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 6: Conditions for SWIM Operationalization

REQUIREMENTS SPECIFICATION TEMPLATE FOR GEMS AND GLOBAL SWIM SERVICE

(Presented by SIPG, presenter ROK)

SUMMARY

This paper provides guidelines for requirements definition from a requirement engineering perspective. It includes relevant international standards, principles to follow when defining requirements, and templates that can be used as reference.

1. INTRODUCTION

1.1 In SWIM implementation document (Doc 10203), SWIM is defined as: *"The system-wide information management (SWIM) builds upon the notion of service, as known in information and communication technology (ICT), which is defined as a mechanism to enable access to one or more capabilities using a prescribed interface."* And the document also defines Technical Infrastructure (TI) as: *"The assembly of software and hardware used to enable the provision of information services."* In addition, the document also describes SWIM from a software perspective. Accordingly, the implementation of SWIM, in a technical aspect, can be regarded as software or system implementation.

1.2 As mentioned in section 1.1, SWIM implementation can be approached by software engineering. And efforts on implementation of regional SWIM in the APAC region can be mapped to the processes defined in the ISO/IEC 15288:2023 - *Systems and software engineering — System life cycle processes* and ISO/IEC 12207:2017 - *Systems and software engineering — Software life cycle processes*.

1.3 The definition of user requirements and system requirements corresponds to the initial phase in both standards. The current activities conducted by SIPG to define the requirements for the Global Enterprise Messaging Service (GEMS) or other efforts conducted by SWIM TF to define global SWIM services can be considered as part of this phase.

1.4 As SWIM implementations continue to expand within the region, these efforts are expected to gain greater significance, particularly because similar procedures will be required for the implementation of global SWIM services. The well-defined and well-documented deliverables of SIPG's work can be referenced and reused in the future.

1.5 However, since there have been no discussions related to the subject of requirements, this paper provides guidelines for requirements definition from a requirement engineering perspective. It includes relevant international standards, principles to follow when defining requirements, and templates that can be used as reference.

2. DISCUSSION

Rationale

2.1 Section 4.5 "Quality of Service Characteristics", SWIM implementation (Doc 10203) states that "*well-specified QoS parameters are vital inputs enabling stakeholders to verify whether an information service meets operational needs.”* And the document also explicitly references ISO/IEC 25010:2023 - *Systems and Software Engineering – Systems and Software Quality Requirements and Evaluation(SQuaRE)*, which defines quality attributes critical for information services.

2.2 Clearly defined requirements, particularly those addressing Quality of Service (QoS), are essential.

Referenced Standards

2.3 The following standards were referenced in the preparation of this paper.

- ISO/IEC 12207:2017 - *Systems and software engineering — Software life cycle processes*;
- ISO/IEC 15288:2023 - *Systems and software engineering — System life cycle processes;*
- ISO/IEC 25010:2023 - *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Product quality model;*
- ISO/IEC 25030:2019 - *Systems and software engineering — Systems and software quality requirements and evaluation (SQuaRE) — Quality requirements framework; and*
- IEEE STD 830:1998 - *IEEE Recommended Practice for Software Requirements Specifications*

Software Quality Characteristics

2.4 The software quality characteristics defined in ISO/IEC 25010:2023 are as follows:

- Functional suitability
- Performance efficiency
- Compatibility
- Interaction capability
- Reliability
- Security
- Maintainability
- Flexibility
- Safety

2.5 When specified as formal requirements, quality attributes mentioned in section 2.4 align closely with the non-functional requirement categories described in IEEE STD 830.

Categories of Software Requirements

2.6 IEEE STD 830 classifies software requirements into the following categories:

- Functional Requirements
- Non-functional Requirements
- Interface Requirements
- Design Constraints
- Other Requirements

2.7 Since IEEE STD 830 does not provide detailed definitions or classifications of non-functional requirements, the requirements necessary to satisfy the quality characteristics described in Section 2.4 are classified as follows:

- Functional Requirements (SFR)
- Non-functional Requirements
  - Performance Requirements (PER)
  - System (Equipment Composition) Requirements (SYR)
  - Interface Requirements (INR)
  - Data Requirements (DAR)
  - Test Requirements (TER)
  - Security Requirements (SER)
  - Quality Requirements (QUR)
  - Constraints (COR)

Software Requirement Specification Fields

2.8 IEEE STD 830 provides a template for the overall structure of a SRS, but it does not define the specific fields of individual requirements. Therefore, ROK has defined the fields as follows:

- Category
- ID
- Title
- Description
  - Definition
  - Detailed Description
- Related Requirements
- Source of Requirement
- Verification Method

Software Requirement Specification Template

2.9 IEEE STD 830 provides a template for the overall structure of a SRS, but it does not define the specific template for requirement specification. Therefore, ROK has designed the template as follows:

Category		
ID		
Title		
Description	Definition	
	Detailed Description	
Related Requirements		
Source of Requirement		
Verification Method		

2.10 Please refer to the Appendix for some examples of software requirements specification for categories defined in section 2.7.

Principles for Defining Software Requirements

2.11 IEEE STD 830 defines the following characteristics that software requirements should possess:

- Correct
- Unambiguous
- Complete
- Consistent
- Verifiable
- Modifiable
- Traceable

CONCLUSION

2.12 This paper presents a structured approach to defining software requirements for SWIM implementation, drawing from internationally recognized standards such as ISO/IEC 12207, ISO/IEC 15288, ISO/IEC 25010, and IEEE STD 830. While existing standards provide comprehensive frameworks for system and software life cycle processes, there remains a gap in detailed guidance on specifying individual requirements, especially non-functional ones, within the SWIM context.

2.13 To address this, ROK has defined an extended classification and a detailed field structure for software requirement specifications, reflecting best practices and aligning with key quality attributes. These contributions are intended to support the ongoing efforts of regional and global SWIM stakeholders by offering reusable guidelines and templates that ensure clarity, completeness, and consistency in requirement documentation.

2.14 As SWIM continues to evolve, clearly defined, verifiable, and traceable requirements will be critical in ensuring interoperability, service quality, and long-term maintainability. The proposed guidelines and examples in this paper are expected to provide practical value and serve as a reference for future implementations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;
b) discuss the proposed guidelines and examples; and
c) discuss any relevant matter as appropriate

– – – – – – – – – – – – – –

[APPENDIX]

Performance Requirements (PER) – Cocurrent User

Category		PER
ID		PER-001
Title		Concurrent User Access
Description	Definition	The system shall support a defined number of concurrent users during peak usage.
	Detailed Description	The system must reliably handle at least 500 concurrent user sessions without degradation in performance
Related Requirements		PER-002 (Response Time) PER-003 (Scalability)
Source of Requirement		N/A
Verification Method		Load Test under simulated 500 concurrent user sessions

Interface Requirements (INR) - Protocol Support

Category		INR
ID		INR-001
Title		Protocol Support
Description	Definition	The system shall support the AMQP for message-based communication.
	Detailed Description	The system should be capable of sending and receiving AMQP 1.0 messages in accordance with the protocol specification.
Related Requirements		INR-002 (Interoperability)
Source of Requirement		ICAO SWIM Doc. 10039
Verification Method		Integration test with test driver that supports AMQP 1.0

Data Requirements (DAR) – Backup

Category	DAR

ID		DAR-001
Title		Data Backup Management
Description	Definition	The system shall back up all critical data regularly to ensure data recovery in case of system failure or data corruption.
	Detailed Description	Backup must include configuration data, transaction logs, and user-generated content.
Related Requirements		DAR-002(Data Backup Method)
Source of Requirement		N/A
Verification Method		Audit

Test Requirements (TER) – Performance Test

Category		TER
ID		TER-001
Title		Performance Test Concept
Description	Definition	The system shall pass performance test verify that it meets performance requirements (e.g., throughput, response time, and resource usage)
	Detailed Description	Key metrics include average response time (< 2 seconds), CPU usage (< 80%), and memory usage (< 75%) under typical and peak loads. Performance degradation under stress should not exceed 10% of baseline throughput.
Related Requirements		N/A
Source of Requirement		N/A
Verification Method		Load Test Tool (LoadRunner) Evaluate Metrics Document Test Result