FROM INNOVATION TO SOLUTION

THE SESAR CONCEPT AND SWIM

David Bowen
Head of ATM Operations & Systems
SESAR Joint Undertaking

founding members
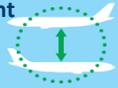
EUROPEAN UNION   EUROCONTROL
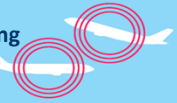
Satellite based Communication & Navigation

Advanced Flexible Use of Airspace

Complexity Assessment & Resolution

Cruise climb

Collision Avoidance Monitoring

Airborne Spacing & Separation

Extended AMAN
Time based separation
Point Merge
AMAN & Point Merge

Business & Mission trajectory
Trajectory Management Framework
Trajectory authorisation & revision using datalink

Performance Based Navigation
Cruise climb
Free routing

Approach Procedures with Vertical Guidance

Optimised RNP

Integrated Departure & Arrival Manager

Integrated Controller Working Position

Dynamic vortex separation
Continuous Climb & Descent

Low Visibility procedures using satellite GBAS

Pilot Enhanced Vision

Enhanced situational awareness

Arrival & Departure Management

Ground safety nets
Surveillance
Ground System Enhancement

Enhanced situational awareness
Brake to vacate
Surface planning & routing

Remote Tower

Network Management

Advanced Flexible Use of Airspace
Enhanced ATFCM Process

User Driven Prioritisation Process

Airport Operations Planning
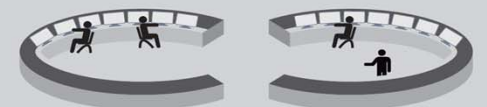Network Operations Planning

System Wide Information Management

System interoperability with air & ground data sharing

Sector Team Operations
Enhanced Short Term Conflict Alert
Conflict Detection & Resolution
Integrated Controller Working Position

Enhanced Decision Support Tools

SESAR Priority Strategic Business Needs

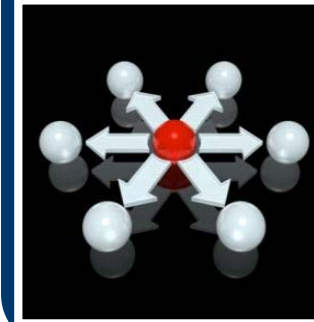**MOVING FROM AIRSPACE TO 4D TRAJECTORY MANAGEMENT**

TRAFFIC SYNCHRONISATION

NETWORK COLLABORATIVE MANAGEMENT AND DCB

AIRPORT INTEGRATION AND THROUGHPUT

**CONFLICT MANAGEMENT AND AUTOMATION**

**SYSTEM WIDE INFORMATION MANAGEMENT**

System Wide Information Management

- Information is at the heart of ATM
- Develop the concept of 'System-Wide Information Management'
- Moving ATM from System-Centric to Information-Centric operations
- Establish the 'intranet' for aviation
- Access to the right information at the right time by all ATM stakeholders in support of the decision making process.

Standards

Infrastructure

Services

SWIM

Qualified parties

Governance
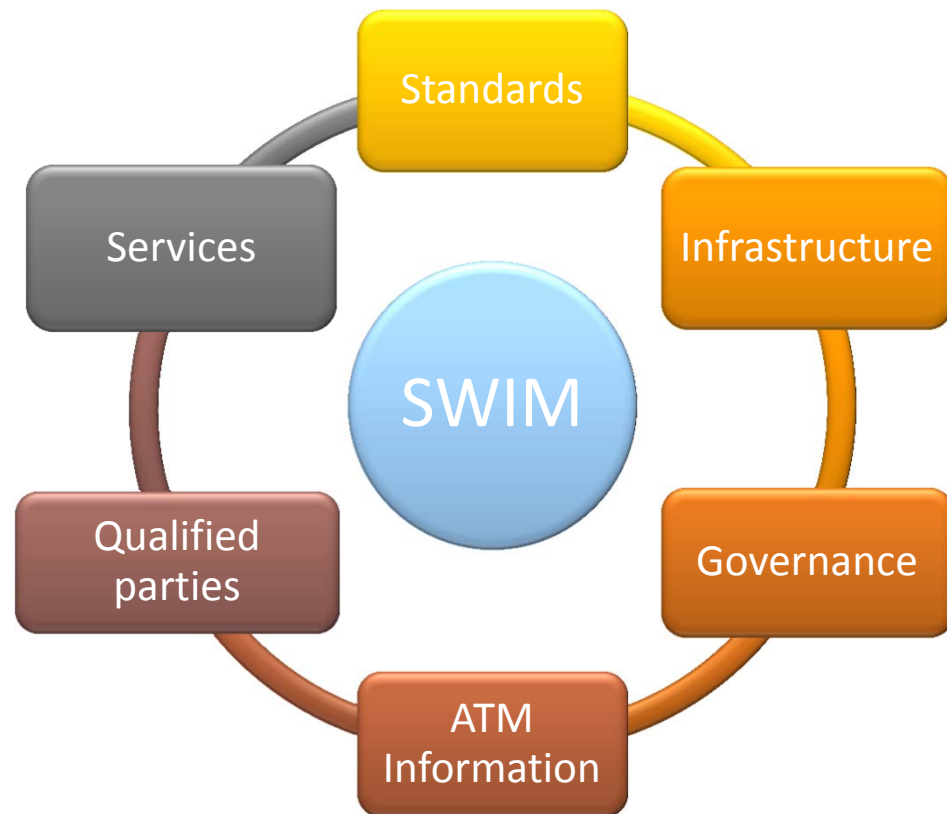
ATM Information

Definition : SWIM consists of standards, infrastructure & governance enabling the management of ATM information and its exchange between qualified parties via interoperable services."

SWIM Global Interoperability Framework
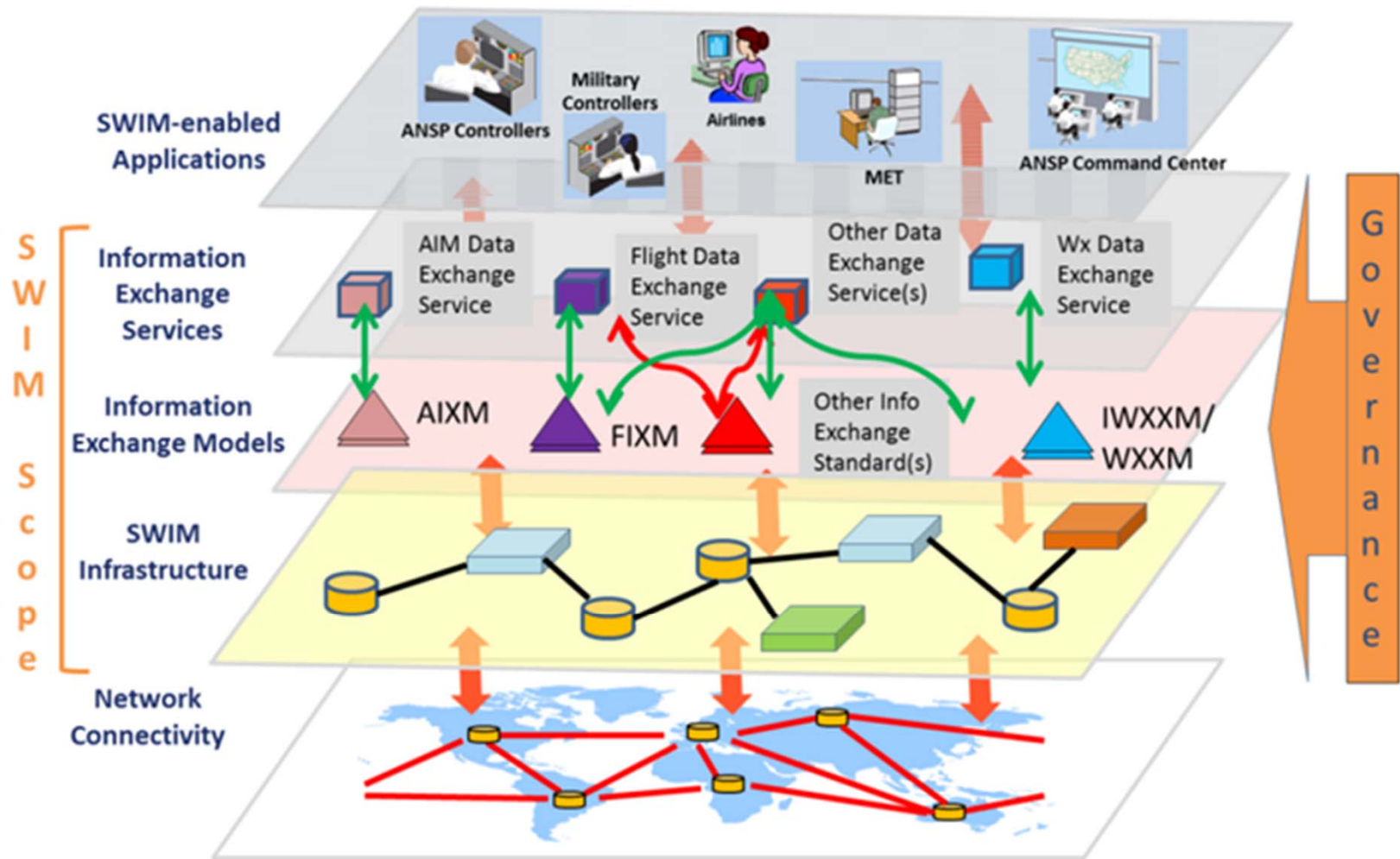
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WHAT IS SWIM ?

Michel Procoudine

SESAR Programme Technical Director

Thales

SESAR
JOINT UNDERTAKING

founding members
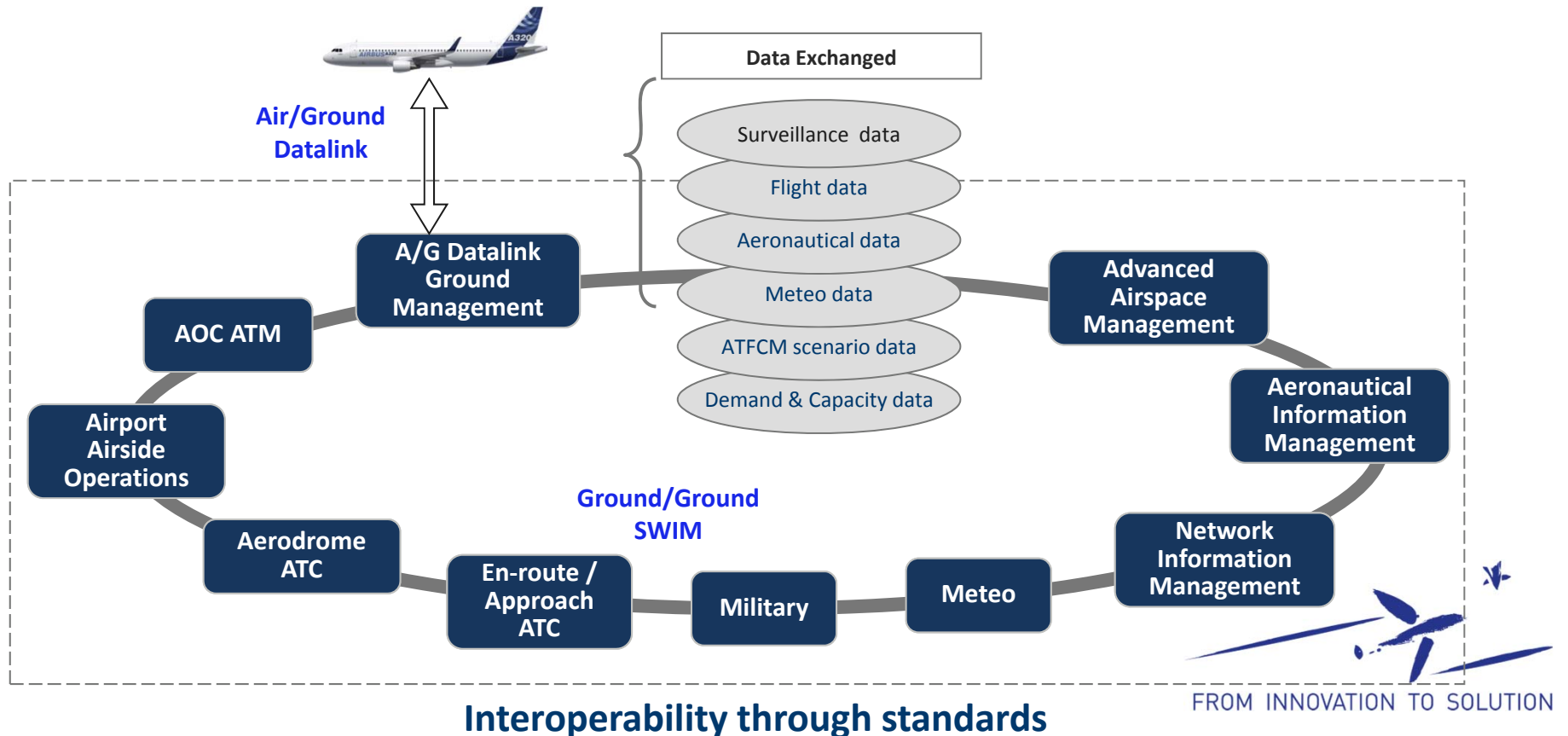
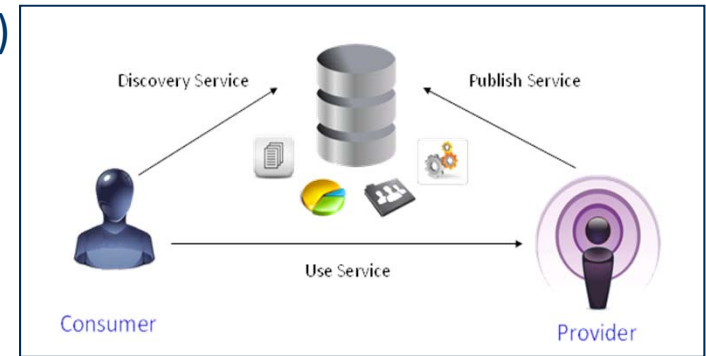EUROPEAN UNION   EUROCONTROL

SWIM definition

SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services
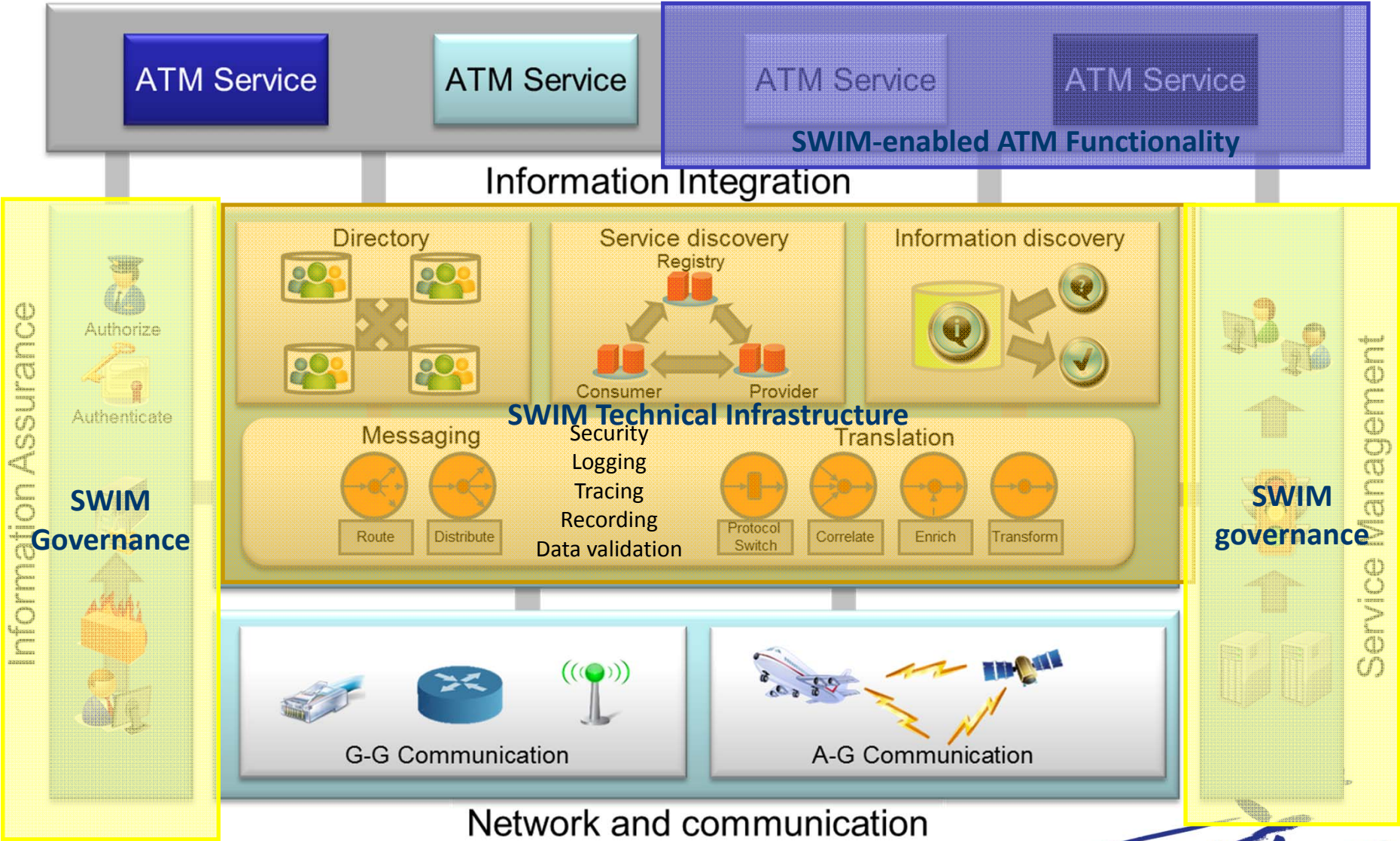

SESAR SWIM DEFINITION : Ref : SESAR SWIM CONOPS, adopted in ICAO SWIM Concept material

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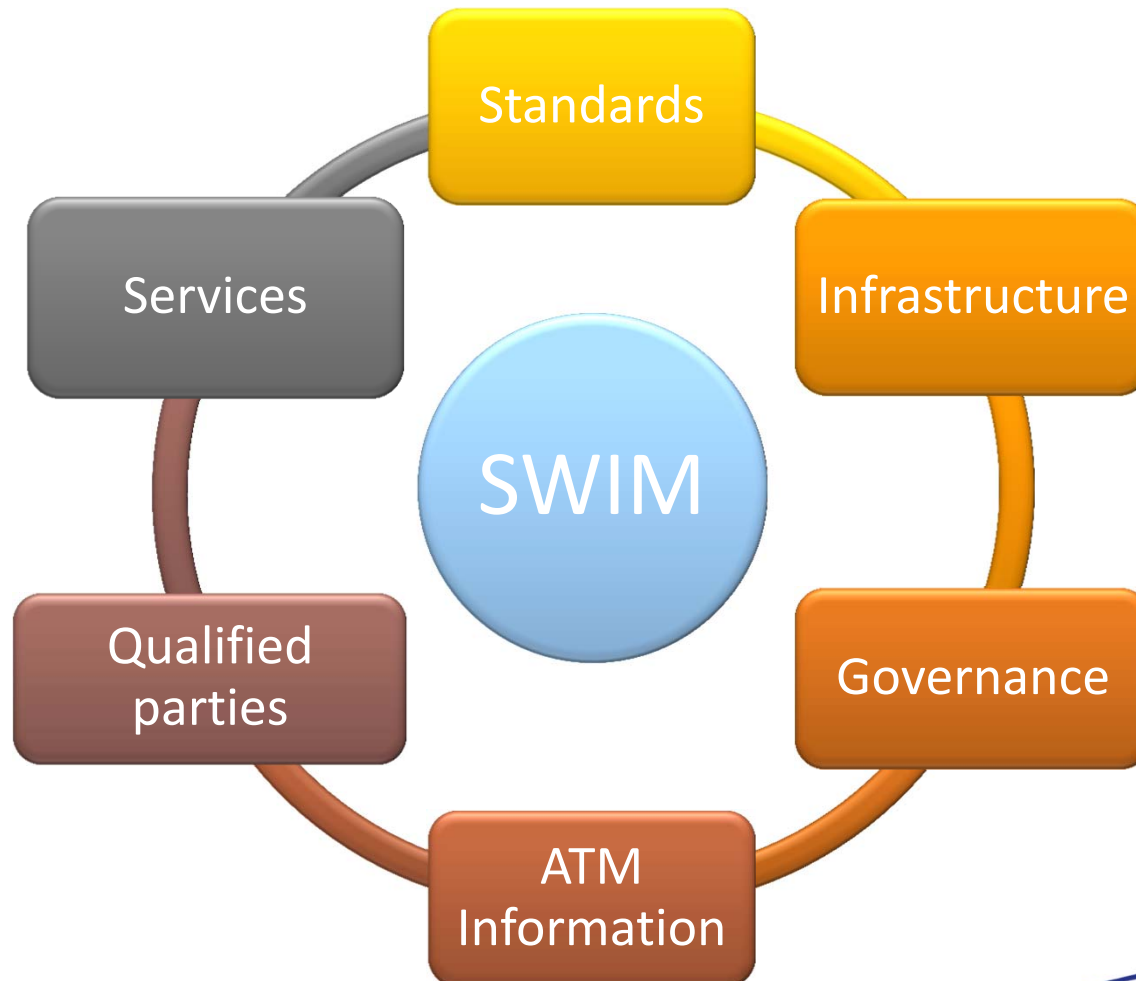
The way to share ATM information using SWIM …

- Sharing information via Providing / Consuming service(s)
  - Information Services Reference Model (ISRM) [Standards]
- Common data definition
  - ATM Information Reference Model (AIRM) [Standards]
- SWIM Technical infrastructure [Standards]

Air/Ground Datalink

Data Exchanged

- Surveillance data
- Flight data
- Aeronautical data
- Meteo data
- ATFCM scenario data
- Demand & Capacity data

A/G Datalink Ground Management

AOC ATM

Airport Airside Operations

Aerodrome ATC

En-route / Approach ATC

Military

Meteo

Network Information Management

Advanced Airspace Management

Aeronautical Information Management

Ground/Ground SWIM

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Interoperability through standards

SWIM Building Blocks

ATM Service | ATM Service | ATM Service | ATM Service

SWIM-enabled ATM Functionality

Information Integration

Information Assurance

SWIM Governance

Authorize

Authenticate

SWIM Technical Infrastructure

Directory

Service discovery
Registry

Consumer   Provider

Information discovery

Messaging
Security
Logging
Tracing
Recording
Data validation

Translation

Route   Distribute

Protocol Switch   Correlate   Enrich   Transform

Service Management

SWIM governance

### G-G Communication

A-G Communication

Network and communication

SWIM infrastructure content

- Standard Service Oriented Architecture (SOA) technologies

- Associated SOA products

  - Enterprise Service bus, Security solutions, supervision products, Data distribution solutions (DDS), etc …

- Developed software to complement and interconnect products

- Relying on IP-based communication network services

- One size does not fit all > technical profiles (stacks of technology)

  - Yellow profile : non critical information (AIM, Weather, …)

  - Blue profile : critical information (Flight Object)

  - Purple profile : to accommodate air-ground exchanges
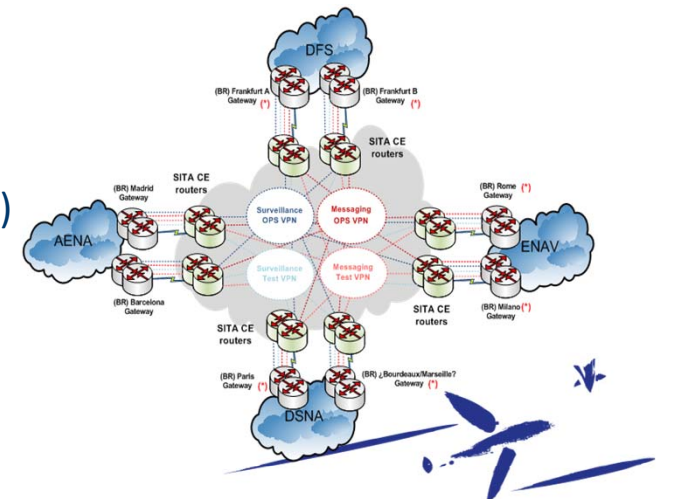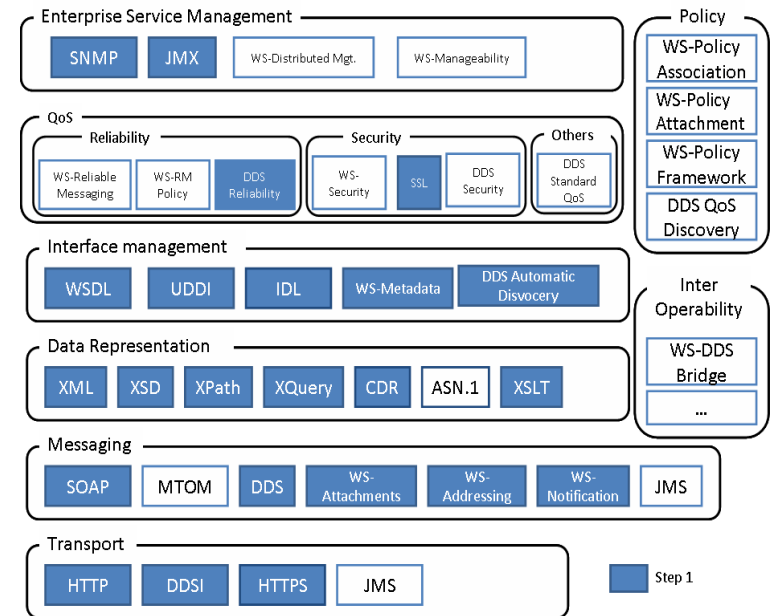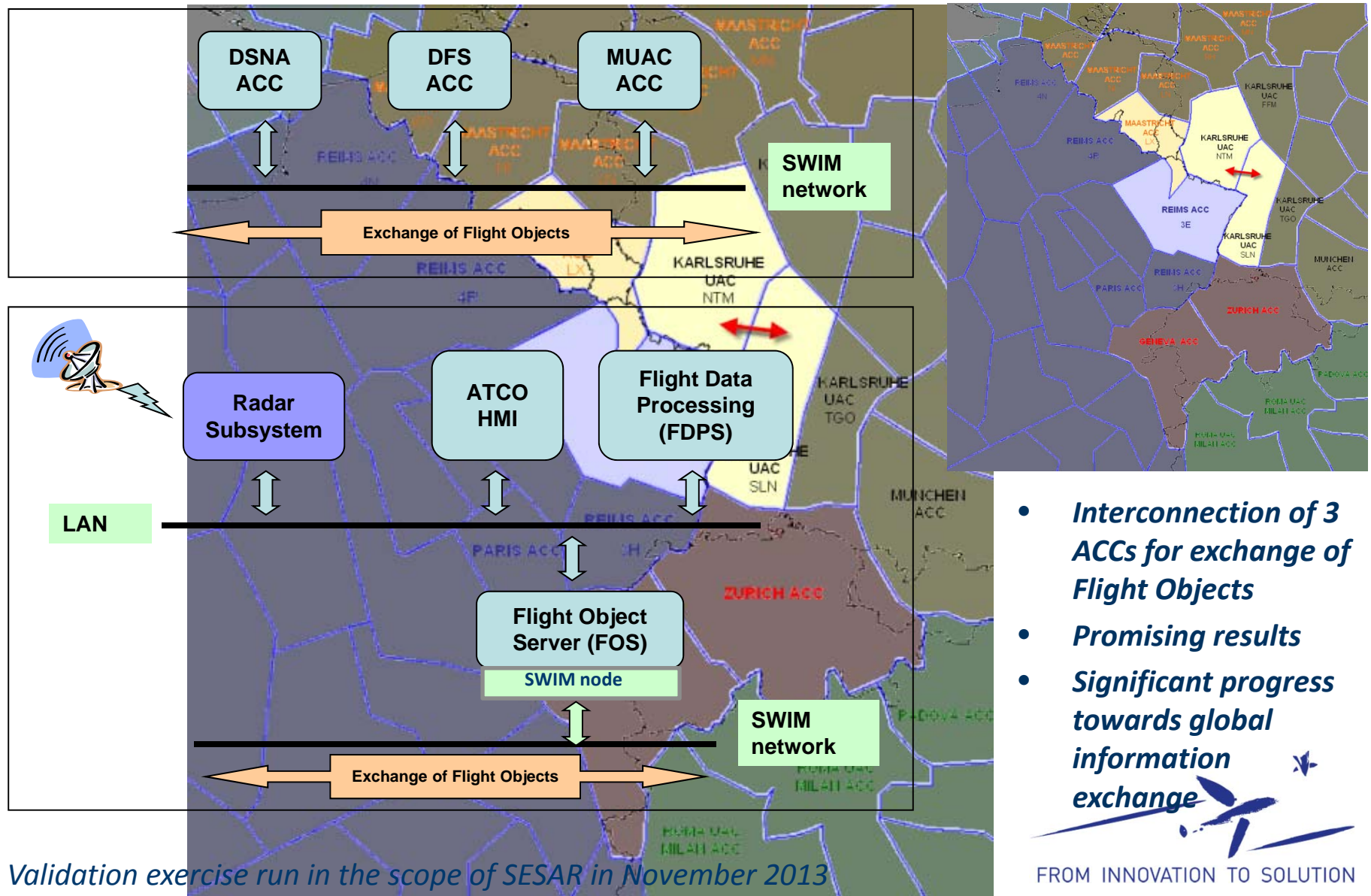

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Example : Flight Object Interoperability

Sharing of consistent flight data between all stakeholders (Civil ATC, Military ATC, Flow Management Systems, Airport Operators, Aircraft Operators and Aircraft Systems)
Coordination of changes to that flight data even between systems that are not yet operationally responsible for the flight

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SWIM Infrastructure – Flight Object IOP example

- **Interconnection of 3 ACCs for exchange of Flight Objects**
- **Promising results**
- **Significant progress towards global information exchange**

Validation exercise run in the scope of SESAR in November 2013

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Global Cooperation & Interoperability

Aeronautical databases (WG44/SC217)
Flight Data Interoperability (WG59)
Aeronautical Information and
Meteorological Management (WG76/SC206)
Standards for Air Traffic Data
Communication Services (WG78/SC214)

- **ATM R**equirements and **P**erformance **P**anel
- Aeronautical Information Services to Aeronautical Information Management Study Group
- Aerodrome Meteorological Observation and Forecast Study Group / Information Management Panel

ICAO

Need to work out the ICAO Global Interoperability Framework (GIF)

ARINC 816 –
ARINC 424A –

...mation Security Mgt

RTCA
ARINC
ISO
OGC
...

NextGe...

Open **G**eospatial **C**onsortium testbeds
Aviation Domain
Working Group

AIRM
Aeronautical Information eXchange Model
Weather eXchange Model
Flight Information eXchange Model
Registry

EU/FAA Coordination

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SWIM SERVICE MODELS

Georg Trausmuth

Head of Corporate Research
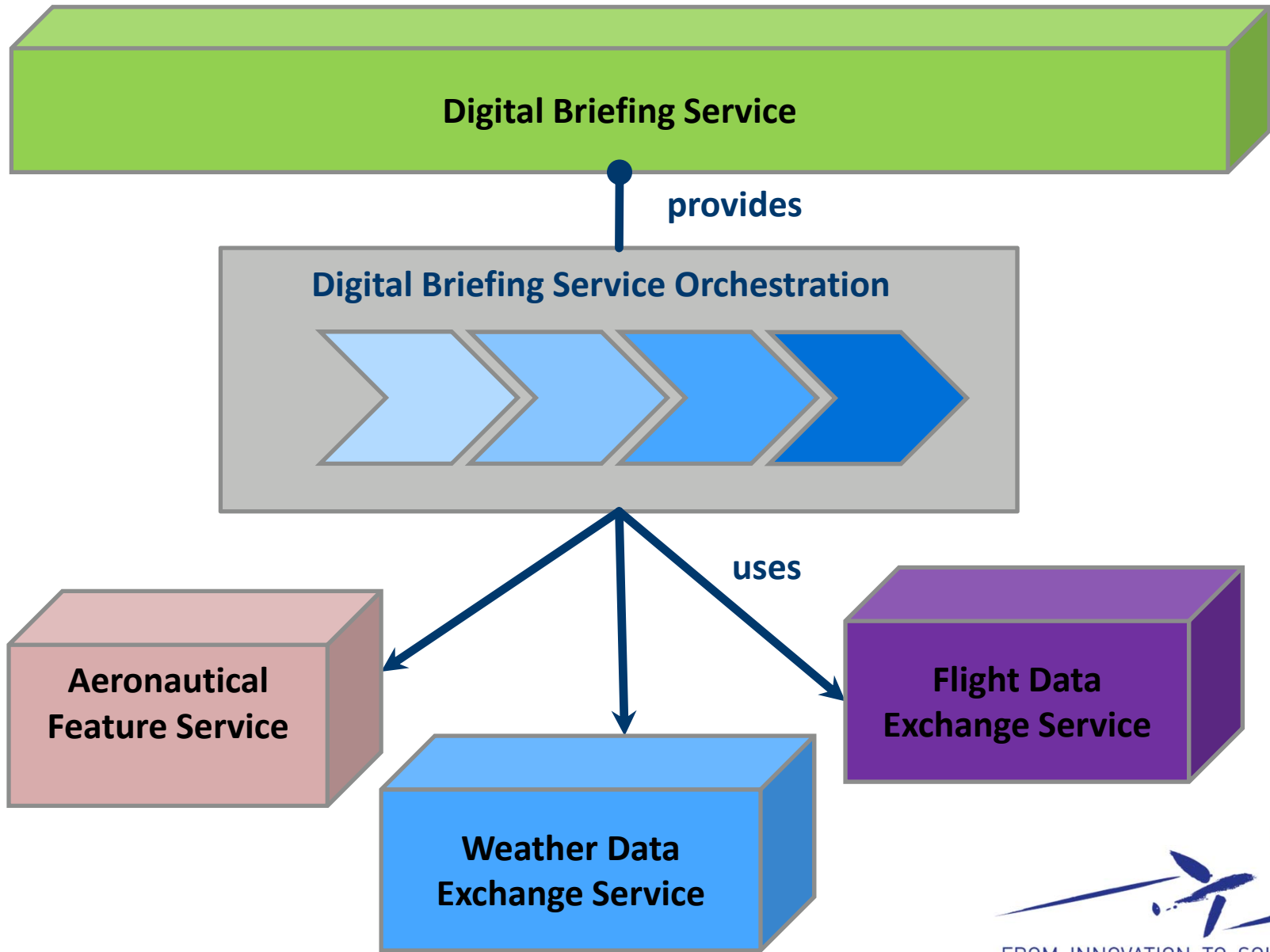
Frequentis

Outline

- Experience report on providing an AIM service on the SWIM platform
  - Integrated Digital Briefing Service
- Service Development Steps
  - Data Models
  - Service Models
  - Implementation
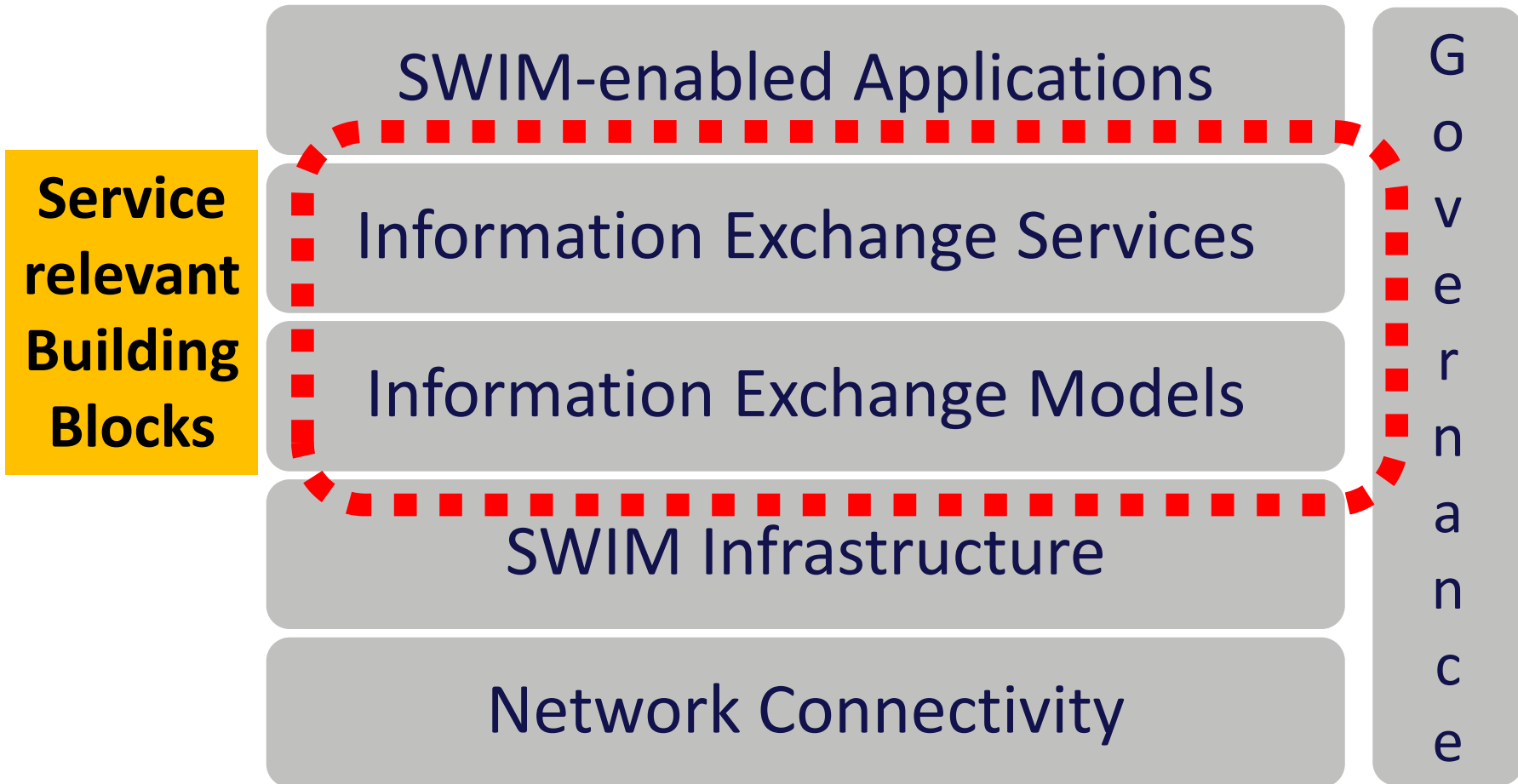- Specific characteristics
- Lessons learned

FROM INNOVATION TO SOLUTION

Briefing Service Overview

Building Blocks

Service relevant Building Blocks

SWIM-enabled Applications

Information Exchange Services

Information Exchange Models

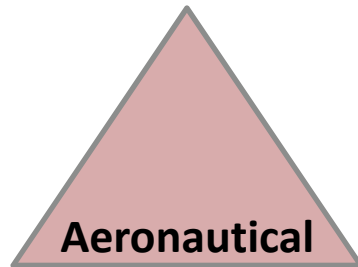SWIM Infrastructure

Network Connectivity

Governance

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Data Model

The Data Model developed by SESAR is called the ATM Information Reference Model (AIRM) – it consists e.g. of:
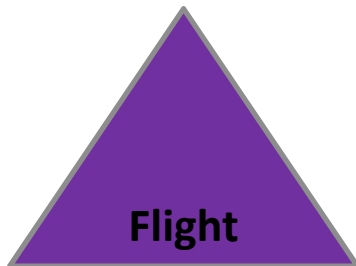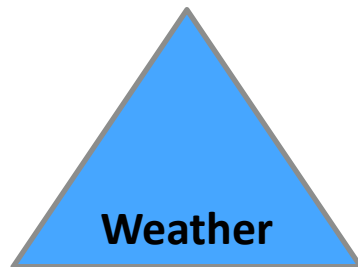
Aeronautical

- Aeronautical Information Exchange Model (AIXM)
- Surface Data and Aerodrome Map Database (AMDB)

Weather

- using the Weather Information Exchange Model (WXXM)

Flight

- using the Flight Information Exchange Model (FIXM)

AIRM models foresee regional extensions

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SWIM Global Interoperability Framework
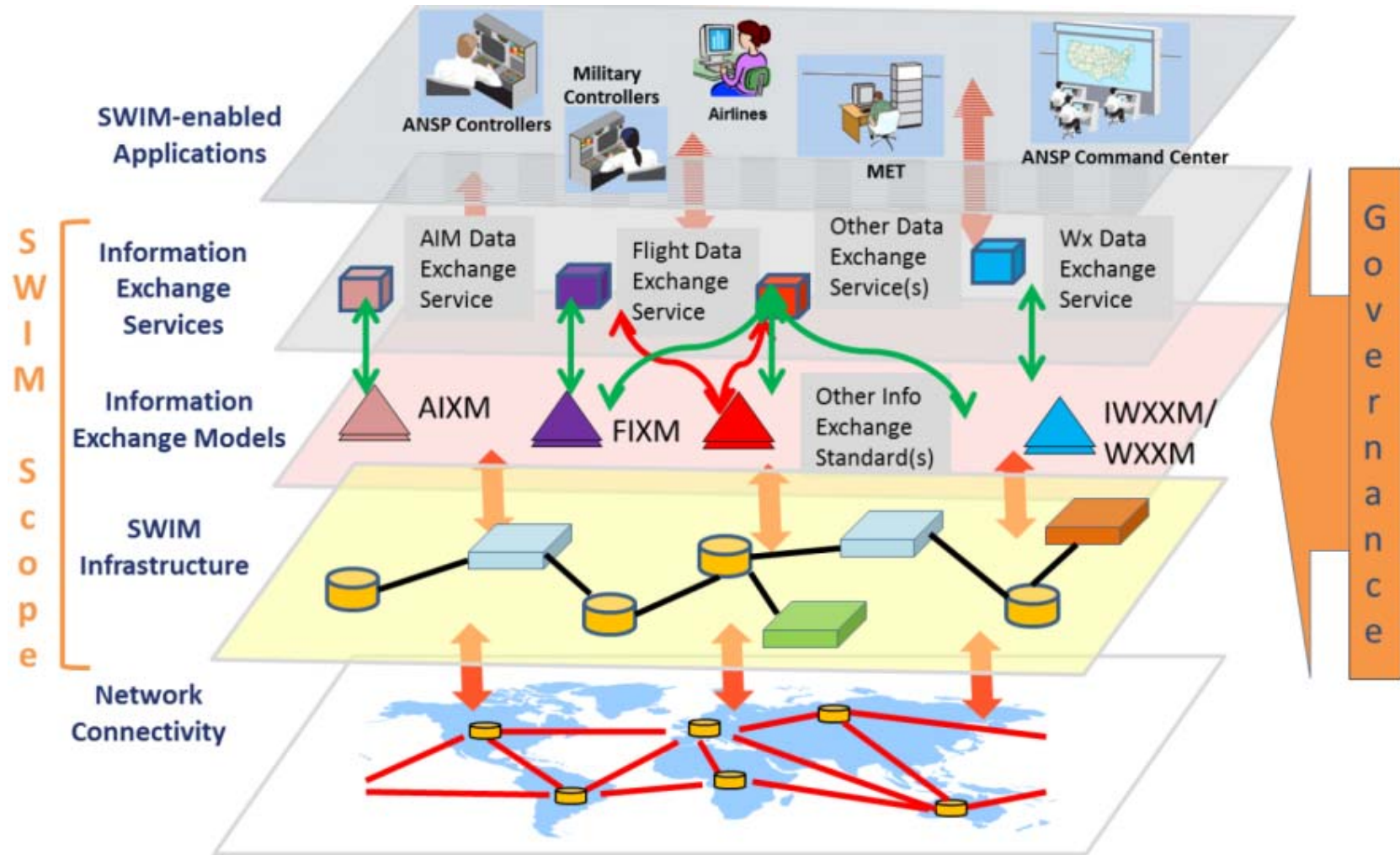
Specific Aspects of the Solution

- Focus on Security because services from different providers are orchestrated to work together
  - Backend services from EAD, Eurocontrol Network Management System and different weather providers are connected

- Experimental work is ongoing to also uplink briefing information to the cockpit via air-ground data link

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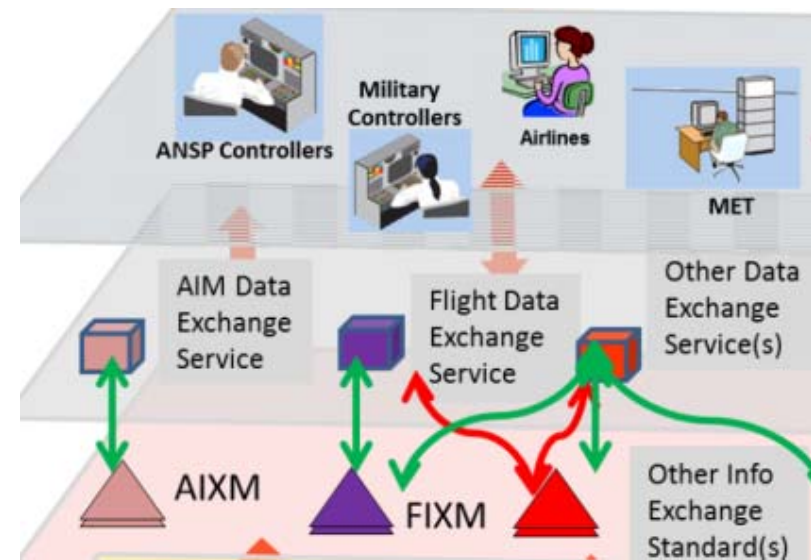
Lessons Learned

- Governance and Security are key for a service oriented system (e.g. Service Catalogue & Registry)

  Service Architecting Process

- International cooperation helps to shape solutions for the whole domain (beyond regional solutions)

- Technology changes are less complex than organisational surroundings

- Technology deployed is proven in use in other fields and ready for Air Traffic Management

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FROM INNOVATION TO SOLUTION

SESAR SWIM OUTREACH

Dirk Janssens
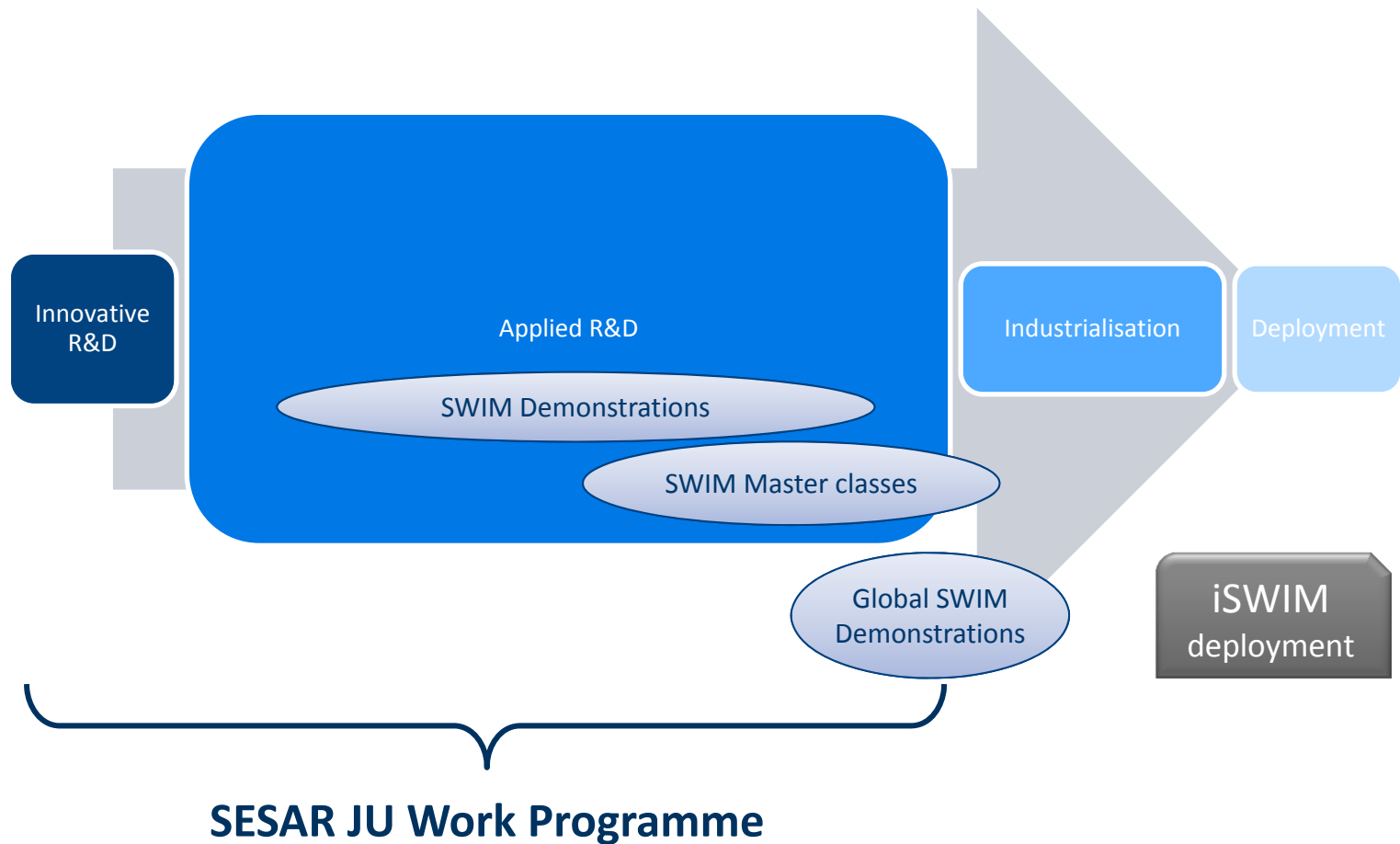
Project Manager
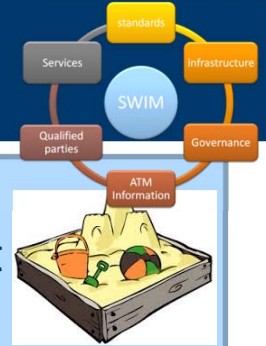
Eurocontrol

founding members

SWIM Outreach

- ## Objectives
  - Passing R&D knowledge to Implementers and Operators
  - Stimulate the transition to SWIM deployment

- ## How ?
  - Mixture of SESAR SWIM Master Class and Demonstrations
  - Going truly global
  - Involving end-users
  - 2014/2015/2016

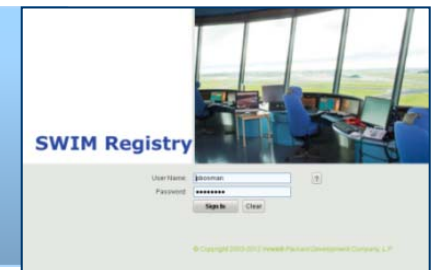# SWIM Demonstrations in the SESAR lifecycle

SESAR SWIM Master Class

A **global SWIM Sandbox**
During 6 months 'play' together in a Non-Operational environment
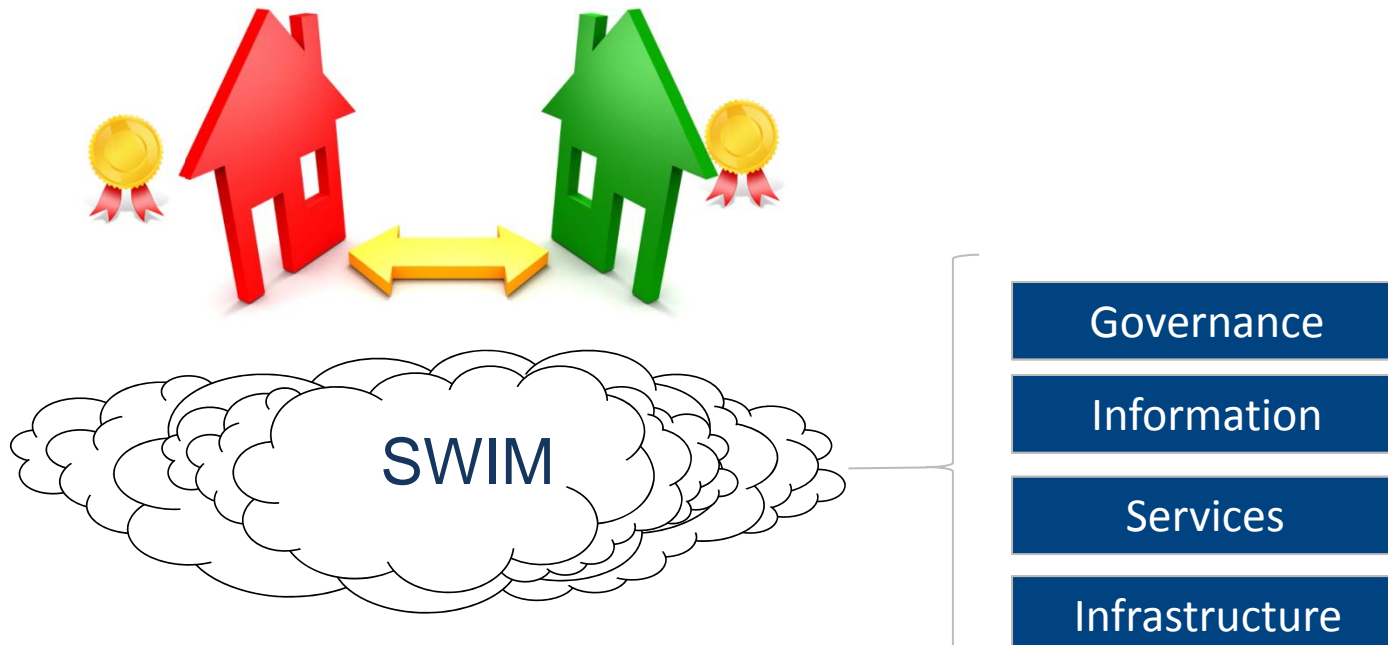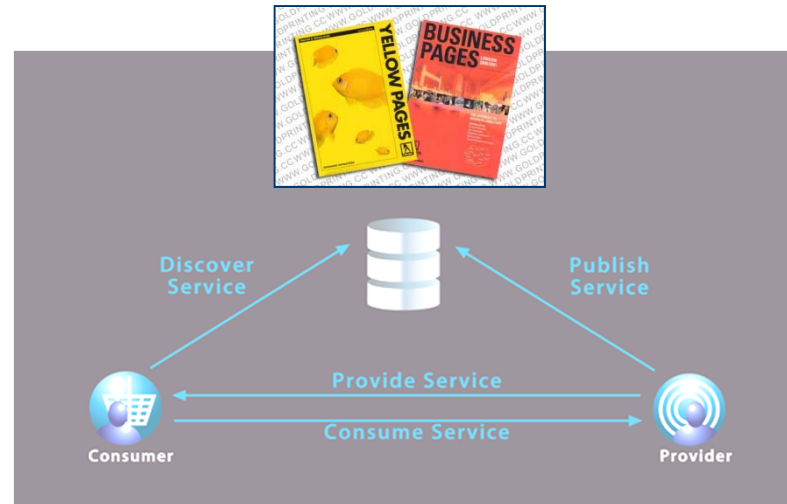providing/consuming SWIM Services

2014
In progress
100 participants
Even more non-European

Aeronautical, Meteorological, Flight,
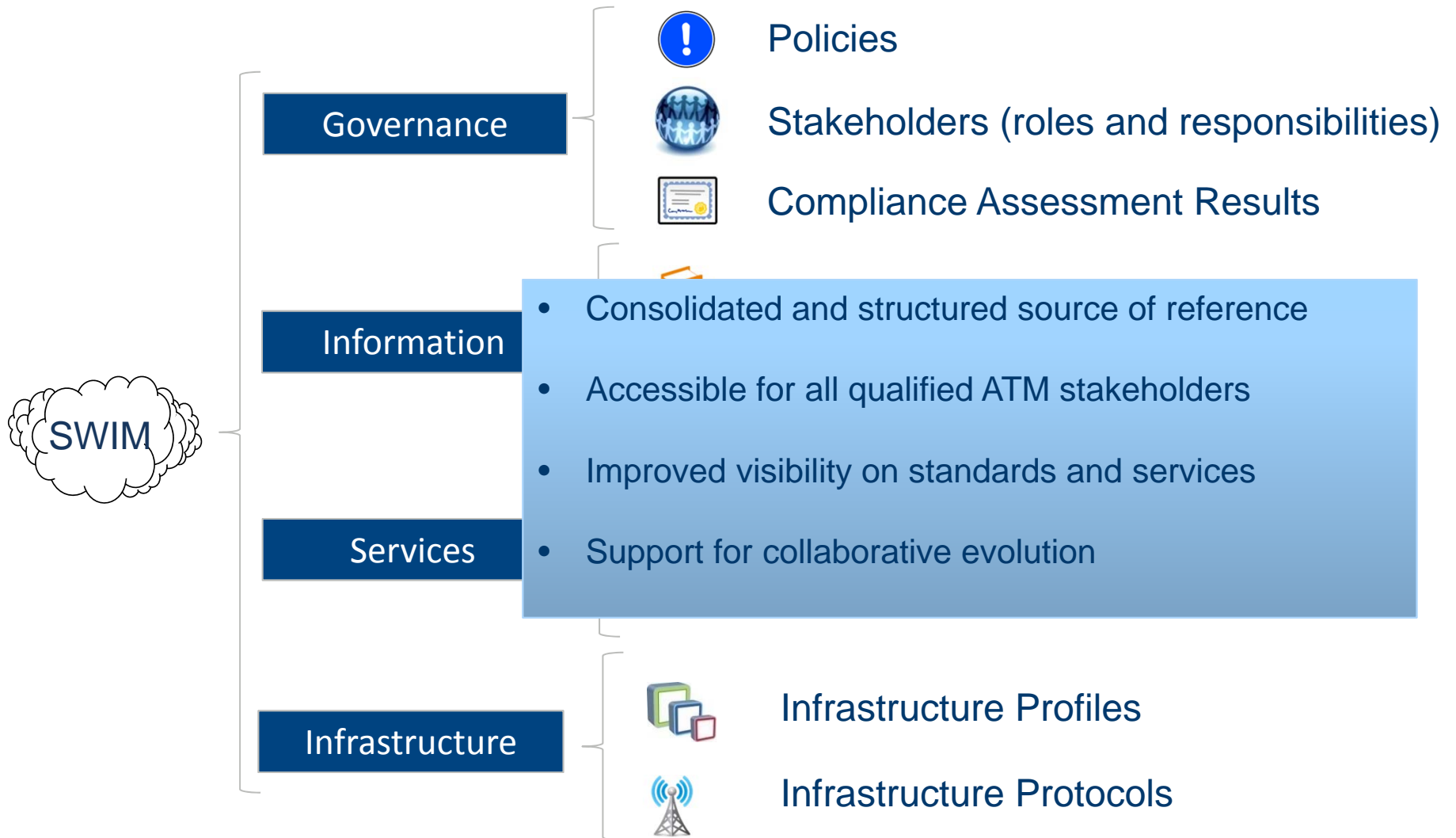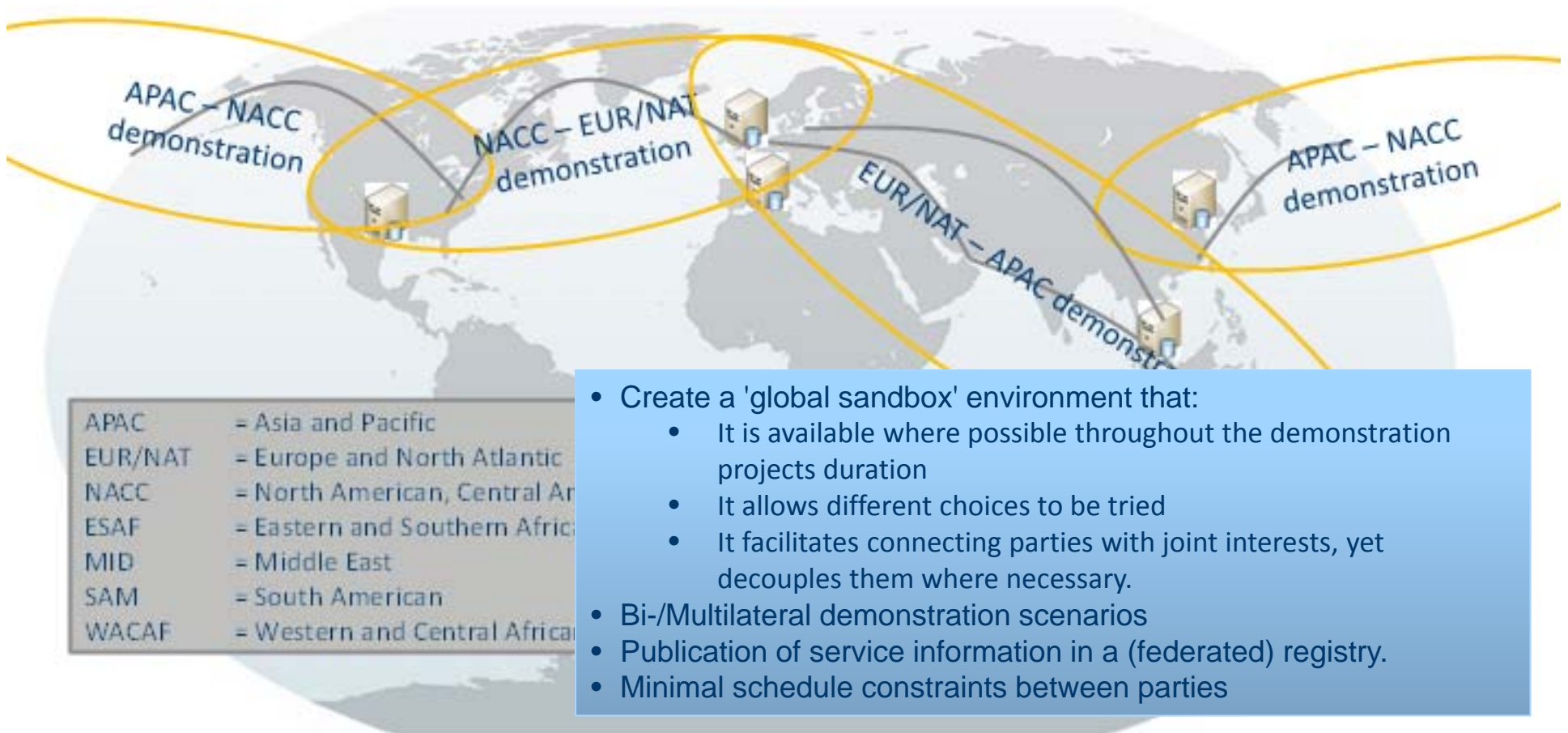Environmental, Surveillance, Aircraft, … services

All in registry

SWIM Registry

Key element : the Registry

SWIM

Governance

Information

Services

Infrastructure

SWIM Artefacts in the Registry

Global SWIM Demonstrations
Long haul information need

APAC	= Asia and Pacific
EUR/NAT	= Europe and North Atlantic
NACC	= North American, Central Ar...
ESAF	= Eastern and Southern Afric...
MID	= Middle East
SAM	= South American
WACAF	= Western and Central Africa...

- Create a 'global sandbox' environment that:
  - It is available where possible throughout the demonstration projects duration
  - It allows different choices to be tried
  - It facilitates connecting parties with joint interests, yet decouples them where necessary.
- Bi-/Multilateral demonstration scenarios
- Publication of service information in a (federated) registry.
- Minimal schedule constraints between parties

SESAR FOCUS
Static and dynamic information between *regional information providers* and *global information consumers*, i.e. airlines conducting long haul flights through different ICAO regions, with a particular focus on the domains of **meteorological**, **aeronautical** and **network management**.

A sneak preview on upcoming opportunities

- "**SWIM Global Demonstrations**" is a common and global workspace for SWIM where the ATM community can find/share/coordinate information about SWIM demonstrations of a global interest, aiming at the deployment of SWIM.

- www.swim.aero

- <u>SWIM</u> is now **becoming a reality**

- **Information Management**, Data/Information models, Registry, ...
  - New concept for ATM (but not new in other industry domains !!)
  - Service Orientated Architecture (SOA) approach

- In terms of **SWIM Implementation**
  - Unlock the data
  - Data exchange models (XMs) are safe investments
  - **Be SOA** - Publish / Consume services

- Lets go for a **truly global SWIM** ...

- **More information on SWIM & how to participate ?**
  - Visit us at the stand of SESAR Joint Undertaking
  - www.sesarju.eu/swim
  - www.sesarju.eu/masterclass
  - www.swim.aero