International Civil Aviation Organization

The Tenth Meeting of System Wide Information Management Task Force (SWIM TF/10) and Second Working Session of SIPG

Bangkok, Thailand, 20 – 30 May 2025

Agenda Item 2: SWIM Architecture: Requirements on Gateway EMS providers

STRATEGIES TO SWIM OPERATIONALIZATION IN THE ASPECT OF VALIDATION

(Presented by SIPG, presenter ROK)

SUMMARY

This document outlines a strategy for the conditions for SWIM operationalization from the perspective of validation and verification. It addresses the aspects related to validation discussed in the SWIM Implementation (Doc 10203) and proposes corresponding strategic approaches

1. INTRODUCTION

1.1 At the SWIM Implementation Pioneer Ad-hoc Group (SIPG) Workshop 1 (WS/1), the group defined action items to be completed before Workshop 2 (WS/2). One of the action items is: Action WS-1-5 *"SIPG will propose the requirements for the Gateway EMS for consideration by the SWIM Task Force 10 (TF/10)."*

1.2 According to ISO/IEC 12207:2017 – *Systems and software engineering — Software life cycle processes* and ISO/IEC 15288:2023 – *Systems and software engineering — System life cycle processes*, once requirements are defined, the next phases are design and implementation, which are responsibilities to be carried out by member states that will implement the Global Enterprise Messaging Service(GEMS).

1.3 In order to operate GEMS, it must undergo validation and verification to ensure that each individual GEMS, as well as the GEMS cluster (i.e., the APAC SWIM architecture), satisfies the specified requirements to be defined and guarantees sufficient reliability and quality — to the extent that users can have confidence in using it for operational use.

1.4 However, the means to achieve the objective stated in section 1.3 have not yet been clearly defined. Therefore, this document outlines a strategy for the conditions for SWIM operationalization from the perspective of validation and verification. It addresses the aspects related to validation discussed in the SWIM Implementation (Doc 10203) and proposes corresponding strategic approaches.

2. DISCUSSION

2.1 The SWIM Implementation (Doc 10203) does not specifically address the **validation of the SWIM Technical Infrastructure (TI)**. However, as described in *SWIM TF/1 – WP/06 "FAA: 10 Years of SWIM Experience – Introductory Best Practices and Lessons Learned, Brief Overview of the SWIM Program"*, there is precedent for classifying the core functions of the SWIM TI—such as messaging, interface management, enterprise service management, and service security—as core

services. In terms of service, validation of GEMS also could refer to the information service validation as GEMS could be considered as core service of APAC SWIM architecture. Accordingly, for validation of GEMS, reference could be made to Section 4.6: *Validation of information services* of *SWIM Implementation (Doc 10203)*.

Validation of information services of SWIM Implementation (Doc 10203)

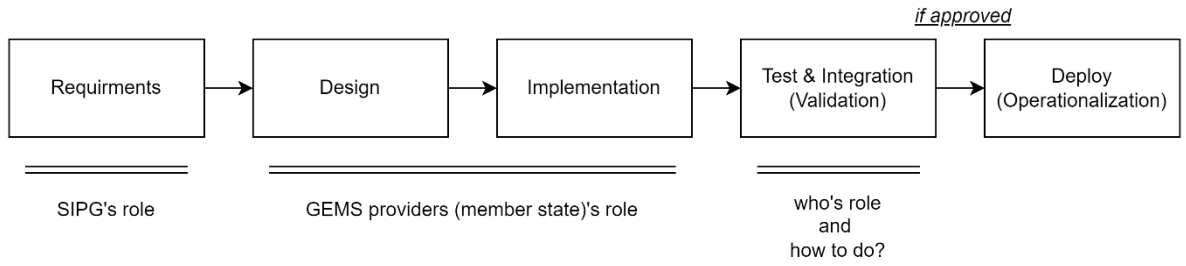
2.2 The document defines validation as "the activity whereby an information service is checked for conformance against the objectives and requirements stated in the information service overview. Validation provides assurance of conformance to the information service consumer."

2.3 The document introduces validation methods as follows:

- Independent validation;
- Collaborative validation;
- User validation; and
- Self-validation.

2.4 The document provides a general description of what should be validated. In Section 4.5 "Quality of Service Characteristics", the SWIM Implementation (Doc 10203) emphasizes that "well-specified QoS parameters are vital inputs enabling stakeholders to verify whether an information service meets operational needs." Additionally, the document explicitly references ISO/IEC 25010:2023 – *Systems and Software Quality Requirements and Evaluation (SQuaRE)*, which defines essential quality attributes for information services.

2.5 And these attributes are reflected in the non-functional requirements of the requirements specification. And, these requirements must be validated to ensure they are satisfied. However, while the document includes a rough outline of validation or requirements, it does not address who should be responsible or what to do, and how to do specifically.



Strategies for Regional SWIM Operationalization in the Aspects of Validation

Development of Test Case/Scenarios for Validation

2.6 In general, validation involves testing, and someone must develop test cases (or test scenarios). From a regional perspective, there are three possible approaches to developing test cases.

- Each GEMS provider develops their own test cases in compliance with requirements
- GEMS providers' group develops co-test cases in compliance with requirements
- SIPG develops test cases in compliance with requirements

Conduct Test Case/Scenarios for Validation

2.7 As stated in Section 2.5, once the test cases are established, testing should be conducted following appropriate procedures and by qualified tester (or validator). For instance, ISO/IEC/IEEE 29119-1*: Software and Systems Engineering — Software Testing* defines test types, and from a regional perspective, there are three possible approaches to conducting tests.

- Unit Test (Each GEMS): Each GEMS implementor
- Integration Test (GEMS Cluster in aspect to technical requirements): GEMS implementors group under SIPG
- System Test (GEMS Cluster in aspect to business requirements): to be defined by SIPG or SWIM TF
- Acceptance Test: to be defined by SIPG or SWIM TF

A Strategy to Improve Objectivity of Test for Validation

2.8 To enhance the objectivity of validation as mentioned in Section 2.7, software quality certification conducted by 3rd party of each member state based on ISO/IEC 25010 can be utilized. In the case of ROK, there is the GS (Good Software) certification, which is a scheme that grants certification to software products that meet a certain level of quality based on ISO/IEC 25000. Similar ISO/IEC 25000-based software quality certification programs also exist in most of the member states participating in the SIPG as follows:

Member State	Certification Name
ROK	GS (Good Software) Certification
Thailand	TISI Certification
Singapore	Singapore Standards (SS)
Japan	JIS Certification (Japanese Industrial Standards)
China	GB/T 25000.51 Certification
Malaysia	SIRIM QAS Certification
Australia	SAI Global Software Quality Certification
Hong Kong	HKAS Accreditation

2.9 The information exchanged through the global SWIM services currently identified by APAC SWIM TF at the regional level is **non-safety-critical**, and therefore, software safety certifications based on RTCA DO-278A under IEC 61508 – *Electronic Functional Safety Package* are not considered at this moment. However, such certifications may need to be considered in the future if safety-critical information is to be exchanged via the SWIM.

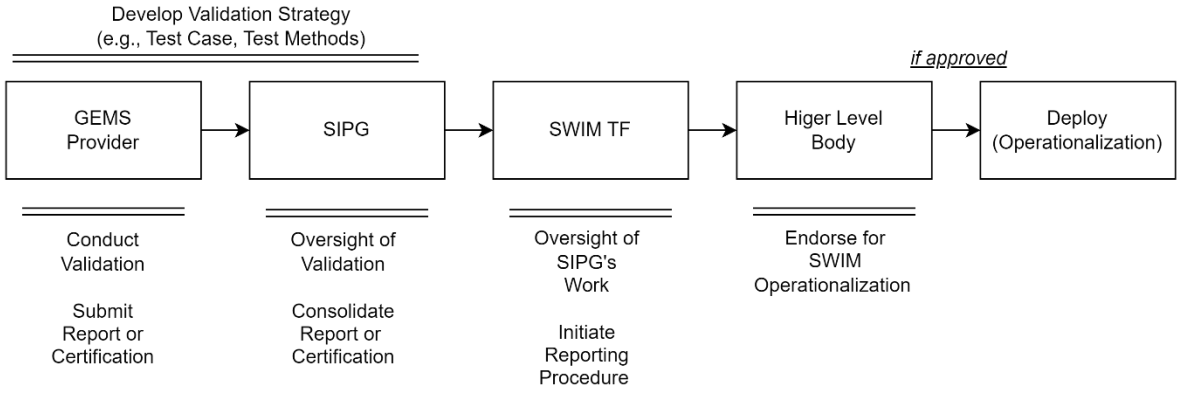
A Strategy to Acquire Condition of Operationalization After Validation

2.10 Once the validation process is completed, an appropriate authority must authorize the GEMS for operational use. To prepare materials for authorization, there are two possible approaches to prove that GEMS meets the specified requirements.

- GEMS providers obtain and submit a certification based on ISO/IEC 25000; and
- SIPG or GEMS providers' group develop and submit a test report.

2.11 Once the materials mentioned in Section 2.10 are prepared, SIPG reports to SWIM TF, and SWIM TF initiates the reporting procedure to the appropriate higher-level body.

2.12 Considering that the procedure described in Section 2.11 may take approximately a year, in order to initiate SWIM operations in the APAC region by 2030, the activities up to Section 2.10 should be completed by early 2029, so that the relevant materials can be submitted to the SWIM TF in time for the subsequent procedures required for operational deployment.



CONCLUSION

2.13 This paper has outlined strategic approaches to support the operationalization of SWIM in the APAC region, with a specific focus on the validation aspect. While the SWIM Implementation (Doc 10203) provides a high-level reference to validation, it lacks specific guidance on how and by whom the validation activities should be conducted, particularly in the context of the SWIM Technical Infrastructure (TI) and GEMS.

2.14 In response, this paper has:

- Interpreted relevant validation concepts and references from international standards such as ISO/IEC 12207, 15288, 25010, and 29119;
- Proposed test case development and execution strategies applicable to the regional context;
- Introduced mechanisms to enhance the objectivity of validation, including third-party software quality certifications; and
- Suggested a procedural flow for obtaining operational approval for GEMS, involving both technical and administrative steps.

2.15 Given the estimated lead time for the final approval process, it is critical that the validation and preparation activities be initiated well in advance — ideally completed by early 2029 — to ensure timely submission of materials to SWIM TF and subsequent endorsement by the appropriate higher-level body. Finally, this strategy described in this paper aims to ensure that the SWIM services and infrastructure, particularly GEMS, meet the required quality and reliability, enabling safe, consistent, and trusted operational deployment across the region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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