



Final Project Report

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Abstract

This document describes the information needed for the formal project closure. During the project time-frame the following objectives were achieved:

- There were defined a set of scenarios for continuing the work done by 14.01.02 related to the SWIM Technologies assessment: real-like scenarios based on expected SWIM services NFRs. With this activity, the way (stepwise approach) for completing a SWIM technology assessment can be considered to be closed.
- The SWIM A/G topic was evolved by describing issues/problems needed be tackled together with a set of possible scenarios to be evaluated. Moreover, a mock-up assessment was performed. SESAR 2020 programme will continue these SWIM A/G activities.

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Document History

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1 Final Project Report

1.1 Context

1.1.1 General Context

SWIM, System Wide Information Management, has been identified in SESAR as one of the four main changes in the ATM Target Concept that impact the European ATM System architecture for the long-term. SWIM aims at ensuring the inter-operability of ATM Systems by standardizing and implementing external interfaces with common services. SWIM will enhance the availability of the information to the end-user applications and allows finding the most appropriate source of information when needed.

SWIM is further decomposed in its Operational (SWIM) aspect and in its Technical Aspect (SWIM-TI, Technical Infrastructure). Both Operational and Technical aspects of SWIM aim at enabling a net-centric architecture following a SOA approach in order to inter-connect the different ATM systems and exchange value added services amongst them.

According to the European ATM Master Plan (ref. [2]), SWIM, (Operational Improvements IS-0901-A, IS-0901-B and IS-0901-C) was set to introduce a complete change in how information is managed throughout its lifecycle across the whole European ATM system.

1.1.2 Specific Context

Project P14.2.1 had to deal with two main goals related to SWIM Technical Infrastructure (SWIM TI) in order to help to achieve the so desired data and services exchange between the different ATM Systems:

- Complete the Communication Technologies Assessment (first steps was done in P14.1.2).
 - Only the scenarios definition task was completed (the other expected tasks were not achieved in the project)
- Evolve the A/G SWIM concept from the ground perspective. (the air side of the SWIM-A/G communications is out of the project scope).
 - An architectural assessment will be performed highlighting some open topics. It was based in the existing inputs.
 - A set of set of scenarios will be defined to assess the design decisions.
 - Prototypes would be developed to cope with the defined scenarios.
 - An assessment has to be defined.

1.2 Project Progress and contribution to the ATM Master Plan

Based on the two main types of activities within the project:

- Regarding the SWIM-TI Technologies evaluation (G/G),
 - Achievement:
 - A set of scenarios were developed based on the available ISRM services to serve as platform for testing the different communication technologies set out by P14.01.02. These scenarios target “real-life” interactions that should be

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potentially performed by ATM Systems using SWIM. This is an initial step towards a SWIM technologies test-bed.

- Thus, this activity complemented the full lifecycle of SWIM-TI technology assessment. This assessment process(s) can be considered “mature” and reusable even if later on could be instantiated for different scenarios/technologies.
- Regarding the SWIM A/G topic:
 - Achievement:
 - The SWIM A/G topic was analysed highlighting the possible issues, open questions, deployment and technological options for a future successful implementation of the A/G SWIM-TI.
 - The analysis presented several possible scenarios/open topics to be addressed when trying to build a global A/G SWIM solution.
 - It performed an exhaustive analysis of the AMQP technology by developing and using mock-ups of possible deployment scenarios.
 - Thus, this activity contributed to give maturity to this rather immature concept (which will be deeply tackled during SESAR 2020). It can be considered to be ready for a wide V2/V3 set of activities in SESAR 2020.
 - Context:
 - It established a coordination framework between the A/G SWIM related projects in order to coordinate the development on the topic in the multiple faces such as ground infrastructure, air infrastructure, networking and services.
 - It is important to mention the lack of clear operational input for dealing with the A/G SWIM topics. Some ad-hoc SWIM A/G operational requirements were agreed, in advance the start-up of the project, and they were used as an input.

1.3 Project Deliverables

The subset of deliverables produced by the project is:

- D01 G/G SWIM Technology Evaluation Scenarios Definition[5]
 - This document is the result of the T001 task and prepares the test-bed needs and thus the benchmarking activity.
- P14.02.01-D05-AG SWIM Deployment Options Analysis [6]
 - This document reflects an analysis of A/G SWIM deployment options
- D06-002 A/G SWIM Deployment Options Mock-Up Assessment [7]
 - A new edition of D06 that improves the quality of the content of the D06 [\[8\]\[9\]\[8\]\[9\]\[9\]](#) document.
 - An enhancement/complement in scope/content of the D05 [6] deliverable where it is covered the scope of the A/G SWIM by also rising a set of open questions.
 - It also includes some mock-up assessment dealing with AMQP technology based mock-ups.
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4 of 8

From a project perspective the D01 [5] and D06-002 [7] deliverables are the two relevant deliverables of the project. The SJU assessment for the deliverables is “Major Reservations”.

The D06-002 valuable information is the set of open topics related to the A/G SWIM area and the preliminary scenarios/assessment done for a developed prototype. D01 contributes to finish the method for assessing SWIM communication technologies (developed mainly in P14.1.2) by providing a set of scenarios.

1.4 Contribution to standardization

The project has not contributed to standardization activities due to the nature of its activities.

1.5 Project Conclusion and Recommendations

The A/G SWIM architecture is immature and needs to be stressed and analysed from all the possible perspectives before proceeding straight to a concrete solution implementation.

All the deliverables were qualified with Major Reservations. Even if the deliverables will neither be formally published nor formally transferred to SESAR 202, the P14.2.1 project partners dealing with SWIM A/G topic in SESAR 2020 could base their initial work on the content produced during this project (D06-002 [7]) taking into account the SJU qualification assessment. The lack of clear operational scenarios and their associated requirements was considered to be a key problem within the project and SESAR 2020 will need to solve it. In SESAR 2020 it is needed to clearly obtain Operational scenarios and requirements for driving the SWIM A/G work.

The A/G work done in this project should collaborate to this objective of evolving the Purple Profile, which addresses the A/G SWIM communications.

For instance, this project considers that the following aspects of the A/G SWIM-TI environment are subject to be taken in account when developing the concept and need further analysis:

- Physical deployment options, taking in account operational responsibilities and legal/safety implications (although this topic is out of the scope of an R&D programme)
- Regional and interregional implications
- Transitions
- Data prioritization and efficiency
- Security
- Safety
- Recovery procedures
- Military integration
- Data link technologies
- Addressing,
- Requirements on the network
- QoS
- Possible usage for tactical data (i.e. safety critical services)
- Etc.

The project considers that A/G SWIM is key to the SESAR Programme objectives, and therefore effort should be dedicated to promote it in the operational side. Thus, SESAR 2020 should address the evolution of the concept for both ground and air sides

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In case that in SESAR 2020 (even if it is not foreseen now) or in any later SESAR programmes there is any emerging technology that needs to be evaluated, the SESAR SWIM evaluation method developed by 14.1.2 and complemented by 14.2.1 could be used.



2 References

- [1] [SESAR Programme Management Plan, Edition 03.00.01](#)
- [2] [European ATM Master Plan, Edition 2](#)
- [3] Multilateral Framework Agreement (“MFA”) signed between the SJU, EUROCONTROL and its 15 selected members on August 11, 2009, amended on 14 June 2010, 19 October 2010 and 2 July 2012
- [4] SCH_14.02.01_Latest_Approved_Baseline. 17/06/2015..
- [5] P14 02 01-D01-GG SWIM Technologies Evaluation Scenarios Definition, ed. 00 01 00, 08/01/2014
- [6] P14.02.01-D05-AG SWIM Deployment Options Analysis, ed. 00.01.00, 27/06/2013
- [7] P14.02.01-D06-002 -AG SWIM Deployment Options Mock-Up Assessment, ed. 00 02 01, 16/10/2014
- [8] P14.02.01-D06-AG SWIM Deployment Options Mock-Up Assessment, ed. 00 02 00, 16/12/2013

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