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**SWIM for Flight Object Interoperability
and Civil/Military airspace coordination**

Xavier Jourdain - Thales



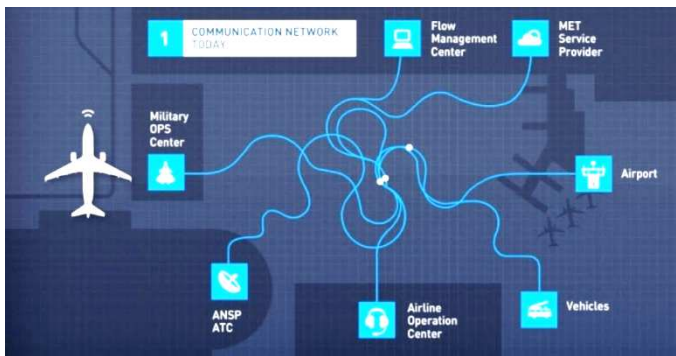
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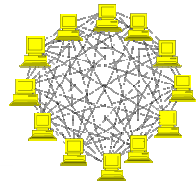
Why SWIM?

One-to-One

For n systems, up to $n(n-1)$ interfaces



- Many custom communication protocols
- Each interface is custom designed, maintained individually and locally
- Inconsistently updated
- Low reuse, duplication



Net Centric

For n systems, n interfaces



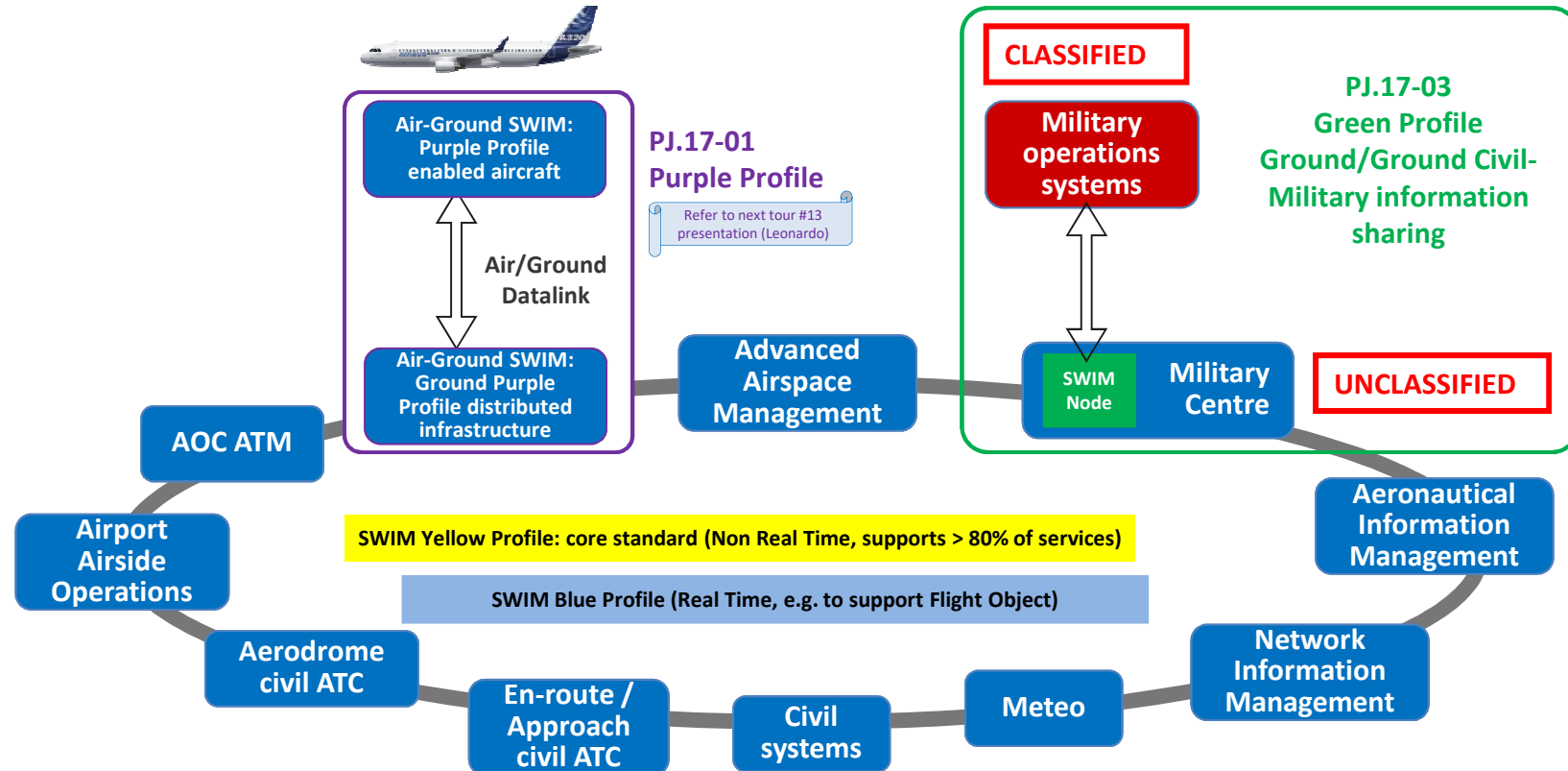
- Decouple information producers from consumers (Service Oriented Architecture)
- Use of open standards
- Functionality packaged as a suite of interoperable services



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SWIM: the intranet of ATM

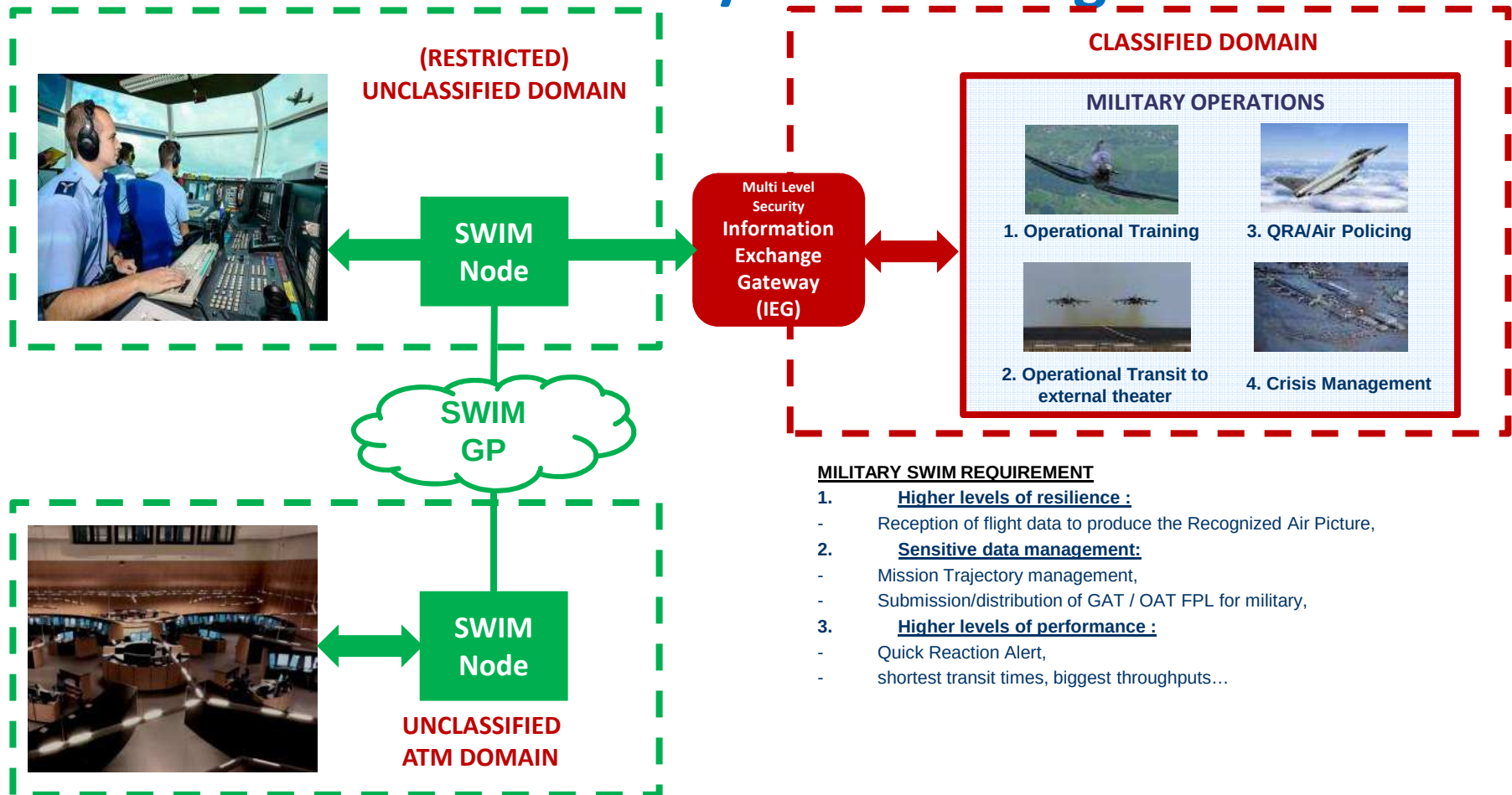


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SWIM Profile: Specification defining an implementation of the SWIM TI. Multiple SWIM TI Profiles can coexist, each of them focused on the implementation of technical infrastructure but with different scope and applicability (EUROCONTROL definition)



SWIM for Civil/Mil exchanges



MILITARY SWIM REQUIREMENT

1. Higher levels of resilience :
 - Reception of flight data to produce the Recognized Air Picture,
2. Sensitive data management:
 - Mission Trajectory management,
 - Submission/distribution of GAT / OAT FPL for military,
3. Higher levels of performance :
 - Quick Reaction Alert,
 - shortest transit times, biggest throughputs...

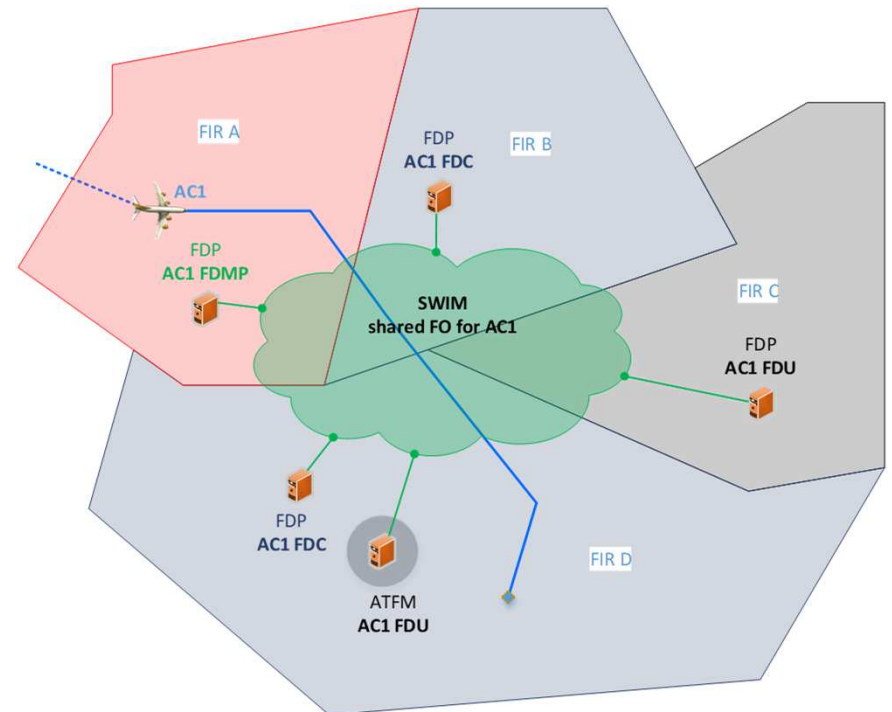
SWIM for Flight Object Interoperability

The Flight Object (FO)

- All connected systems share the Flight Object (FO)
- At any given time, an FO is managed by one and only one system (publisher)
- Selected other systems can subscribe to FO updates
- For the European SWIM, FO format and management rules are specified in the ED133 document (part of the SWIM governance)

Terminology Surrounding FO

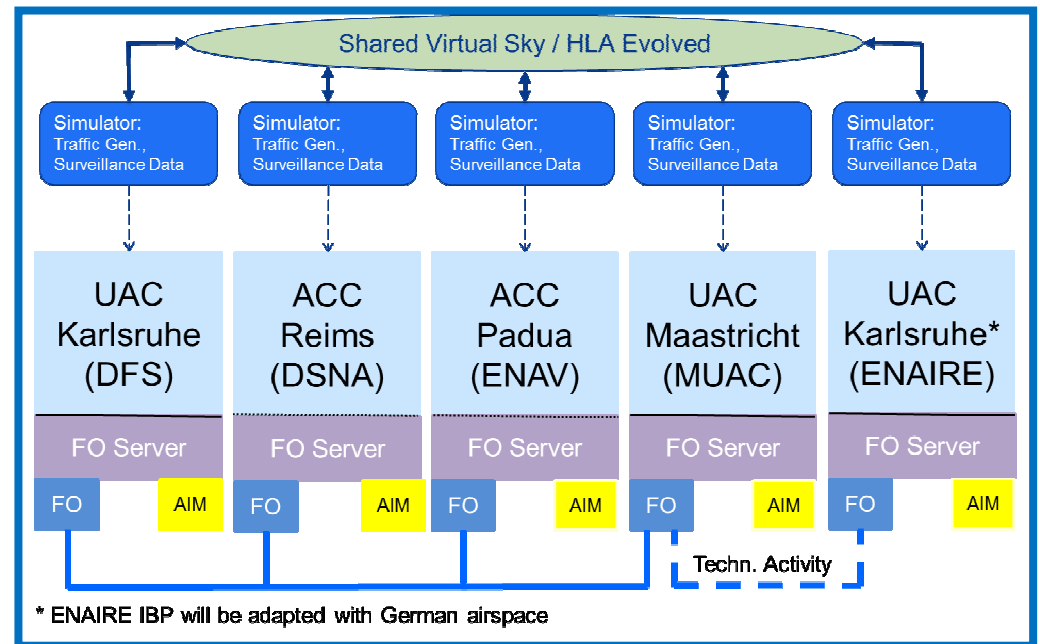
- **FDMP:** Flight data manager publisher. Designates the system that can modify the FO
- **FDC:** Flight data contributor. Designate systems that are authorised to request the FDMP to update the FO. For example systems downstream to the FDMP for the flight
- **FDU:** Flight data user. Any other system with read-only access to the FO
- **FIXM:** Another model/format for the FO (different from EUROCAE ED-133)



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SESAR 2020 validation setup (Solution PJ.18-02b)



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Q&A



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JOINT UNDERTAKING



This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 699238

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**SWIM Purple Profile for air/ground
advisory information**

Dario Di Crescenzo - Leonardo

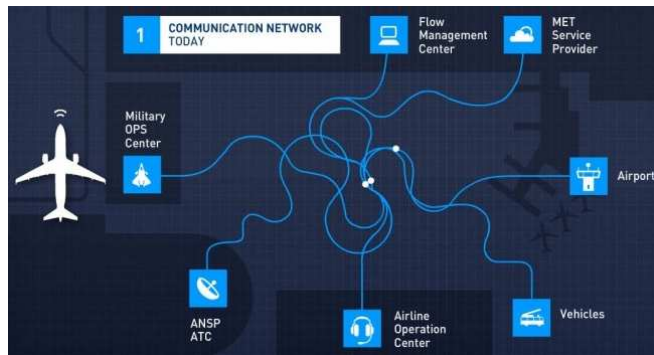


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Air/Ground SWIM advisory Information Sharing:

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).



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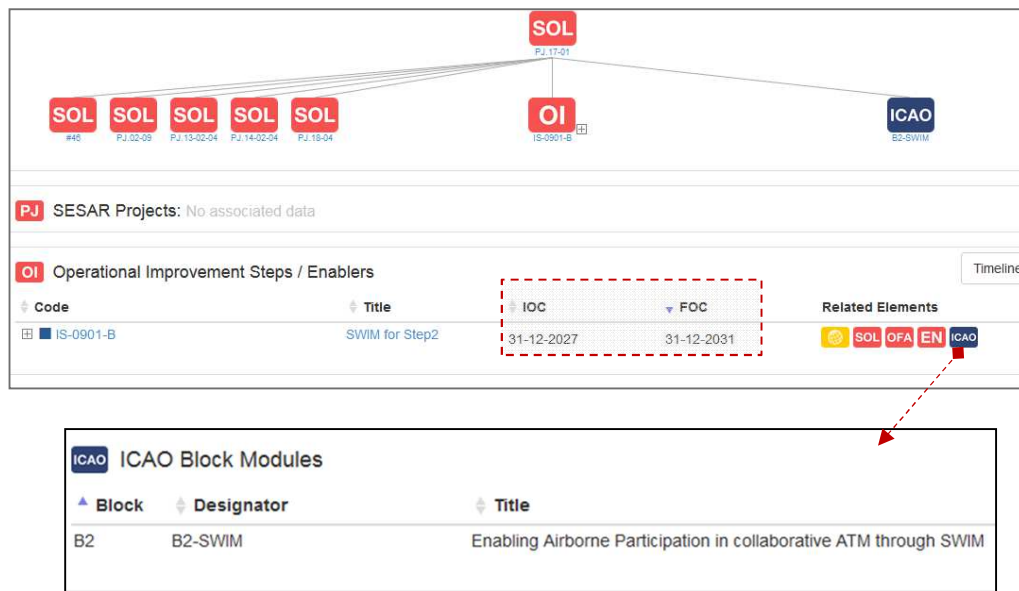
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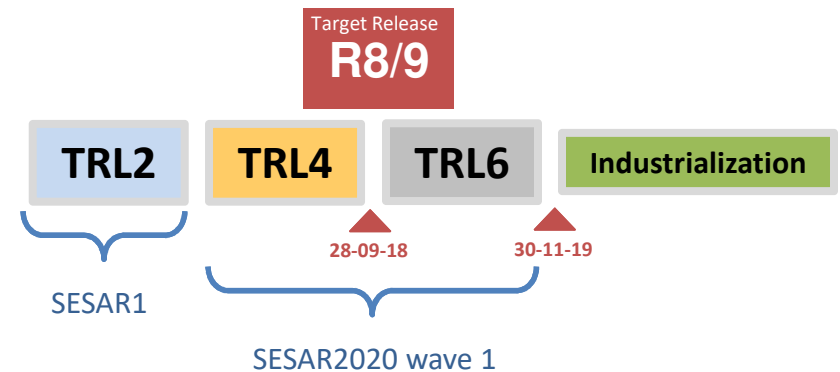
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Air/Ground SWIM advisory Information Sharing: When?

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



SESAR (PJ17-01) TRLs and target releases:



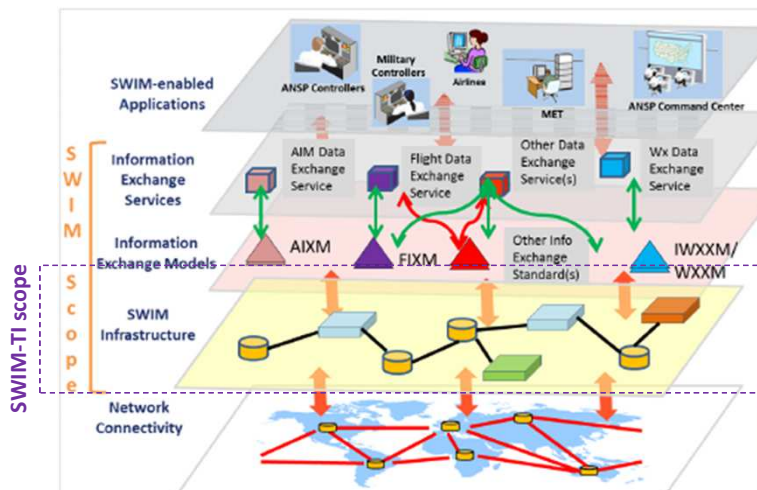
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Air/Ground SWIM advisory Information Sharing: What?

- (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 (led by Leonardo) 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*.

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Air/Ground SWIM advisory Information Sharing: where we are

Selex-GmbH MET Provider
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Leonardo, Selex-GmbH, Frequentis EXE (Q2 2018 – TRL4 -> Moving to TRL6 in Q3 2019)

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Simulator equipped with
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Aeronautical Digital Map Service

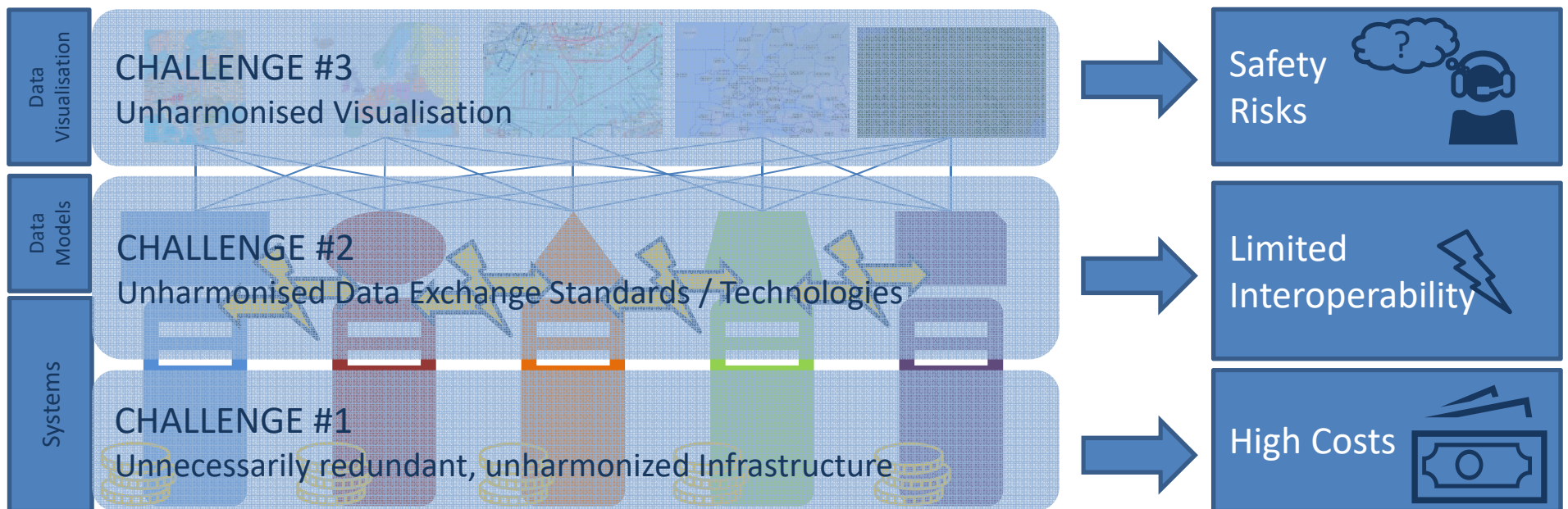
- Harmonised Visualisation of Aeronautical Information
 - Avoids multiple parallel inconsistent and unharmonized visualisations
- Strongly connected to (Static) Aeronautical Data Service
 - Consolidated Information Storage and distribution
 - Avoids information gaps and interoperability issues
- Common Services, provided regionally or sub-regionally
 - Safety improvement
 - Efficiency improvement
 - Cost reduction



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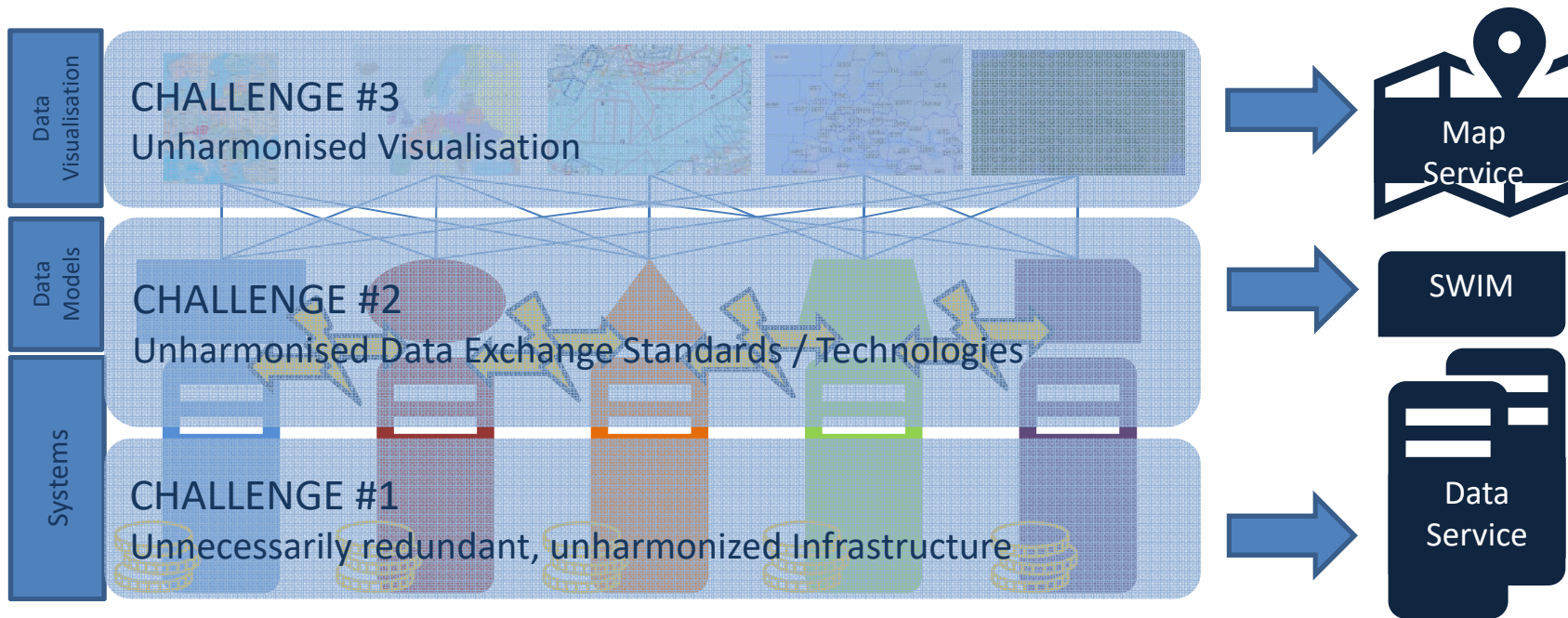
Challenges of the Status Quo



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Static Aeronautical Data Service, SWIM and Aeronautical Digital Map Service

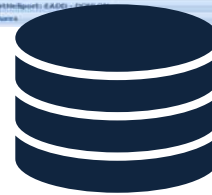
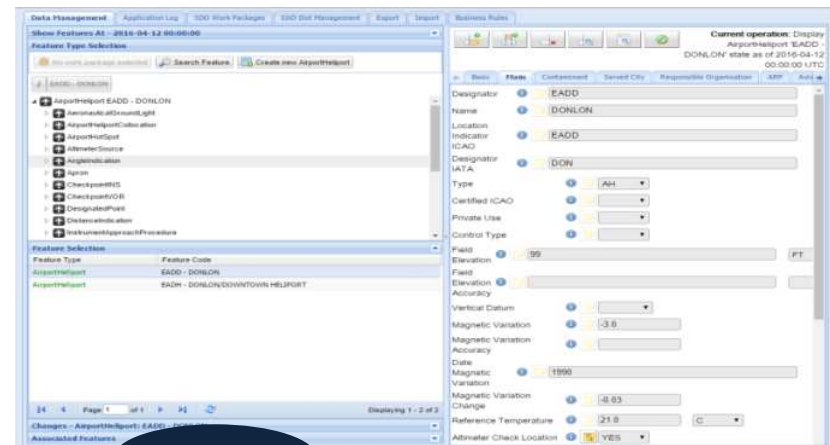


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(Static) Aeronautical Data Service

- Implemented based on Frequentis Comsoft CADAS-AIMDB
 - Native AIXM 5.1 database
 - Full support for temporality as defined in AIXM 5.1
 - Data fusion of static and dynamic data
 - Business Rule Engine

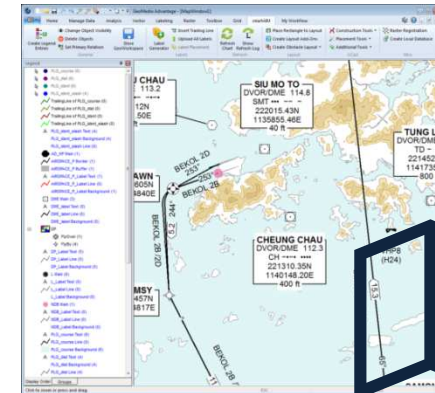
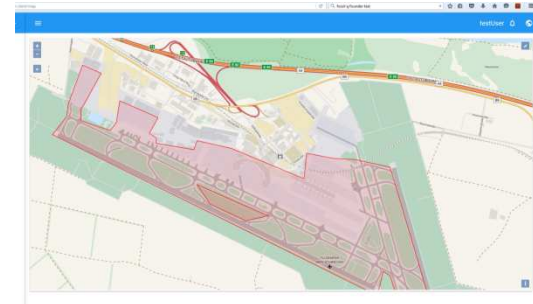


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Aeronautical Digital Map Service

- Implemented based on Frequentis smartGIS and smartCharting
 - Ad hoc visualisation from Static Aeronautical Database in smartGIS
 - Visualisation for aeronautical products in smartCharting
- Information from Static Aeronautical Data Service
- Use-case dependent harmonized symbolisation



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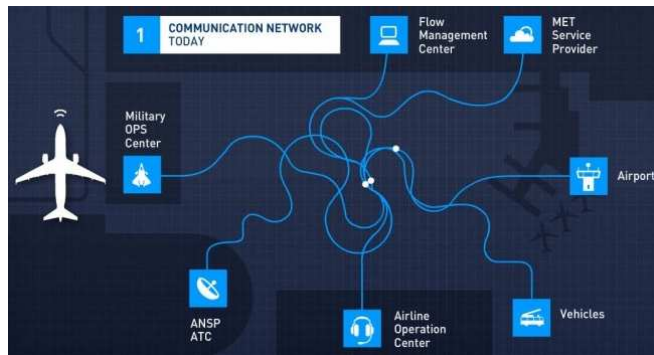


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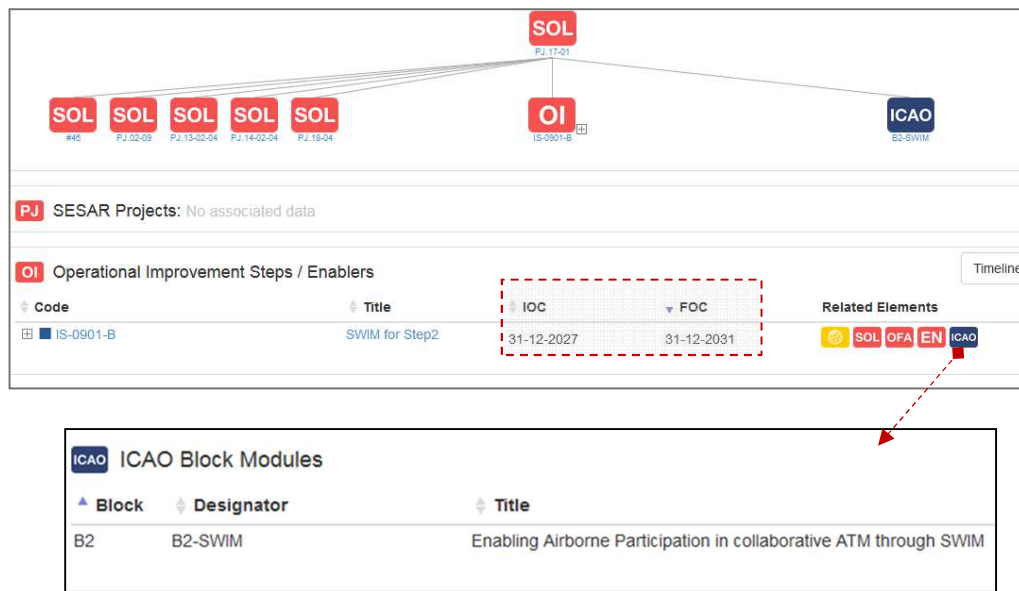
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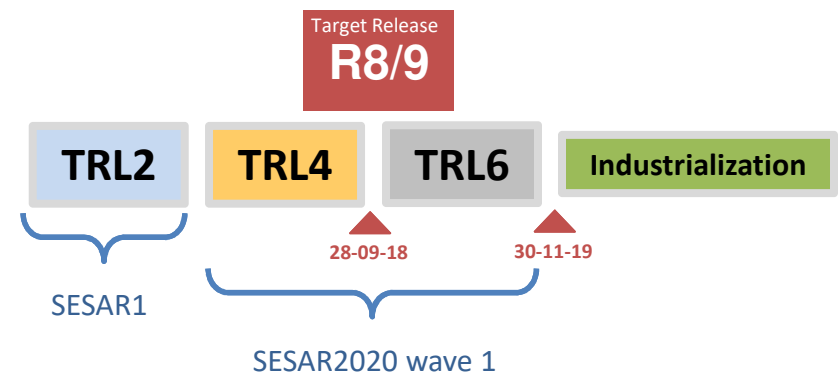
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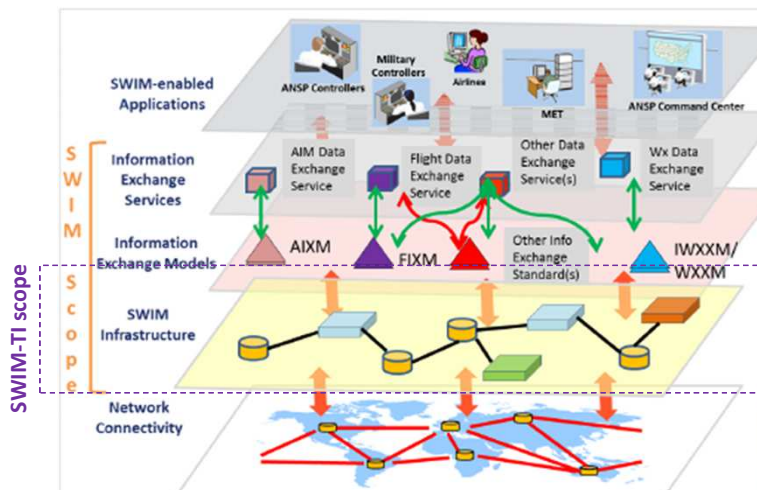
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Stakeholders contribution for the procurement and deployment of NewPENS



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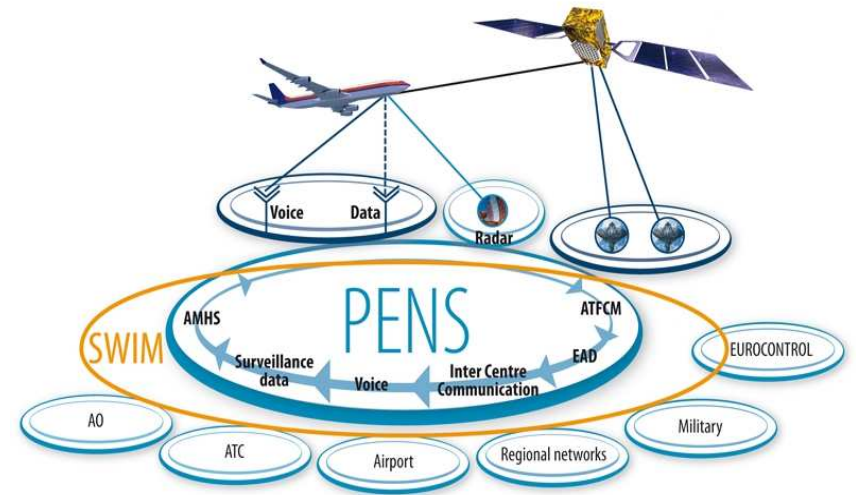


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What is (New)PENS

- PENS is an international ground/ground communications infrastructure jointly implemented by EUROCONTROL and the European ANSPs in order to meet existing air traffic communication requirements.
- NewPENS project emerged from the requirements induced by relatively new concepts like SESAR and SWIM, the increasing focus on cost effectiveness and the obsolescence of key legacy technologies.



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Main Objectives of NewPENS



- Offer a single ATM-grade IP network for all ATM stakeholders **replacing all cross-border connections**
- SWIM backbone ensure full compliance with SESAR concepts
- wide range of service levels and access technologies to offer a safe, secure and cost effective solution for the deployment of ICAO standardized ATM IP based applications
- Support both voice and data based applications



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WHO are the stakeholders?

- Civil ANSPs
- Military ANSPs
- Airspace Users – Aircraft Operators
- Airport Operators
- Meteorological SP



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CEF Call 2015

- In 2015 ROMATSA applied, under CEF Transport Call 2015, for *NewPENS Stakeholders contribution for the procurement and deployment of NewPENS project*, coordinated by SDM and led by Eurocontrol
- The implementing partners involved:
 - Air Navigation Services of the Czech Republic (ANS CR)
 - BULATSA
 - Croatia Control
 - LETOVE PREVADZKOVE SLUŽBY, ŠTATNY PODNIK (LPS SR)
 - ROMATSA
- Expected Performance Benefits:
 - Cost efficiency
 - Security
 - Availability
 - Flexibility



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Project Status

- The contract with the tender winner was signed by NewPENS Executive Board by mid-April last year (short after WAC 2018)
- Contractor then started the setup of its infrastructure (team, organization, service desk, processes, planning, network) with due date March the 15th this year
 - Stakeholders were involved in this phase by opting on relevant services and communication characteristics (bandwidth, interfaces used, special requirements)
 - Contractor led site surveys were performed that generated detailed documents on all physical and operational aspects involved in the smooth transition/connection to NewPENS
- Connection to NewPENS and migration of applications to use the new infrastructure scheduled to start after the completion of the current phase and planned to be completed by the end of 2020



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Questions ?



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