MIGRATION TO SWIM- CHALLENGES & SOLUTIONS

John Fort, CEO Frequentis California

FREQUENTIS

→ Agenda

- → About Frequentis
- → Introduction to SWIM
- → SWIM Infrastructure
- → Management of Aeronautical Information
- → Management of Weather Information
- → Management of Flight Information
- → Digital Briefing
- → Conclusion

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About Frequentis

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→ About Frequentis

- → Privately Owned Company
- → Over 1,100 Employees
- → Headquarters in Vienna, Austria
- → Subsidiaries in USA, Canada, UK, Germany, Brazil,…
- → Frequentis California created after acquisition of Global Weather Dynamics, Inc. (GWDI) in March 2010
- → Supplier of Communication and Information Systems to 5 markets
- → 22,000 Controller Working positions installed in over 100 countries
- → No 1 Supplier in Control and Command Centers

→ Frequentis Markets

→ AIM Business Unit

- → Offers a complete suite of Messaging and Information Management Solutions to ANSPs (AIM, MET, AMHS,..)
- → Frequentis is an official member of the SESAR Joint Undertaking
  - AIRM (Aeronautical Information Reference Model) Data and Service Modelling (WP-8)
  - SWIM Infrastructure (WP-14)
  - Digital NOTAM/Digital Briefing (WP-13)
- → Frequentis is a contributor to the Open Geospatial Consortium (OGC)
  - Dissemination of Weather Information using Web Coverage Services (2014)

smartAIM - Aeronautical Information Management

- AIXM Database
- NOTAM Management
- Flight Plan Management
- PIB Production (Combined NOTAM and MET data)
- Internet Briefing
- AIP, Electronic AIP/Charts
- Currently being enhanced with Flexible Workflow Management (ADQ Compliance in Europe) & Digital NOTAM

smartWeather – Weather Information Management

- Acquisition/Management of Textual & Binary (GRIB2/BUFR) data and Graphics Products
- Data Processing (i.e Production of W&T and SIGWX Charts)
- Data Presentation (Overlay of Weather charts over flight routes)
- Data Access via Web Portal, Integrated Briefing
- Currently being enhanced with support to IWXXM/WXXM Exchange Models and OGC Web Services standards (WCS, WFS, WMF)

→ smartAMI- AIM/MET Information Display System

- → Provides Real-time information about Airspace and Weather information to Users (i.e. ATC Controllers, Dispatchers,…)
- → Supports acquisition of NOTAM and Weather information from multiple sources

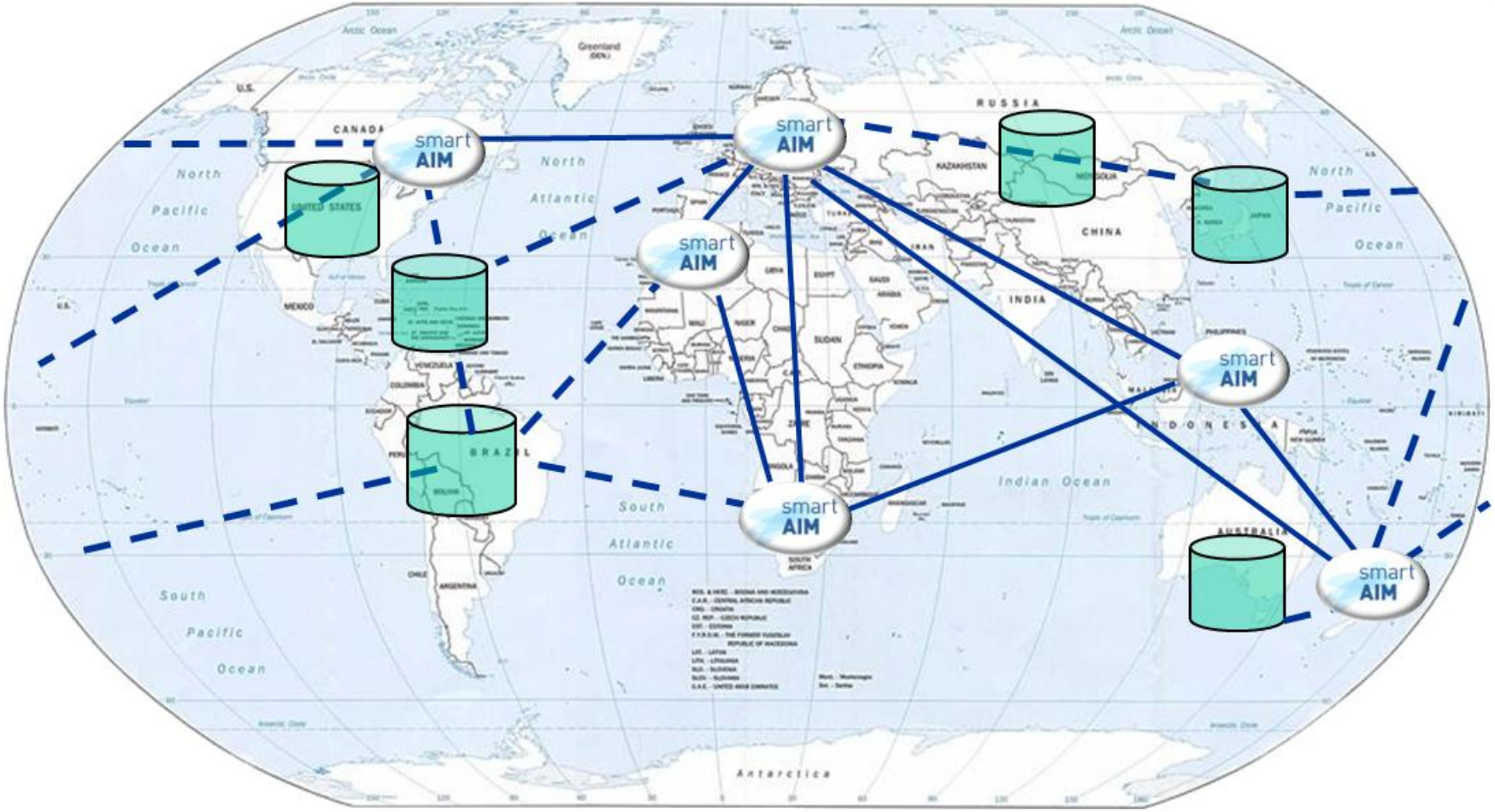
→ smartMessenger- ATS Message Handling

- → Fastest and most flexible AMHS available on the market
- → Supports AMHS, AFTN, CIDIN, WMO, SITA-B message formats
- → Supports conversion between message formats (i..e AFTN to AMHS)
- → Supports data exchange with Centralized Directory Services (i.e EDS)
- → Currently being enhanced with SWIM/AMHS Gateway

→ smartAIM References (Partial List)

- **Regional Hubs**
  - **European Aeronautical Database (Hub for Europe)**
    - System Supplied and Maintained by Frequentis
    - Operated by GroupEAD (JV between DFS, Aena and Frequentis)
    - 50,000 registered users
  - **ATNS, South Africa (Hub for Africa)**
  - **Airways NZ (Hub for Asia/Pacific)**
- **Large ANSPs**
  - NavCanada, DFS,…
- **small ANSPs**
  - Latvia, Czech Republic
- **Commercial Companies**
  - SITA

→ Frequentis AIM References



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System Wide Information Management (SWIM)

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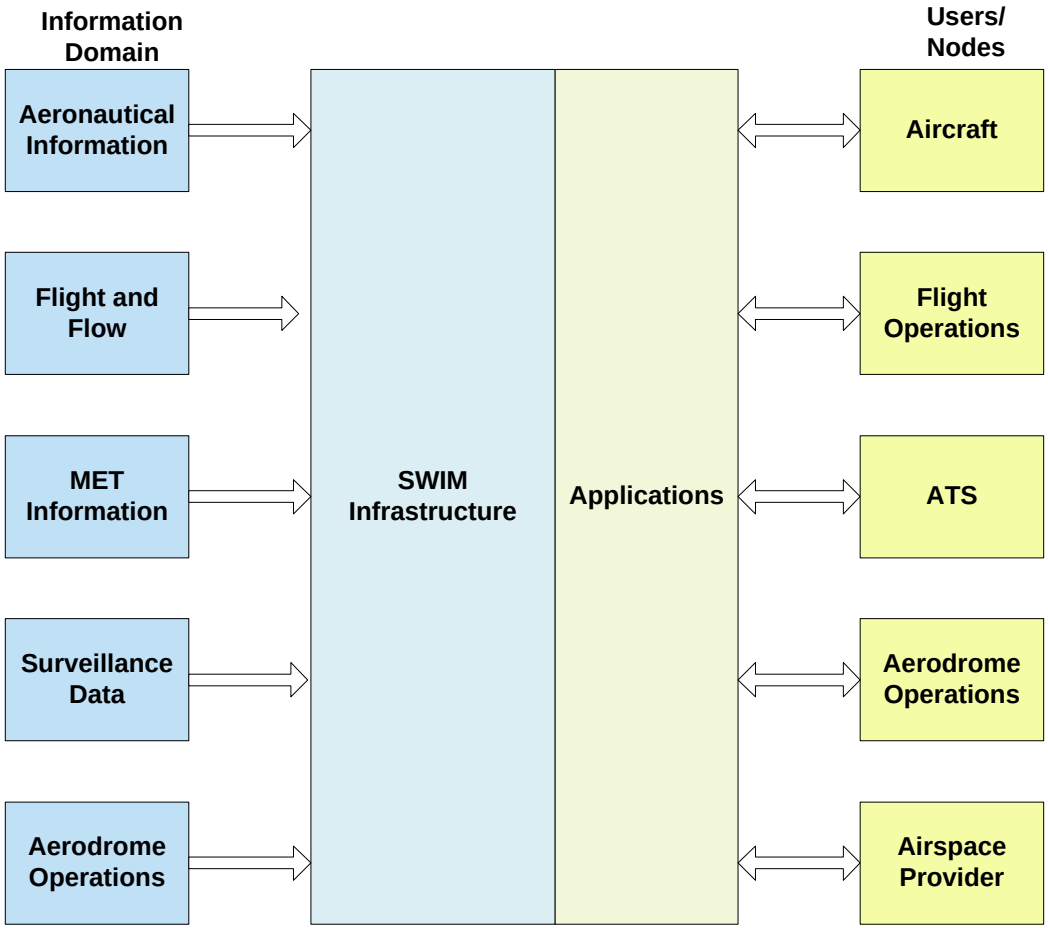
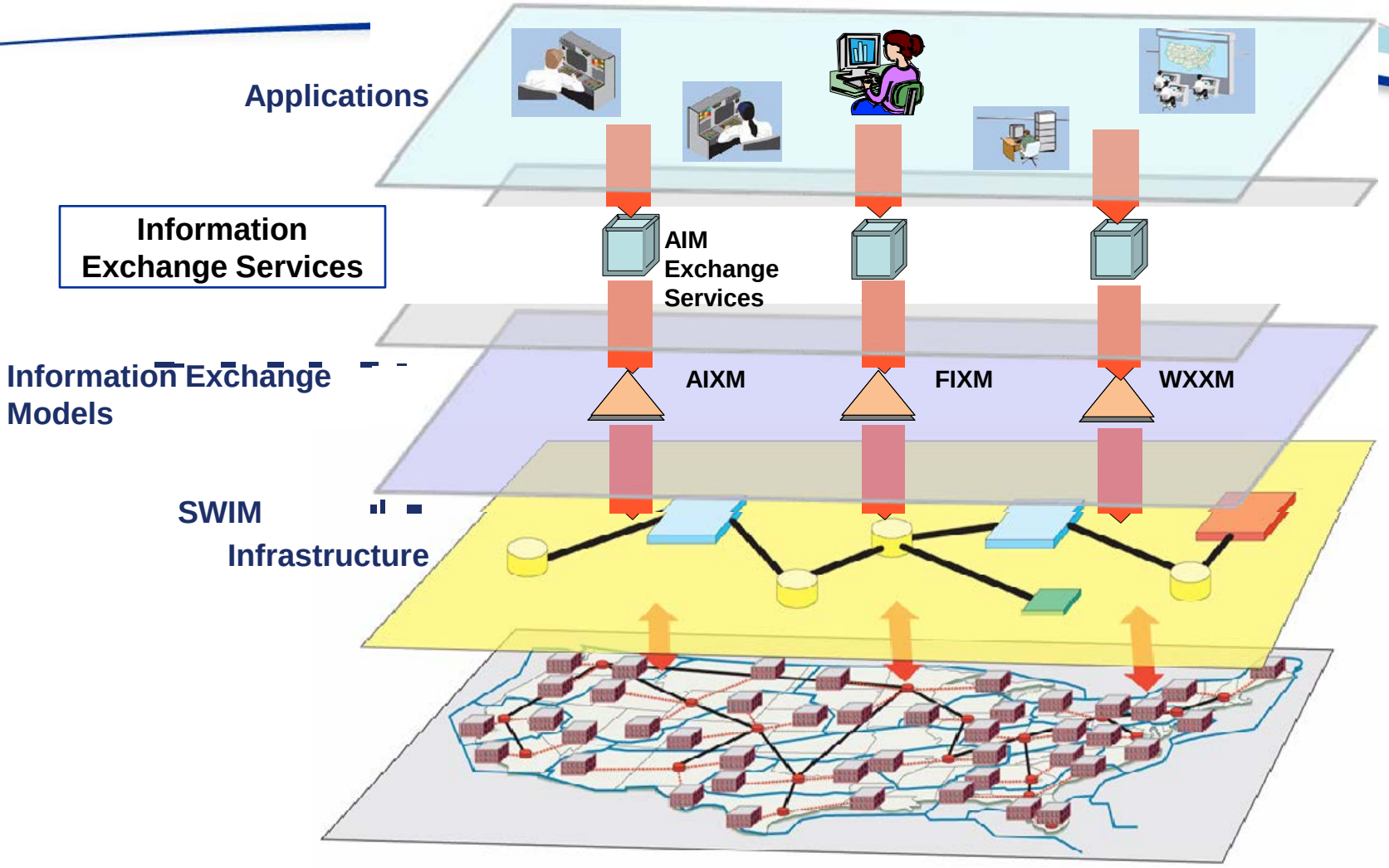
→ SWIM Objectives

1. Establish a globally interoperable information network (i.e. an ATM Intranet)
2. Supports the exchange of timely, relevant and quality assured information
3. Leading to improved decision making and operational efficiency for all Stakeholders of the aviation community

→ SWIM Information Domain



→ SWIM Conceptual Model



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SWIM Infrastructure

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→ SWIM Infrastructure

- → SWIM is based on interconnected “nodes”, which are SWIM compatible standard middleware appliances (hardware and software)
- → SWIM uses standard internet based addressing like every other internet application.
- → SWIM technologies are classified into subsets (technology stacks) called **profiles** for the sake of interoperability and for design and development simplification
- → Every ATM operational service will fit to at least one SWIM profile considering their operational and non-functional requirements (performance, reliability, security).
- → SESAR SWIM has defined three different profiles:
  - Blue profile: Flight Object using DDS (Data Distribution Service).
  - Yellow profile: AIXM/WXXM using WS-N (Web Services Notification) /SOAP (Simple Object Access Protocol) and AMQP
  - Purple profile: Air to Ground via AMQP (Advanced Message Queuing Protocol)

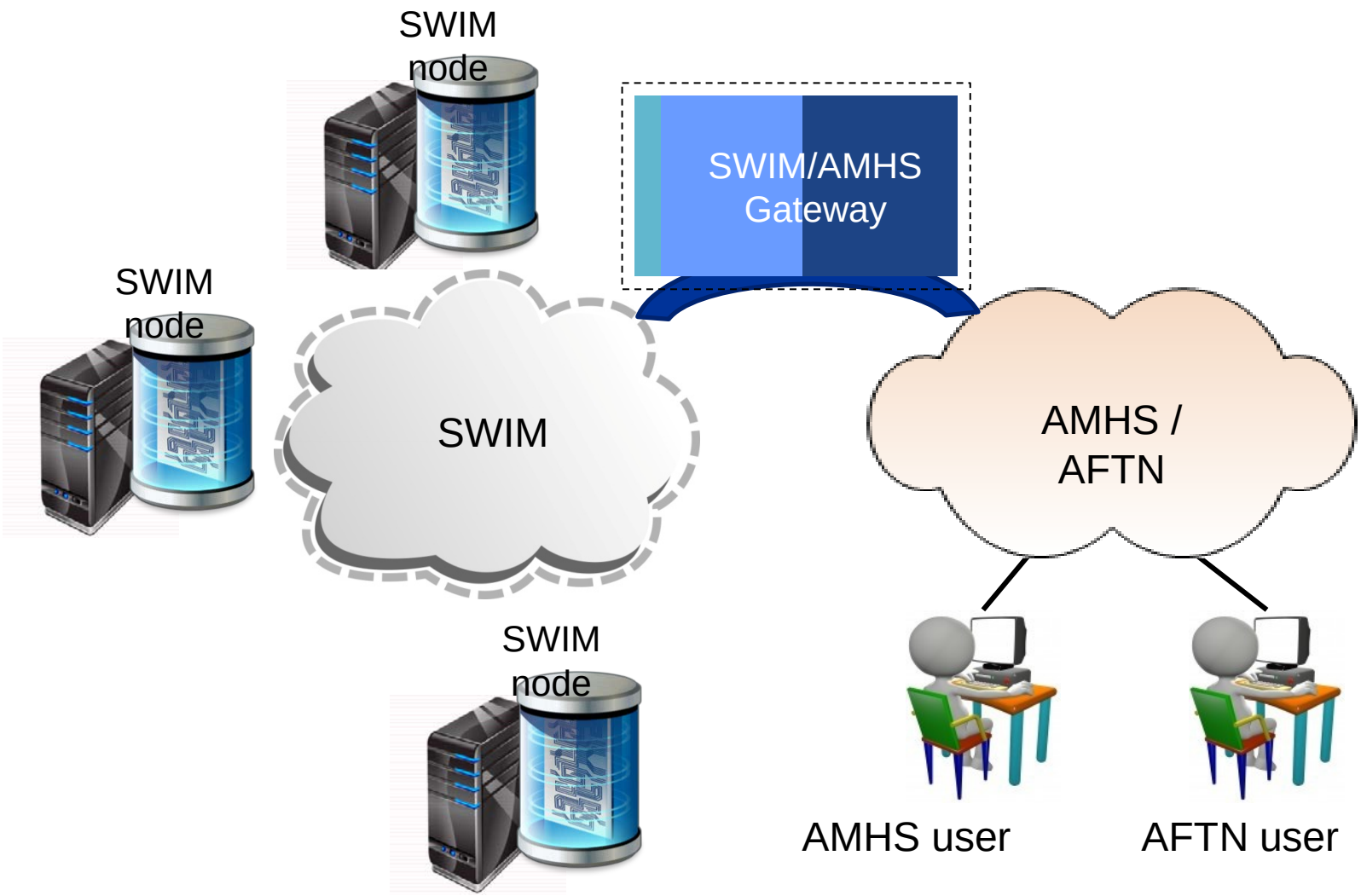
→ Challenges

- → During last 10 years, ANSPs around the world have implemented AMHS systems has a replacement to AFTN
- → AMHS could be used to transport SWIM Information
- → SWIM Infrastructure defined in NEXGEN/SESAR is NOT based on AMHS
- → There will be a long transition period when both AMHS and SWIM will cohabit
- → The only solution when communication between AHMS and SWIM is required is to implement a SWIM/AMHS Gateway
- → There is no technical specification defined by ICAO for SWIM/AMHS gateway

→ FRQ Solution

- → Implementing a SWIM/AMHS Gateway as part of our messaging solution (smartMessenger)
- → Recently presented a paper during an ICAO meeting and offered to work with ICAO/Eurocontrol to define the specifications

→ SWIM/AMHS Gateway



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Management of Aeronautical Information

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→ ICAO Standards

- → AIS to AIM Roadmap Document, 1st Edition 2009
- → ICAO Annex 15 - Aeronautical Information Services
  - Amendment 37 (Nov 2013)
  - Amendment 38 (Nov 2016)
- → ICAO Annex 4- Aeronautical Charts
  - Amendment 57 (Nov 2013)
  - Amendment 58 (Nov 2016)
- → Supporting Documents
  - Doc 8126 - Aeronautical Information Services Manual
  - Doc 7383 - Aeronautical Information Services Provided by States
  - Doc 8697 - Aeronautical Chart Manual
  - Doc 9674 - WGS 84 Manual

→ AIS to AIM Roadmap- 21 Steps

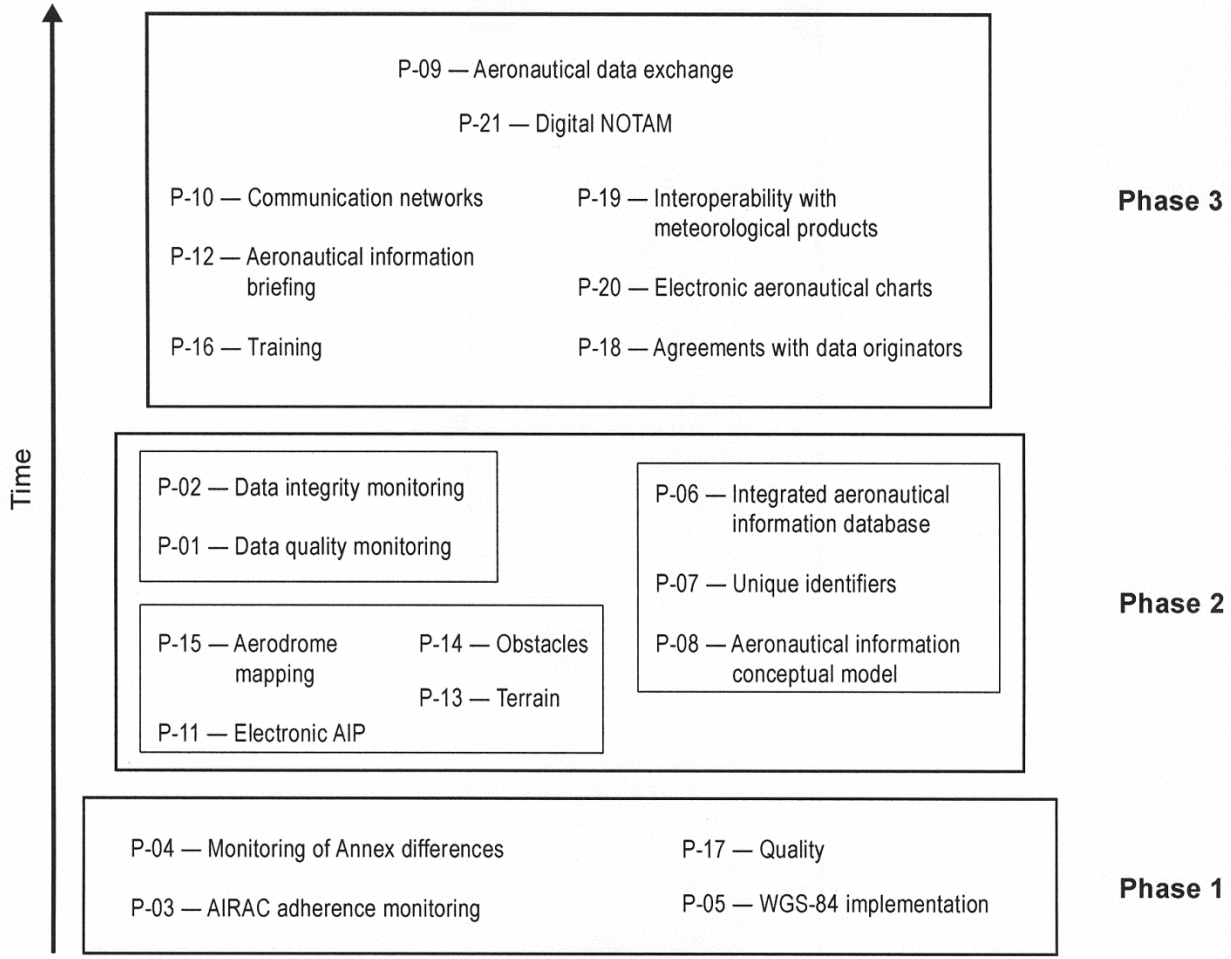
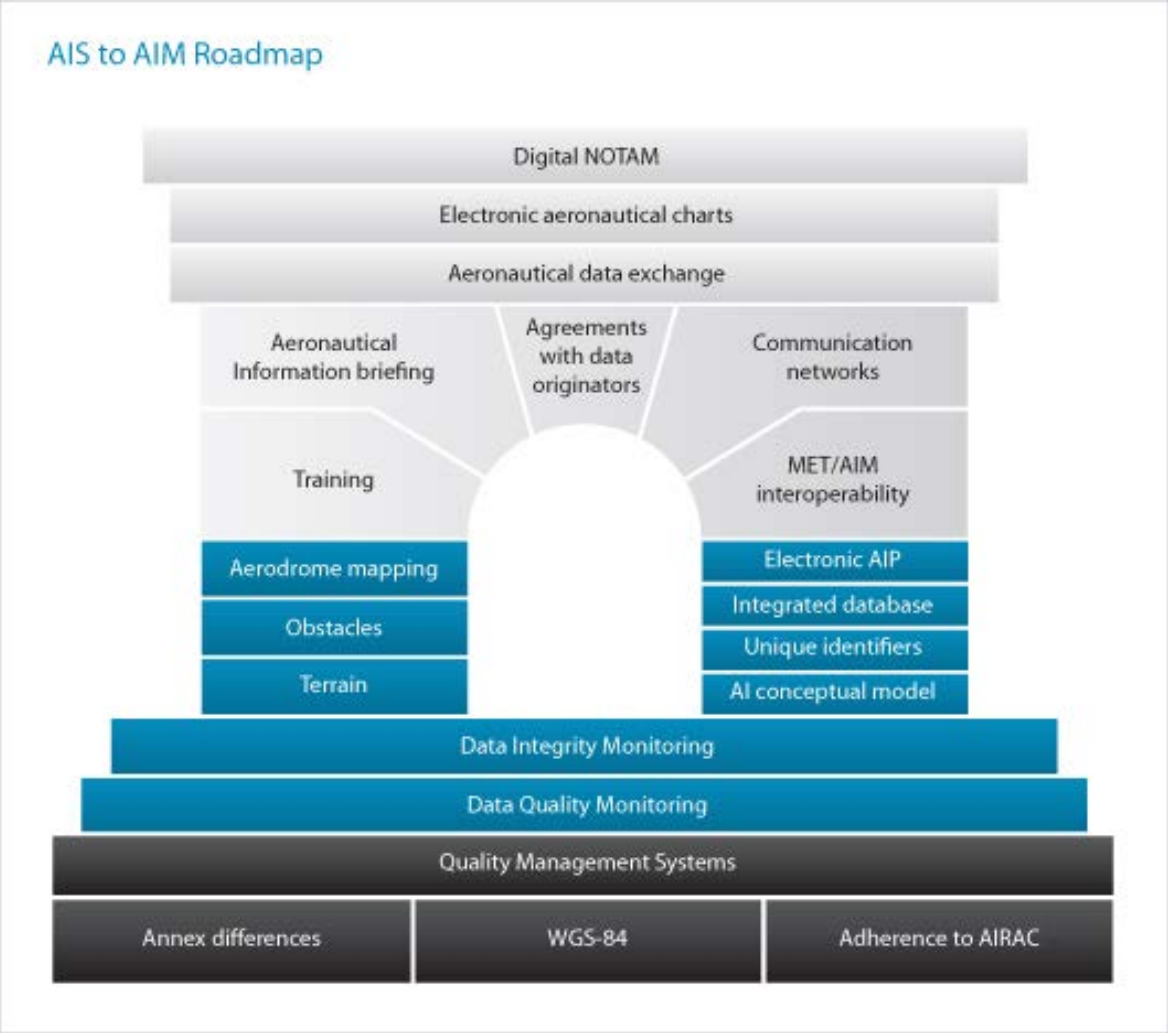


Figure 3. Positioning of the 21 steps of the roadmap in the three phases

→ AIS to AIM Roadmap- 21 Steps



→ AIXM

- → AIXM was originally developed by Eurocontrol
- → AIXM is an exchange model for aeronautical information
- → AIXM 4.5 is the version currently operated by EAD (And most ANSPs around the world)
- → AIXM 5.1 was developed by Eurocontrol and FAA
  - Based on Geography Markup Language (GML)
  - GML is the XML grammar defined by the Open Geospatial Consortium (OGC) to express geographical features
  - GML serves as a modeling language for geographic systems as well as an open interchange format for geographic transactions on the Internet

→ Challenges

- → AIXM 4.5 and AIXM 5.x are very different models
- → They will be in operation for many years to come

→ FRQ Solution

→ smartAIM supports both models (AIXM 4.5 and AIXM 5.1)

→ Digital NOTAM

- → Digital NOTAM is a **sub-concept of AIXM 5**. It was the main reason for the FAA to support AIXM
- → The traditional free text information contained in NOTAM messages is replaced with structured information (XML), which is suitable for automated computer processing
- → Digital NOTAM Event Specifications
  - Version 1.0 Released in 2011 (Specifications for only 12 Events)
  - Version 2.0 will be released in May 2014 (Workshop in Brussels)

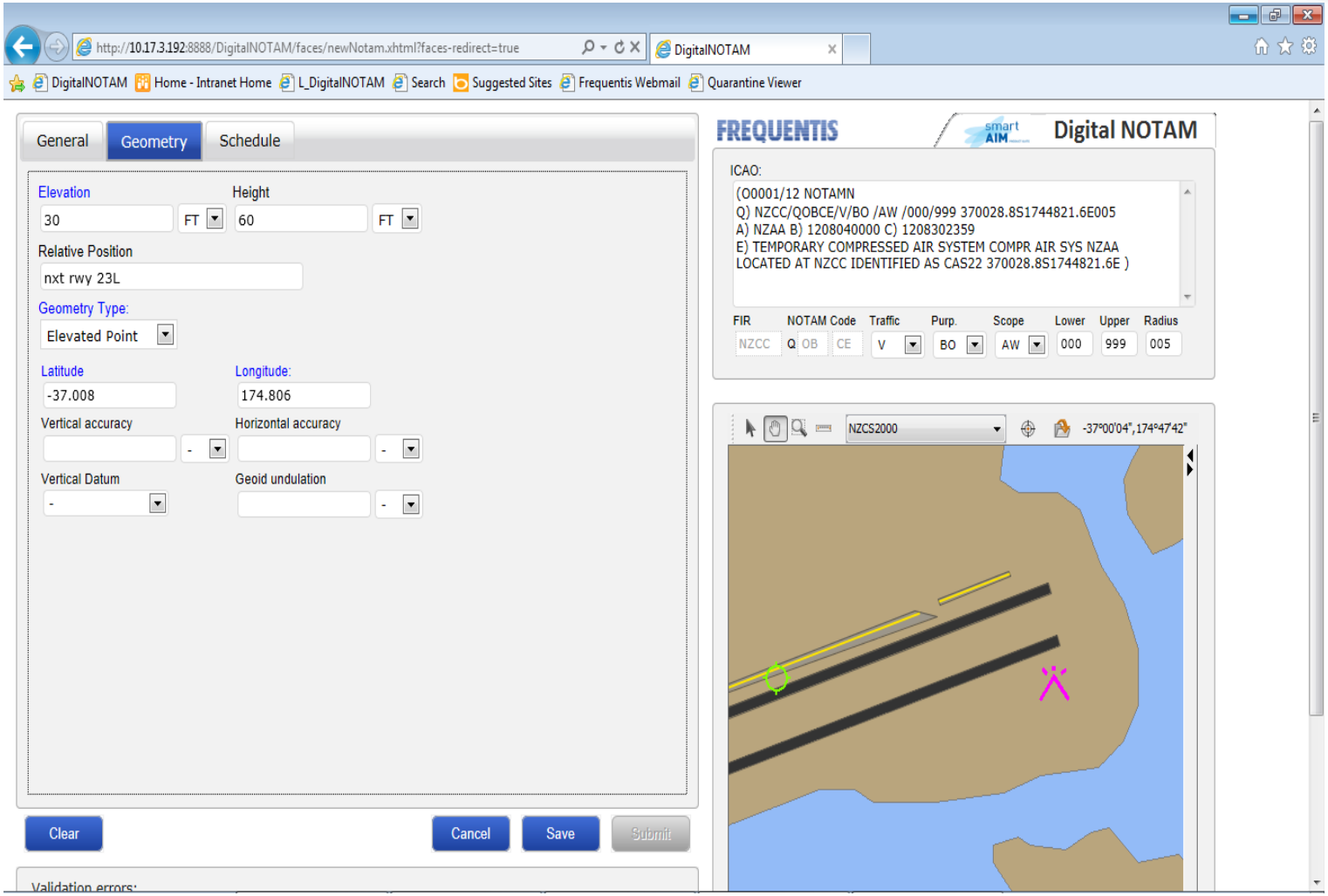
→ Challenges

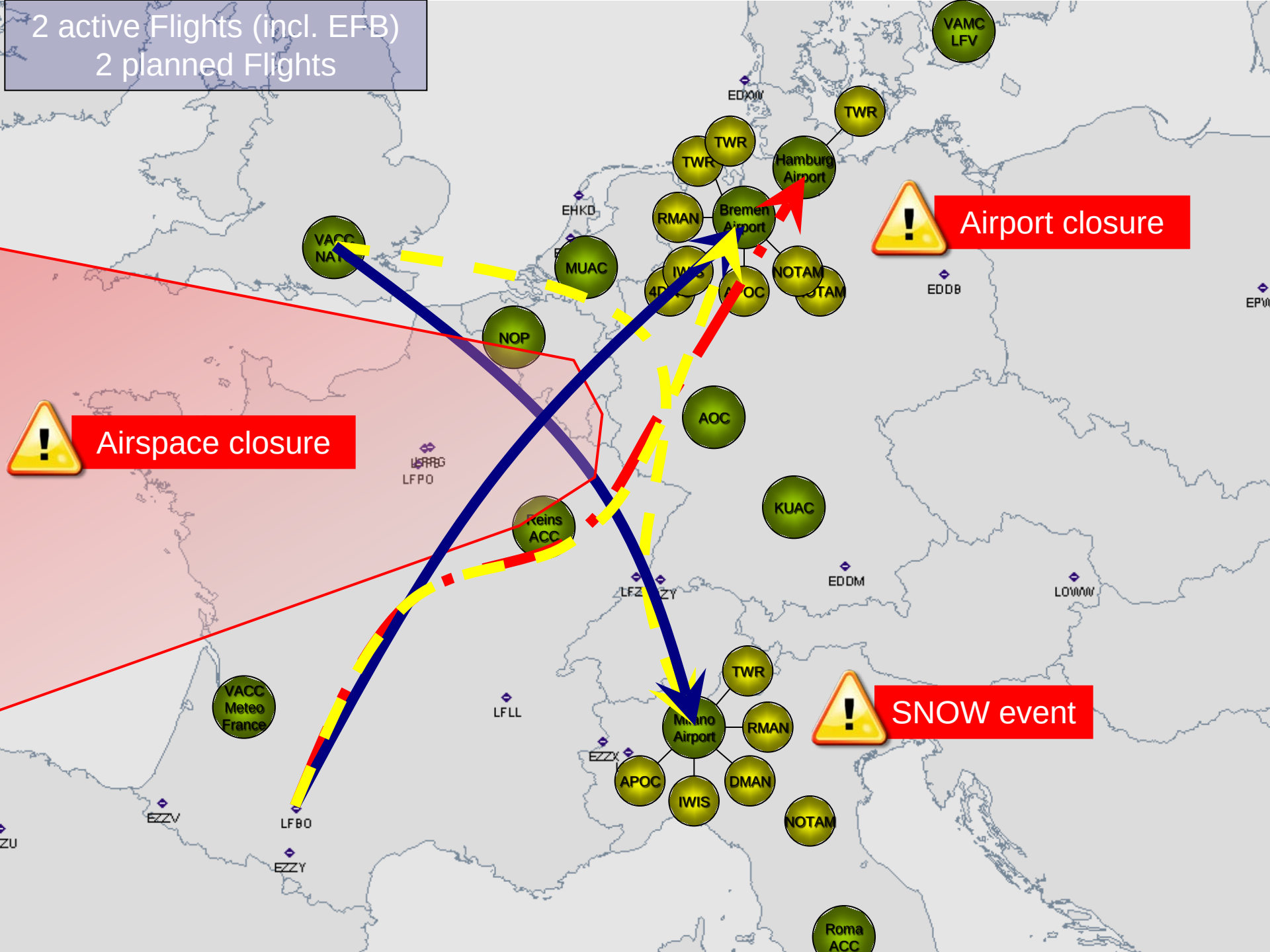
→ The migration from traditional textual (Alphanumeric) NOTAM and Digital NOTAM (XML) will take many years

→ Frequentis Solution

→ smartAIM supports the creation and management of both the textual and XML NOTAM (Digital NOTAM)

→ Digital NOTAM




2 active Flights (incl. EFB)
2 planned Flights
VAMC LFV
EDXW
TWR
TWR
TWR
Hamburg Airport
EHKD
RMAN
Bremen Airport
VACC NAT
MUAC
NOTAM
OC
EDDB
NOP
Airport closure
AOC
Airspace closure
LFPO
KUAC
Reims ACC
EDDM
LFLL
TWR
RMAN
APOC
DMAN
IWIS
NOTAM
SNOW event
VACC Meteo France
EZZV
LFBO
EZZY
Roma ACC

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Management of Weather Information

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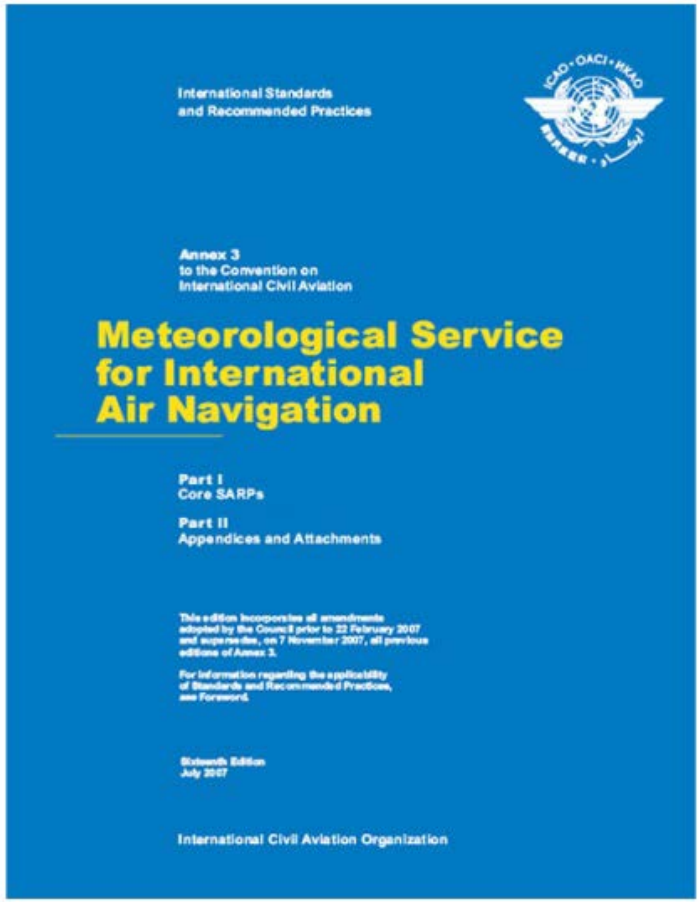
→ ICAO Standard

→ Aviation MET is regulated by ICAO Annex 3



→ Amendment 76 & 77 of ICAO Annex 3

- → Amendment 76 – Nov 2013
  - "*States in a position to do so* should exchange METAR, SPECI, SIGMET and TAF in a digital form" (XML/GML)
- → Amendment 77 – Nov 2016
  - "METAR, SPECI, SIGMET and TAF should be exchanged in a digital form"

→ IWXXM (AvXML)

- → Managed by ICAO and WMO
- → XML Representation of Textual Products
- → Strict and complete representation of ICAO Annex 3 products – METAR, SPECI, TAF, SIGMET (**regulated** products)
- → Business rules strongly enforced
- → Updated on roughly the same time scale as ICAO Annex 3 (currently 3 years)
- → Version 1.0 has been released

→ WXXM

- → Extension of IWXXM
- → Managed by Eurocontrol, FAA, and other partners
- → Many products and data types beyond ICAO Annex 3
- → Support for Next-generation of aviation and weather data representations
- → Data is Geospatially and temporally identified
- → Release schedule
  - Updated roughly every year
  - Version 1.0 is current released version
  - Version 2.0 was scheduled to be released at the end of 2013 and Version 3.0 at the end of 2014
  - Version 2.0 was not released per original schedule – New Release date =Sept 2014

→ Challenges

- → There are currently two exchange models (IXXXM, WXXM)
- → Current Weather representation does not fully handle the needs of the aviation/ATM community

→ FRQ Solution

- → smartWeather supports both exchange models
- → smartWeather support new methods for data presentation

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Management of Fight Information

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→ FIXM

- → XML representation of Fight Plans
- → Current ICAO flight plan only contains information about a proposed flight
- → FIXM has the capability to depict information about all phases of a flight
- → FIXM will be used to exchange all flight information
- → GUFI - Global Unique Flight Identifier
  - <country code>.<org code>.<date>.<time>.<sequence number>
  - Examples: us.faa.20120210.0631.17; fr.f9893rl.20110930.1745.1

→ Challenges

→ FIXM and traditional ICAO FPL textual formats will coexist for a long period of time

→ FRQ Solution

→ smartAIM supports both ICAO FPL format (textual) and XML version (FIXM)

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Digital Briefing

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→ Problems with Current PIB

- → Too long
- → NOTAM not prioritized
- → Irrelevant NOTAM
- → Format difficult to read
  - ALL CAPS
  - abbrv.
  - pour Inglesh
- → No grouping per feature
- → Missing data in case of significant re-routing or due to inappropriate selection criteria

→ Expectations with Digital Briefing

- → Easy to understand
  - Graphical (where appropriate)
  - Organized per phase of flight
  - Critical information highlighted
- → Only the relevant information should be included
- → Available for EFB (Electronic Flight Bag)

→ Challenges

→ These is currently no ICAO specifications

→ FRQ Solution

- → Working with Eurocontrol on Digital Briefing Project (SESAR WP 13.2.2)
- → Writing the specifications
- → Working on a prototype

Conclusion

→ Conclusion

- → Frequentis is actively involved in defining and developing all the building blocks required for the migration to SWIM
- → Frequentis is the best position to assist ANSPs around the world in their migration to SWIM