



PJ.17-01 Solution overview

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Pj17-01 Solution lead

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Leonardo Rome, Italy



Founding Members

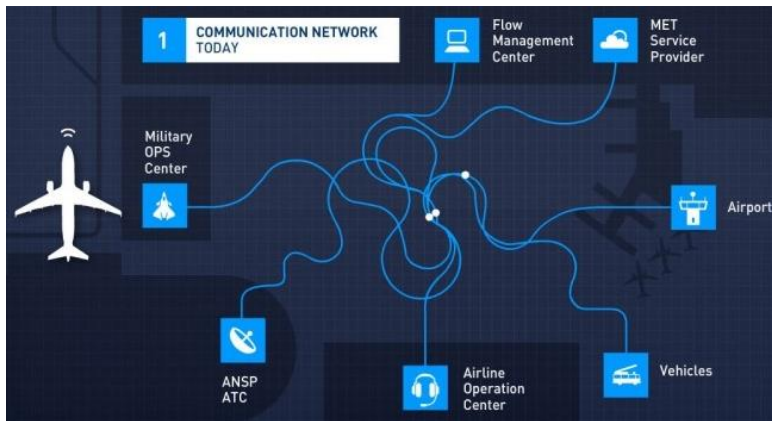


Outline (30')



- Air/Ground SWIM advisory Information Sharing:
 - Why & When & What
- Current SESAR2020 Air/Ground SWIM Advisory Information Sharing plan
- Key aspects of the Air/Ground SWIM Advisory Information Sharing design

Air/Ground SWIM advisory Information Sharing: Why?



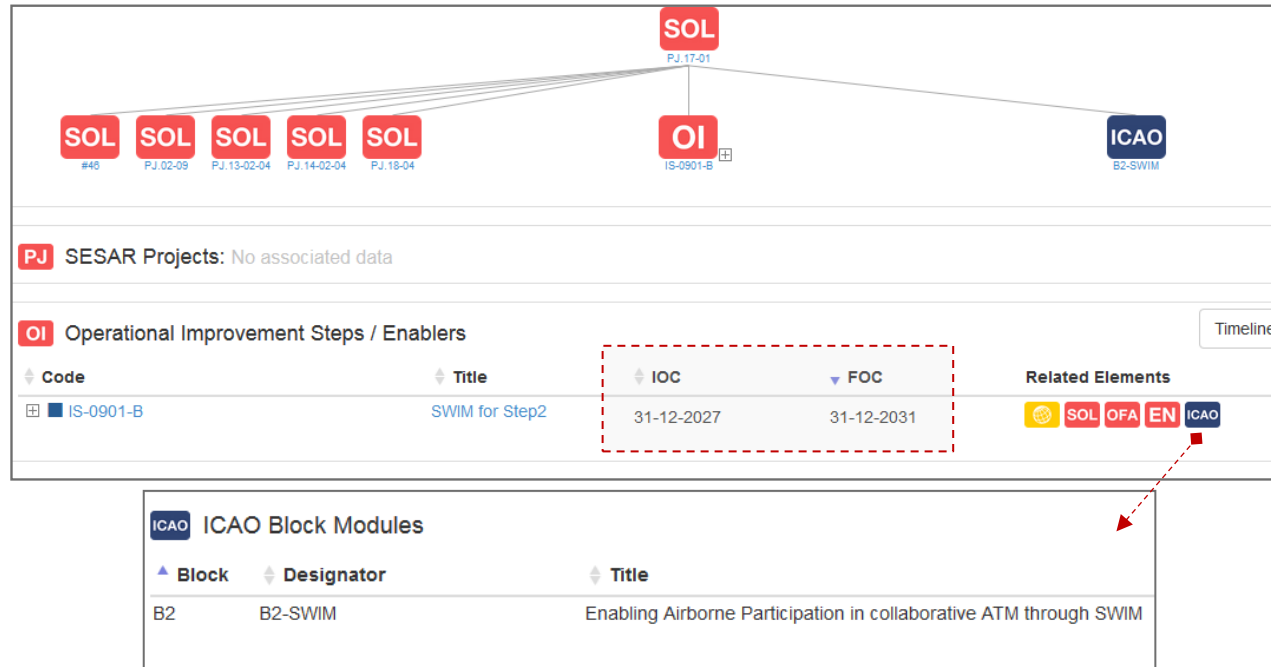
- The ICAO Global Air Navigation Plan (Doc 9750) introduces **ASBU B2-SWIM** “Enabling Airborne Participation in Collaborative ATM through SWIM” which considers the aircraft to be a fully connected information node in SWIM, enabling full participation in collaborative ATM processes with exchange of data, including meteorology.
- ICAO Doc 9750 plans to start with non-safety critical exchanges supported by commercial data links:
 - Non-safety critical (or advisory) information is defined as supplemental information that is not necessary for command and control of an aircraft (ICAO Doc 10039 Manual on SWIM Concept).

- Ground-based systems, air traffic managers and flight crews will all benefit of this timely **bi-directional** information exchange expected to contribute to increase predictability, flexibility and efficiency.
- Flight crews may benefit of **SWIM enabled uplink** information exchange in improving common situational awareness between flight crews and ground operations, while promoting strategic/tactical planning and more informed decision making.
- Ground-based systems and air traffic managers may benefit of **SWIM enabled downlink** information exchange in obtaining near real-time information about surrounding airspace conditions (e.g. atmospheric conditions).

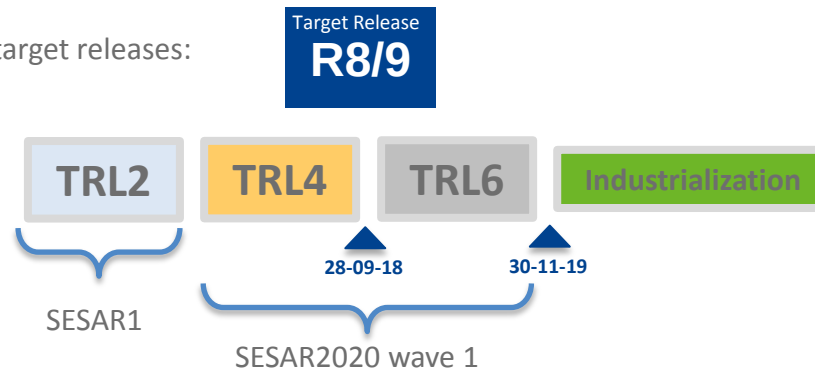


Air/Ground SWIM advisory Information Sharing: When?

European ATM Mater Plan (Initial and Full operational capability dates):

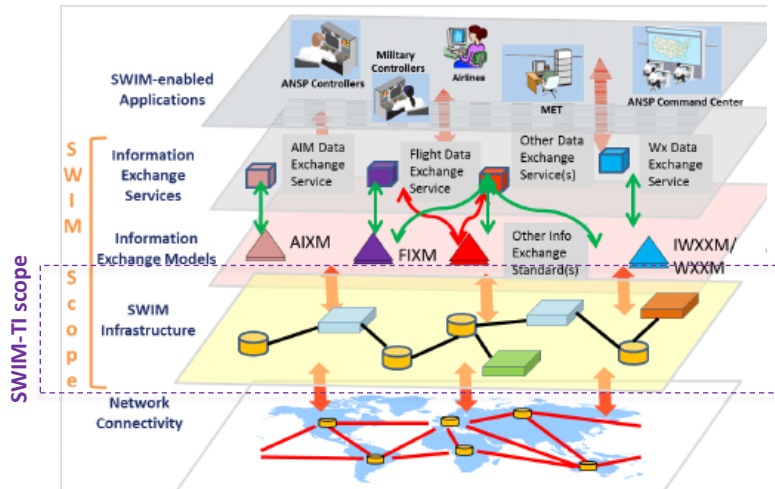


PJ.17-01 TRLs and target releases:



Air/Ground SWIM advisory Information Sharing: What?

- (ICAO Doc 10039) SWIM (System Wide Information Management) consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services.
- A service can be described using various perspectives or aspects including business aspect, operational aspect (e.g. what the service is about) and the solution aspect.



- PJ.17-01 contributes to the solution aspect of the Air/Ground SWIM service design (or SWIM-enabled services as defined in ICAO Doc 10039) and in particular to the technical interoperability.
- PJ.17-01 is exploring a standard based Air/Ground SWIM infrastructure solution building on top of results from SESAR 1. The solution aims at supporting ATM operational improvements that depend on Air/Ground (A/G) information exchanges to enable a better situational awareness and collaborative decision making with a focus on advisory information.
- Concrete examples of uplink and downlink information exchange are described in the *EUROCAE ED-151 - Operational Services and Environment Definition (OSED) for Aeronautical Information Services (AIS) and Meteorological (MET) Data Link Services*.

Air/Ground SWIM advisory Information Sharing: Current SESAR 2020 plan



- The solution is finalizing TRL4 and initiating TRL6

Milestone	ID	Due date (PMP)	Actual Due date	Status
TRL4 TS/IRS and TVALP available (SYS)	PMP_M.010	04/08/2017	27/11/2017	Achieved
TRL4 AN available (EXE START)	VAL.010	15/12/2017	12/04/2018	Achieved
TRL4 EXEs execution completed (EXE END)	VAL.020	23/02/2018	27/04/2018	Achieved
TRL4 TVALR available	PMP_M.020	27/04/2018	29/06/2018	DEL under assessment



Task/DEL Name	Task/DEL Code	Start	Finish
TRL6 Technical Specification	T2.610	01/06/2018	30/11/2018
PJ.17-01 TRL6 TS	D2.2.610	30/11/2018	30/11/2018
TRL6 Technical Validation Planning	T2.620	01/06/2018	31/08/2018
TRL6 Technical Validation Plan Refinement	T2.621	03/12/2018	04/01/2019
PJ.17-01 TRL6 TVALP	D2.2.620	04/01/2019	04/01/2019

PJ.17-01 Exercises and dates:

- **EXE1** (Leonardo, Frequentis, Selex ES GmbH): Uplink and downlink advisory information (weather, aeronautical) exchange in a scenario involving different Purple Profile SWIM Node prototypes, aircraft and ground Purple Profile enabled SWIM services (**TRL4 - 2Q2018**)
- **EXE2** (Indra): Ground test application to communicate with several simulated aircrafts through a SATCOM emulator (**TRL4 - 2Q2018**)
- **EXE3** (Thales Air Systems, Thales Avionics, Sita, Eurocontrol): Technical Validation of capabilities and robustness of the A/G SWIM Segment supporting interoperable communication between a/c and Ground SWIM Enabled Apps (**TRL4 - 2Q2018**)
- **EXE4**: Evolution of EXE1, as defined in TRL4, according to TRL6 (**3Q2019**)
- **EXE5**: Evolution of EXE2, as defined in TRL4, according to TRL6 (**3Q2019**)
- **EXE6**: Evolution of EXE3, as defined in TRL4, according to TRL6 (**3Q2019**)
- **EXE7 (TBC)**: EXE including a sub-set of EXE4, EXE5 and EXE6 (**3Q2019**)

Air/Ground SWIM advisory Information Sharing: key design aspects: evolution



- Starting from the baseline assessment, the Purple Profile functional and technical architectures have been improved. These architectural views have been then used to refine the functional and non-functional requirements included from the baseline.

- Main improvements with respect to the baseline include:
 - Harmonization and improvement of the reference ontology and terminology.
 - Harmonization and improvement of the functional and technical architecture.
 - Harmonization and improvement of the Security risk assessment.
 - Harmonization and improvement of functional and non-functional requirements.
 - Evolution from AMQP 0-9.1 to AMQP 1.0 ISO/IEC standard.

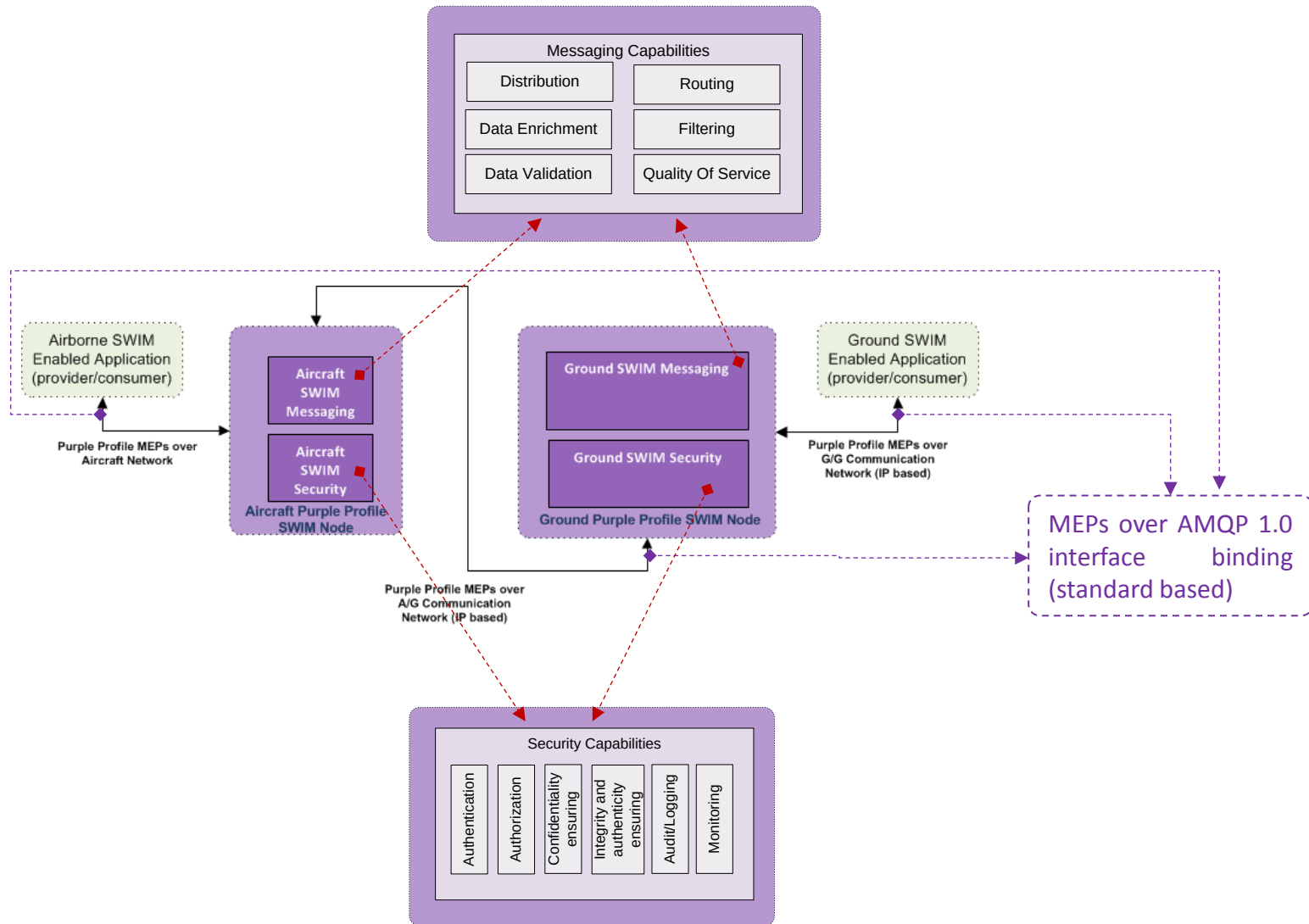
Air/Ground SWIM advisory Information Sharing: key design aspects: technical use cases driven

EUROCAE ED-151 - Operational Services and Environment Definition (OSED) for Aeronautical Information Services (AIS) and Meteorological (MET) Data Link Services, December 2007.

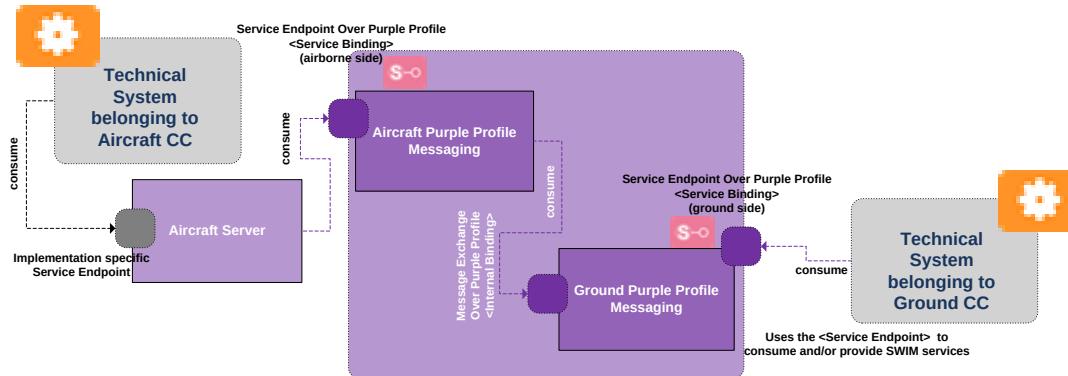
Data link mode	Realization options (MEPs)
Broadcast	Publish/Subscribe Push (PSPUSH-MEP)
	Request/Response (FDRR-MEP)
Demand	Publish/Subscribe Pull (PSPULL-MEP)
	Request/Multi-Response (FDRMR-MEP)
Contract	Request/Response (FDRR-MEP) composed with Publish/Subscribe (PS*-MEP)
	Publish/Subscribe (PS*-MEP)

UC ID	UC Title	Aircraft role	Ground-based system role	MEP Family	Brief description
PPUC-01a	Aircraft initiated Request/Response information exchange	Consumer	Provider	Request/Response	An aircraft consumes a Request/Response SWIM service provided by a ground-based system (FDRR-MEP).
PPUC-01b	Aircraft initiated Request/Multi-Response information exchange	Consumer	Provider	Request/Response	An aircraft consumes a Request/Response SWIM service provided by a ground-based system (FDRMR-MEP).
PPUC-02	Ground-based system provided Publish/Subscribe information exchange	Consumer	Provider	Publish/Subscribe	An aircraft consumes a Publish/Subscribe SWIM service provided by a ground-based system (PS*-MEP).
PPUC-03a	Ground-based system initiated Request/Response information exchange	Provider	Consumer	Request/Response	A ground-based system consumes a Request/Response SWIM service provided by an aircraft (FDRR-MEP).
PPUC-03b	Ground-based system initiated Request/Multi-Response information exchange	Provider	Consumer	Request/Response	A ground-based system consumes a Request/Response SWIM service provided by an aircraft (FDRMR-MEP).
PPUC-04	Aircraft provided Publish/Subscribe information exchange	Provider	Consumer	Publish/Subscribe	A ground-based system consumes a Publish/Subscribe SWIM service provided by an aircraft (PS*-MEP).

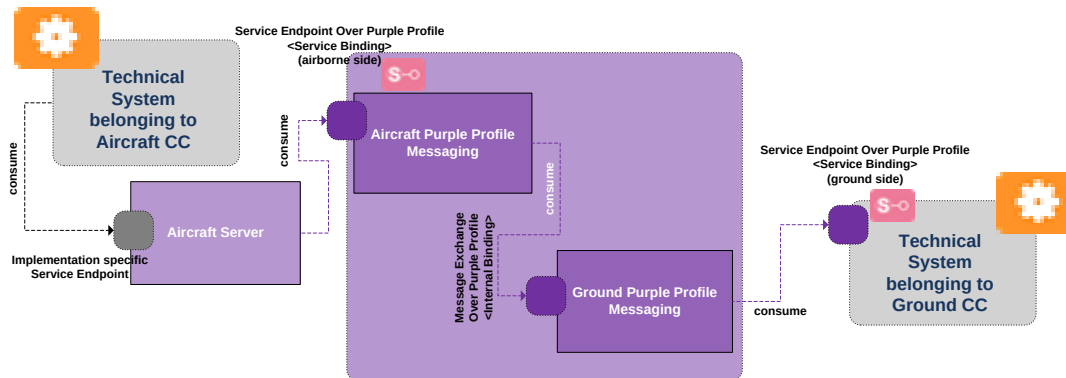
Air/Ground SWIM advisory Information Sharing: key design aspects: HL architecture



Air/Ground SWIM advisory Information Sharing: key design aspects: PP enabled SWIM service



a) Technical view applicable to use cases PPUC-01, PPUC-02, PPUC-03 and PPUC-04



b) Technical view applicable to use cases PPUC-01 and PPUC-02 (Ground provided services)

A given Purple Profile enabled SWIM service is instantiated over the infrastructure according to its technical design that mainly consists of:

- SWIM Service specific artefacts describing the «contract» field of the selected «Service Binding» pair (e.g. message schema, etc.).
- Resources allocation and configuration concerning the triad of interface bindings (e.g. including message topics and subscription handling for Publish/Subscribe services).
- SWIM Service specific message distribution and routing.
- SWIM Service specific QoS configuration.
- SWIM Service specific security configuration including X.509 certificates, private keys, etc.
- For Publish/Subscribe MEP, SWIM Service specific filtering criteria definition





PJ.17-01 Solution overview

Thank you very much for your attention!



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Founding Members



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