IDS CRONOS
Industry Experience

Complete Reliable Operable NOtam System

IDS Dynamic AIM Solution

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Presentation Overview

1) **Experience in Dynamic AIS**
   i. Reference Projects
   ii. Origins of CRONOS
2) **xNOTAM Project**
   i. Overview
   ii. Capabilities
   iii. Architecture
   iv. Compliance to Event Specs
3) **The System - CRONOS**
   1) Overview
   2) Logical Architecture
   3) (x)NOTAM
   4) MET
   5) Flight Planning
   6) Briefing
4) **ADQ / ADP**
5) **Conclusions**

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EXPERIENCE in DYNAMIC AIS

CRONOS – IDS Dynamic AIS Management System

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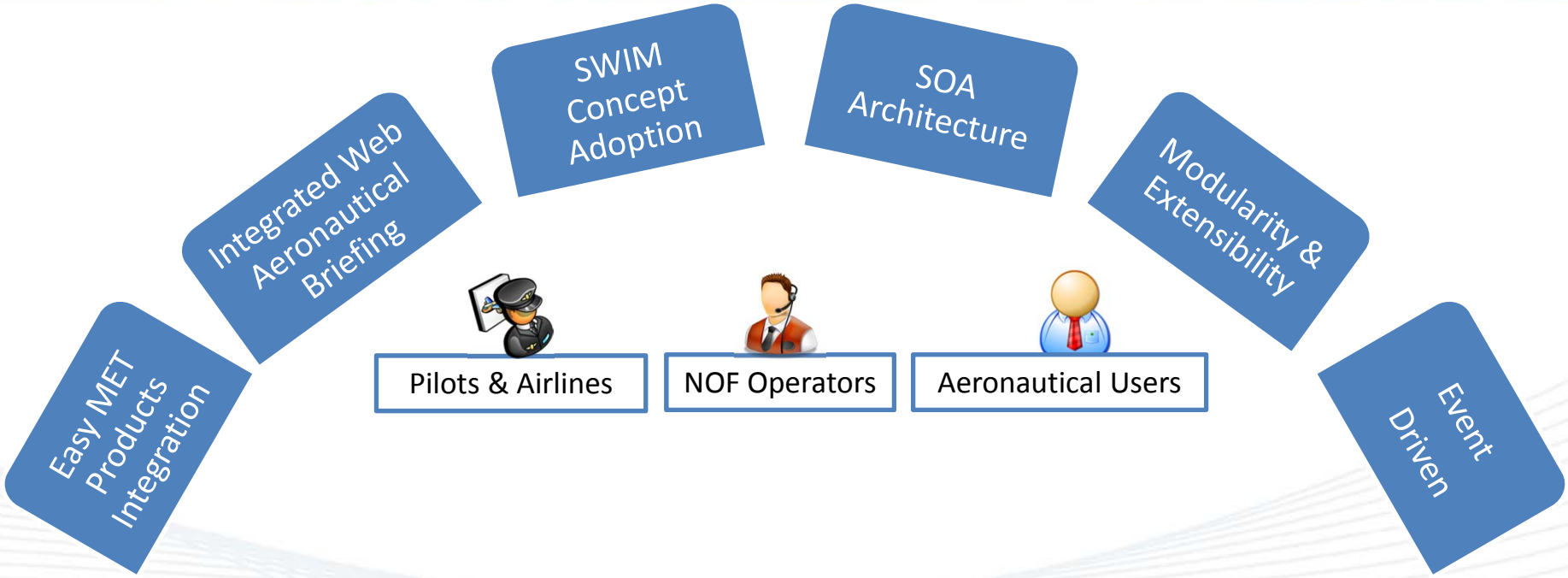
XNOTAM drivers



- ***Deeply Integrated within IDS AIS System (no duplicated data, PLX integrated)***
- ***Web Service oriented***
- ***Graphical interaction with data on WEB GIS***
- ***Static database integration***

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IDS support and contribution

- OGC OWS-8/OWS-9:
  Contribution to the implementation of the module for the « *dissemination* of Digital NOTAM: IDS Broker

- Eurocontrol Digital NOTAM Event Specification Focus Group:
  presentation of Digital NOTAM (compliant Event Specification 1) support for the evolution of Event Specification 2
- EUROCONTROL "Digital NOTAM and Digital Integrated Briefing Support" (WP 13.2.2):
  support to the definition of validation plan &report relevant to the Digital NOTAM e *digital briefing*

SESAR – Support to ENAV on WP7 and WP13

- SESAR SWIM Demo:
  dissemination of Digital NOTAM via SWIM
- SWIM Master Class:
  implementation of communication interfaces with CFMU via B2B Services

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Dynamic AIS Reference Projects

ENAV - Italian ANSP
Digital NOTAM Project

TTCAA - Trinidad & Tobago ANSP
NOTAM, MET, FPL, & PIB

AEROTHAI - Thailand ANSP
NOTAM, MET, FPL, & PIB

Aerocivil – Colombia ANSP
NOTAM, MET, & PIB

CAAB – Botswana ANSP
NOTAM, MET, FPL, & PIB

IDAC – Dominican Republic ANSP
NOTAM, MET, FPL, & PIB

NACL – Zambia ANSP
NOTAM, MET, FPL, & PIB

NAATC – Curacao ANSP
NOTAM, MET, FPL, & PIB

Oro Navigacija – Lithuania ANSP
NOTAM, MET, & PIB

JCAA – Jamaica ANSP
NOTAM, MET, FPL, & PIB

Open Geospatial Consortium
OWS-8 (2011) & OWS-9 (2012)

EUROCONTROL
Digital NOTAM Event Specification Focus Group

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Introduction to CRONOS

Traditional NOTAM Management System

- NOTAM, OPMET, FPL management & dissemination
- minSDO AIXM Database
- Briefing Functionality
- High Availability & Replication
- AMHS & AFTN Interoperability

Digital NOTAM System

- Digital NOTAM management
- Full SDO AIXM5.1
- Wizard FPL Creation
- Advanced Briefing
- SWIM interfaces

CRONOS
Aeronautical Information Management System

- Event driven Dynamic AIS data management
- Advanced Briefing Functionality
- Full SDO AIXM 5.1 Database
- SWIM services and AMHS & AFTN
- High Availability Architecture
- Dual Environment for NOTAM and D-NOTAMs

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EXPERIENCE in DYNAMIC AIS

CRONOS – IDS Dynamic AIS Management System

xNOTAM

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xNOTAM Overview

- **ENAV** together with **IDS** has been cooperating on a three-year Project (divided in 3 phases) aimed at implementing a prototype for NOTAM messages digitalization according:
  - AIXM 5.1 standards
  - AIXM 5.1 temporality model
  - GML standards

- The aim of the **xNOTAM Project** is to provide a framework, resources and substantiated proof-of-concept of digital NOTAM concept, in order to support an accurate and always up-to-date common situational awareness of aeronautical operations environment

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xNOTAM Project

- ***xNOTAM Phase 1***:
  - Implementing Dynamic Database linked to AeroDB
  - Traditional NOTAM acquisition and digital translation
- ***xNOTAM Phase2***:
  - Flight Plans and Pre-Flight Information Bulletin
  - Enquiry of NOTAM Messages (Dig… Format)
  - Map Widget Implementation for Web
- ***xNOTAM Phase 3***:
  - Digital NOTAM Aeronautical Event Pro…

```
A3322/06 NOTAMN
Q)LIXX/QXXXX/IV/M/E/000/999/400
7N01358E330
A)LIMM LIRR LIBB
B)0607092045 C)0607092115
E)SPECIAL NOTICE: GERMANY 2006
FIFA WORLD CUP -
WINNER :  ITALY
CAMPIONI DEL MONDO
CHAMPIONS OF THE WORLD
MEISTER DER WELT
CHAMPIONS DU MONDE
CAMPEONES DEL MUNDO
CAMPE/ES DO MUNDO
MESTERE AV VERDENEN
KAMPIOENEN VAN DE WERELD
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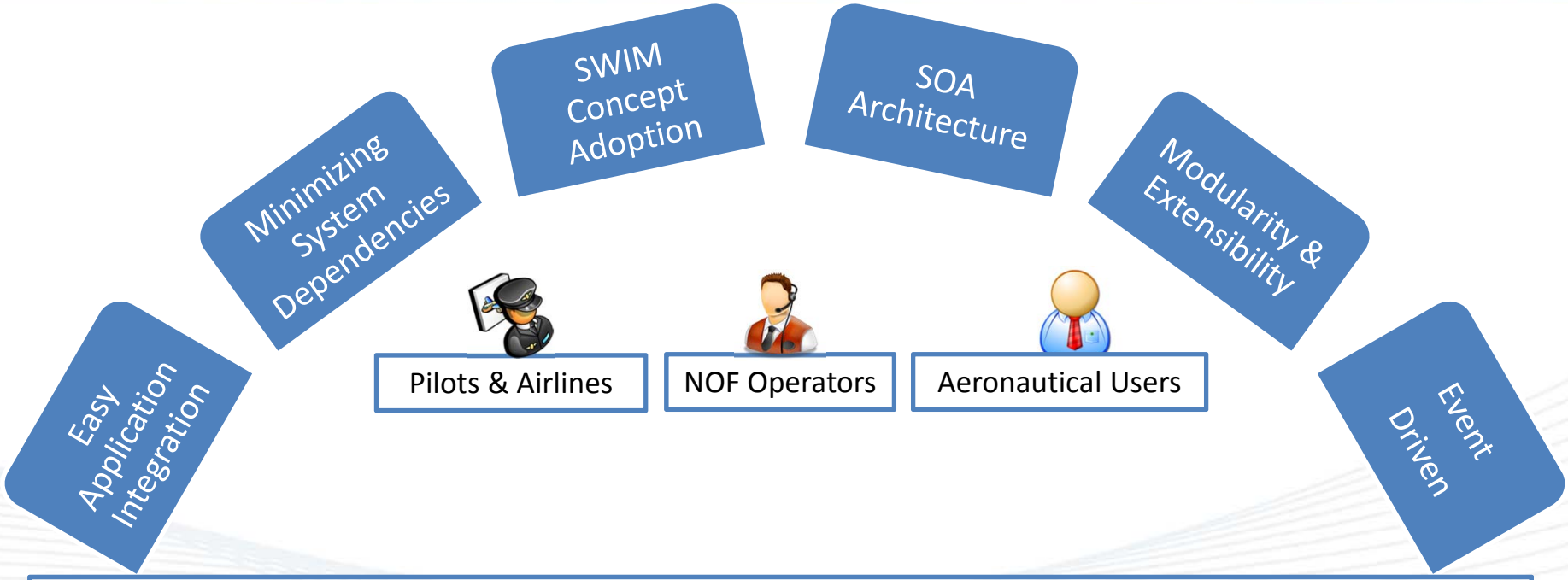
xNOTAM ENAV project



- ***Enav Project results***
  - **has been tested with AIS & NOF Operators**
  - **the results have been tracked – the success of the overall Project identifies other requirements to be implemented, such as management of Events even for static data**
  - **Once more, this project has proved the constructive partnership between ENAV and IDS**
  - **ENAV potentially could be among the first to go digital**

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Compliance to Event Specifications

- ***All Events included into ECTL – Digital NOTAM Event Specification, including the ones defined as "work in progress"***

Published special activity area – Activation	Published ATS Airspace – Activation or Deactivation	Ad-Hoc special Activity area – creation
Ad-Hoc ATS airspace – Creation	Route Portion Closure	Route Portion Opening
Aerodrome Closure	Runway Closure	Navaid unserviceable
New Obstacle	Other Event	
Withdrawn Obstacle	**Taxiway Closure**	**Airport Surface Contamination**

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ENAV CONTACT

- For any question regarding the result of the project you can contact :

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Air Navigation Service Department

Aeronautical Information Service

Head of Aeronautical Data Management/Quality and Production Unit

giulio.melilli@enav.it

IDS CRONOS SYSTEM

CRONOS – IDS Dynamic AIS Management System

CRONOS

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CRONOS Overview

- *Single Product*
  - *Inherits core capabilities of each product*
  - *Repositions these capabilities to reflect the future paradigm of AIM*
- *Event Driven data management of NOTAM, D-NOTAM, MET, and FPL information*
- *Advanced briefing capabilities*
- *Fully Integrated with AIXM 5.1 database*
- *Interoperable with AMHS, AFTN & SWIM and b2b Svcs*
- *Interoperable with other IDS's Tools*
- *High-availability deployment configuration*

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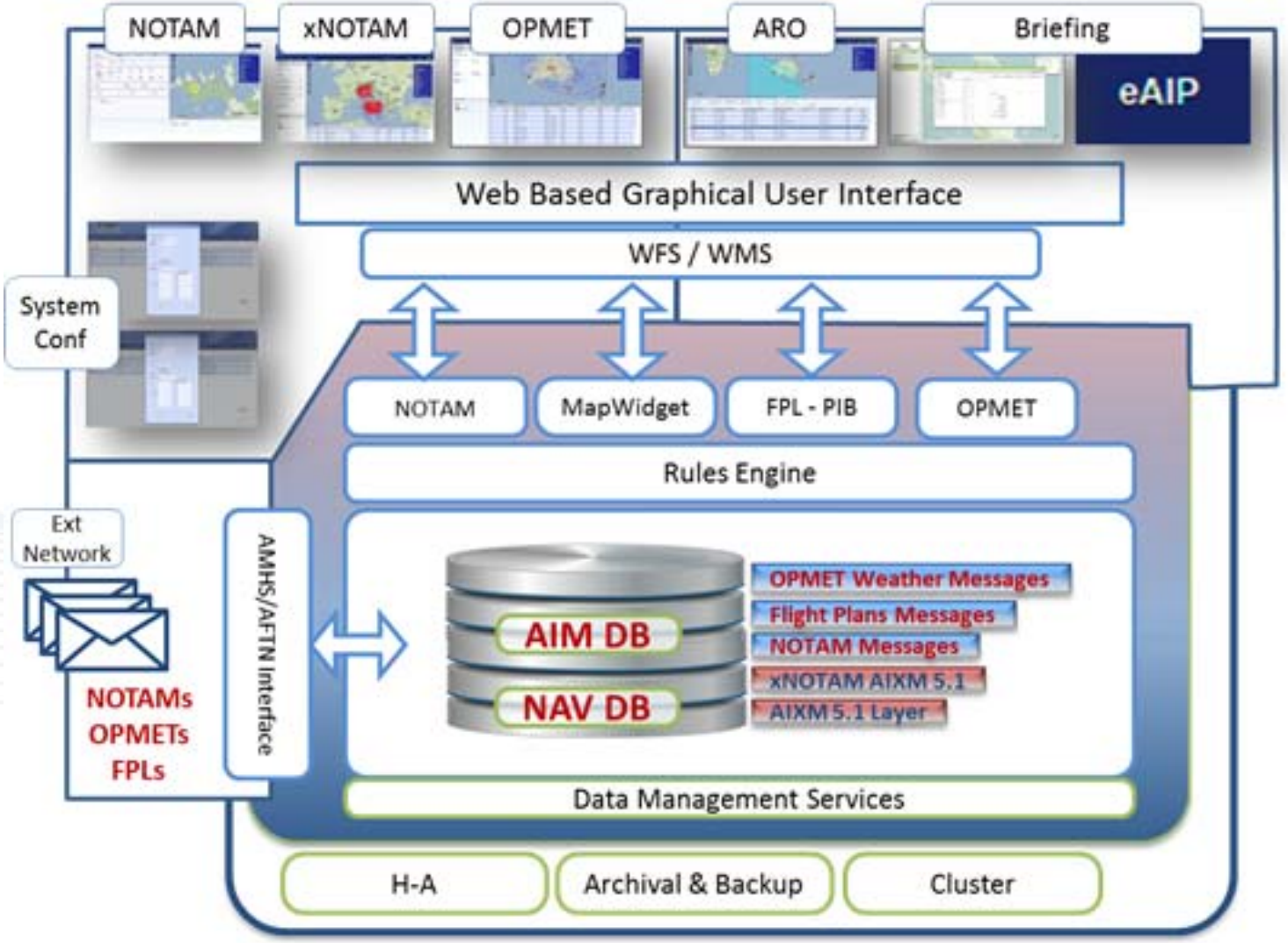
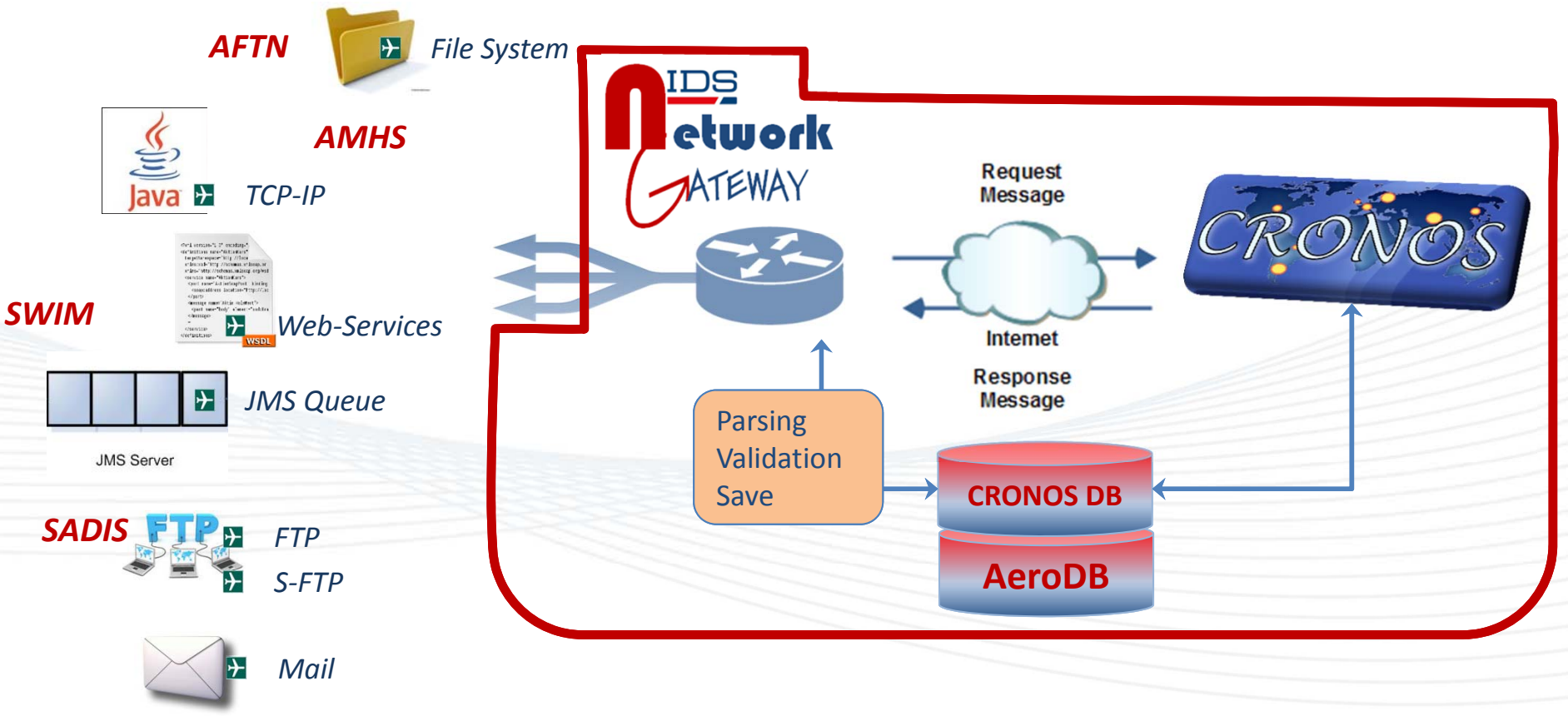
CRONOS' Architecture



CRONOS Network Gateway

Integration and Communication Patterns



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Traditional NOTAM Capabilities

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NOTAM Module

- Management of NOTAM MSGs: NOTAM (N, R, C), SNOWTAM, ASHTAM, BIRDTAM
- ICAO compliant forms for the creation of all NOTAM types
- Validation engine for both domestic and foreign NOTAMs
- NOTAM distribution by series
- Automatic Checklist generation
- Automatic validation of foreign Checklists and RQN issuance
- Automated response to received RQN/RQL/RQO messages
- Flexible NOTAM querying & reporting
- Geographical visualization of NOTAMs

MET Module

- Management of Meteo MSGs: METAR(SA), SPECI(SP), TAF(FT/FC), SIGMET(WS/WC/WV), AIRMET(WA), ARFOR(FA), GAMET(FA), SYNOP(SM),AIR Report (UA), WINTEM(FB), ADWarnings(WO), Tropical Cyclone Advisory(FK), & Volcanic Ash Advisory(FV)
- Sends/receives MET messages to/from AFTN/AMHS and SADIS
- WMO compliant forms for the creation of MET messages
- Validation engine for both domestic and foreign MET messages
- Flexible MET querying & reporting
- Automated response to RQM

Flight Plan Module

- Management of ARO MSGs: FPL , SPL, CHG, DLA, CNL, DEP, ARR, EST, CDN,ACP, ALR, RCF, CPL, LAM, RQP, & RQS
- Sends/receives FPL messages to/from AFTN or AMHS
- ICAO DOC 4444 compliant forms for FPL message creation (including 2012 FPL format)
- Validation engine for both domestic and foreign FPLs
- Support for Repetitive Flight Plans [RPL]
- Flexible FPL querying & reporting
- Geographical FPL Route visualization
- Automated response to received RQS/RQP messages

Briefing Module

- PIB query types: Narrow Route, Standard Route, Airspace, & Aerodrome
- PIB direct from FPL
- PIB contains consolidated NOTAM & MET information
- Customizable PIB formats
- PIB output in ASCII, HTML/XML, PDF

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Digital NOTAM Capabilities

Aerodrome (***Runway*** and ***Taxiway***)

- Closure
- Limitation
- *Other Event*
- *Trigger*
- Airport Surface Contamination

Airways (Routes)

- Closure
- *Opening*
- *Other Event*
- *Trigger*

ATS Airspace

- Activation / De-Activation
- Creation
- ***Other Event***
- ***Trigger***

SAA Airspace

- Activation / De-Activation
- Creation
- *Other Event*
- *Trigger*

NavAIDS (Waypoints)

- Creation
- Unserviceable
- *Other Event*
- *Trigger*

Obstacle

- Obstacle Creation
- Obstacle Withdrawn
- *Obstacle Other Event*
- *Obstacle Trigger*

Airways (Routes)

- Route Portion Closure
- Route Portion Opening

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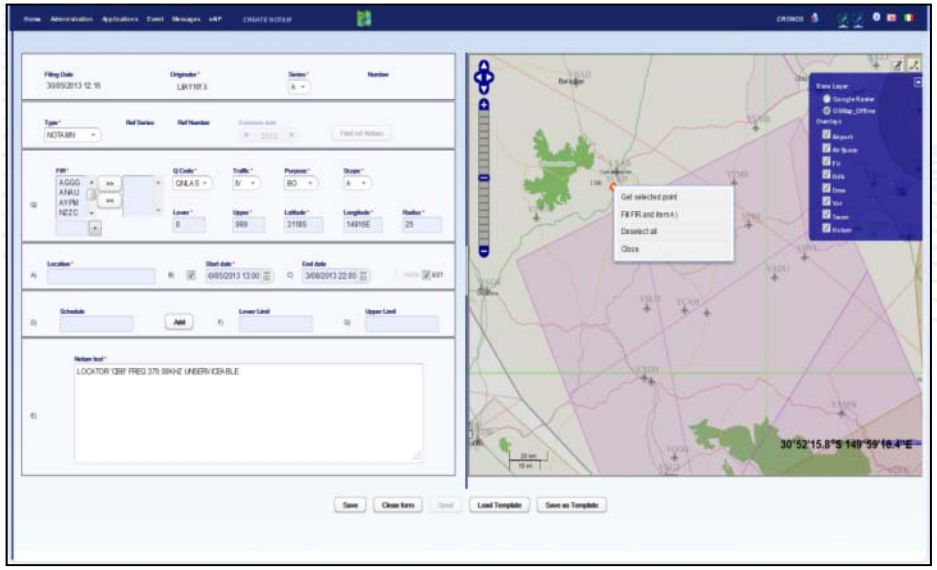
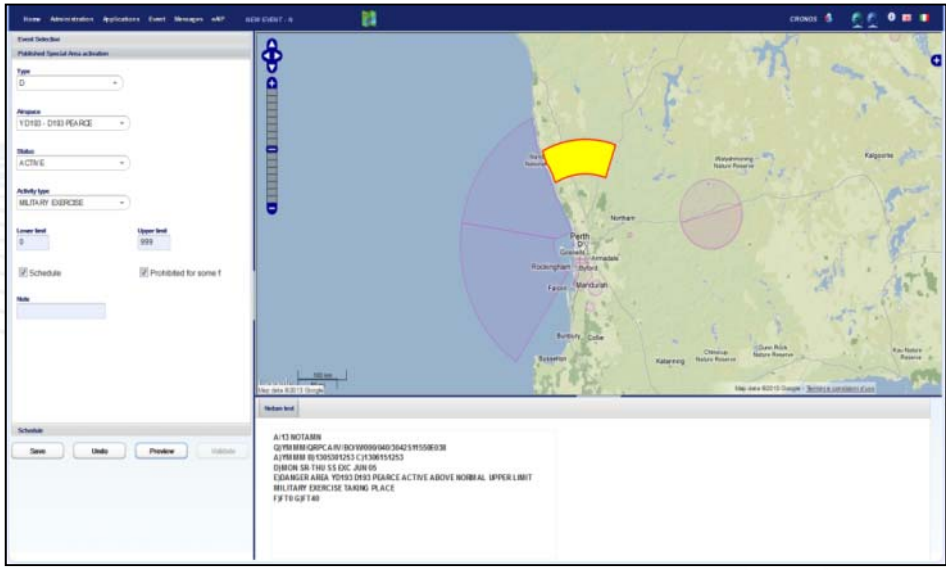
Aeronautical Message Publishing

- *NOTAM proposal creation/update*
- *NOTAM dissemination*
- *NOTAM Replacement*
- *NOTAM Cancelation*
- *x-TAM Lists*
- *Traditional ICAO Templates*
- *Message Templates*
- *Aeronautical Event creation/update*
- *Digital NOTAM dissemination*
- *Digital NOTAM Replacement*
- *Digital NOTAM Cancelation*
- *Events' List*
- *Wizard-driven creation process*
- *Enhanced interaction with Web GIS components and aeronautical data*





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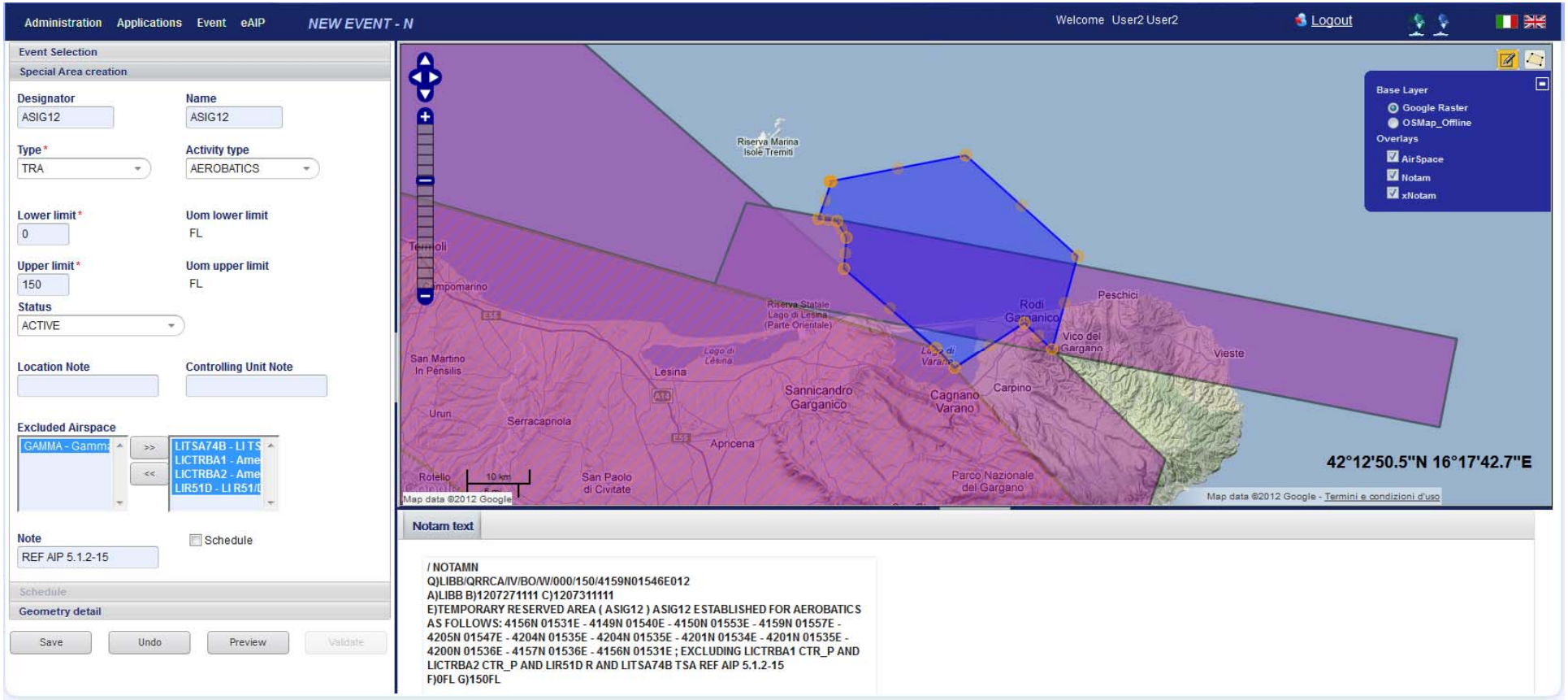
Aeronautical Digital Message Publishing



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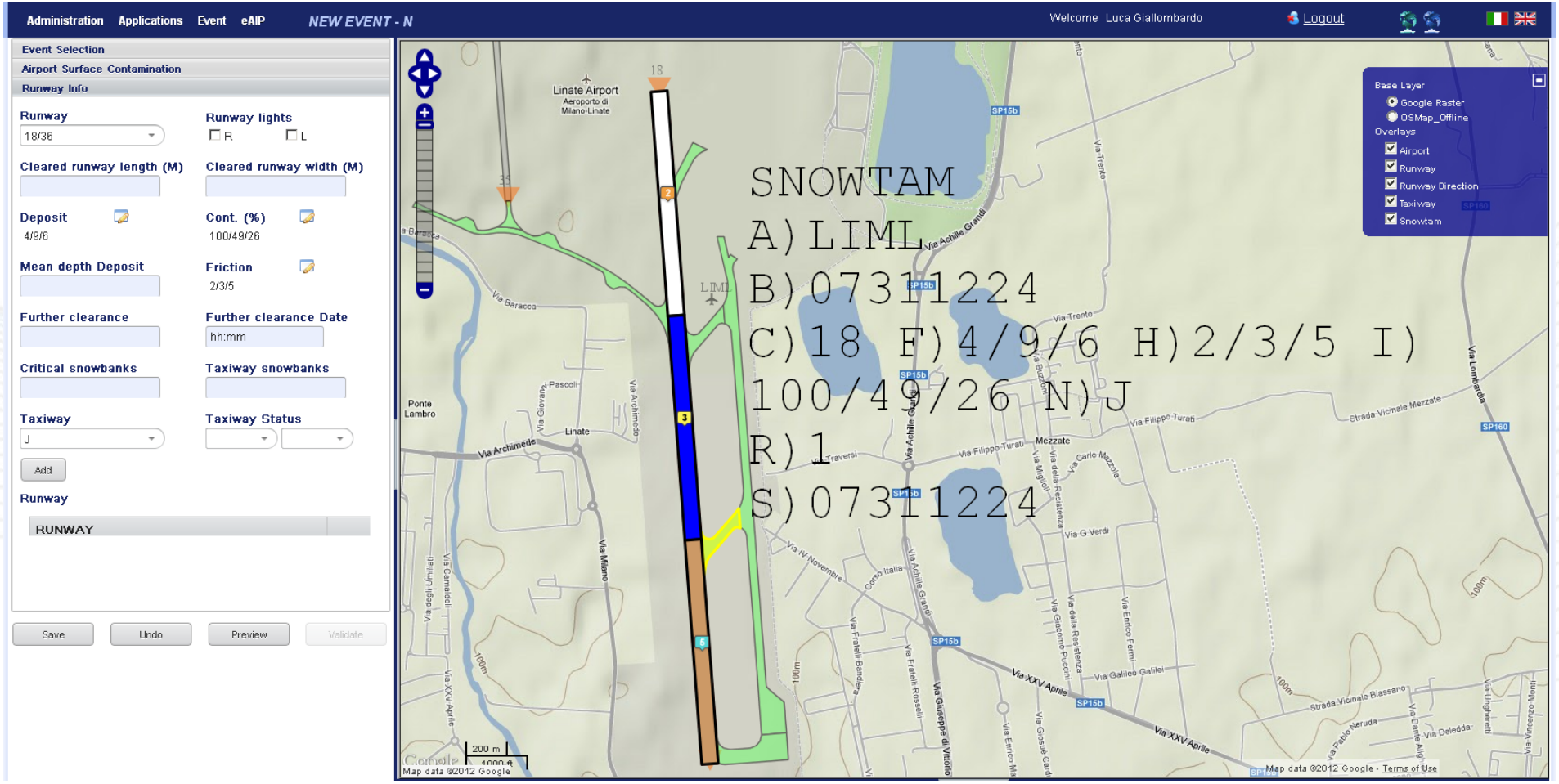
Aeronautical Digital Message Publishing



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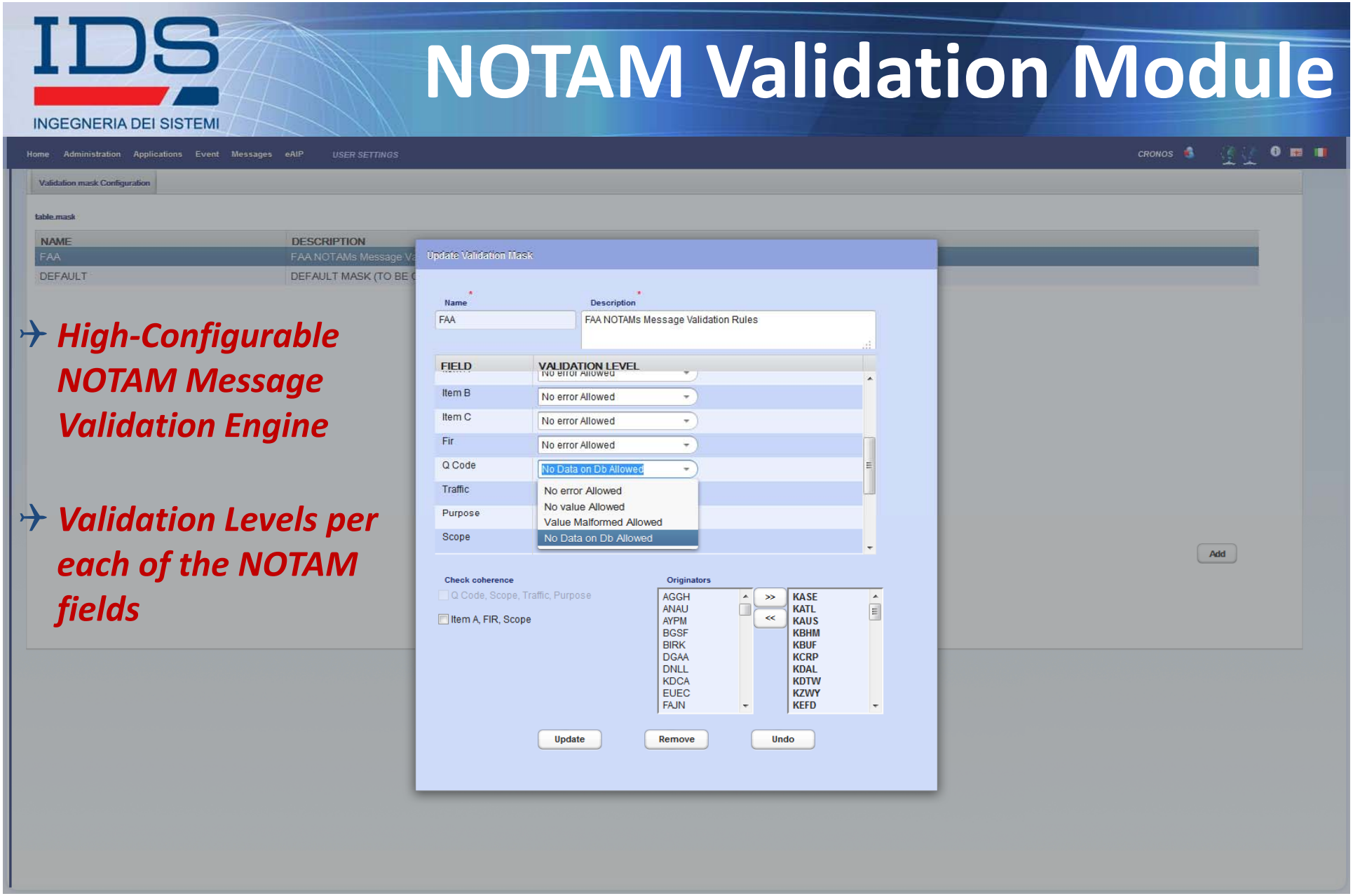
NOTAM Validation Module

- *High-Configurable NOTAM Message Validation Engine*
- *Validation Levels per each of the NOTAM fields*



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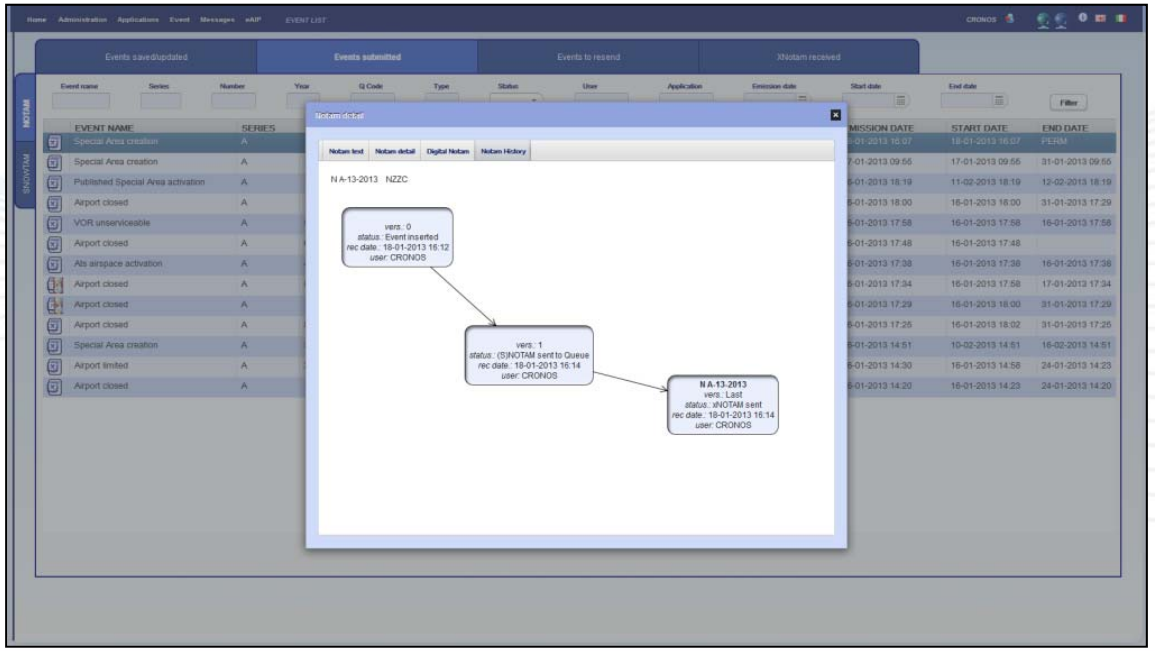
Aeronautical Message Auditing

- *x-TAM Lists per status*
  - *Saved/Updated*
  - *In sending*
  - *Submitted*
  - *Received*
  - *Invalid Received*
- *NOTAM History*
- *Message Auditing*
- *Event List per status:*
  - *Saved/Updated*
  - *In Sending*
  - *Submitted*
  - *Received*
  - *Invalid Received*



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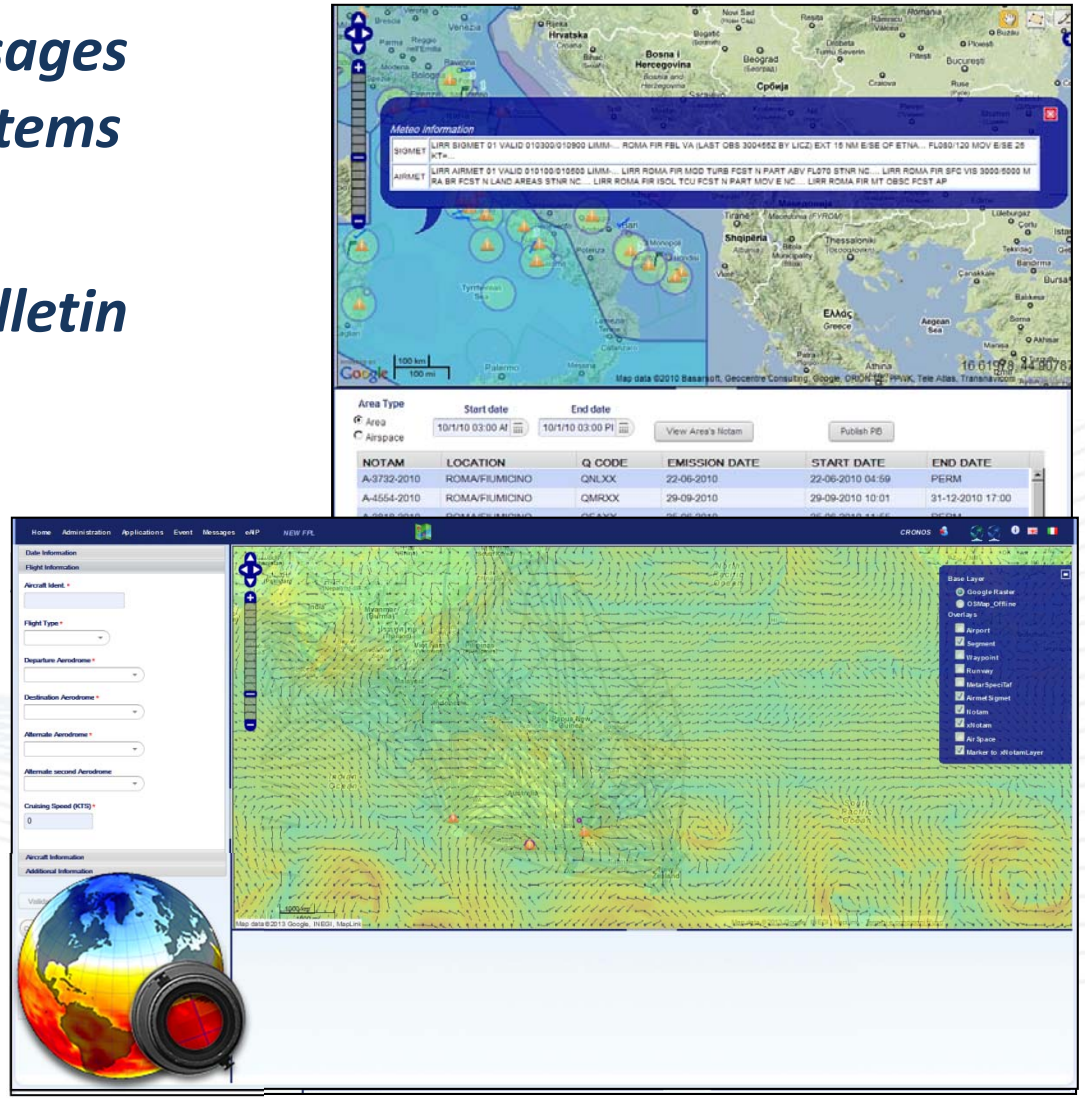
MET Capabilities

- *Collection of OPMET messages and data from External Systems*
- *Fully compliant MET bulletin collection and distribution*
- *Storage of graphical products*
- *WebGIS visualization of information*



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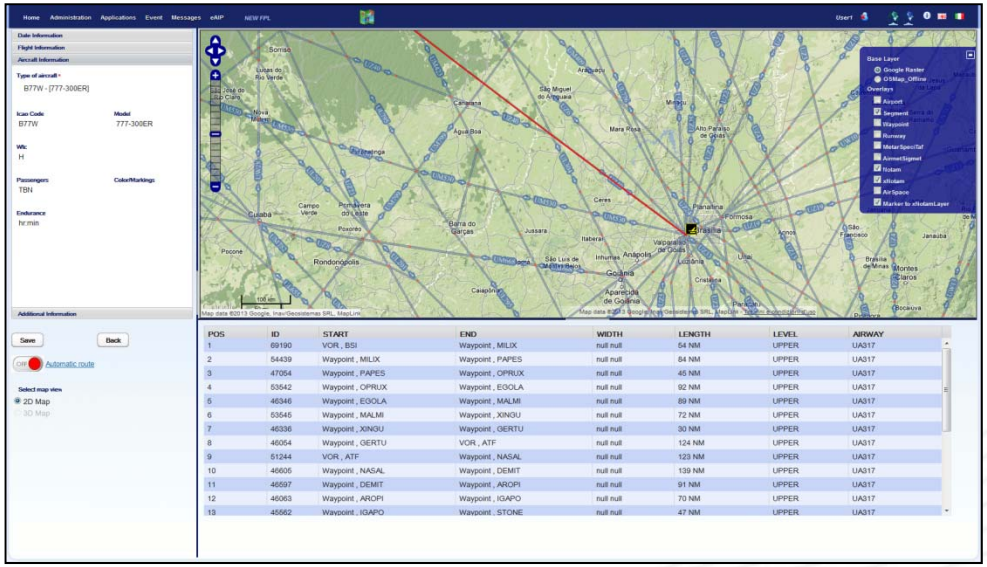
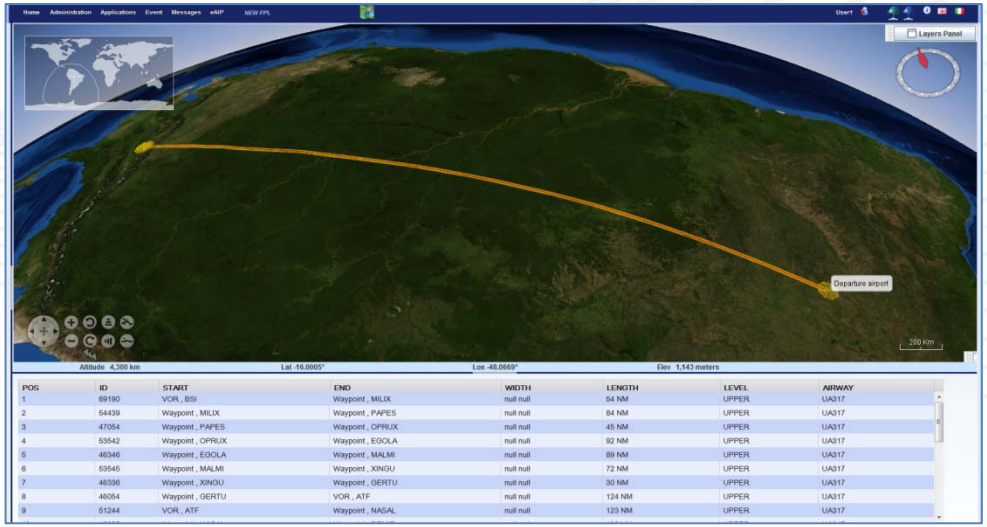
Flight Planning Capabilities

- *FPL as a Digital Object to which linking updates*
- *Flight Plan Registration*
  - *Wizard based tool*
  - *Automatic Routing*
  - *FPL Route Assistance using web-GIS interaction and visualization*
- *Flight Plan 3D Visualization*
- *FPL approval process*
- *PIB from FPL production*





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Flight Planning Interoperability

- ***SWIM Standard – CFMU IFPS interoperability***
  - ***Compose Flight Plans by using published aeronautical valid data***
  - ***Propose Route for approval***
  - ***Validate Route***
  - ***Send FPL and Store Flight Object***
  - ***Get Response messages (ATS) from CFMU***
    - ***ACK***
    - ***REJ***
    - ***DLN***
    - ***CHG…***

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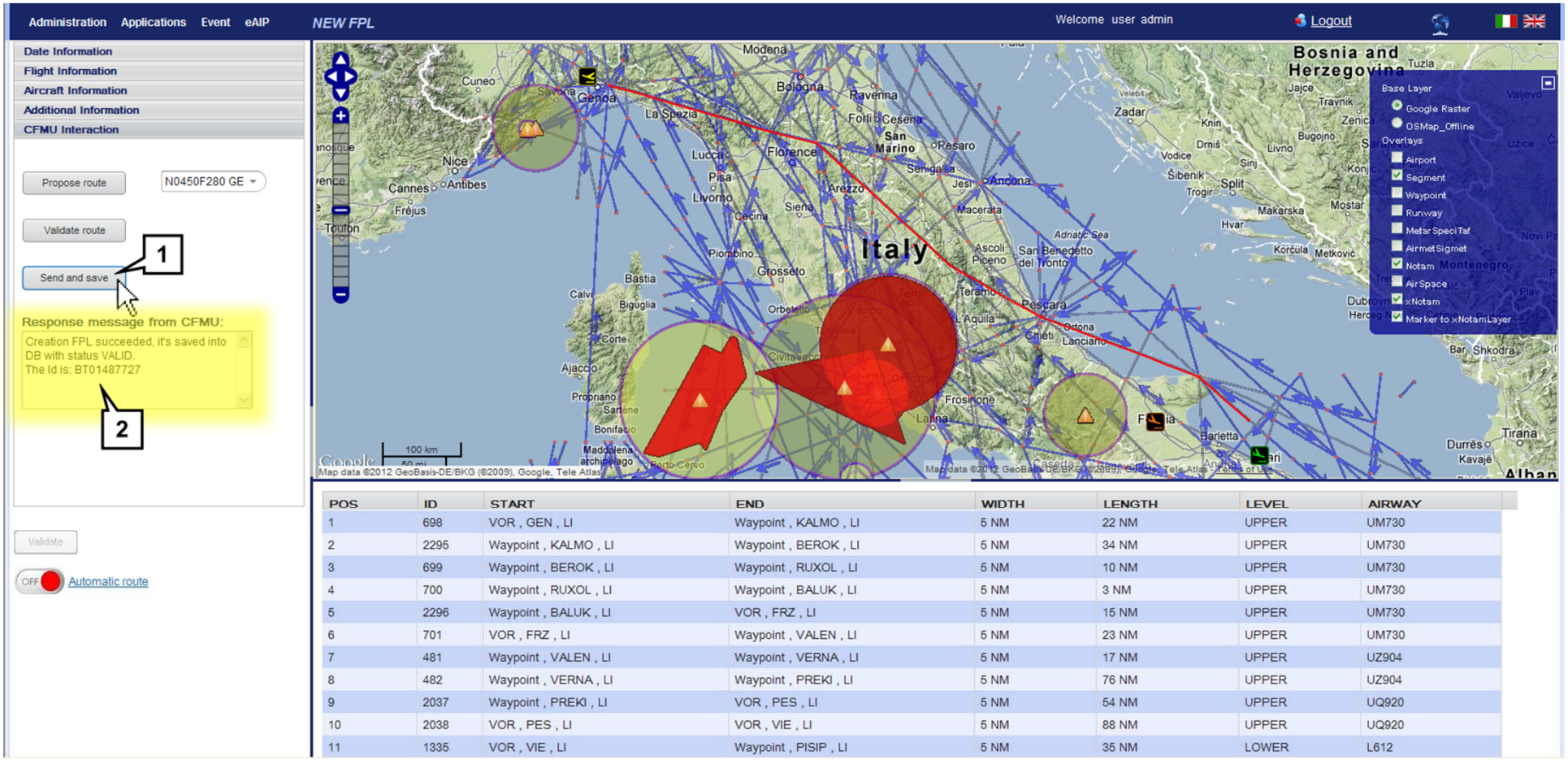
Flight Planning Capabilities

SWIM Standard – CFMU IFPS Interoperability



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1	698	VOR , GEN , LI	Waypoint , KALMO , LI	5 NM	22 NM	UPPER	UM730
2	2295	Waypoint , KALMO , LI	Waypoint , BEROK , LI	5 NM	34 NM	UPPER	UM730
3	699	Waypoint , BEROK , LI	Waypoint , RUXOL , LI	5 NM	10 NM	UPPER	UM730
4	700	Waypoint , RUXOL , LI	Waypoint , BALUK , LI	5 NM	3 NM	UPPER	UM730
5	2296	Waypoint , BALUK , LI	VOR , FRZ , LI	5 NM	15 NM	UPPER	UM730
6	701	VOR , FRZ , LI	Waypoint , VALEN , LI	5 NM	23 NM	UPPER	UM730
7	481	Waypoint , VALEN , LI	Waypoint , VERNA , LI	5 NM	17 NM	UPPER	UZ904
8	482	Waypoint , VERNA , LI	Waypoint , PREKI , LI	5 NM	76 NM	UPPER	UZ904
9	2037	Waypoint , PREKI , LI	VOR , PES , LI	5 NM	54 NM	UPPER	UQ920
10	2038	VOR , PES , LI	VOR , VIE , LI	5 NM	88 NM	UPPER	UQ920
11	1335	VOR , VIE , LI	Waypoint , PISIP , LI	5 NM	35 NM	LOWER	L612

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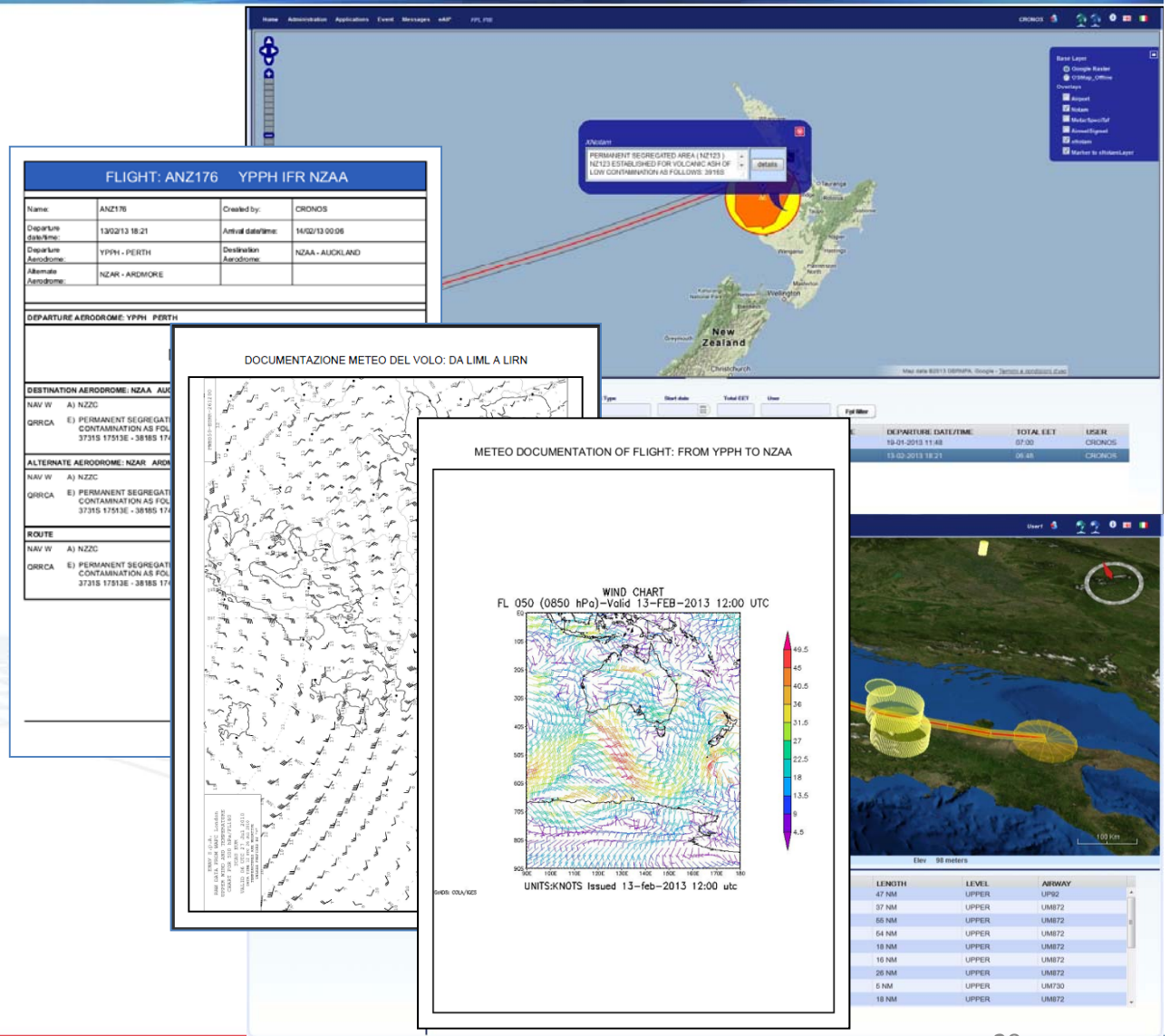
Briefing Capabilities

- *5 Types of PIB:*
  - *FPL*
  - *Area (2)*
  - *Airway*
  - *Aerodrome*
- *PIB Outputs:*
  - *Graphical*
  - *Textual (ASCII)*
  - *HTML, XML, PDF*
- *Incremental Notifications:*
  - *Triggered Email*



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ADQ ADP

CRONOS – IDS Dynamic AIS Management System

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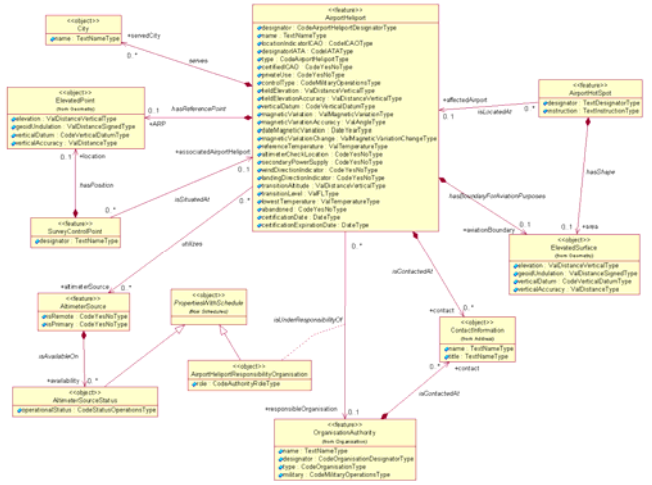
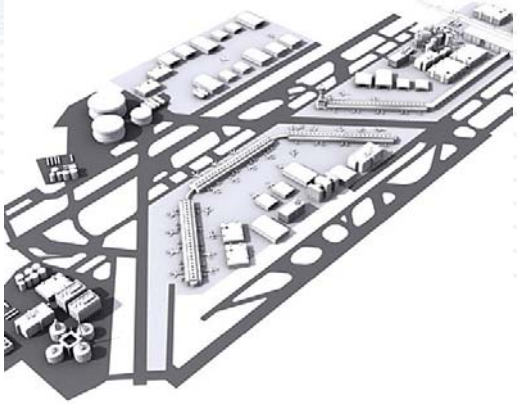
Dynamic Data Integration

- ***What matters is the information, not how it is distributed or organized in DBs***
  - ***User Assisted***



  - ***Product Assisted***



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Dynamic Data Integration Event Concept

- *Has a time of validity*

- *Represents Changes to:*
  - *Aeronautical data*
  - *Meteorological data*
  - *FPL data*

EVENT

- *May be Notified via Aeronautical Networks:*
  - *AMHS*
  - *WS*
  - *AFTN*

- *May be published via different communication paths:*
  - *eAIP, AIP, Chart*
  - *Web*

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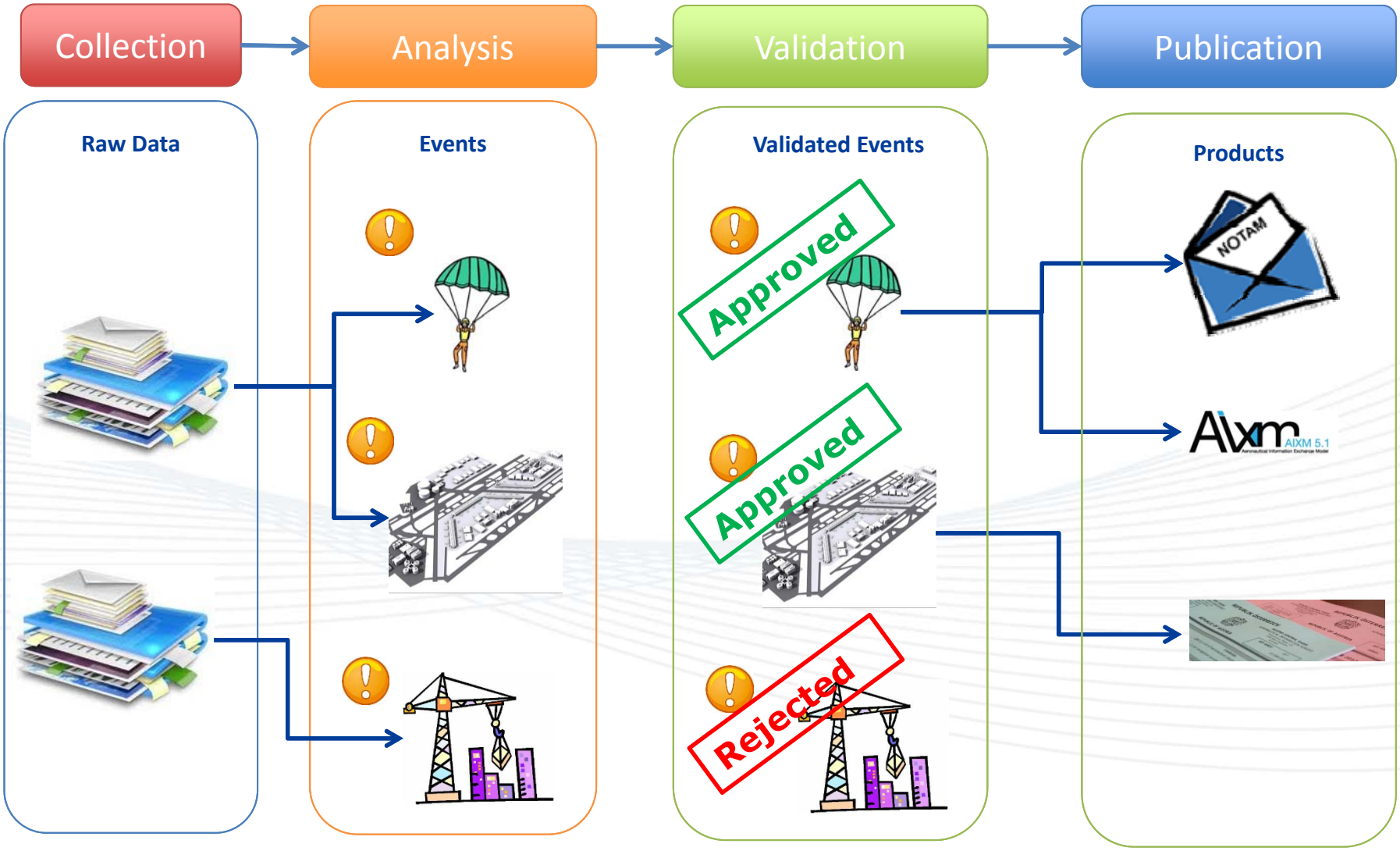
Dynamic Data Integration



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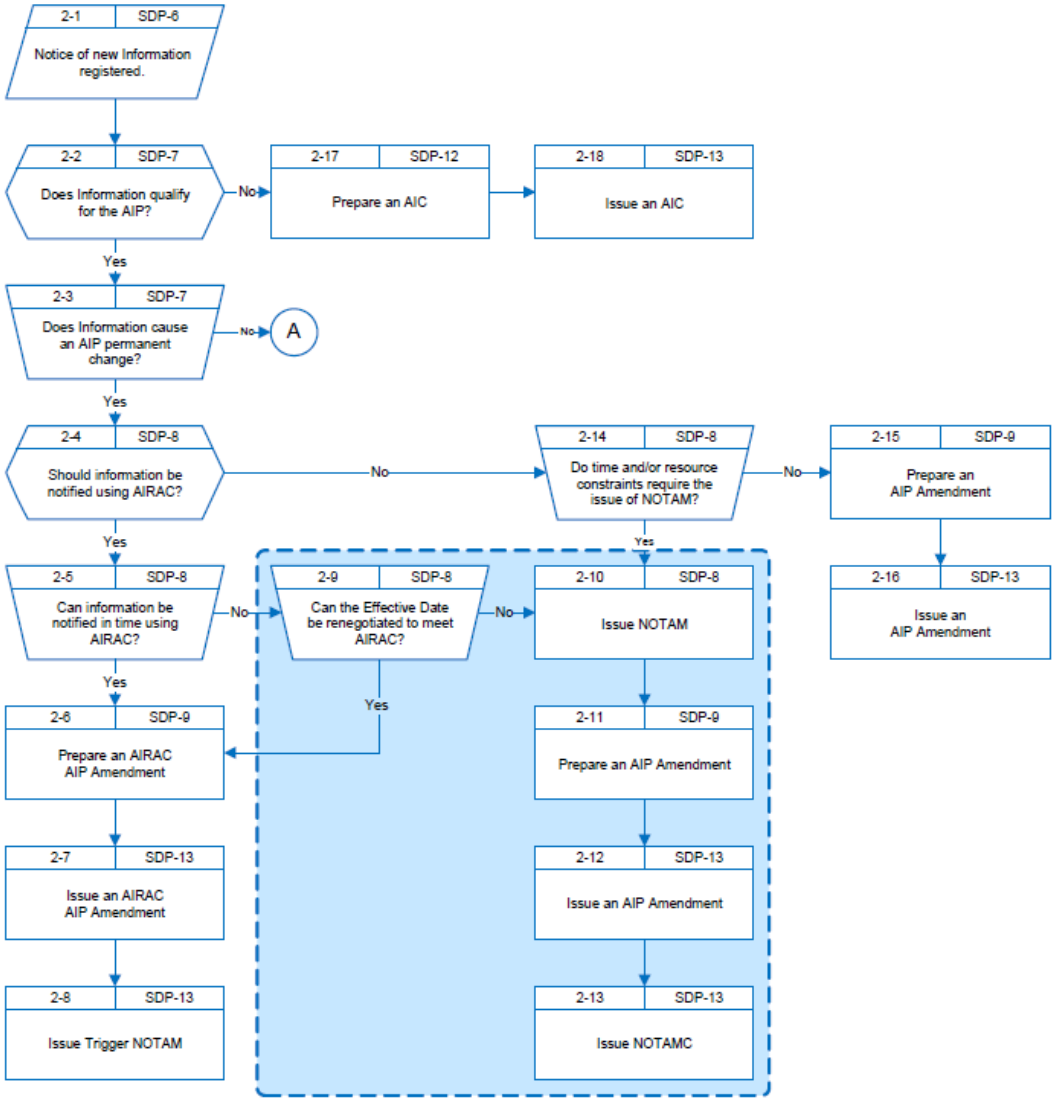
Dynamic Data Integration ADP



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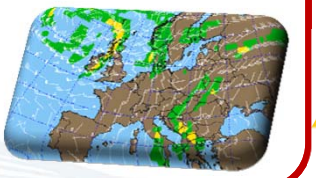
ADQ/ADP Chain *as is*

Private Pilot

Briefing

FPL Submission

Aviation Weather



INTERNET

Not Compliant to ADQ IR Articles:

- *Art. 6 – Quality of the data*
- *Art. 8 – Requirements on tool and software*
- *Art. 9 – Data Protection*

NOTAM Proposal via FAX

Data Originator

FAX Receival & Data Entry

Data Receiver, AIS Admin

Not Compliant to ADQ IR Articles:

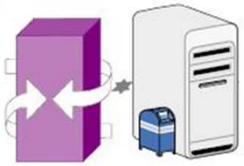
- *Art. 6 – Quality of the data*
- *Art. 8 – Tools and Software*
- *Art. 9 – Data Protection*

- *AIP Publications*
- *NOTAM Creation/Validation/Submission*

AIS Operator

Not Compliant to ADQ IR Articles:

- *Art. 4 – dataset*
- *Art. 5 – data exchange*
- *Art. 6 – Data quality*
- *Art. 8 – Tools and Software*
- *Art. 9 – Data Protection*



AFTN AMHS

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ADQ/ADP Chain *to be*

Private Pilot

Advanced Briefing

FPL Submission

- *Digital Entry Point with graphical selection of Aeronautical Static Published Data*
- *Metadata (Date/Time of the Information)*
- *Structured ITEM E / Aeronautical Event*
- *CRC*

PLX

Data Originator

Digital Aviation Weather

INTERNET

CRONOS

AIS Operator

Data Receiver

AIS Admin

AeroDB Suite

AMHS

Client

Request Message

Internet

Response Message

IFPS

Web Service

- *(Digital) NOTAM with graphical selection of Aeronautical Static Published Data*

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Advantages

- **Aeronautical Information Briefing**
  - *Distributed Access to Static and Dynamic Aeronautical Information in a common and integrated environment*
  - *eAIP connectivity*
  - *Incremental Notification Updates for Pilots*

- **Auditing**
  - *Efficient Tracking of the main activities on aeronautical data (Who does what, and when)*
- **Technology**
  - *MET Interoperability*
  - *SOA – Compliancy to SWIM standards ready to be used*
  - *Interoperability system-to-systems and b2b services*
- **Strategic – Leadership in implementing Digital NOTAM**
  - *Leadership in improving data quality and integrity*

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Conclusion

- ***…..Proven system for traditional message management***
  - ***….compliance to all "+" Digital NOTAM event specifications***
    - ***….event driven data management***
      - ***….SWIM Compliance***
        - Dedicated GUIs to CFMU interaction

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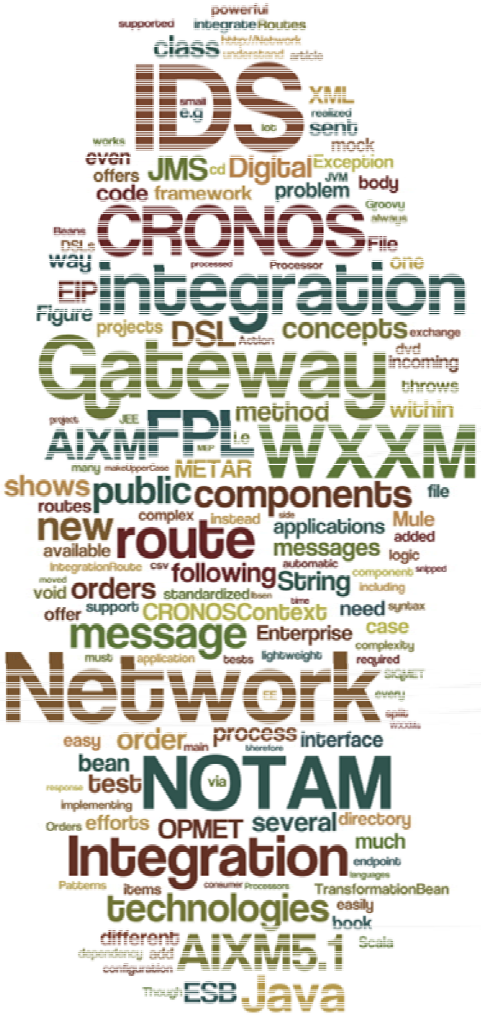
Implementation Services & Architecture

LIVE DEMO



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