ICAO APAC / EUR / MID Workshop on Service Improvement through integration of AIM, MET and ATM Information Services

Session 12: AI5 – Integrated Information Services
SWIM best practices providing integrated service delivery
SWIM Building Blocks
Getting the right information versus Information Overload

- As already indicated by Alexander Schwassmann, IFATCA on day 1:
  - Overload of information for pilots and controllers
  - Information is too unfocused
  - Risk to miss important information
  - Sometimes hard to interpret (e.g. Field 10)

- SWIM can help to
  - Make the right information available through interoperability between systems
  - Allow automated and semantic filtering
  - Harmonise the information
SWIM BUILDING BLOCKS

Service Models
“How to access”

Data Models
“Payload”

Infrastructure
“How to transport”

ISRM: Service Reference Model
Which services are offered to access the payload

AIXM: AIP / Digital NOTAM
WXXM: MET
FIXM: Flight Plan

Physical transfer medium
Directories
Security / Authentication
IT
SWIM from ATM Supplier Point of View

Build on it

Govern it

Deploy on it

Secure it

Consume, provide it

SWIM applications (smartAIM, smartWeather)

Integration platform

Hosting infrastructure

Network infrastructure

Security
FRQ Integration Platform - Main Functions

- Supports all available SWIM Service Definitions as well as legacy services
- Acts as a information backbone connecting ANSPs with main aviation stakeholders (Airports, Airlines, MET Office)
- Route, convert, transform messages between consumers and providers
- Data Conversion
  - Bridge applications talking different protocols and formats around a common information exchange format
  - Support of SWIM data formats but also legacy protocols and data formats to facilitate transition
- Provides service inventory / registry
FRQ Integration Platform - Main Functions

DATA:
Processing, Conversion, Storage, Analysis

National stakeholders

Worldwide stakeholders
FRQ Integration Platform - Main Building Blocks

Security

API Management

Identity & Access Management

Service Registry

System Management/ Monitoring

Business Monitoring/ Data Analytics/ Billing

Enterprise Integration Bus

Open Messaging System

Data Store

ATM Messages Validation & Mediation

External Protocol Connectors (i.e. AMHS)

Data Mediator (i.e. ATS messages to FIXM)

Services Implemented by Customer

Applications (i.e. smartWeather)
Example Use Case: Digital Integrated Briefing
Integrated Digital Briefing

- Research Project of SESAR
- Showcase of SWIM
- Real application utilizing
  - SWIM Infrastructure
  - SWIM Data Model
  - SWIM Service Model
- Interdisciplinary (AIM + Airline related)
- Interoperable (multiple different vendors)
Digital Integrated Briefing

Integration Platform
A/G Broker

Ground Services
Digital Briefing

On-board
Electronic Flight bag
Digital Integrated Briefing

- AIXM
- ISRM
- FIXM
- WXXM
- ISRM

Service Models
- "How to access"
- "How to transport"

Data Models
- "Payload"

SWIM Technical Infrastructure

Integration Platform

ية Ground

Aircraft

EFB

AIFS/WFS
AIXM 5.1 Static Data
ISRM 1.4

AIFS/WFS
AIXM 5.1 Digital NOTAM
ISRM 1.4

Integrated Digital Briefing Service (IDBS)
ISRM 2.0

iWXXM Service
(METAR, TAF, SIGMET)
ISRM 2.0

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# ePIB Load Flight Data

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ePIB View Airport
ePIB Airport NOTAM
ePIB Airport MET
semNOTAM Key Aspects

- Ontology-based Representation and Semantic Querying of Digital Notices to Airman (NOTAM)
  - semNOTAM is a service not an application
  - Enable fine-grained intelligent semantic filtering and prioritization
    - Utilizing advantages of AIXM 5.1

- Knowledge-based system
  - Separating data and rules from reasoning
  - Incremental rule base

- Intelligent and fine-grained DNOTAM filtering is not enough
  - PIBs still contain substantial number of DNOTAMs that are relevant for a specific flight
  - Missing organization capabilities of relevant DNOTAMs
SemNOTAM Knowledge Base

- Background Knowledge (Aerodromes, Routes, Segments, etc.)
- DNOTAM Knowledge (recent DNOTAMs from NOTAM Service)
- Flight-Specific Knowledge (Flight Path, Enrichments, Aircraft, etc.)
- Result Set (relevant and enriched DNOTAMs)

SemNOTAM Knowledge Base
- SemNOTAM Ontology (Concepts)
- Filter Rules
- Enrichment Rules (Classification Rules)
- Ranking Rules
ePIB Semantic Prioritization
Airport NOTAM with Semantical Annotations
EFB – Select Flight
Request ePIB from Integrated Digital Briefing System
EFB – View Map
True SWIM Integration

AIXM 5.1

Digital NOTAM

iWXXM
True SWIM Integration

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**Yellow Profile**

**Purple Profile**

**SWIM TI**

Technical Infrastructure
Detailed Zoom in for Techies ;-) SESAR SWIM Profiles

Yellow Profile
- REST
- SOAP
- WS-Notification
- WS-Security
- WS-ReliableMessaging
- AMQP 1.0

Purple Profile
- AMQP 0.9.1
- AMQP 1.0
- Publish/Subscribe
- Request/Response
- Request/Multiresponse

Blue Profile
- DDS
- DDSI
- SOAP
- TLS
- OMG DDS Security

Ground/Ground
Air/Ground
Real-time FO
True SWIM Integration

ISRM Compliant
Semantic Data Containers to unleash the full Potential of SWIM

- Part of SWIM will be searching and selecting the appropriate data sources for a particular task, filtering for relevant data items, and composition of multiple data sources.
  
  → Linked Data

- Without dedicated support, the data logic will likely be hard-coded in applications and service implementations.

- An established principle in software engineering is the separation of data logic from business and presentation logic.
  
  → The SESAR2020 Exploratory Research BEST’s semantic data container aims to introduce such a separation of concerns to SWIM
Electronic Flight Bag for Flight UAE415 (YSSY-OMDB) on 01/06/2017

--- Membership Condition ---
Data item type: NOTAM
Location: Route YSSY-OMDB
Valid time: 2017-06-01

--- Membership Condition ---
Data item type: NOTAM
Location: Route YSSY-OMDB
Valid time: 2017-06-01
Annotated-for-Aircraft:A380

--- Membership Condition ---
Data item type: METAR
Location: YSSY airspace
Valid time: 2017-06-01

--- Membership Condition ---
Data item type: METAR
Location: YSSY-OMDB (Airspace 1)
Valid time: 2017-06-01

--- Membership Condition ---
Data item type: METAR
Location: YSSY-OMDB (Airspace 2)
Valid time: 2017-06-01

--- Membership Condition ---
Data item type: METAR
Location: YSSY-OMDB (Airspace 3)
Valid time: 2017-06-01