUFI service that is one of FF-ICE services defined as an APAC SWIM common services using synchronous R/R MEP.

5.1.1. Overview of GUFI Service

GUFI service is defined in the APAC SWIM Common Services (APAC Common SWIM Information Services, WP11, SWIM TF/10), but it is briefly described what it is, to make use it for scenarios, pseudo-operation of GUFI service is defined as follows:

Operation	Use Case	Resource
ValidateGufi	Retrieving a GUFI from GUFI service instance	/gufi-service /validate?gufi={gufi}

5.1.2. Overview of Scenario Topology

As R-R MEP Guidance Material (draft) doesn't define the specific topology of API GW in the Asia/Pacific region, but identifies candidate topologies, this chapter uses two different topologies to describe scenarios.

5.1.2.1. Full Mesh API GW Environment

In a full mesh architecture, every Edge API GW establishes a direct communication link with all other Edge API GWs in the network. This direct gateway-to-gateway connection model removes the need for an intermediary global routing hub. It allows incoming requests to be routed immediately to the appropriate service provider across the region based on the established RESTful URI structures.

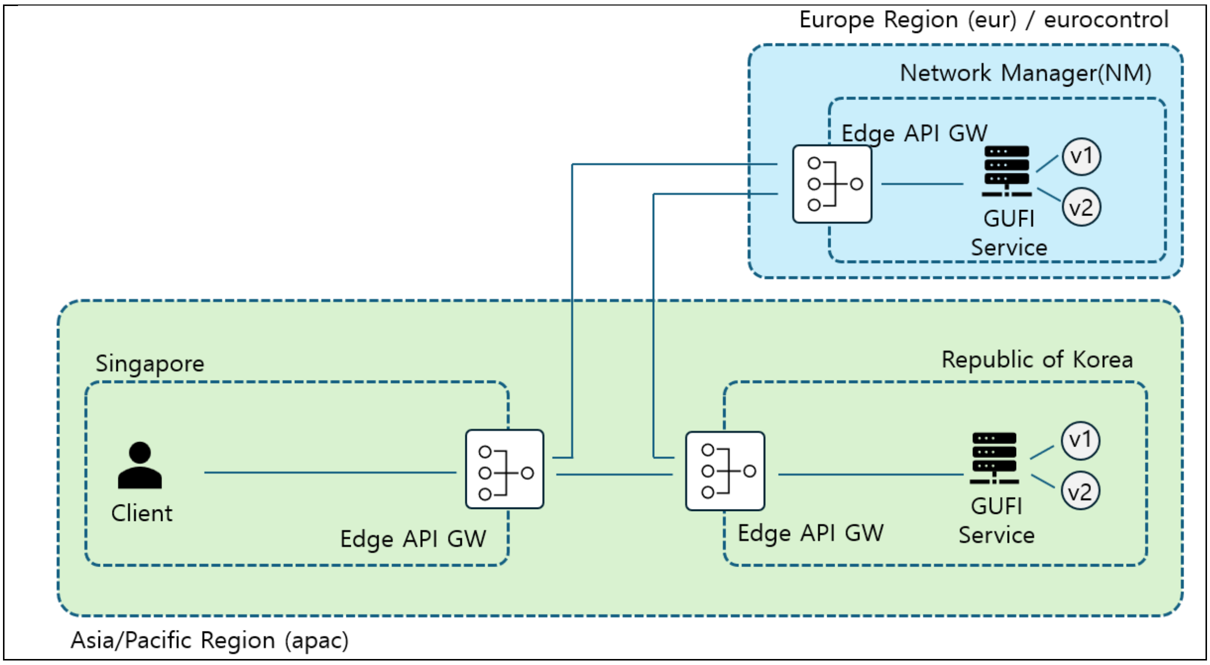


Figure 3 Full Mesh API GW Environment Scenario

5.1.2.2. Hierarchical API GW Environment

In a hierarchical architecture, Edge API GWs do not connect directly to every other gateway in the network. Instead, local Edge API GW requests the delivery to a cluster of regional global API GW (or proxies).

A cluster of regional global API GWs (or proxies) act as the primary router for the network. It receives incoming requests from edge API GWs and analyses the established RESTful URI structures to forward the traffic to the appropriate destination at the global level. The destination could be another edge API GW within the same region, such as routing from Singapore to the Republic of Korea. For cross-regional interoperability, some of global API GWs (or global proxies) could take a responsibility for message delivery between regions.

Unlike the full mesh topology, a hierarchical architecture could reduce the number of direct point-to-point connections required across the network, making it a highly scalable approach for integrating complex, cross-regional SWIM environments.

To ensure high availability and operational continuity against malfunctioning of a certain regional global API GW (or proxy), failover mechanism could be configured. Edge API GW and global API GWs (or proxies) could support upstream level redundancy, and active health check & retries. This capability would be defined in the API GW requirement specification document (TBD).

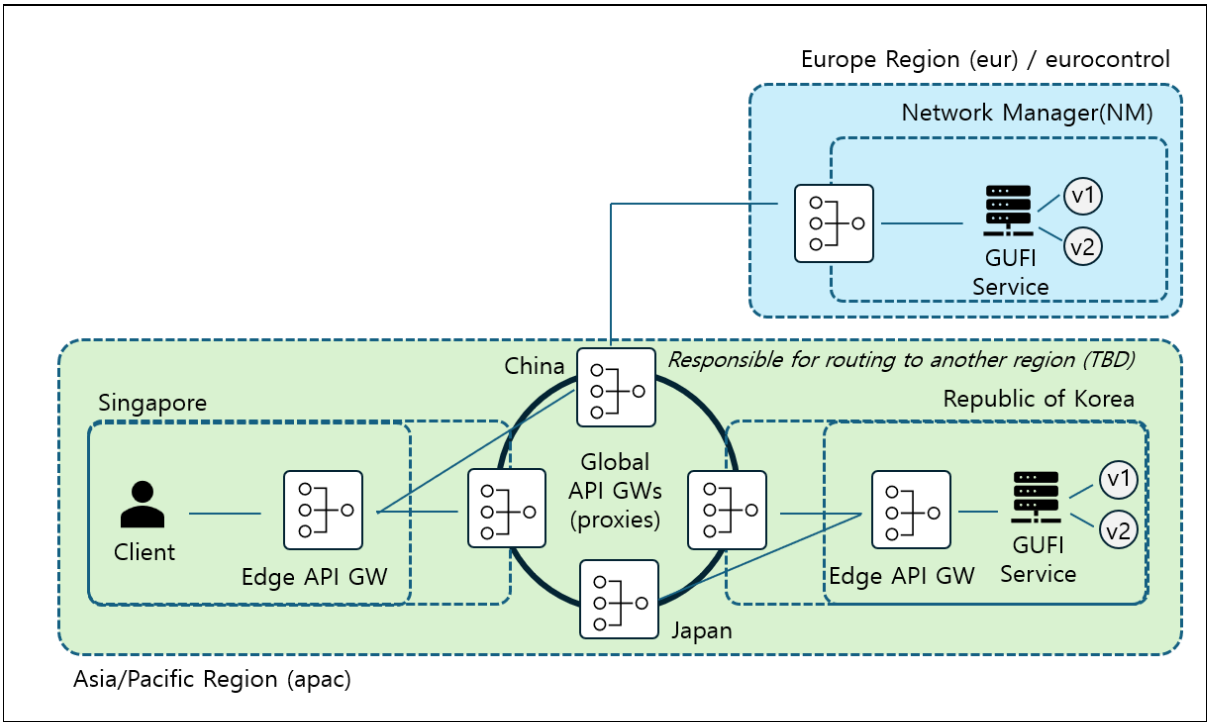


Figure 4 Hierarchical API GW Environment Scenario

5.1.3. Cross-regional Routing Scenario

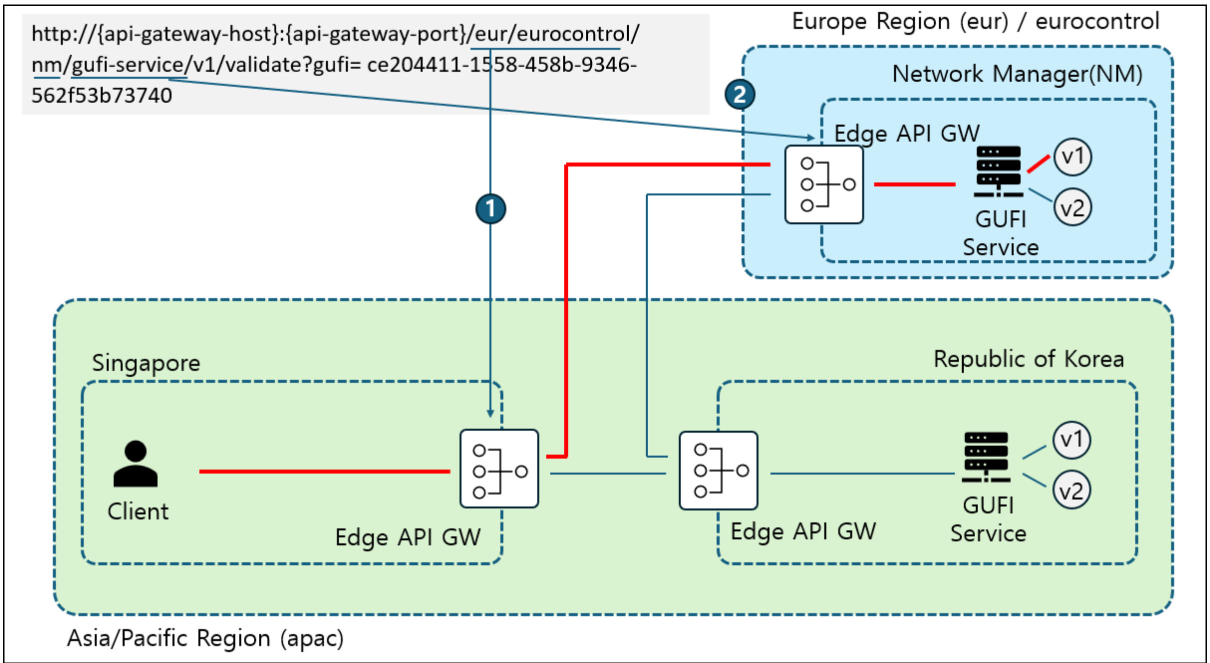
To enable cross-regional routing, the {region-code}, {country-or-jurisdiction-code} and {service-provider} path elements are referenced. The edge API GW or global API GW (or global proxies) responsible for cross-regional routing interprets the URI as follows:

1. checks {region-code} and follow step 2 or 3 when {region-code} does not match its own region.

2. If the destination region operates a centralized SWIM Technical Infrastructure (TI), the registered jurisdictional or regional routing namespace ought to be filled in {country-or-jurisdiction-code}. (e.g., eurocontrol). And, the edge API GW reroutes the request to the centralized API GW of that region based on the IP and port information of the {service-provider} registered in the edge API GW.

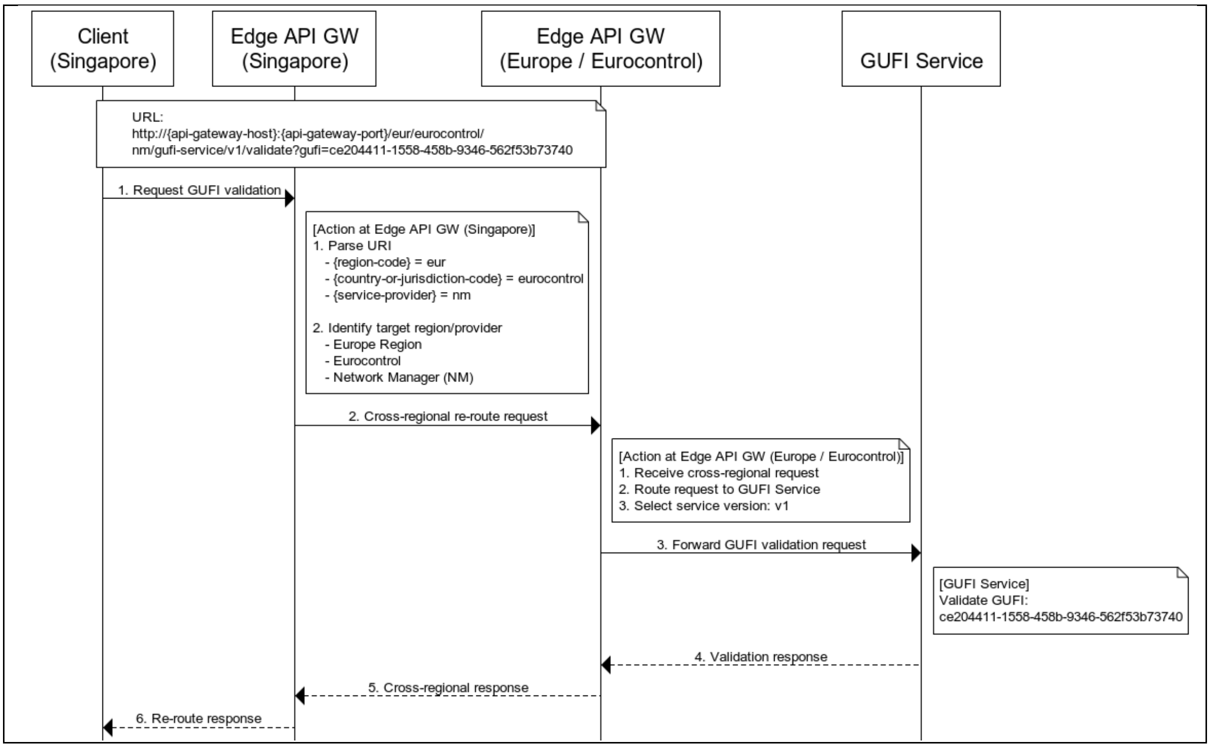
3. If the destination region operates a decentralized SWIM TI, the gateway reroutes the request to one of Edge API GWs in the target region based on the IP and port information associated with the {country-or-jurisdiction-code} registered in the edge API GW.

5.1.3.1. Full Mesh API GW Environment

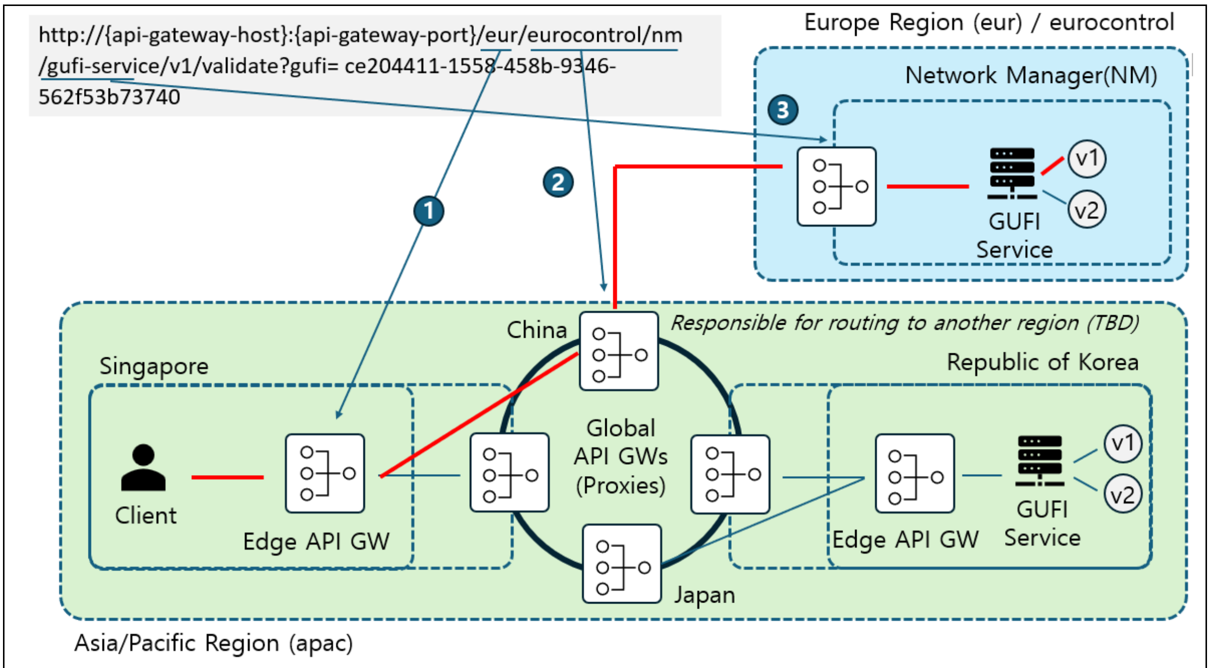


Step	Mechanism
1	**Determine the Routing Type and Forward to the Edge API GW** - When a client initiates a request, the edge API GW checks the {region-code} in the URI to determine whether the routing is inter-regional or cross-regional. - If it is determined to be cross-regional routing, the request is forwarded to the direct external API GW that isn't registered in own region.
2	**Final Routing within the Destination Region** - Upon receiving the request, the edge API GW in the destination region checks the remaining detailed path elements. /{country-or-jurisdiction-code}/{service-provider} - Routing mechanisms may vary depending on the topology of each region. - Refers to 5.1.5 - Local Routing Scenario

* In this scenario, each Edge API GW SHALL recognize other API GWs both within and outside its region. Whenever a region code outside of the local region is identified in the path, the originating Edge API GW is required to route the request directly to the destination region's API GW.



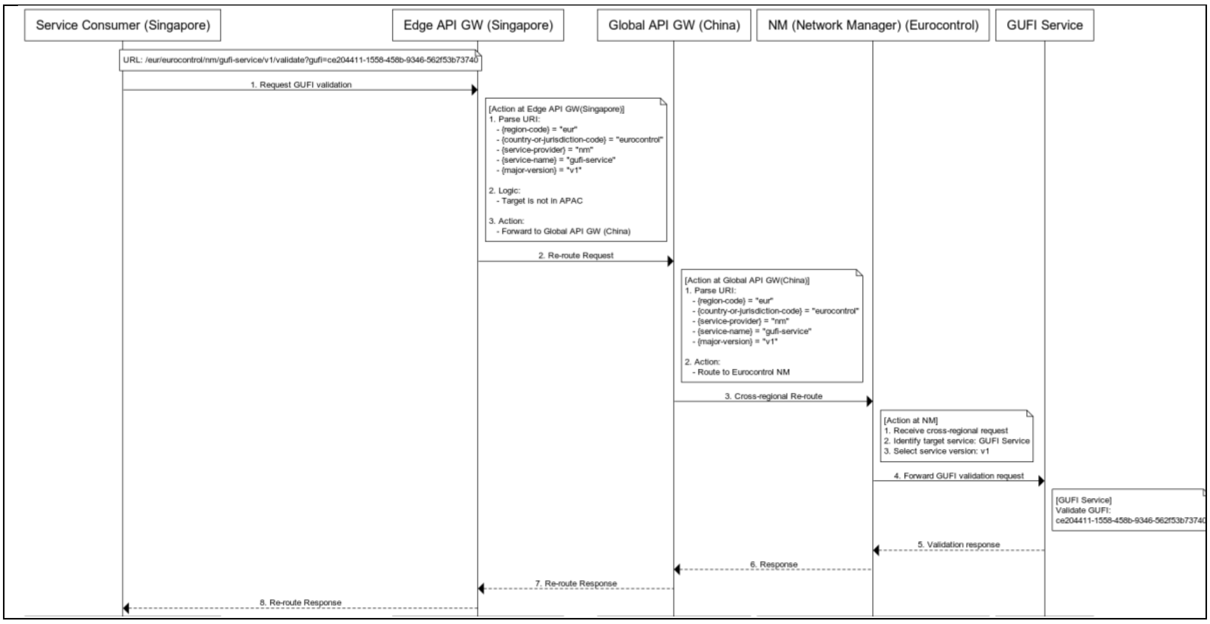
5.1.3.2. Hierarchical API GW Environment



Step	Mechanism
1	**Determine the Routing Type and Forward to the Responsible Global API GW (or global proxies)** - When a client initiates a request, the Edge API GW checks the {region-code} in the URI to determine whether the routing is inter-regional or cross-regional. - If it is determined to be cross-regional routing, the request is forwarded to the Global API GWs (or global proxies) responsible for cross-regional message transfer (e.g., the China node in the diagram).

	- If the originating Edge API GW is not directly connected to the responsible Global API GW (or global proxies), the request is relayed through an adjacent connected Global API GW (or global proxies) to reach the responsible node.
2	**Route to the Destination Region's Edge API GW** - The Global API GW (or global proxies) responsible for cross-regional transfer interprets the URI elements to route the request to its destination. - When routing to a region with a centralized SWIM TI, such as Europe, the {country-or-jurisdiction-code} field ought to contain a jurisdictional or regional routing namespace, while the {service-provider} field should identify the relevant service provider, such as nm. - On the other hand, {country-or-jurisdiction-code} is used for target region where decentralized environment is adopted
3	**Final Routing within the Destination Region** - Upon receiving the request, the edge API GW or global API GW (or global proxies) in the destination region checks the remaining detailed path elements. - Routing mechanisms may vary depending on the topology of each region. - Refers to 5.1.5 - Local Routing Scenario

* In this scenario, a specific global API GW (or global proxies) must be authorized to handle cross-regional routing. Whenever a region code outside of the local region is identified in the path, all other edge and global API GWs (or global proxies) are required to route the request to that designated global API GW (or global proxies).



5.1.4. Inter-Regional Routing Scenario

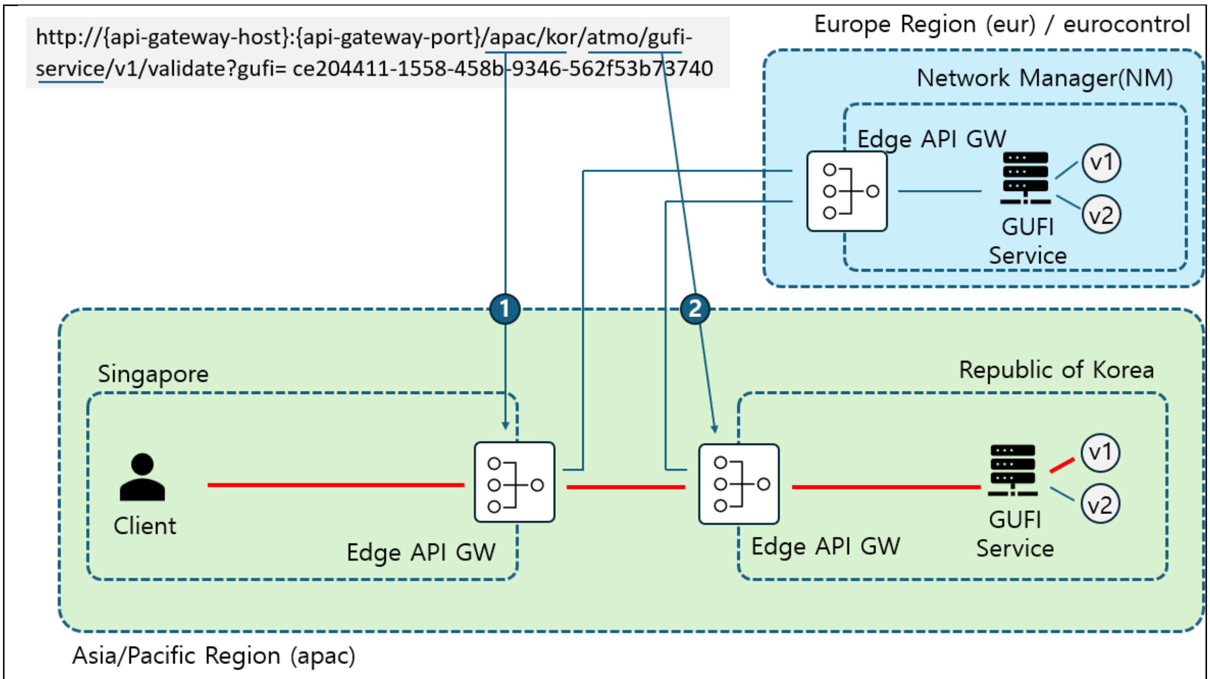
To enable inter-regional routing for Asia/Pacific region, the {region-code}, {country-or-jurisdiction-code} path elements are referenced. The edge API GW or global API GW (or proxies) responsible for inter-regional routing interprets the URI as follows:

Step 1. The edge API GW checks {region-code} and follow step 2 when {region-code} matches its own region. For full mesh API GW environment, go to Step 2, and for hierarchical API GW environment, go to Step 3.

Step 2. In the full mesh API GW environment, the edge API GW reroutes the request to one of edge API GWs within the Asia/Pacific region based on the IP and port information associated with the {country-or-jurisdiction-code} registered in the API GW.

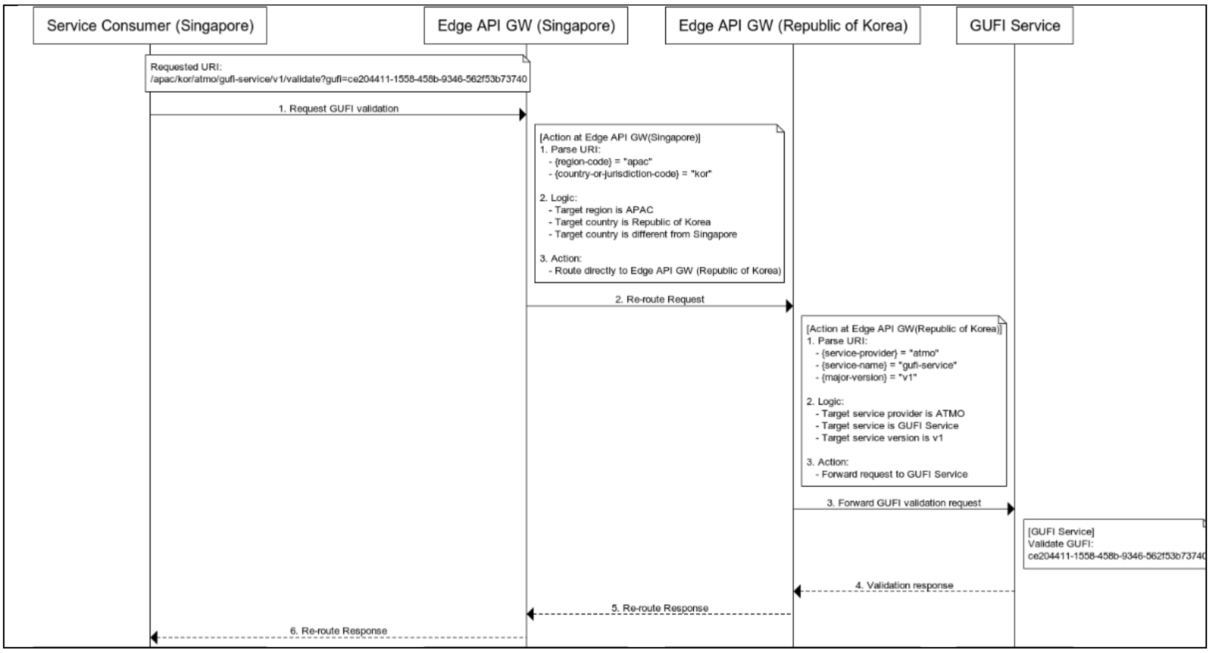
Step 3. In the hierarchical API GW environment, the edge API GW reroute to the global API GW (or proxies). The global API GW (or proxies) reroutes the request to another global API GWs (or proxies) or edge API GW associated with routing path elements.

5.1.4.1. Full Mesh API GW Environment

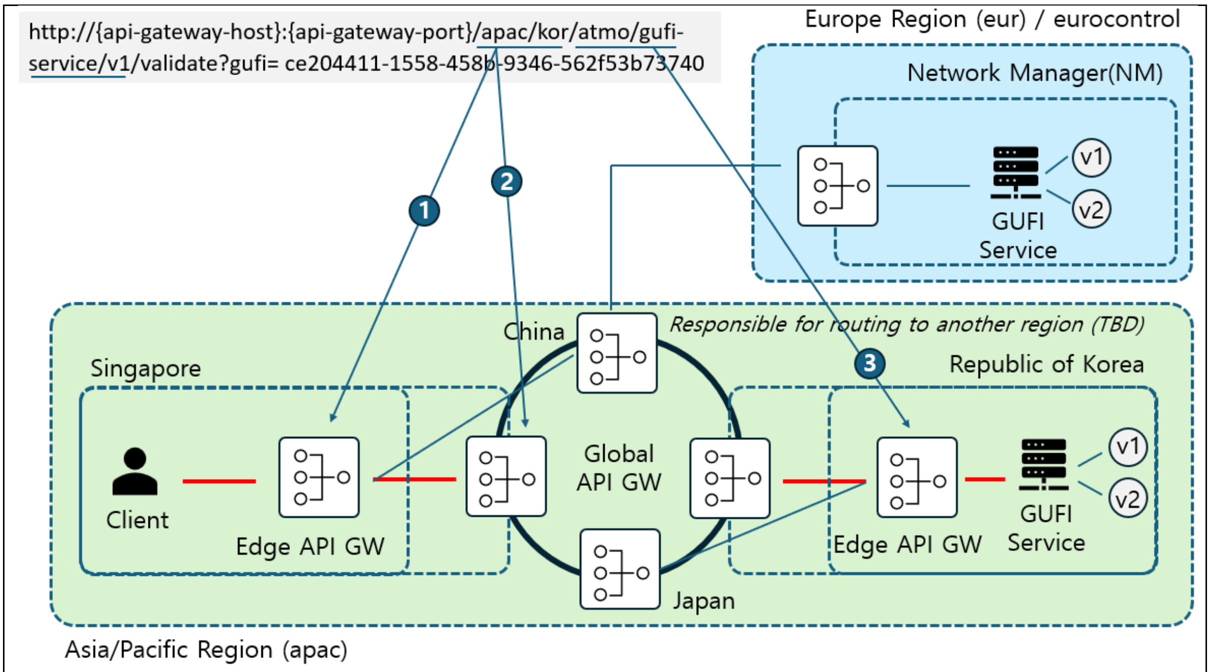


Step	Mechanism
1	**Determine the Routing Type and Forward to the Edge API GW** - When a client initiates a request, the Edge API GW checks the {region-code} in the URI to determine whether the routing is inter-regional or cross-regional. - If it is determined to be inter-regional routing, the request is forwarded to the direct edge API GW registered in own region.
2	**Conduct Local Routing** - Refers to 5.1.5 - Local Routing Scenario

* In this scenario, each Edge API GW SHALL recognize other API GWs both within and outside its region. Whenever a region code outside of the local region is identified in the path, the originating Edge API GW is required to route the request directly to the target API GW within the region.



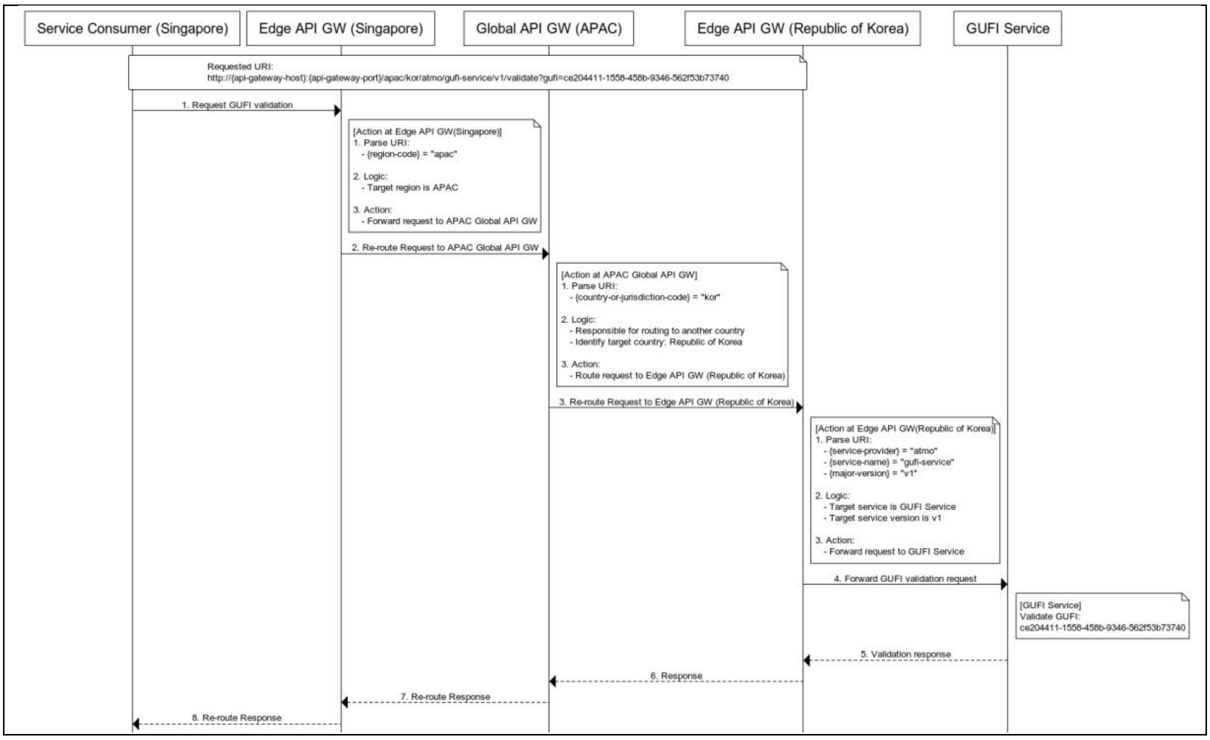
5.1.4.2. Hierarchical API GW Environment



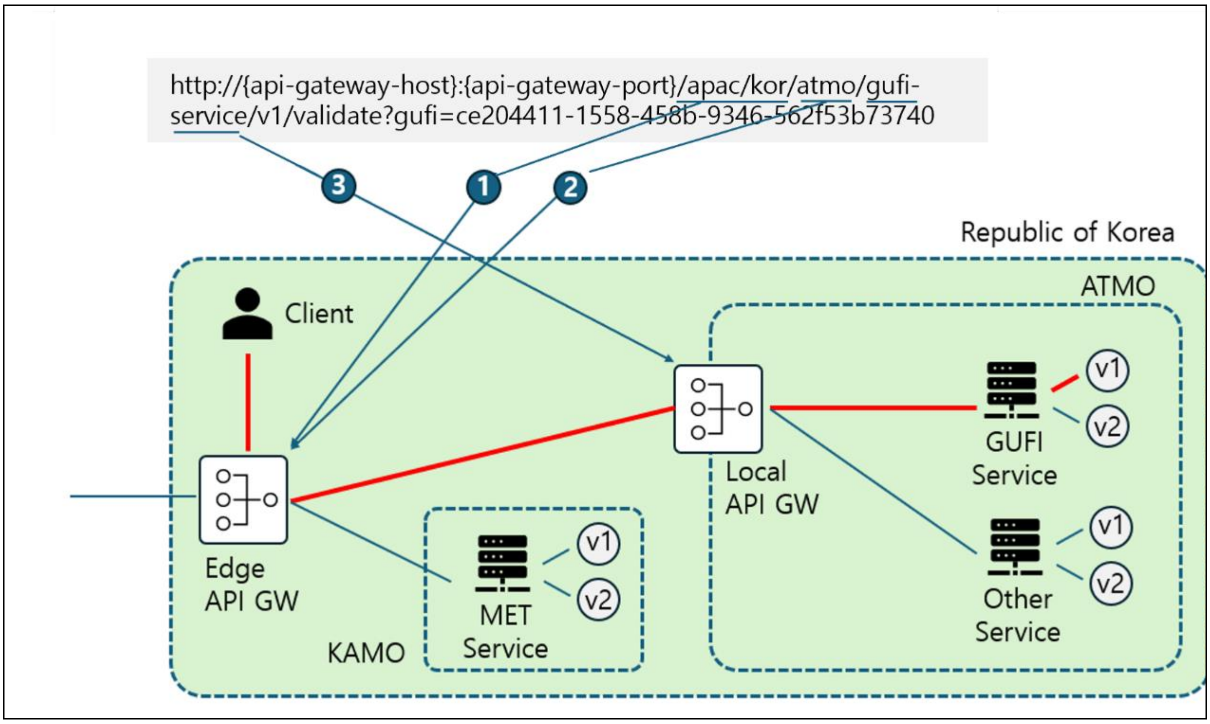
Step	Mechanism
1	**Determine the Routing Type and Forward to the Global API GW** - When a client initiates a request, the Edge API GW checks the {region-code} in the URI to determine whether the routing is inter-regional or cross-regional. - If it is determined to be inter-regional routing, the request is forwarded to the global API GW
2	**Forward to Another Global API GW Node and Route to Target Country** - The global API GW checks the {country-or-jurisdiction-code} in the URI.

	- The global API GW routes the message to another Global API GW node connected to the target country code.
3	**Conduct Local Routing** - Refers to 5.1.5 - Local Routing Scenario

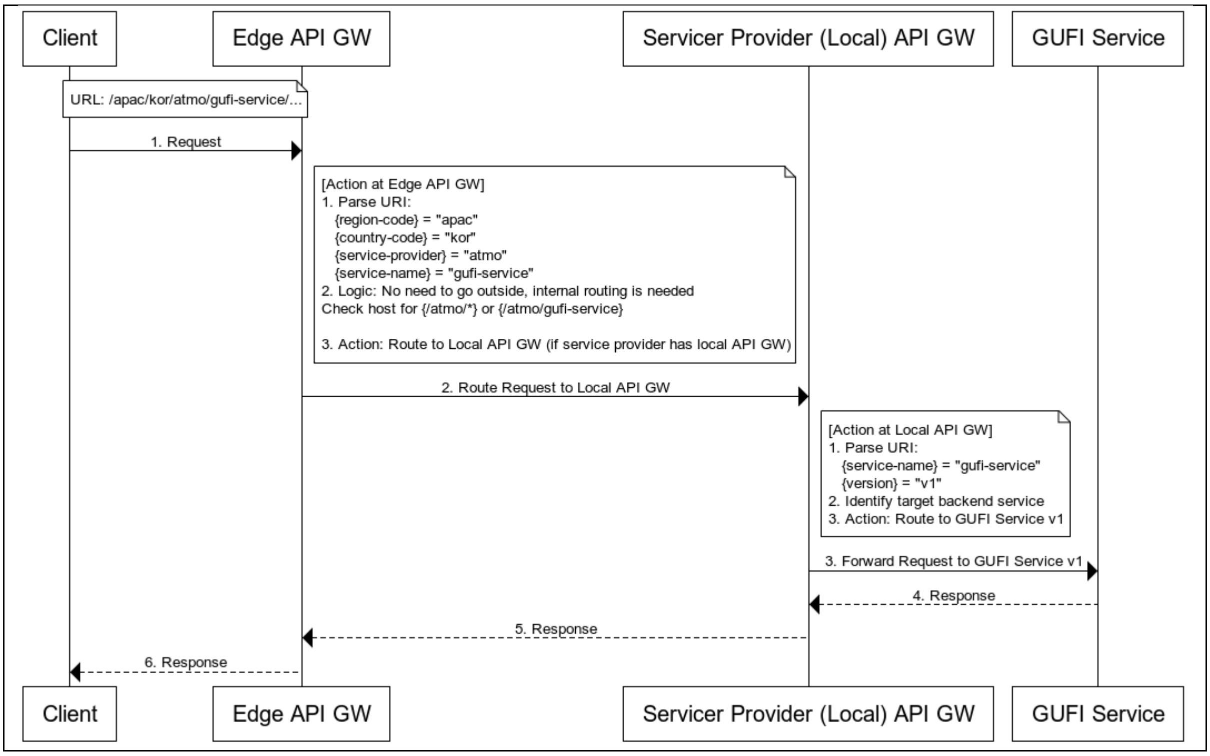
* In this scenario, an edge API GW does not need to establish direct connections with every other gateway. Instead, the global API GW SHALL recognize other global API GW nodes and their associated {country-or-jurisdiction-code} within the region.



5.1.5. Local Routing Scenario



Step	Mechanism
1	**Determine the Routing Type** - The edge API GW checks the {country-code} in the URI to determine whether the request is intended for domestic routing. - If the target is not domestic, the request is routed to an external edge API GW or a global API GW.
2	**Route to Service Provider** - For domestic routing, the edge API GW checks the service-provider path element. - Routing mechanisms may vary depending on the specific service-provider. Some service providers might not operate their own local API GW, exposing their service instances directly to the Edge API GW. In contrast, some service providers may maintain their own local API GW, requiring the Edge API GW to route the request to the provider's local gateway.
3	**Final Routing to the Service Instance** - The local API GW (or the edge API GW, if a local GW doesn't exist) checks the remaining detailed path elements, such as {service-name}, and {service-version}. Based on these elements, the gateway routes the request directly to the final service instance for execution.



SWIM TECHNICAL MEMORANDUM OF COOPERATION

BETWEEN

<SWIM Message System Participant 1>

AND

<SWIM Message System Participant 2>

AGREEMENT FOR THE TECHNICAL AND PROCEDURAL COOPERATION FOR SHARING OF AIR TRAFFIC MANAGEMENT AND AIR NAVIGATION SERVICE INFORMATION THROUGH SYSTEM WIDE INFORMATION MANAGEMENT (SWIM)

EFFECTIVE: [Month Year as MMM YYYY]

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SWIM TECHNICAL MEMORANDUM OF COOPERATION

BETWEEN

<SWIM Message System Participant 1>

AND

<SWIM Message System Participant 2>

AGREEMENT FOR THE TECHNICAL AND PROCEDURAL COOPERATION FOR SHARING OF AIR TRAFFIC MANAGEMENT AND AIR NAVIGATION SERVICE INFORMATION THROUGH SYSTEM WIDE INFORMATION MANAGEMENT (SWIM)

In consideration of the ICAO Asia/Pacific (APAC) Letter covering the provision of SWIM in the ICAO APAC Region:

<SWIM Message System Participant 1> and <SWIM Message System Participant 2>, henceforth the Participants, wish to cooperate with each other on the technical and procedural arrangements related to providing System Wide Information Management (SWIM) Messaging Services between their respective organisations, using their SWIM Technical Infrastructure (SWIM TI) and interconnecting services.

These SWIM Messaging Services are intended to support the Global Air Traffic Management Operational Concept and Global, Regional and National Air Navigation Plans enabling Information Service Consumers to receive information from Information Service Providers via SWIM Message Systems in order to provide for safe, secure, efficient and beneficial air traffic management and air navigation services to aviation participants in the ICAO APAC region and across ICAO regional boundaries where adjacent to APAC.

PARAGRAPH 1 – CITATION

1.1 This SWIM Technical Memorandum of Cooperation will hereinafter be referred to as the “SWIM TMC”.

PARAGRAPH 2 – PURPOSE AND DEFINITIONS

2.1 This SWIM TMC identifies and defines the agreements and procedures by which each party intends to provide and maintain the SWIM Messaging Services between the Participants for the purpose of providing Air Traffic Management and Air Navigation Service information from Information Service Providers to Information Service Consumers. The SWIM TMC is not intended to cover agreements with Information Service Consumers (to be defined in a Service Registry or other separate agreement(s)) or Information Service Providers (to be defined outside the SWIM TMC by each Participant connecting to an Information Service Provider).

2.2 SWIM Technical Infrastructure comprises SWIM Message Systems (for publish/subscribe, request / reply or other services). These SWIM Message Systems are considered either Edge Message Systems ("Edge/s") where they connect to Information Service Providers and / or Information Service Consumers, or Gateway Message Systems ("Gateway/s"). SWIM TMC agreements and connections are expected to be between providers comprising either end of an Edge to a Gateway, or between Gateways (enabling assurance / resilience capabilities, i.e., 'information transit functions / services') within APAC. Information Service Providers / Information Service Consumers are not considered SWIM Message Systems in the context of using the SWIM TMC between providers of APAC Edge and Gateway SWIM Message Systems. SWIM Message Systems are also expected to provide connections between ICAO Regions but the SWIM TMC is not expected to be used for these agreements / connections.

2.3 Edge to Edge messaging directly via the SWIM network layer as part of a request / reply service, if so / as defined in the Implementation Manual (see Paragraph 4 Implementation of SWIM), is not expected to use Gateways. In this case, it is expected that the Service Registry definitions, connections of the Information Service Provider and Information Service Consumer to Edges (not covered by the SWIM TMC), and associated telecommunication service(s) of the associated Edges (and the relevant agreements for all of these) are sufficient and no separate SWIM TMC is expected directly between Edge Participants. This implies a local Edge Participants act as if they were an Information Service Consumer to access remote Edge services via that remote Edge Service Registry for onward provision to an Information Service Consumer connected to them.

PARAGRAPH 3 – FINANCIAL AND COMMERCIAL OBLIGATIONS

3.1 Each Participant shall be responsible for the commercial terms and conditions and their own respective costs and expenses arising from the establishment, operations and maintenance of their SWIM TI and/or their connection to a service delivery point of a multi-point telecommunications service provided by a telecommunications provider to enable connections between Participants, including where an Internet connection is used but not where a separate, specific, point-to-point connection used between Participants (henceforth "multi-point telecommunications service delivery point").

3.2 Where a separate, specific, point-to-point telecommunications service is to be used to connect Participants, such connection will be subject to a separate agreement between the parties (and the associated telecommunications provider(s)) outside this SWIM TMC with respect to commercial terms and conditions, costs (and activities) arising from establishment, operations, and maintenance of this connection.

PARAGRAPH 4 – IMPLEMENTATION OF SWIM

A. SERVICE LOCATIONS

<SWIM Message System Participant 1>
[Air Traffic Service Centre Name]
[Address, incl. State / ZIP or Postal Code / Country]
Tel: [Telephone Number incl. Country / Area Code]
Email: [Email Address] or Refer to Coordination Points for Amendments

<SWIM Message System Participant 2>
[Air Traffic Service Centre Name]
[Address, incl. State / ZIP or Postal Code / Country]
Tel: [Telephone Number incl. Country / Area Code]
Email: [Email Address] or Refer to Coordination Points for Amendments

B. PROCESS AND PROCEDURAL RESPONSIBILITIES

I. GOVERNANCE

1. Through the ICAO APAC SWIM Task Force (TF), all APAC SWIM Message System Participants will form an APAC SWIM Operation Group (OG) to provide ongoing governance and management of operational APAC SWIM matters that need to be agreed across APAC and with neighbouring adjacent regions.
2. Prior to the formation of the APAC SWIM OG, the ICAO APAC SWIM TF shall fulfil this function and OG and TF shall be considered synonymous until the APAC SWIM OG is formed.
3. The APAC SWIM TF shall develop and publish an Implementation Manual to describe the implementation of SWIM in the APAC region such that appropriately defined SWIM messaging is possible between Information Service Providers and Information Service Consumers within a network of SWIM Messaging Systems (comprising Edge and/or Gateway Messaging Systems), and an Operations Manual to describe and enable ongoing governance and management of SWIM in the APAC region.

II. SERVICES

1. Message exchange between SWIM Message System participants will use messaging protocols and carry data comprising ICAO Information Exchange Model formats (e.g., FIXM, AIXM, IWXXM, and other future models as may be identified through ICAO) and other necessary data, to be defined and agreed in the Implementation Manual.

III. IMPLEMENTATION OF THE SWIM TI AND SCHEDULING

1. The Participants will implement operational SWIM TI that provide Gateway and/or Edge capabilities / facilities, as to be described in the Implementation Manual.
2. The Participants intend to make their best efforts to coordinate, test and implement services toward an operational cutover. Actual cutover dates will be dependent on the Participants' separate mutual written agreement that SWIM TI interoperability testing is completed and successful and all material defects have been resolved.
3. Where for operational air traffic management / air navigation service use, the Participants shall provide SWIM TI and interconnecting telecommunications service delivery point(s) and other aspects of service and infrastructure provision compliant with their own national regulatory obligations. If these differ from the Implementation Manual, these should be advised to the other party, to the SWIM Task Force (and OG, if formed), and identified in the Participant's SWIM Service Registry if necessary for service operations or handled as defined in the Implementation Manual and / or Operations Manual (if covered in the manuals).
4. Where for non-operational air traffic management / air navigation service use for interoperability testing (etc.), the Participants can provide SWIM TI (and any interconnecting telecommunications service delivery point(s)) in line with either the Implementation Manual, or any separate specific agreement between the parties so long as any differences from the Implementation Manual are identified by either / both Participant(s) to the other, as part of interoperability testing or otherwise.
5. The proposed schedule for the establishment of the SWIM Messaging Service(s) between the Participants' SWIM TI will be maintained by the APAC SWIM OG.

IV. MAINTENANCE AND RESTORATION OF SWIM MESSAGING SERVICES

1. The Participants are obligated to notify each other at least thirty (30) days prior to making any changes to their operational SWIM TI (or their multi-point telecommunications service delivery point, or any relevant separate, specific, point-to-point telecommunications service that relates to the operational SWIM Messaging Services between the Participants) which will impact the operations and / or services between the Participants.
2. The Participants will coordinate with each other to minimise anticipated interruptions and unnecessary engineering modifications of the operational SWIM Messaging Service(s).

3. The Participants are responsible for maintaining their own equipment and contracts / agreements with any provider of their SWIM TI and / or any associated telecommunication service(s) enabling connections between the parties. The Participants intend to coordinate with each other for their respective maintenance and operational activities affecting the operational SWIM TI and SWIM Messaging Services in advance of these activities.

4. Disruptions to either parties' operational SWIM TI or any associated telecommunication service(s) enabling connections between the parties shall be reported to the other party as soon as it is practical to do so. The target restoration time for services shall be advised as soon as practical by the respective party.

5. The Participants anticipate that they will periodically exchange service performance and operation references, points of contact of service providers and other details as deemed appropriate by the participant providing the information to support ongoing operations and maintenance of SWIM Messaging Services between the parties.

6. The Participants, without obligation, will endeavour to provide maintenance / restoration of any existing SWIM TI and any associated telecommunication service(s) enabling connections between the parties (or others within ICAO APAC Region) as soon as possible and will advise the other party of any expected delay or discontinuance of these systems and/or services

7. The Participants will provide notifications as soon as possible of service disruptions, restrictions or impacts via relevant SWIM Service Registry/ies and / or other method(s) identified in the Implementation Manual and / or Operations Manual.

8. The 24-hour single point of contact and escalation stages for all coordination regarding the SWIM Messaging Services are:

<SWIM Message System Participant 1>

For SWIM:
Maintenance Notifications: [Team / Person Name]
Tel: [Telephone number]
Email: [email addresses]

Escalation 1: [Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

Escalation 2: [Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

Final Escalation:
[Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

<SWIM Message System Participant 2>

For SWIM:
Maintenance Notifications: [Team / Person Name / Role]
Tel: [Telephone number]
Email: [email addresses]

Escalation 1: [Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

Escalation 2: [Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

Final Escalation:
[Team / Person Name / Role]
Tel: [Telephone number]
Email: [email address]

PARAGRAPH 5 – REVISIONS, MODIFICATIONS AND AMENDMENTS

5.1 No revision, modification or amendment to this SWIM TMC will be effective unless made in writing and signed by both Participants.

5.2 Such revision, modification or amendments hall come into effect on such date as may be agreed by the Participants and specified in the document made in accordance with sub-paragraph 5.1, taking into consideration all domestic procedures that have to be complied with.

5.3 Any revision, modification or amendment shall not affect the rights and obligations arising from or based on this SWIM TMC prior to the effective date of such amendment.

PARAGRAPH 6 – SETTLEMENT OF DISPUTE

6.1 Any difference or dispute between the Participants concerning the interpretation and/or implementation and/or application of any of the provisions of this SWIM TMC shall be settled amicably through mutual consultation and/or negotiations between the Participants without reference to any court, international tribunal or other third party for settlement.

PARAGRAPH 7 – CONFIDENTIALITY & PROPRIETARY INFORMATION

7.1 Both parties undertake not to use or reveal to any third party any proprietary or confidential information about the other party unless required to by law or unless such information is for the purposes of air traffic management or air navigation services (or equivalent) and it is necessary to do so to provide the associated services.

PARAGRAPH 8 – SUSPENSION

8.1 Each Participant reserves the right for reasons of national security, national interest, public order or public health to suspend temporarily, either in whole or in part, the implementation of this SWIM TMC. The suspension shall take effect immediately upon written notification to the other Participant.

PARAGRAPH 9 – EFFECT OF THIS COOPERATION

9.1 This SWIM TMC serves only as a record of the Participants' intentions and does not constitute or create, or is not intended to constitute or create, legally binding rights or obligations under domestic or international law and will not give rise to any legal process and will not be deemed to constitute or create any legally binding or enforceable obligations, express or implied.

9.2 Notwithstanding anything in sub-paragraph 9.1, paragraph 3 (Financial and Commercial Obligations), paragraph 5 (Revision, Modification and Amendment), paragraph 6 (Settlement of Disputes), paragraph 7 (Confidentiality & Proprietary Information) and paragraph 8 (Suspension) shall be binding on the Participants.

PARAGRAPH 10 – EFFECTIVE DATE, DURATION AND TERMINATION

10.1 This SWIM TMC will come into effect on the date of last signature by both Participants and will continue to have effect for a period of five (5) years.

10.2 Thereafter, this SWIM TMC may be extended by mutual agreement of the Participants made in writing in accordance with paragraph 8.

10.3 Notwithstanding anything in this paragraph, either Participant may terminate this SWIM TMC by giving no less than sixty (60) days' prior written notice to the other Participant.

10.4 Any termination of this SWIM TMC will not affect the implementation of on-going projects and/or programmes, which have been agreed upon by the Parties prior to the effective date of the termination of this SWIM TMC.

PARAGRAPH 11 – SIGNATURE IN COUNTERPARTS

11.1 To facilitate execution, this SWIM TMC and each of its annexes and addenda, if any, may be executed in counterparts, each of which will be an original, but all of which together will constitute one and the same agreement.

PARAGRAPH 12 – AUTHORITY

12.1 The Participants agree to the provisions of this agreement as indicated by the signatures of the duly authorised representatives below.

12.2 The foregoing record represents the understandings reached between the Participants regarding the matters referred to therein.

12.3 Signed by the Participants' duly authorised representatives on the dates set out below in two (2) original texts in the English language.

<SWIM Message System Participant 1>	<SWIM Message System Participant 2>
Authorised Representative	Authorised Representative
Signature:	Signature:
______________________________	______________________________
[Full Name]	[Full Name]
[Position/Team]	[Position/Team]
Date: _________________________	Date: _________________________

ICAO APAC SWIM INDICATORS

1. SWIM Implementation Status- In preparation/planning

Criteria 1: Readiness of the implementation plan

Final Score: (Total Score/6) x 100%

1) Use case development: Identify and develop use case(s)

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

2) Stakeholder mapping: Identify information providers and consumers

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

3) Gap analysis: Determine required data transformation/preparation to standardised information exchange models

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

4) Service identification: Decide on and prioritise information services to be implemented

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

5) TI design: Decide on SWIM TI architecture

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

6) Governance framework design: Draft SWIM governance and policy framework

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

2. SWIM Implementation Status- Under development/implementation

Criteria 1- Engineering buildup and testing

Final Score: (Total Score/6) x 100%

1) Data preparation: Transforming/preparing data into standardised information exchange models
   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

2) Information services buildup:

   a. Developing and implementing information services

      Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   b. Ensuring service discoverability through the service registry

      Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

3) TI buildup: Developing and implementing SWIM TI

Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

4) Testing & validation

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

5) Governance establishment

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

3. SWIM Implementation Status- In operation

Criteria 1- Establishment of SWIM TI + Trial information service(s)

Final Score: (Total Score/9) x 100%

1) Data delivery: Information delivery in standardised information exchange models through trial information services

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

2) Service discovery: Information services discoverable

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

3) Governance execution (**Governance Score**: (Total Score/7) x 100%)

   i. Executing mechanism to ensure Service Level Agreement(s) tracking

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   ii. Executing mechanism to monitor performance through Quality of Service (QoS) metrics

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   iii. Executing mechanism to ensure Information service lifecycle management

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   iv. Executing framework to ensure SLA and QoS of SWIM TI

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   v. Executing mechanism/framework for access control and management

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   vi. Executing framework/guideline for information service onboarding/offboarding

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

   vii. Executing procedures to resolve disputes between the information service provider and the consumer

   Options: Not implemented (0), Partial implementation (0.5), Full implementation (1)

Statement of Work

Task 1 Implementation Planning

Task Manager: David Leow and Amornrat Jirattigalachote

Project: SWIM Task Force	
Revision number: 04	**Approved:** Click here to enter a date.

Objective and scope of the project

- Maintain the Asia/Pacific regional roadmap for SWIM implementation.
- Track the work done by the SWIM Implementation ad-hoc Pioneer Group (SIPG) and update the regional roadmap.

Deliverables

- Maintenance of the Asia/Pacific regional roadmap until the SIPG completes the implementation of the Asia Pacific SWIM Technical Infrastructure.

Milestones

- The roadmap is updated according to the SIPG timelines.

Dependencies

- Dependencies with projects supervised by different SG (will be controlled by APANPIRG):
  - AAITF
  - MET/IE WG
  - ATFM SG
  - APA-CDM TF
- Dependencies with projects supervised by the SG (will be controlled by SG):
  - CRV OG
  - SURICG
- Dependencies between tasks in the project (will be controlled by the Task Force):
  - SIPG
- Other dependencies
  - IMP
  - TFP

Task participants

State/Organization	Name	Role/ Responsibility	Email	Phone
Thailand	Amornrat Jirattigalachote	Lead	amornrat.ji@aerothai.co.th	+66 2 287 8262
Singapore	David Leow	Lead	david_leow@caas.gov.sg	+65 812 6 9724
Sri Lanka/Airport & Aviation Services Limited	Asanga Senarath Bandara	Contributor	asanga.eane@airport.lk asangasenarath@gmail.com	+9476824 2654 +9411226 3619

State/Organization	Name	Role/ Responsibility	Email	Phone
Indonesia/ Directorate General of Civil Aviation	Maruli Tua Edison Saragih	Contributor	edisonsaragih@yahoo.com edisonsaragih.es@gmail.com m_t@dephub.go.id	+628129785067 +6281246569
Australia/ Airservices Australia	Tim Hailes	Contributor	Tim Hailes <tim.hailes@bom.gov.au>	
ICCAIA/ Frequentis	Harald Milchrahm	Contributor / Observer	harald.milchrahm@frequentis.com	+43 664 60850 3223
Thailand/ CAAT	Jakrin Kutantham	Contributor	jakrin.k@caat.or.th	+66 92 295 6174
Thailand/ CAAT	Papasarin Jirawiwatkul	Contributor	Papasrin.j@caat.or.th	
Thailand/ CAAT	Renuka Kunsakda	Contributor	renuka.k@caat.or.th	+66 0 86 550 5987
Thailand/Airport of Thailand PLC	Boosapa Tavichai	Contributor	boosapa@airportthai.co.th	66 95 952 8423
Thailand/ Airport of Thailand PLC	Paytye Junphuang	Contributor	paytye.j@airportthai.co.th	66 25352431
Fiji/ Fiji Met Service	Adil Ali	Contributor/Observer	adil.ali@met.gov.fj	+6796724888
Thailand/TMD	Rassmee Damrongkietwattana	Contributor	rassmee@hotmail.com	+66 21340011 Ext 213
Thailand/TMD	Rungtiwa Ruechai	Contributor	rungtiwa_ruechai@yahoo.com	+66 21340007
Thailand/TMD	Aphinya Chitchaeng	Contributor	aphinya.tmd@gmail.com	+6621340007
Thailand/TMD	Ms. Paweena Panikodom	Contributor	wpetsuwan@hotmail.com	+66 21340007
Thailand/TMD	Ms. Natthaporn Lertsamranpinit	Contributor	natthaporn.le@gmail.com	+66 23994596
China	Gao Honglei	Contributor	gaohonglei@atmb.net.cn	+861087786917

Working arrangements

☐ Face-to-face meetings

☒ Web conferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: E-mail

Statement of Work

Task 2 Regional SWIM Infrastructure

Task Leader: ~~Yasushi Iwasawa~~Yosuke Moro, Xiaodong Lu, Henry Chan

Project: APAC SWIM Task Force	
Revision number: 03	**Approved:** Click here to enter a date.

Objective and scope of the project

- Define the high-level APAC SWIM Architecture including policies on implementation and distribution of SWIM services
- Define the requirements for the APAC SWIM Infrastructure with the goal of ensuring technical interoperability
- Outline policy to ensure backwards compatibility with non-SWIM capable entities
- Develop a roadmap for the implementation of APAC SWIM Infrastructure

Deliverables

- Develop APAC SWIM Architecture requirements and policy
  - Regional interoperability and connectivity
  - Common aeRonautical VPN (CRV) integration
  - Supporting Regional SWIM information services
  - SWIM mediation and backwards compatibility
  - APAC SWIM Architecture roadmap
- Develop APAC SWIM Infrastructure requirements
  - Messaging requirements
  - Security requirements
  - Technical Infrastructure Management requirements

Milestones

Indicate here the main milestones of the task or give a reference to a planning (Gantt chart etc)

- Milestone 1: Define a CRV-based APAC SWIM Architecture to ensure interoperability during the transition period (Related to the discussion of AMHS/SWIM Gateway Study Group)
- Milestone 2: Develop APAC SWIM Technical Infrastructure Profiles based on the related ICAO documents (Related to the discussion of IMP)
- Milestone 3: Propose an approach to implement secure APAC SWIM Infrastructure by cooperating with Task 3 Security Services (Related to the discussion of TFP and CYSECP)
- Milestone 4: Validate the APAC SWIM Infrastructure implementation via the joint demonstration with other task teams (Related to the discussion of ATMRPP)

Dependencies

Dependencies with projects supervised by different SG (will be controlled by APANPIRG):

- Manual on SWIM, SARPS, PANS and Guidance material from IMP, TFP, CYSECP, CP and ATMRPP

Dependencies with projects supervised by the SG (will be controlled by SG):

- Availability and capability of CRV implementation

Dependencies between tasks in the project (will be controlled by the Task Force):

- Task 3 – Security Services
  - Provide a trust framework for information services
- Task 5 – Governance
  - Integrate SWIM Governance requirements and policy
- Task 6 – Information Services
  - Support the implementation of SWIM Information Services
- Task 8 – SWIM Service and Application Validation
  - Get feedback for interoperability from SWIM Service and Application Validation

Task participants

State/Organization	Name	Role/Responsibility	Email	Phone
Japan	~~Yasushi Iwasawa~~Yosuke Moro	Co-Leader	~~iwasawa-y28j@mlit.go.jp~~ moro-y02vf@mlit.go.jp	+81-3-5253-8~~75~~111
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Japan	Xiaodong Lu	Co-Leader	luxd@mpat.go.jp	+81-422-41-3528
Thailand	Amornrat Jirattigalachote	Member	amornrat.ji@aerothai.co.th	+66-2-287-8262
Thailand	Pipat Leawroongroj	Member	pipat.le@aerothai.co.th	+66-2-286-9252

Working arrangements

☒ Face to face meetings

☒ Web conferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: Email

Statement of Work

Task – 3 Security Services

Task Manager: Jim Laymon (FAA); TBD

Project: APAC SWIM Task Force	
Revision number: 01	**Approved:** Click here to enter a date.

Objective and scope of the project

- Advises TF Chair and Task Leads in the area of cybersecurity for APAC. Specific objectives include:
    - Determining the scope of security responsibility of SWIM, consistent with SWIM technical infrastructures envisioned by the ICAO Information Management Panel (IMP) and the APAC regional network infrastructures, including the CRV.
    - Proposing a trust framework to ensure that the correct information is sent to the correct users, considering identity and access management initiatives (IAM) from member states.
    - Ensures interoperability of trust frameworks within the APAC region and with other ICAO regions.
    - Developing SWIM Cyber Security Architecture Framework and SWIM security strategy for the Asia-Pacific Region. Analyses and captures SWIM security risks.
    - Provide security guidelines and best practices to be incorporated in SWIM APAC Governance activities.

Deliverables

- APAC SWIM Security Scope and Context (Working Paper)
- APAC SWIM PKI Trust Framework (Working Paper)
- Cyber Security Architecture Framework for SWIM in ICAO Asia-Pacific Region (Final, working Paper)

Milestones

- Draft Cyber Security Architecture Framework for SWIM in ICAO Asia-Pacific Region by (TBD)
- Working paper on APAC SWIM Security Scope, due TBD
- Working paper on the trust framework for APAC SWIM, due TBD
    - Survey of IAM Initiatives relevant to APAC SWIM, due TBD
    - Development of framework, due TBD
- APAC Trust Interoperability Demonstration - Complete
- Cyber Security Architecture Framework for SWIM in ICAO Asia-Pacific Region (Final Version), TBD

Dependencies

Dependencies with projects supervised by different SG (will be controlled by APANPIRG):

- SARPS, PANS & Guidance material from the IMP & other relevant panels (ie, ATMRPP)
- Coordination with CRV OG

Dependencies with projects supervised by the SG (will be controlled by SG):

Dependencies between tasks in the project (will be controlled by the Task Force):

- SWIM Manual Vol. II- Implementation Guidelines provide SWIM Security Capability and Security Non-Functional Qualities requirements in 5.3 under Chapter 5-SWIM Technical Infrastructure (TI).
- Annex 17 – Security (tenth edition, April 2017), Doc 8973 Aviation Security Manual (9th edition, Oct.2014) and Doc 9985 ATM Security Manual (first edition, restricted, 2013) provide guidance for Cyber Security Architecture Framework of SWIM.
- Task 2 - Regional SWIM infrastructure
- Task 5 – Governance
- Task 6 – Information Services

Dependencies with projects at member states:

- SWIM Identity and Access Control projects

Task participants

State/Org-anization	Name	Role/Respon-sibility	Email	Phone
FAA	Jim Laymon	Task Lead	Jim.Laymon@faa.gov	(609) 485-6930
TBD	TBD	Task Lead	TBD	TBD
		Team Member		
…				

Working arrangements

☒ Face-to-face meetings

☒ Needs an ICAO-secured portal, name: SWIM Cyber Security

☒ Teleconference

☒ Other: Internet Cooperative Work

Statement of Work

Task 4 Technical Architecture

(Development and Maintenance of Regional Information Exchange Models)

Task Manager: Amornrat Jirattigalachote and Wen Zhu

Project: SWIM Task Force	
Revision number:03	**Approved:**Click here to enter a date.

Objective and scope of the project

- Support APANPIRG WG/TF regarding information exchange models and examine if any extension to the existing information exchange models, i.e. AIXM, FIXM, and IWXXM, and/or the new information exchange model(s) are required to support the Asia/Pacific regional operational requirements

Deliverables

- Support APANPIRG WG/TF regarding information exchange models
- Information exchange model gap identification, i.e. to examine if any extension to the existing information exchange models, i.e. AIXM, FIXM, and IWXXM, and/or the new information exchange model(s)are required for the Asia/Pacific operational use
- Strategy to maintain the artifacts required to support the regional development and maintenance of information exchange model(s) and the extensions
- Approaches for information exchange model interoperability within the region and with other aviation partners

Milestones

- Now – SWIM TF Dissolution
  - Review of operational requirements on data required to be exchanged to support the Asia/Pacific regional operations
  - Examine if the required data attribute(s) are currently available in the existing information exchange models
  - Develop and test the extension(s) and/or new information exchange model(s), if needed
- SWIM TF/5
  - The first version of strategy to maintain the artifacts required to support the regional development and maintenance of information exchange model(s) and the extensions

Dependencies

- Dependencies with projects supervised by different SG (will be controlled by APANPIRG):
  - ATFM SG
  - APA-CDM TF
  - MET/IE WG
- Dependencies with projects supervised by the SG (will be controlled by SG):
  - None
- Dependencies between tasks in the project (will be controlled by the Task Force):
  - Task 1 Implementation Planning

  - Task 2 SWIM Infrastructure
  - Task 5 Governance
  - Task 8 SWIM Services and Application Validation
  - Task 10 Regional Coordination and SWIM-related Information Sharing
- Other dependencies:
  - Information exchange model change control boards, e.g. FIXM Change Control Board (FIXM CCB)

Task participants:

State/Organization	Name	Role/Responsibility	Email	Phone
Thailand	Amornrat Jirattigalachote	Lead	amornrat.ji@aerothai.co.th	+66 2 287 8262
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China	Su Lisi	contributor	slslsl13@163.com	+86 28 85702138
Hong Kong, China	Macro Mang Hin Kok	Contributor	mhkok@hko.gov.hk	+852 2926 8702

Working arrangements

☐Face-to-face meetings

☒ Webconferences

☐ Needs an ICAO-secured portal, name: Click here to enter text.

☒ Other: E-mail

Statement of Work

Task 5, SWIM Governance

Task Manager: Mark Kaplun (USA), TBD (ROK)

Project: SWIM Task Force	
Revision number: 02	**Approved:** Click here to enter a date.

Objectives

I. Establish a robust and sustainable Governance model to ensure that a common set of policies, rules, and standards for identifying, designing, implementing, discovering, and operating SWIM-enabling components is consistently applied and enforced throughout the APAC.
II. Develop or adopt standards, policies, and procedural guidelines to support the functional requirements for implementing all aspects of service-oriented development in the context of APAC SWIM.
III. Facilitate visibility and control for insight into all APAC SWIM-enabled services by supporting developments of flexible mechanisms for service discovery, including, but not limited to, service registries.

Deliverables

I. WP: APAC SWIM Service Discovery and Registry Interoperability Approach
II. WP: APAC SWIM Governance Policies: Status and Plans
III. WP: APAC SWIM Service Level Agreement (SLA): Template
IV. WP: SWIM Interoperability Assessment Matrix (SIAM): Template
V. IP: SWIM Metadata standards and taxonomies

Milestones

I. Operational deployment of SWIM Discovery Services (SDSs) produced by the FAA and KAC (March 2022)
II. Analysis and subsequent updates of SDS/registries network in APAC SWIM (August 2022)
III. APAC SWIM Governance Policies: Status and Plans (TBD)
IV. Release of SLA Template (June 2022)
V. Release of SIAM Template (July 2022)

Dependencies

Dependencies between tasks in the project (will be controlled by the Task Force):

- Task 2 – Technological solutions and architectural views to be utilized in support of APAC SWIM infrastructure
- Task 3 - Information and analysis about security solutions deployed in APAC regions
- Task 6 - Identified standards and technological approaches to be utilized for service validations

Task participants

State/Organization	Name	Role/ Responsibility	Email
Australia	Brent Flohr	Contributor	Brent.Flohr@AirservicesAustralia.com
USA	Mark Kaplun	Task Lead	mark.kaplun@faa.gov
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China	Gao Honglei	Member	gaohonglei@atmb.net.cn
Japan	Xiaodong Lu	Member	luxd@mpat.go.jp

Working arrangements

☐ Face to face meetings

☒ Webconferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☐ Other: Click here to enter text.

Statement of Work

Task 6: Information Services

Task Manager: Marco Kok (Hong Kong, China), Jeremy Bienkowski (Australia)

Project: SWIM Task Force	
Revision number: 04	**Approved:** Click here to enter a date.

Objective and scope of the project

- To define the list of APAC Common SWIM Information Services based on operational needs in APAC
- To define the data catalog for APAC Common SWIM Information Services

Deliverables

- Develop the APAC Common SWIM Information Services and determine the priority of implementation for
  - APAC Common SWIM Aeronautical Information Services
  - APAC Common SWIM Flight Information Services
  - APAC Common SWIM MET Information Services
  - APAC Common SWIM Surveillance Information Services
- Develop the associated data catalog for APAC Common SWIM Information Services
- Document the above deliverables related to Information Services in "APAC SWIM Implementation Guidance Document"
- Provide input for the development of the sample use cases for inclusion in the "APAC SWIM Implementation Guidance Document" to demonstrate the operational benefits brought by the various SWIM information services within a State or between States.

Milestones

- Milestone 1: Present the results on the region-wide survey on APAC Common SWIM Information Services in SWIM TF/9 (May 2024)
- Milestone 2: Present the propose list of information to be exchanged via APAC Common SWIM Information Services, with the description of the business functionality, in SWIM TF/9 and seek comments (May 2024)
- Milestone 3: Seek comments from relevant groups (AAITF, ATFM SG, FF-ICE Ad-hoc group, MET/IE WG, SURSG, MET SG, AOP SG, and ATM SG) and subject matter experts on the proposed list of APAC Common SWIM Information Services updated by SWIM TF/9 (Jun 2024 to Apr 2025)
- Milestone 4: Revise the list of initial APAC Common SWIM Information Services and their data catalog based on feedback received from different contributory bodies and present it in SWIM TF/10 for further consideration (May 2025)

- Milestone 5: Monitor the global development of Information Service Definition (ISD) template for subject-matter-expert Panels, e.g. ATMRPP, METP, which is being progressed by IMP; and develop domain-specific ISDs for APAC Common SWIM Information Services according to the agreed priority of each service, with regional descriptions aligned with the global guidance (Nov 2025)

Dependencies

- Task Group #5 (Governance) – the work on interoperability of Registry and service discovery, which provides recommendations on the Information Service Overview.

Task participants

State/Organization	Name	Role / Responsibility	Email
Hong Kong China / HKO	Mr. Marco Kok	Co-Lead	mhkok@hko.gov.hk
Australia / Airservices Australia	Mr. Jeremy Bienkowski	Co-Lead	Jeremy.Bienkowski@AirservicesAustralia.com
Thailand / TMD	Mr. Wanchalearm Petsuwan	Contributor	wpetsuwan@hotmail.com
Thailand / TMD	Ms. Rassmee Damrongkietwattana	Contributor	rassmee@hotmail.com
Thailand / TMD	Mr. Worapong Noothong	Contributor	pui-74@hotmail.com
Thailand / AEROTHAI	TBC	Contributor	TBC

Working arrangements

☐ Face to face meetings

☒ Webconferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: emails

Statement of Work

Task 7 SWIM Demonstrations

Task Manager: David Leow (Singapore) and Amornrat Jirattigalachote (Thailand)

Project: SWIM Task Force	
Revision number: 1	**Approved:** Click here to enter a date.

Objective and scope of the project

- Track and observe SWIM demonstrations and trials within the Asia/Pacific region and ensure that reports of those demonstrations and trails are presented to the SWIM Task Force
- Provide, if requested, support for regional SWIM demonstrations
- Support trials and proof of concepts work as determined by the SIPG

Deliverables

- Reports from other SWIM demonstrations within the Asia/Pacific region
- Reports on SIPG trials and PoC activities

Milestones

- As needed: Reports from other SWIM demonstrations
- As needed: Reports from SIPG trials and PoCs

Dependencies

- Dependencies between tasks in the project (will be controlled by the Task Force):
  - All

Task participants

State/Org-anization	Name	Role/Respon-sibility	Email	Phone
Singapore	David Leow	Lead	david_leow@caas.gov.sg	+65 6595 6771
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Working arrangements

☐ Face to face meetings

☒ Web conferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: Click here to enter text.

Statement of Work

Task 8 SWIM Service and Application Validation

Task Leader: Yosuke Moro, Xiaodong Lu, Honglei Gao, Yong Jin Ha

Project: APAC SWIM Task Force	
Revision number: 03	**Approved:** Click here to enter a date.

Objective and scope of the project

- Construct a platform for SWIM service and application validation
- Support the implementation of SWIM service and applications
- Support the demonstration of SWIM based operations

Deliverables

- Develop validation requirements for APAC SWIM Infrastructure services
  - Interface Management
  - Messaging
  - Security
- Define and validate the required SWIM services and applications for supporting different operation levels under mixed-mode environment
  - SWIM based information sharing (ATFM, A-CDM and etc.)
  - FF-ICE/R1 operation
  - FF-ICE/R2 operation
  - Trajectory Based Operations
- Develop a common platform for SWIM service and application validation
  - Test system for FIXM, AIXM, and IWXXM message exchange
  - Technical support for regional validation and demonstration

Milestones

Indicate here the main milestones of the task or give a reference to a planning (Gantt chart etc)

- Milestone 1: ~2019.12 Construct a platform for SWIM service and application validation
- Milestone 2: ~2020.11 Conduct a demonstration for FF-ICE/R1 service validation
- Milestone 3: ~2023.12 Develop validation requirements for Regional SWIM Infrastructure
- Milestone 4: Validate the Regional SWIM Infrastructure with Security Services via the joint demonstration
- Milestone 5: Validate the required SWIM services and applications for different operation levels via the APAC TBO Pathfinder Project

Dependencies

Dependencies with projects supervised by different SG (will be controlled by APANPIRG):

- Manual on SWIM, SARPS, PANS and Guidance material from IMP, TFP, CYSECP, CP and ATMRPP

Dependencies with projects supervised by the SG (will be controlled by SG):

- The status of SWIM TI implementation in APAC Region

Dependencies between tasks in the project (will be controlled by the Task Force):

- Task 2 – Regional SWIM Infrastructure, Task 3 – Security Services
    - Provide a platform for SWIM-based operations
- Task 5 – Governance
    - Integrate SWIM Governance requirements and policy
- Task 6 – Information Services
    - Support the validation of SWIM Information Services

Task participants

State/Organization	Name	Role/Responsibility	Email	Phone
Japan	Yosuke Moro	Co-Leader	moro-y02vf@mlit.go.jp	+81-3-5253-8111
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Working arrangements

☒ Face to face meetings

☒ Web conferences

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: Email

Statement of Work

Task 9 Monitoring of Panel work

Task Manager: Yosuke Moro

Project: SWIM Task Force	
Revision number: 02	**Approved:** Click here to enter a date.

Objective and scope of the project

- Monitor developments by IMP and escalate issues/inputs as required

Deliverables

- Monitor developments by the IMP and escalate issues as required
- Periodic updates to IMP from SWIM Task Force work plan

Milestones

Indicate here the main milestones of the task or give a reference to a planning (Gantt chart etc)

- Milestone 1: IMP/3 September 30 to October 4, 2024, in Montreal
- Milestone 2: IMP/WG/13, 15 to 19 September 2025 in Montreal
- Milestone 3: IMP/4, 20 to 24 April 2026, TBD

Dependencies

- ATM SG
- ATFM SG
- CNS SG
- MET SG

Task participants

State/Org-anization	Name	Role/Respon-sibility	Email	Phone
Japan	Yosuke Moro	Task manager	moro-y02vf@mlit.go.jp	+81-3-5253-8111

Working arrangements

☐ Face to face meetings

☐ Needs an ICAO secured portal, name: Click here to enter text.

☐ Other: Click here to enter text.

Statement of Work
Task 10 : REGIONAL COORDINATION AND SWIM-RELATED INFORMATION SHARING
Task Manager: John Moore

Project: SWIM Task Force	
Revision number: 2.0	**Approved:** Click here to enter a date.

Objective and scope of the project

- Monitor identified SWIM-related activities being undertaken in Asia & Pacific Region outside of the ongoing direct SWIM discussions and initiatives
- Liaise with relevant regional TF/WGs to refine operational and communications requirements, provide guidance to those WG/TFs developing and using SWIM, and influence outcomes from other WGs and TFs that will support successful expansion of SWIM

Deliverables

- Identify and monitor SWIM related activities (and their interdependencies) in planning or development within other Working Groups (WGs) and Task Forces (TFs).
- Update other groups on the activities of the SWIM TF
- Update SWIM TF on the activities of other groups outside of the direct activities of the SWIM TF or related groups

Milestones

- Updates where relevant at other WG/TF meetings and a Working Paper update at each SWIM TF meeting
- Updates (WP/IP) to APANPIRG WG/TF as needed

Dependencies

- All relevant WGs, TFs or initiatives unrelated to ICAO group activities (eg: CANSO, OEM or individual State activities)

Task participants

State/Org-anization	Name	Role/Respon-sibility	Email	Phone
IATA	John Moore	Task Lead	moorej@iata.org	

Working arrangements

☐ Face to face meetings

☐ Needs an ICAO secured portal, name: Click here to enter text.

☒ Other: Web meetings and Phone Calls

Statement of Work

Task 11 - SWIM Implementation Education and Promotion

Task Manager: Thomas Green

Project: APAC SWIM Task Force	
Revision number: V1	**Approved:** Click here to enter a date.

Objective and scope of the project

- Creation of an educational and promotional program needed to support SWIM implementation, operations, and facilitate cooperation among stakeholders within the region.
- Collaboration with other APAC SWIM TF task to ensure cohesiveness between the guidance materials and educational material deliverable from the APAC SWIM TF.
- Management, organization, and dissemination of all APAC SWIM educational material
- Creation of an APAC SWIM education and promotional catalog

Deliverables

- APAC Region SWIM Educational and Promotional Roadmap
- APAC Regional SWIM Brochure
- APAC Regional SWIM Symposium
- APAC SWIM Regional Outreach Plan
- APAC SWIM Education and Promotional Catalog

Milestones

Task Number	Activity	Estimated Date of Completion
1	Creation of Draft APAC SWIM Brochure	TBD
2	Draft 3 year SWIM Education and Promotional roadmap	September 10, 2021
3	Confirm date for APAC SWIM Regional Symposium	TBD
4	Complete Draft APAC SWIM Regional Outreach Plan	TBD
5	Complete Draft of APAC SWIM Education and Promotional Catalog	TBD

Dependencies

- ICAO Doc 10039 - Manual on SWIM Concept
- SWIM Manual and Technical Guidance Material
- Guidance Materials issued via the various APAC SWIM TF Task

Task Participants

State/Org-anization	Name	Role/Respo n-sibility	Email	Phone
LST	Thomas Green	Task Lead	Thomas.green@lstechllc.com	
AEROTHA I	Jittima Asawachaipor n	Participant	jittima214@gmail.com	

Working arrangements

☐ Face to face meetings

☐ Needs an ICAO secured portal, name: Click here to enter text.

☐ Other: Click here to enter text.

TERMS OF REFERENCE

SWIM Task Force

Objectives: In order to achieve the SWIM thread as specified in the Aviation System Block Upgrade (ASBU) of the Global Air Navigation Plan (GANP), the Asia/Pacific Seamless ANS Plan objectives, and the air navigation systems that are in compliance with ICAO global standards for the conceptualisation and exchange of aeronautical, flight and meteorological information, the SWIM Task Force will:

a) Benchmark the various successful implementations of SWIM in States and regions to promote best practices;

b) Develop and maintain the Asia/Pacific regional roadmap for SWIM implementation, including SWIM technical infrastructure, SWIM governance, SWIM information services;

c) Propose a high-level Asia/Pacific regional SWIM architecture, the corresponding SWIM technical infrastructure requirements, and the implementation approach to construct such architecture principally over CRV and other IP based networks to ensure interoperability among regional SWIM participants, to support transition for non-SWIM capable entities;

d) Develop the Asia/Pacific regional SWIM cyber security architecture framework and SWIM security strategy in line with ICAO International Aviation Trust Framework (IATF);

e) Support APANPIRG WGs/TFs regarding information exchange models and examine if any extension to the existing information exchange models, i.e. AIXM, FIXM, and IWXXM, and/or the new information exchange model(s) are required to support the Asia/Pacific regional operational requirements;

f) Establish a robust and sustainable governance model to ensure that a common set of policies, rules, and standards for identifying, designing, implementing, discovering, and operating SWIM-enabling components, including SWIM registries, is consistently applied and enforced throughout the Asia/Pacific region;

g) Develop and define the Asia/Pacific version of the SWIM information service overview specifications and the Asia/Pacific version of data catalogue for information services based on the regional operational needs;

h) Track and observe SWIM demonstrations and trials within the Asia/Pacific region as well as provide, if required, support for regional SWIM demonstrations;

i) Encourage and support interested APAC Member States to construct a platform for SWIM services and applications validation and to support the implementation of SWIM services and applications;

j) Monitor developments by the IMP and escalate the regional issues as required;

k) Identify, communicate, and liaise with relevant APANPIRG WGs/TFs in regard to SWIM-related activities, including providing support to refine SWIM operational and communications requirements;

l) Develop an educational and promotional materials required to support the regional SWIM implementation to ensure cohesiveness among regional SWIM participants;

m) Assist APAC Member States to implement the Asia/Pacific regional SWIM, as appropriate;; and

n) Undertake any other approved tasks related to SWIM implementation that may arise in the future.

Composition:

The SWIM TF will consist of experts from ATM, AIM, MET, and CNS from Asia/Pacific States and international organizations such as IATA and ICCAIA.

Conduct of the work:

The task force will conduct its work through web conferences, teleconferences, other electronic means of communications, and Face-to-Face meetings.

Reporting:

The group will report to CNS SG.

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Project	Old Task number	New Task No	Old Task Description	New Task Description	Planned Start	Planned completion	Dependencies	Guidance for SOW	SOW (reference)	Task Lead(s)
SWIM - Definition phase	1-1		Benchmarking of best practices		2017	2018	SWIM Task Force created, resources available Panels deliver as expected Task 1.7 (common vocabulary)	benchmark existing governance models (FAA, Europe), existing catalogues, existing arrangements for quality of service/SLA (availability/reliability), existing registries if any Benchmark mediation of legacy users Benchmark available existing SWIM and industry models for service descriptions ICCAIA IP13 to be included	1-1 Benchmarking - SOW	David J. Almeida (USA)
			Guidance To States: Interregional workshop Develop SWIM implementation guidance for phase 1 Develop SWIM implementation guidance for phase 2 (dual operations) Regional workshops		2017 2017 2017 2019 As needed	2022 2017 2018 2020	SWIM iKit (if confirmed by IMP)	From the task 1-3 APANPIRG WG/TF planning to use or using SWIM may need guidance (ad hoc basis) Guidance to States Mediation of legacy users Lessons learnt from ASEAN SWIM demonstration		
			Guidance for publishers/consumers;		2017	2018	Task 1.1 Task 1-5 and 1-6 Task 1-4 (service descriptions)	Common vocabulary requirement on publishers and suscribers to use the common controlled vocabulary Should include developing a guide for the preparation of service descriptions (dependency = 1.4) Could include guidance for developers/publishers on a set of protocols/formats to use See WP/5 appendices b and c for FAA guidance Analyse which guidnace is necessary from IP/6 and WP/6		
	1-2		SWIM Regional roadmap	Task 1 - Implementation Planning	2019	2022	SWIM Manual 10039 and Technical Manual	Roadmap needs to be updated to reflect the changes and developments that have occured in the last SWIM TF meetings. It needs to be more granular and help direct the work of the other task groups for APAC regional SWIM implementation. To decide and agree on the target architecture for APAC SWIM that will address all the members' concerns. To Include target timelines for the production of regional requirements and guidelines. To include plan for the actual implementation of the regional SWIM technical infrastructure, regional governance framework, ~~R~~registry(s), and information services.	1-2 Regional Roadmaps - SOW_TF1_AJv1	David Leow (Singapore) and Amornrat Jirattigalachote (Thailand)
	1-3		Regional coordination within APAC and guidance and training to APANPIRG bodies		2016	2022	SWIM Manual and Technical Manual Guidance on IWXXM	Use APANPIRG organizational chart Revise on an annual basis Establish simple "MOU" between concerned APANPIRG bodies	1-3 Regional Coordination - SOW_v0.1	John Moore (IATA)
			Guidance and training to APANPIRG WG/TF : - Provide guidance to APANPIRG WG/TF using SWIM		2017 2017 2017 2019 As needed	2022 2017 2018 2020	SWIM iKit (if confirmed by IMP)	From the task 1-3 APANPIRG WG/TF planning to use or using SWIM may need guidance (ad hoc basis) Guidance to States Mediation of legacy users Lessons learnt from ASEAN SWIM demonstration		
	1-4		SWIM governance		2018	2022	SWIM Manual and Technical Manual draft SARPS (stable and mature) lessons learnt from existing governance models (FAA, Europe)	Should include all stakeholders in APAC Should identify SARPS and guidance issued by IMP/ATMRPP/METP Strong coordination required with 1-5 WP04 recommends two service Description models - task 1.4 to study options Version management should address backward compatibility and the content of models (FIXm, AIXM) possibility to operate PKI through the CRV service provider to be further explored	1-4 SWIM Goverance - SOW_updated_fri	David Wills (New Zealand) for SWIM TF/1 and Mark Kaplun (USA) from SWIM TF/2
	1-5		Design Regional SWIM Registry and architecture for phase 2		2017	2019	SWIM ConOPs and Technical Manual Overall requirements: Refer 2.5.4 of DOC 10039	Should take into account how to efficiently implement 2.5.4 of DOC 10039. Search, access, discovery features Should include access control and search functionalities. Chapter 3.5 SWIM Registry For architecture should take into account CRV and that there is no central operational entity in APAC to run common services Input= paper about service description (FAA) Strong coordination required with 1-4 3 approaches proposed in WP07, not exclusive Not forget access to registries outside APAC Confirm if the option of PKI is suitable If yes coordinate with CRV OG to seek if PKI services provided by CRV provider would be a suitable option possibility to operate PKI through the CRV service provider to be further explored Consider SWIM architecture principles from IP02	1-5 SWIM Registry - SOW	Kang Jiseok (ROK) and David Leow (Singapore)
	1-6		Regional SWIM models		2016	2017	Global model definitions available	From the task 1-3 models may need extension /refinements - there is already a case for ATFM Interaction with "light" approach discussed by IMP, coordination with 1-7 Relation with CCB - coordination with task 1-4	1-6 SWIM Regional Models - SOW_TF1_AJv2	Amornrat Jirattigalachote (Thailand)
	1-7		Monitoring of panels work		2016	2022	SWIM Manual and Technical Manual	Escalate issues to the panels Report back from panels 2 IMP meetings per year, monthly conferences A need for a Discussion paper at IMP (deliverable of the task) Focal point for common controlled vocabulary, in coordination with 1-4 Version management should be coordinated regarding backward compatibility and the content of models (FIXm, AIXM) Focal pint to trigger change requests to the models	1.7 Monitoring Panels - SOW	Yukinobu Ryu (Japan)
SWIM Implementation Phase 1 - initial expansion of services and preparation of phase 2	2-1-1		Promote new needs and new services and maintain database of publishers (ID/access points/services/interface/format..) pen		2017	2019		An "Excel" file? Include service descirptions etc Assume registry services can be available on CRV from 2019 onwards 70 FAA applications are available for use and should be referenced in the catalogue	2-1-1 SWIM IMP Phase 1 - SOW_v1	Marco Mang Hin Kok (Hong Kong China)
	2-1-2		Implement SWIM registry and architecture		2019	2022	Task 1-5 completed CRV implemented	Assume registry services can be available on CRV from 2019 onwards Design and implement a mediation service (see SWIM TF-1, WP05)	2-1-2 SWIM Registry - SOW	David Leow (Singapore)
	2-1-3		Support validation and publication of SWIM based applications		2017	2019	Availability of SWIM applications (task 2-1-2) SWIM registry and architecture (DNS service, security, etc) (task 2-1-4) Procedures/SLA: Task 1-4 Models: 1-6	SARPS and guidance Envisage a regional validation as a final step - see report of SWIM TF-1 for large scale tabletop exercise	2-1-3 SWIM IMP Phase 1 - SOW-v1	Xiaodong Lu (Japan), Gao Honglei (China) and Jiseok Kang (Republic of Korea)
SWIM Implementation Phase 2 -generalization	2-2-1		SWIM generalization		2022	2025	SWIM Manual and Technical Manual National transition roadmaps Task 2-1-2 Task 2-1-3 Task 2-1-1	Populate registry (2-1-2) using catalogue (2-1-1), and maintain it Make systematic cross-validation of new services using testbeds from 2-1-3 Optimize architecture on CRV (DNS, proxies) Assist States in their transition to full SWIM Assist States with LOA and guidance (1-1)	*SOW to be drafted later on*	*TBD later on*
	2-2-2		Facilitate dual operations		2022	2025		Operate a mediation service (see SWIM TF-1, WP05) until all states have transitioned to SWIM (2-2-1)	*SOW to be drafted later on*	*TBD later on*

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
1-1		2.2.1 & 2.2.2	~~Jeri Groce (Chair)~~, Task 1, Secretariat	Introduce the mediation principle in the design of the SWIM transition	TBD	Open	This will be assigned to the eventual lead of 2.2.1. Should be in SWIM Planning. Assigned to Task 1. (SWIM TF/6) Ongoing in SIPG (SWIM TF/10) Still open (SWIM TF/11)
1-2		1.1	All	Confirm their interest in ASEAN SWIM demonstration	30-Apr-2018	Completed	• The participation package for the ASEAN demo has be out since October, but have had limited responses. • Awaiting feedback from China, Korea, and Japan. • A new due date of 31st of March has been requested. There are several confirmed partners, and an airline is helping with the coding and messaging in the scenarios. David Leow and Amo are involved with the demo, this task is moving forward on its own, perhaps David and Amo can provide update at next coordination meeting Australia, Hong Kong, Indonesia, Japan, Laos, Malaysia, Myanmar, New Zealand, Philippines, Singapore, Thailand, VietNam, USA
1-3		1.7 & 2.1.1	Yukinobu Ryu-san, (David Almeida)	Confirm terms used to designate the APAC SWIM “catalogue” are in compliance per controlled vocabulary	8-May-2018	Completed	
1-4		Thomas Green	Le Thi Phuong, (David Almeida)	Contribute to Task 1-1 regarding the benchmarking of quality and verification process, Service Level Agreements (SLA)	TBD	Closed	Dependent on Task 1.1 Work Plan. David Almeida will reach out to Member of Viet Nam to establish schedule.

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
1-5		New conversation	Jiseok Kang	Define the minimum set of imformation and basic function of APAC SWIM registry	30-Nov-2018	Completed	This activity must be aligned to the SARPS, PANS and guidance defined by the IMP. This acivity needs a coordination with Task 2-1-1 to define service description elemenets for APAC SWIM servicies 1.While we are looking forward to getting more guidance from IMP PANS, SARPS, the IMP is also wish to get more input on SWIM implementation from regional office while they are developing these two documents. So I suggest APAC SWIM TF should work in parallel, working on researching the policy of registry, in the meantime paying attention to the progress of IMP's developing PANS and SARPS of. I think it will be helpful to IMP and APAC SWIM implementation. 2.The core editorial team of PANS-IM has invited" Yukinobu Ryu, David Leow and Han Hong (Hannah) to join the Vol.II editorial team with the objective to use their insights for verifying whether current draft Vol.II fulfills the requirements of the users,
1-6	3;5	1.4	Mark Kaplun ~~and David Wills~~ Task 3 Lead (SWIM TF/6)	Embark requirements laid out in ICAO provisions and FAA best practices and other practices as available to define the SWIM security governance	4/30/2019 SWIM TF/11	Closed	There is interest in establishing a security task to discuss the crosscutting SWIM issues, perhaps this should be a separate task as ICAO moving toward global trust security networks The due date will be pushed to April 2019 for the next plenary meeting The secretariat will add an agenda item to the next plenary for "splitting out security from governance into its own task"
1-7	1	1.1	David Almeida and Edward Curtis	Introduce lessons learnt from ICCAIA in the benchmark	27-May-2018	Completed	Dependent on Task 1.1 Work Plan. To be addressed after TF/3
1-8	8	2.1.3	Xiaodong Lu	Plan a large scale tabletop exercise and message exchange demonstration in the mid-term (2019 or 2020)	30-Nov-2018	Closed	There are currently two tasks – the ASEAN SWIM demo and FF-ICE/2 validation task. This task is reliant upon coordination with those 2 tasks. The due date will be pushed to November 2018 to allow time for FAA and ASEAN to make decisions Working on tabletop between Japan, Korea, and China. Will discuss this issue at TF/3
1-9		Work Plan	Jeri Groce	Consolidate the SOW and update the work plan accordingly	22-May-2017	Completed	A residual action includes to setup webconference for the Task Leads.
1-10		Work Plan	Frederic Lecat	Create a SWIM TF space under ICAO secure portal		Closed	

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
1-11		1.2	Amo, Stuart Wilson, David Almeida	Define the purpose of scope of "Outreach to Aviation Partners" deliverable	5-Oct-2017	Completed	
1-12	1	1.2 & 2.1.1	Amo, David Leow, Marco Kok	Align interdepedencies between Task 1.2 and 2.1.1.	30-Apr-2018	Completed	Artifacts of 2.1.1 can support 1.2. Will discuss at the October Brussels meeting.
1-13		1.5	Jiseok Kang	Develop Working Paper for APAC SWIM registry approach	31-Dec-2018	Completed	This action is dependent on action item **ID# 1-5** to finish before work can begin
1-14		1.1	Ryu-San, David Leow, and David Almeida	Need to create a WP for presentation to the IMP, letting them know which artifacts the APAC TF is dependent on, and by what date we need the artifacts by.	1-Nov-2017	Closed	
1-15		Work Plan	Frederic Lecat	Send out ICAO Regional Martial out to team	1-Nov-2017	Closed	
1-16	1	1.2	Marco Kok, and John Moore	Develop plan for development of a data catalog for Aeronautical, Flight, and Weather data	30-Nov-2018	Closed	
1-17		1.1 & 1.4	Stuart Wilson, and Mark Kaplun	Need to coordinate development of SWIM Governance Framework for coordination between Task 1.1 and Task 1.4	30-Jan-2018	Closed	
1-18		Work Plan	Mark Kaplun	Coordinate with Stephan Dubet who is developing the ICAO IMP SWIM Governance document		Closed	
1-19		1.5	David Leow	Provide detailed Task 1.5 SOW to Stuart	10-Jan-2018	Completed	
1-20		1.4	Mark Kaplun	Provide Goverernence and Registry lessons learned out to Task 1.5	30-Jan-2018	Completed	
1-21		1.6	Frederic Lecat	Send ED-133 documentation to Amo and Amo to take this into consideration for requirements development for Task 1.6		Closed	
1-22		1.8	Jeri Groce	Determine who will be the leader of Architecture Task (Task 1.8)		Closed	
1-23		Work Plan	Stuart Wilson	Coordinate possible dates for next meeting and send out a poll.		Closed	
1-24		Action Item 1-16	APAC Task Force Leadership	APAC Task Force Leadership to support Marco Kok, and John More on Action Item 1-16.	9-Apr-2018	Closed	Amo: The AeroThai group have already developed an initial data catalogue and will provide to Mr. Kok. Shane: May be able to provide input into this activity as well.
1-25		1.8	Yunkinobu Ryu	Provide proposal on structure of Task 1.8 by the end of January.	30-Jan-2018	Closed	WP 1-8 closed this task.

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
2-1		2.1.3	Yunkinobu Ryu, Xiaodong Lu, Gao Honglei, Jiseok Kang	Plan Regional message exchange demonstration	30-Nov-2018	Closed	This action is related to action 1-8 and the due date will be scheduled for November 2018. This action was included in action 1-8 and has been closed as a result
2-3	1	1.1	David Almeida, Thomas Green	Establish contact with any SWIM-related working groups in other ICAO Regions	30-Apr-2019	Closed	The main effort in Europe working on identity access management and security. Some policies that are evolving and service lifecycle management activities.
2-4	1	1.1	David Almeida, Thomas Green	Make recommendations on the APAC Region applicability of items in SWIM TF/2 WP/4	30-Apr-2019	Closed	XM recommendations will continue to be addressed as needed
2-5	10	1.3	John Moore	Coordinate SWIM TF and MET IE/WG outcomes and activities This action is really about broader coordination of SWIM activities in APAC (not solely MET) and raising awareness of the work of the SWIM Task Force.	31-Dec-2019	Closed	WP09 SWIM in ASEAN Demonstration presented at ICAO APA-CDM TF/3
2-6	10	1.3	John Moore More appropriate lead would be Amo or David Leow as the leads of the demonstration.	Coordinate minutes of SWIM in ASEAN Demonstration with SWIM TF	30-Nov-2018	Closed	David shared the minutes of ASEAN TIM #1, #2 on 18/11/2018
2-7	5	1.4	David Willis, Mark Kaplun; Xiaodong Lu	Examine CRV OG to determine what structure may be used to form an APAC Regional SWIM Governance Review Board	Closed in SWIM TF/5	Closed	Task will be left as is until more clarification from Wen Zhu Closed in SWIM TF/5
2-8	5	1.4	David Willis, Mark Kaplun	SWIM in ASEAN Demonstration participant Administrations to share any lessons learned or other insights relating to SWIM governance	30-Nov-2019	Closed	This task's due date will be scheduled for a few months after the ASEAN SWIM demo to obtain their lessons learned, demo date 27/6/19.
2-9		1.4	David Willis, Mark Kaplun	Develop a draft APAC Governance Framework		Closed	Group decided this was a duplicate of task 1.4 and closed the action as it will be addressed by that task
2-10		1.6	Amornrat Jirattigalochote	Coordinate SWIM in ASEAN Demonstration findings on A-CDM data attributes with APA-CDM/TF		Closed	WP09 SWIM in ASEAN Demonstration presented at ICAO APA-CDM TF/3
2-11	2	1.8	Yunkinobu Ryu, Xiaodong Lu	Investigate the role of CRV in APAC SWIM and make recommendations on how APAC SWIM will interconnect with the CRV	30-Apr-2019	Closed	There are two options to establish SWIM platform on CRV. Confirms details of CRV and IMP to consider how to implement this method of the regional CRV. Xiaodong Lu will give a report about this in next SWIM TF meeting in 2019

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
2-12		2.1.1	Marco Mang Hin Kok	Re-Draft SWIM survey, together with educational material to also inform survey participants on SWIM	30-Apr-2019	Closed	Survey results presented at SWIM TF/3
2-14	1	1.1	~~David Almeida,~~ Thomas Green (Thomas left), New Task 7 after restructure	Develop an APAC SWIM education implementation plan and high level education materials	SWIM TF/6 SWIM TF/7 SWIM TF/9 SWIM TF/10 SWIM TF/11 SWIM TF/12	Open	The SWIM education video for those with technical background has been finished which will be published on APAC website in March. (DONE) The SWIM brochure has been in the final stage for design and will be completed in April. (will review comments) The SWIM education implementation plan draft was presented at TF/3 wil continue to be developed
2-15			All	Commence drafting an APAC Regional SWIM Implementation guidance document		Closed	oThis action is the pure output of the APAC TF to serve as a repository of output of the TF. oShane Sumner took an action to discuss the due date for the APAC Regional SWIM Implementation guidance document and report back to the group oThe Secretariat and David Almeida took an action to create a skeleton structure of this document Discuss the due date for the APAC Regional SWIM Implementation Guidance document and report back to the group This action was merged with 3-1
2-16		Action Item 2-8	John Moore	Confirm the dates of the ASEAN SWIM Demo with David Leow and Amo		Closed	Demo June 27, 2019
2-17		Action Item 2-15	Shane Sumner	Discuss the due date for the APAC Regional SWIM Implementation Guidance document and report back to the group		Closed	Action merged with 2-15
2-18		Action Item 2-15	Secretariat and David Almeida	Create a skeleton structure of APAC Regional SWIM Implementation guidance document		Closed	Action merged with 2-15
2-19		Action Item 2-14	All	All states are encouraged to provide more SWIM education materials		Closed	
2-20	5	1.4	Wen Zhu, Mark Kaplun, David Leow, and David Almeida	Discuss and draft a proposal to the chair and try to get clarification on deliverables 1.4		Closed	
2-21	2	1.8	David Leow and Amornrat Jirattigalochote	Provide all ASEAN SWIM Demo lessons learned and each subtask can absorb the lessons applicable to that group.	30-Nov-2019	Closed	To be addressed after demonstration

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
2-22	5	2.1.4	Xiaodong Lu	Send an email to **Jiseok Kang** and Shane Sumner to resolve the discussion if task 2.1.4 should be included in the SWIM Registry/Architecture task		Closed	
2-23			Jay Zimmer	follow up with Shane Sumner to coordinate how APAC TF can interface with the CRV during Plenary 3. Need CRV points of contact to get on the agenda and brief out as well as attend this meeting		Closed	Shane Sumner: We'll coordinate any necessary changes to the provisional agendas internally within the Secretariat, in consultation with the Chairs. Our current plan has SWIM TF/3 scheduled for 06 to 10 May 2019, and CRV OG/6 for 08 to 10 May. FYI the CRV OG/5 meeting will be held in early January
3-1			Task leads	The Task Leads will address the APAC SWIM Implementation Materials Table of Contents of the at the next quarterly Task Force Lead Teleconference and provide input of supplementary materials by SWIM TF/4	30-Apr-2020	Closed	
3-2	2;3	1.3	Wen Zhu	Set up dedicated working group to covers other areas of cybersecurity	30-Apr-2020	Closed	
3-3	4	1.6	Amornrat Jirattigalochote	The APAC SWIM FIXM Extension be forwarded to the FIXM Change Control Board (CCB) for validation and publication on the FIXM official website	30-Apr-2020	Closed	
3-4	9	1.7	Task Force members	SWIMTF members to submit comments to Japanese IMP member,Yukinobu Ryu	20-May-2019	Closed	
			Tasf Force members	SWIMTF to review Table of Contents for APAC SWIM Eductation programme (Appendix F to the SWIMTF/3 meeting report)	30-Jun-2019	Closed	
4-1	1,10	Task 1&10	Secretariat	Enhance communication with ICAO EUR/NAT Office on SWIM PT activities	On-Going	Closed	
4-2	7		Task Leads	Further exploit and deliberate the outcomes of SWIM in ASEAN Demonstration to benefit States/Administration	SWIM TF/6 SWIM TF/7	Closed	Longer time action. Closed in SWIM TF/7
4-4			Task Leads of Task 2, Task 5 and Task 6	To join the sudy group proposed by SURICG to explore the initiative on surveillance data sharing over SWIM	SWIM TF/5	Closed	
4-5			TF chair and Task Leads	Review the ToR and consolidate the action items in this list	SWIM TF/5	Completed	To align with GANP edition 6, APAC Seamless ANS Plan 3.0 and aim to enhance the interaction with other relevant contributory bodies of APANPIRG
4-6			Amornrat Jirattigalochote, Secretariat	Plan another SWIM workshop	1st TL meeting in 2021	Closed	
4-7			TF chair and Task Leads	Follow up the Task 3 and Task 11	1st TL meeting in 2021	Closed	

Action ID	Task No	Reference	Who	What	Due date	Status	Comment
4-8	9	Task 9	Yukinobu Ryu, Secretariat	List of SWIM relevant ICAO Panels and representatives from APAC	Need to provide list before removing from Action Items List provided	Closed	To better monitor the Panels Work relevant to SWIM on the available resources and representation in APAC As ongoing, need to remove from Action List and will manage by Secretariat
4-9	10	Task 10	John Moore, Secretariat	List of SWIM relevant meetings in APAC	SWIM TF/6	Closed	To better support the regional coordination and SWIM related information sharing
4-10	11	Task 11	Task Leads, Secretariat	Seek information on SWIM education and promotion for consolidation by Task 10.		Closed	
4-11	11	Task 11	Task Leads, Secretariat	Share SWIM related material for future compilation of the APAC SWIM Implementation Materials	SWIM TF/6 SWIM TF/7	Closed	ICAO Secretariat will revise IGD ToC Consolidate the first draft of IGD **Done and closed in SWIM TF/7**
4-13	2	Task 2	Task 2 Group	Develop APAC SWIM TI Profile	SWIM TF/6 SWIM TF/7 SWIM TF/8 SWIM TF/10	Completed	Proposed by Australia, needs further consideration Australia presented WP/19 in SWIM TF/5 Next action from Task group-2 Infrastrure binding can be considered as a part of TI profile. Each country has different TI profile. Australia can
5-1	Task 2, Task 5, 4,6 and Task 7	NA	Task Leads of Task 2, Task 5, Task 4 and Task 6, SURSG, **S3TIG**	Start study of surveillance data being carried via SWIM on CRV; Study to include exploration of updated exchange model	SWIM TF/6 SWIM TF/7 **SWIM TF/9** **SWIM TF/10**	Closed	Action resulted from TL meeting Approved by the plenary Work is under SURSG (SWIM TF/10)
5-2	Task 7	NA	Task 7 TLs, Secretariat	Conduct SWIM over CRV demo; Present lesson learned and findings to the group	SWIM TF/6 SWIM TF/7 SWIM TF/9 SWIM TF/10	Completed	Action resulted from TL meeting Approved by the plenary S3TIG demo may embed the demo. (SURSG chair) Demo required more types of data e.g. ATFM… HK China sumbitted WP in SWIM TF10

2026 The Eleventh Meeting of System Wide Information Management Task Force (SWIM TF/11)
(Bangkok, THAILAND 25-29 May 2026)

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* Virtual Attendance

LIST OF WORKING/INFORMATION PAPERS

WP/IP/SP Number	Agenda	Subject	Presented by
		WORKING PAPERS	
WP/01	1	Provisional Agenda	Secretariat
WP/02	3	Review of relevant meetings	Secretariat
WP/03	3	Summary of SWIM related Outcomes from Relevant APAC MET Meetings	Secretariat
WP/04	3	Outcomes of ANSIA TF/1	Secretariat
WP/05	3	Outcomes of SURICG/11	Secretariat
WP/06	3	Outcomes of ACSICG/13	Secretariat
WP/07	3	Outcomes of SWIM TF Task Leads Meetings and Joint Meetings of SWIM TF Task Leads and CRV OG Experts in 2025-26	Secretariat
WP/08	3	SWIM Implementation Pioneer Ad-hoc Group Progress Report	Singapore
WP/09	3	Asia/Pacific Regional Flight and Flow Information for a Collaborative Environment (FF-ICE) Release 1 Implementation Plan	FF-ICE Ad Hoc Group
WP/10	3	Update on MET-SWIM Documentation	Australia
WP/11	6	Progress of TBO Pathfinder Development in the Asia/Pacific Region	Hong Kong China, Indonesia, Japan, New Zealand, Philippines, Republic of Korea, Singapore, Thailand, Viet Nam, USA and IATA
WP/12	4 (c)	ATFM FIXM Message Template for ATFM messages based on FIXM VERSION 4.3 Extension	ATFM SG
WP/13	6	Update on MET Information Exchange Via AMQP in Europe	Australia
WP/14	5	Review of outcomes and action items from the ICAO APAC CRV-SWIM Experts Workshop: Reviewing of CRV II Specifications and ICAO APAC SWIM Architecture in September 2025	Secretariat
WP/15	7	SWIM Discovery Service (SDS) Update: Schema release, testing, and global adoption for Registry Interconnection	United States

WP/IP/SP Number	Agenda	Subject	Presented by
WP/16	7	Guidance Material for Business Functionality of APAC Common SWIM Information Services	Task 6 Leads
WP/17	7	Feedback on Business Functionality Requirements for APAC Common SWIM Information Services – Flight Information Services	FF-ICE Ad Hoc Group
WP/18	7	API Management and Gateway Introduction, Framework, and Best Practices for Harmonised SWIM Request/Reply Messaging	United States
WP/19	7	Review of SWIM TF ToR, SOW, Work Plan, and Outstanding Action Items	Secretariat
WP/20	4 (d)	APAC SWIM Implementation Framework	Japan
WP/21	4 (b)	Hierarchical SWIM Architecture to Achieve Message Exchange Patterns in the APAC Region	Japan
WP/22	4(f)	Establishment of a SWIM Test Environment for APAC SWIM	Japan
WP/23	6	Latest status of IWXXM	Hong Kong China
WP/24	3	Work Progress of SIPG Task 2: Refine the Revised Hierarchical Architecture	China
WP/25	7	Comments on the Technical Memorandum of Cooperation (TMC) document for ATM information exchange through SWIM	New Zealand
WP/26	7	SWIM Discovery Service Jump Starter Kit v2.0	Republic of Korea
WP/27	7	Progress on Development of R/R MEP Guidance Material	SIPG
WP/28	7	Progress on Development of REST API URI Structuring and Naming Guidance Material	SIPG
WP/29	3	Outcomes of ATFM & A-CDM Steering Group 16 Meeting	ATFM & A-CDM SG
		INFORMATION PAPERS	
IP/01	1	Meeting Bulletin	Secretariat
IP/02	8	Organisation of SWIM Training cum Workshop in August 2026	Secretariat
IP/03	8	First ICAO global Communications, Navigation, Surveillance, and Spectrum Symposium (CNSS 2026), Kotor, Montenegro, from 12 to 15 October 2026	Secretariat
IP/04	4(g)	IMP Updates	Japan

WP/IP/SP Number	Agenda	Subject	Presented by
IP/05	6	Data Volume of Digital NOTAM Messages Handled on SWIM	Japan
IP/06	6	Progress Update on SWIM Implementation in Japan	Japan
IP/07	4 (g)	Raising Airlines' Awareness of SWIM, FF-ICE and TBO	IATA
IP/08	6	Verification of ATFM Information Exchange Based on SWIM Test Platform	China
IP/09	6	Application of the SWIM concept for MET information provision in the low-altitude economy	Hong Kong China
		PRESENTATIONS	
SP/01	7	SWIM Discovery Service (SDS) Update: Schema release, testing, and global adoption for Registry Interconnection	United States
SP/02	7	API Management and Gateway Introduction, Framework, and Best Practices for Harmonised SWIM Request/Reply Messaging	United States
SP/03	7	Updates from Editorial Ad-hoc Group	Editorial Ad-hoc Group
SP/04	7	APAC SWIM Implementation Progress Indicators	SWIM TF Co-Chair
SP/05	7	Need for SWIM TF Tasks restructuring	SWIM TF Co-Chair
		FLIMSY	
Flimsy/01	4(d)	Online Survey on the Draft APAC SWIM Governance Agreement	Japan
Flimsy/02	7	APAC Common SWIM Information Services	Task 6 Leads (Australia and Hong Kong China)

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