AIXM/UML/XML/GML Workshop
ICAO SAM, Lima, Peru, 28-SEP – 02-OCT-2015
AIM Unchained
based on the story by Ulrich Kaage
presented by Peter Cornelius

Development of the Industry related to AIXM, WXXM and FIXM
AIM Unchained
The Chains

- Text Based
- Product Centric
- Closed Architecture
- Proprietary Data Models
AIM Vision 2008 (COMSOFT)

- Interoperability
  - Machine readable content
  - Open and standardised Interfaces
  - Open System Architecture
- Quality Control Process involving Data Originators
- No product centric view. Instead, access to all information in a uniform way.
ICAO AIS to AIM Roadmap 2009

Phase 1
- P-03 – AIRAC adherence monitoring
- P-04 – Monitoring of Annex differences

Phase 2
- P-01 – Data quality monitoring
- P-02 – Data integrity monitoring
- P-06 – Integrated aeronautical Information database
- P-07 – Unique identifiers
- P-08 – Aeronautical information conceptual model
- P-05 – WGS 84 implementation
- P-17 – Quality

Phase 3
- P-09 – Aeronautical data exchange
- P-10 – Communication networks
- P-12 – Aeronautical information Briefing
- P-16 – Training
- P-18 – Agreements with data originators
- P-19 – Interoperability with meteorological products
- P-20 – Electronic aeronautical charts
- P-21 – Digital NOTAM

Time
AIM Systems 2015
ICAO AIS to AIM Roadmap 2015

Phase 1
- P-03 – AIRAC adherence monitoring
- P-04 – Monitoring of Annex differences
- P-17 – Quality

Phase 2
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Time
ICAO AIS to AIM Roadmap 2015

Phase 1
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Phase 2
- P-01 – Data quality monitoring
- P-02 – Data integrity monitoring
- P-06 – Integrated navigation Information
- P-07 – Unique identifier
- P-08 – Aeronautical information conceptual model
- P-11 – Electronic AIP
- P-13 – Terrain
- P-14 – Obstacles
- P-15 – Aerodrome Mapping

Phase 3
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ICAO AIS to AIM Roadmap 2015

Phase 3

- P-09 – Aerodrome Information
- P-10 – Communication Networks
- P-12 – Aeronautical Information Publication
- P-16 – Training
- P-18 – Agreements
- P-19 – Interoperability
- P-20 – Electronic Flight Bag
- P-21 – Digital Maps

Agreement by the recommendation of the coordinators and originators

Meteorological products

Digital charts
AIM Vision 2015

To Solve: P-09 Aeronautical Data Exchange

- Interoperability
- Machine readable content
  - Open and standardised Interfaces
  - Open System Architecture
- Quality Control Process involving Data Originators
- No product centric approach. Instead, access to all information in a uniform way.

To Solve: P-10 Communication Networks

To Solve: P-21 Digital NOTAM
P-09 – Aeronautical Data Exchange

System Vendor A

System Vendor B

Central Aeronautical Database

SDO

eAIP

Airspace Design

Procedure Design

eTOD

EAD

FPL Mgmt

Briefing

NOTAM Office

Charting

Central Aeronautical Database

SDO

eAIP

Airspace Design

Procedure Design

eTOD

EAD

FPL Mgmt

Briefing

NOTAM Office

Charting
P10 – Communication Networks

A Physical Database Network Structure: Vision
Global AIM 2012 Buenos Aires
A Physical Database Network Structure: Vision

Global AIM 2012 Buenos Aires

AMHS
The Physical Database Network Structure
The Physical Database Network Structure
AIM Regulations At A Glance (courtesy of skyguide)

- Annex 3 - Meteorological Service for International Air Navigation
- Annex 4 - Aeronautical Charts
- Annex 10 - Volume II - Aeronautical Telecommunications
- Annex 11 - Air Traffic Services
- Annex 14 - Aerodromes, Volume I - Aerodrome Design and Operations (ADQ requirements)
- Annex 14 - Aerodromes, Volume II - Heliports (ADQ requirements)
- Annex 15 - Aeronautical Information Services
- DOC 4444 - Procedures for Air Navigation Services - Air Traffic Management
- DOC 7030 - Regional Supplementary Procedures
- DOC 7754 - European Region Air Navigation Plan, Volume I, Basic ANP
- DOC 7754 - European Region Air Navigation Plan, Volume II, FASID (Facilities And Services Implementation Document)
- DOC 7910 - Location Indicators
- DOC 8126 - AIS Manual
- DOC 8400 - ICAO Abbreviations and Codes
- DOC 8585 - Designators for Aircraft Operating Agencies
- DOC 8643 - Aircraft Type Designators
- DOC 8697 - Aeronautical Chart Manual
- DOC 9002 - ICAO's Policies on Charges for Airports and Air Navigation Services
- DOC 9161 - Manual on Air Navigation Services Economics
- DOC 9377 - Manual on Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services
- DOC 9683 - Human Factors Training Manual
- DOC 9705 - Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN)
- DOC 9713 - International Civil Aviation Vocabulary
- DOC 9750 - Global Air Navigation Plan
- DOC 9855 - Guidelines on the Use of the Public Internet for Aeronautical Applications
- ICAO EUR DOC 005, CIDIN Manual
- ICAO EUR DOC 010, Harmonized Access to AIS and MET Services Relating to Pre-flight Planning
- ICAO EUR DOC 014, European Region SIGMET Guide
- Roadmap for the transition from AIS to AIM
- European ATM Master Plan
- SESAR Master Plan - DS
- EC No 549/2004 laying down the framework for the creation of the single European sky
- EC No 552/2004 on the interoperability of the European Air Traffic Management network
- Commission Implementing Regulation (EU) No 1035/2011 laying down common requirements for the provision of air navigation services
- Guidance Material for Air Navigation Services Provider’s compliance with the Common Requirements - Volume I Air Traffic Services Provider and Communication, Navigation and Surveillance Services Provider
- Guidance Material for Air Navigation Services Provider’s compliance with the Common Requirements - Volume II Aeronautical Information Services Provider
- EC No 482/2008 establishing a software safety assurance system to be implemented by air navigation service providers and amending Annex II to Regulation (EC) No 2096/2005
- EC Regulation No 691/2010 laying down a performance scheme for air navigation services and network functions and amending Regulation (EC) No 2096/2005 laying down common requirements for the provision of air navigation services
- EC No 1033/2006 laying down the requirements on procedures for flight plans in the pre-flight phase for the Single European Sky
- EC No 929/2010 amending Regulation (EC) No 1033/2006 as regards the ICAO provisions referred to in Article 3(1)
- EC No 1794/2006 laying down a common charging scheme for air navigation services
- EC No 1191/2010 amending Regulation (EC) No 1794/2006 laying down a common charging scheme for air navigation services
- EC Regulation No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky
- Guidelines supporting the implementation of the regulation on ADQ
- EC No 255/2010 of 25 March 2010 laying down common rules on the air traffic flow management
- AIXM Conceptual Model (AICM)
- AIS Data Process (ADP chart)
- Static Data Procedures (SDP)
- Strategic Guidance in Support of the Execution of the European ATM Master Plan
- Network Operations HANDBOOK & Guides
- ATFCM Operations Users Manual
- IFPS Users Manual
- Common AIS Profiling (CASIP)
- EUROCONTROL AIS Training Development Guidelines
- ESSIP
- LSIP
- EUROCONTROL Report on the SES Legislation Implementation
- Operating Procedures for AIS Dynamic Data (OPADD)
- EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services (including Service Continuity)
- SNOWTAM Harmonisation Guidelines
- Terrain and Obstacle Data Manual
- Guidance for the implementation of safety management in AIS/AIDS in the ECAC region
- EUROCONTROL Specification for Data Assurance Levels
- EUROCONTROL Specification for the eAIP
- EUROCONTROL Specification for Aeronautical Information Exchange
- EUROCONTROL Specification for Data Quality Requirements
- EUROCONTROL Specification for the Origionation of Aeronautical Data - Volume 2: Guidance Material
- Integrated Briefing High-Level User Requirements Document - AIM/AEP/BRIEF/0021
- Integrated Briefing High-Level Concept Document - AIM/AEP/BRIEF/0024
- Integrated Briefing Technical Concept Document - AIM/AEP/BRIEF/0025
- Integrated Briefing - IPB Guidelines for Presentation - AIM/AEP/BRIEF/0029
- EUROCONTROL - Centralised Service on European ATM Information Management (EAIMS) - Concept of Operations
SWIM is...

... a cable
Which Plug?
SWIM is...

... a cable

... and a plug

AIXM
FIXM
WXXM
TIXM
**XM

ISRM
WFS-T 2.0
CAW
SWIM-Cable HowTo

- Define what comes through
  - AIXM
  - FIXM
  - WXXM
  - TIXM
  - AMXM
  - **XM …

- Define the plug
  - WFS-T 2.0 (Web Feature Service Transactional version 2.0, ISO 19142 and 19143)
  - ISRM (Information Service Reference Model)
  - …
SWIM Global Interoperability Framework

Source: ICAO
OWS Interoperability Research Project

- Main focus on
  Interoperability
  Open Standards
  SWIM compliance

- Sponsored by EUROCONTROL and FAA
- Coordinated by OGC
OWS-7/8/9/10 Architecture

**Client Tier**
- WXXM Client
- EFB/Handheld
- Flight Dispatch
- Other Client Applications

**Business Process Tier**
- Registry
- WXXM Portrayal
- AIXM Portrayal
- Event Alert
- AIXM Handling Tools

**Access Tier**
- AIXM 5.1 WFS - T
- 4D Weather Data Cube
- WXXM 1.1 WFS
- Other Services: SWIM, NOAA

**SWIM Network**
- Request data or updates to data
- Query registry
- Request portrayal
- Post Events
- Update data

**Request data or updates to data**
SWIM Interfaces: OWS Interoperability Research Projects
OGC/OWS-8: WFS-T 2.0 Temporality Extension

Discussion Paper: Use Case Oriented Approach to Time Slice retrieval with WFS 2.0: Temporality Extensions, i.e. client side temporal queries
When Do We SWIM?

http://www.flickr.com/photos/anachronism_uk/280453752
FIXM – CADAS-ATS with FIXM 2.0 in a SWIM Environment

- Issuing of FIXM 2.0 messages in a SWIM environment
- Reception of FIXM 2.0 messages from the SWIM network
- Data Exchange with GUFI service
- Integrated FO server
FIXM – Interface to Aeronautical Billing

Data Sources
- Manual Input
- FPL-FIXM (CADAS-ATS)
- Movement Logs (PRISMA FDPS)
- AIXM 5.1 AIS (Static Data)
- Proprietary Data (3rd Party AODB)

CAB Backend
- CADAS-AIMDB

Generic Features
- Web Services (Push/Pull)
- AIXM 5.1 Application Schema (Basic, user, and operational data)
- Temporality
- Traceability

Data Users
- Customer portal / data exchange
- EUROCONTROL CRCO
- Customer ERP system
- Invoices
- Statistics
FIXM – Interface to Aeronautical Billing

**Data Sources**
- FPL-FIXM (CADAS-ATS)
- AIXM 5.1 AIS (Static Data)

**CAB Backend**
- CADAS-AIMDB

**Data Users**
- Customer ERP system
- Invoices
- Statistics

**Diagram**
- CADAS ATS publishes messages to a JMS server, which then delivers messages to the CADAS-ATS JMS adapter.
- The CAB Core subscribes to the Topic and manages the interface.
WXXM - Gateway
WXXM – Future Applications? – CADAS-IMS SIGWX

- Automated processing
- Automatic rendering
SWIM-Enabled Applications – CAD vs GIS

- CAD
  - Is a graphics program
  - Lines and shapes are important
  - Supports 2D and 3D
  - Uses SQL
  - Is deprecated

- GIS
  - Is a database program
  - The data behind the lines is important (data-driven)
  - Supports 2D and 3D
  - Uses Web Services
  - AIXM 5 is a GIS format (GML)
  - Is recommended by EUROCONTROL and FAA SWIM activity
  - Is the future
SWIM-Enabled Applications – Procedure Design (Approach)
SWIM-Enabled Applications – eTOD/Obstacle Management

- Use-case oriented input forms for AIXM5
  - Input and editing of electronic obstacle data
  - Checking via Business Rules Framework
  - Integration into Business Workflows
- Publishing via the well-established tool-chain comprising CADAS-EPS
- Complemented with an elaborate 3D viewer for verification
SWIM-Enabled Applications – CADAS-ATS Route Planning
SWIM-Enabled Applications – CADAS-ATS CFMU B2B Interface
P21 – Digital NOTAM

Operational Concept?

Prototype 2011
P21 – Digital NOTAM Concept of Operation

1. Worldwide AIXM 5.1 Static Data Exchange
2. Worldwide Digital NOTAM Data Exchange
AIM Unchained! (COMSOFT Roadmap)

- 2015/16 -
  AIXM 5.1 Interoperability Trials

- 2016 -
  WFS-T 2.0

- 2016 -
  Digital NOTAM
THANK YOU

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