



SESAR SWIM SUCCESS STORIES

SESAR SWIM Best in Class awards ceremony

Brussels, EUROCONTROL Headquarters (EUROPA Conference Room)

10 December 2015

SESAR SWIM Success Stories – Moving towards implementation

What was a high-level concept a few years ago, system wide information management (SWIM) is now becoming a reality!

The four editions of the SESAR SWIM Master Class have largely contributed to progressing SWIM concepts and standards into advanced prototypes and solutions in all ATM areas such as meteorological information, airport operations, extended arrival management, the integration of remotely-piloted aircraft systems, etc.

This remarkable achievement could only happen with the involvement of dedicated pioneers.

**Discover here a selection of these SWIM success stories.
More stories are welcome!**

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Solution name: DCB Hotspot Predictor

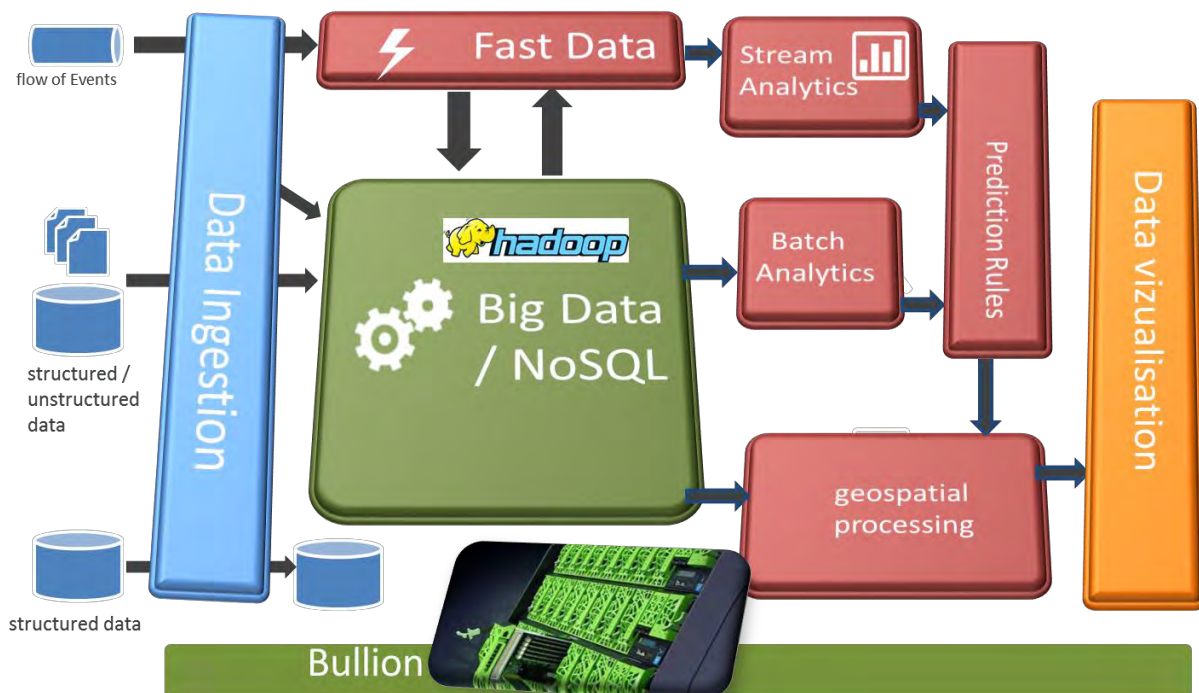
Point of contact: Guy Le Roux guy.le-roux@atos.net

Developed by Atos/Fastconnect, the **DCB HotSpot Predictor** is a big data analytics engine for the airport terminal manoeuvring area (TMA). A learning phase is based on a post-ops dataset archive at final approach fixes and departure waypoints, including last of standard terminal arrival route (STAR) final approach point (FAP) and first of standard instrument departure (SID). Once the engine is configured for a specific airport TMA, it subscribes to a surveillance information distribution service. Real-time predictions on airport capacity imbalance are based on learned correlations between flight patterns at waypoints.

The '**DCB HotSpot Predictor**' and its data analytics engine aim to:

- indirectly and independently predict demand and capacity balancing (DCB) imbalances in airport airside operations;
- predict the need to generate departure planning information (DPI) messages to the network operations plan (NOP) on behalf of a non-collaborative decision-making (CDM) airport.

Functional architecture of the DCB HotSpot Predictor:

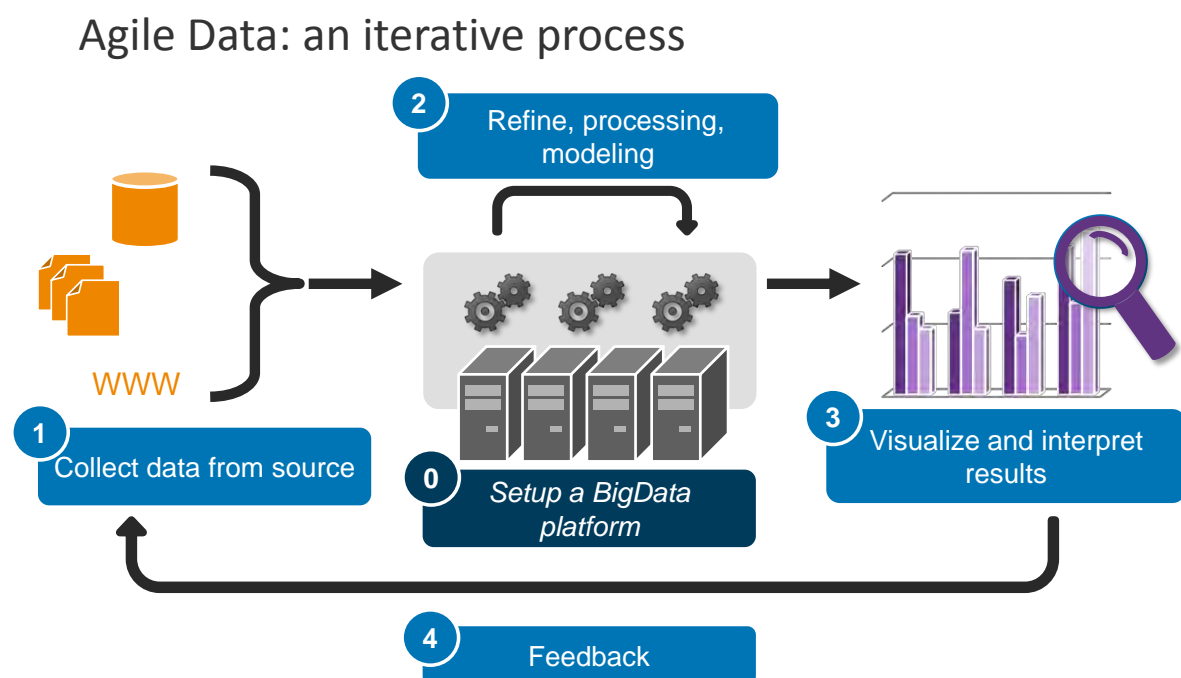


The project includes two main steps:

1. Analysis of data in order to identify patterns, investigate additional data sources, produce a model and rules;
2. Implementation of these rules on a production system in order to achieve predictive analysis based upon live data.

The analysis phase is an iterative process so that the data analysis can be refined and data sources can be adjusted according to needs, all with a view to improving the prediction capabilities.

The following diagram describes the global methodology for an agile data analysis process:



You will find more details on Fastconnect capabilities on its web site:

www.fastconnect.fr/fr/nos-offres/bigdata

AVITECH

Solution name: Avitech's civil and military SWIM solution

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Since 2005, Avitech has been progressively developing a **SWIM solution which conforms to the SWIM software architecture requirements** of the European ATM Master Plan, and the ICAO Manual on SWIM Concept (Doc 10039-AN/511). In this time, the company has served the civil and military aviation market, continuously growing, researching and refining its technology to provide its customers with up-to-date, high quality solutions.

Applying a **service-oriented approach** and consistently decoupling providers from consumers of information, we ease your system evolution and increase its flexibility, agility and effectiveness.

Avitech's civil and military SWIM solution seamlessly integrates AIM services, ATM services, MET services and SWIM messaging using a service-oriented approach. The services are also available across the security boundaries between civil and military systems by taking into account necessary protection profiles.



More specifically, the solution:

- is **interoperable** with the Network Manager;
- follows SWIM de-facto standards, such as AIXM 5.1, FIXM 3.0, WMO TT-AvXML 1.0 (IWXXM);
- has server backwards **compatibility**, ensuring easy upgrades;
- includes of air traffic services interfacility data communication and on-line data interchange (OLDI);
- is **compliant** with OGC WFS-T 2.0 and certified as the first in the world.

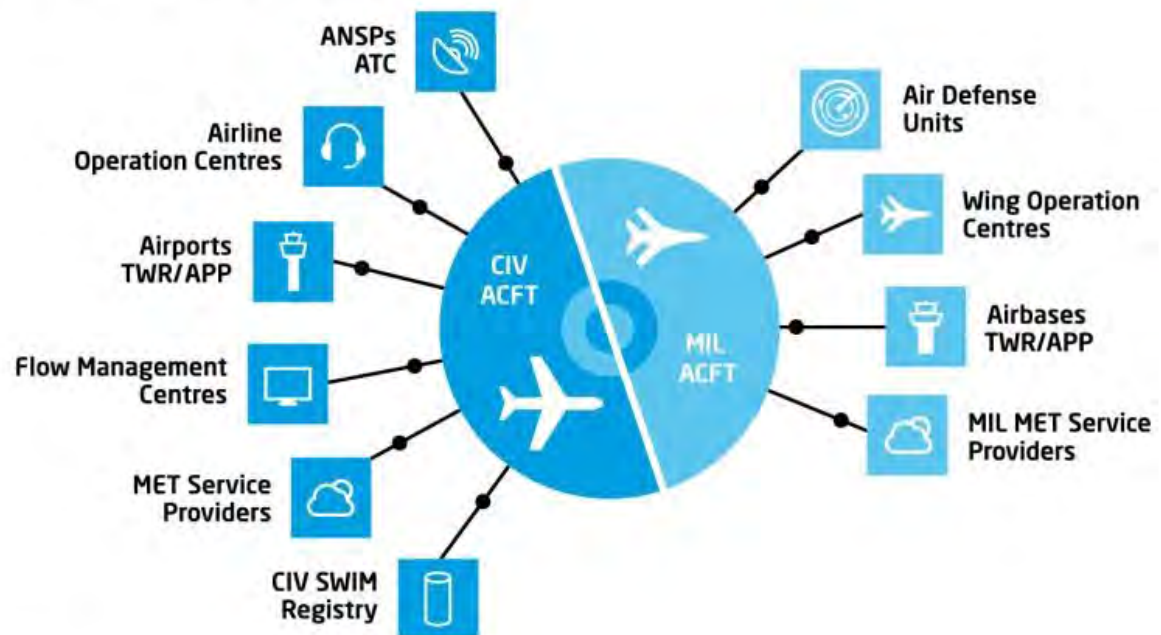
"The use of standards such as AIXM, FIXM, and WXXM shortens implementation time in terms of interoperability and reduces risk for our ANSP and military customers and for us as manufacturer and supplier", said Peter Rudolph, Avitech Director Business Development and Products.

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Avitech SWIM Environment



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EUMETNET

Solution name: MET-GATE

Point of contact: Kamel Rebai Kamel.Rebai@meteo.fr

Guided by the European ATM Master Plan and the SESAR vision of the future ATM system, [Météo France](#), [UK Met Office](#) and [DWD](#) (Deutscher Wetterdienst) came together under the aegis of [EUMETNET](#) to deliver pan-European meteorological services through a system called the **MET-GATE**.

Developed within the **SESAR R&I programme** (SESAR WP11.2), the [MET-GATE prototype](#) respected the following criteria: a single access point, a consistent seamless vision of MET in Europe, **fit-for-purpose MET information** and **SWIM compliance**. The SWIM expertise was secured through the participation of industry represented by [THALES](#) in the WP11.2.

Designed as the one-stop-shop for MET, the **MET-GATE** provides eight SWIM services from classical regulated products to innovative products related to latest scientific fields such as convection, icing and clear air turbulence. The **MET services cooperate through EUMETNET** to ensure best quality possible in the service provided.

From the MET point of view, the **MET-GATE** considerably reduces the effort for any meteorological service provider to make their MET products available for ATM stakeholders in a SWIM compliant way. From the ATM point of view, the MET-GATE masks the complexity of MET data standards, formats and multiple sources, and via a single access point provides user-ready data through SWIM compliant services.

After a “dry run” participation in **2014 SESAR SWIM Master Class**, Météo France proposed and coordinated a European involvement in the 2015 edition of the Master Class with its WP11.2 partners DWD and UK Met Office, under the EUMETNET umbrella. State-of-the-art MET services have been registered in the SWIM registry to compete in the “Service” category.

Following the **SESAR SWIM Master Class Launch event in June 2015**, [Airbus Defence and Space](#), [IDS](#) and [Alticode](#) quickly declared their interest to become clients of MET-GATE. Following initial coordination, minimum support was needed to provide them with easy daily access needed. Thanks to the Master Class, the range of unique clients has expanded, covering a wide spectrum: popularisation of MET services with Alticode, ATM operations with THALES, ATM research with Airbus Defense and Space, ATM

simulation with IDS.

As stated by Eric Petermann, EUMETNET's Executive Director, "the SEAR SWIM Master Class is a unique opportunity to promote state-of-the-art cooperative MET information services at a European level. It allows us to challenge the concept and architecture developed in SESAR with real-world applications. As MET service providers, we have to increase awareness about latest scientific developments and to bring final ready-to-use services to our stakeholders. The interest of such significant ATM actors in the MET-GATE services gives us confidence to build a fully operational MET-GATE system in SESAR's future activities."

ATM stakeholders have already expressed their will to continue cooperation beyond the **2015 SESAR SWIM Master Class**, which could potentially lead further innovation and new business opportunities in this domain of ATM information management.

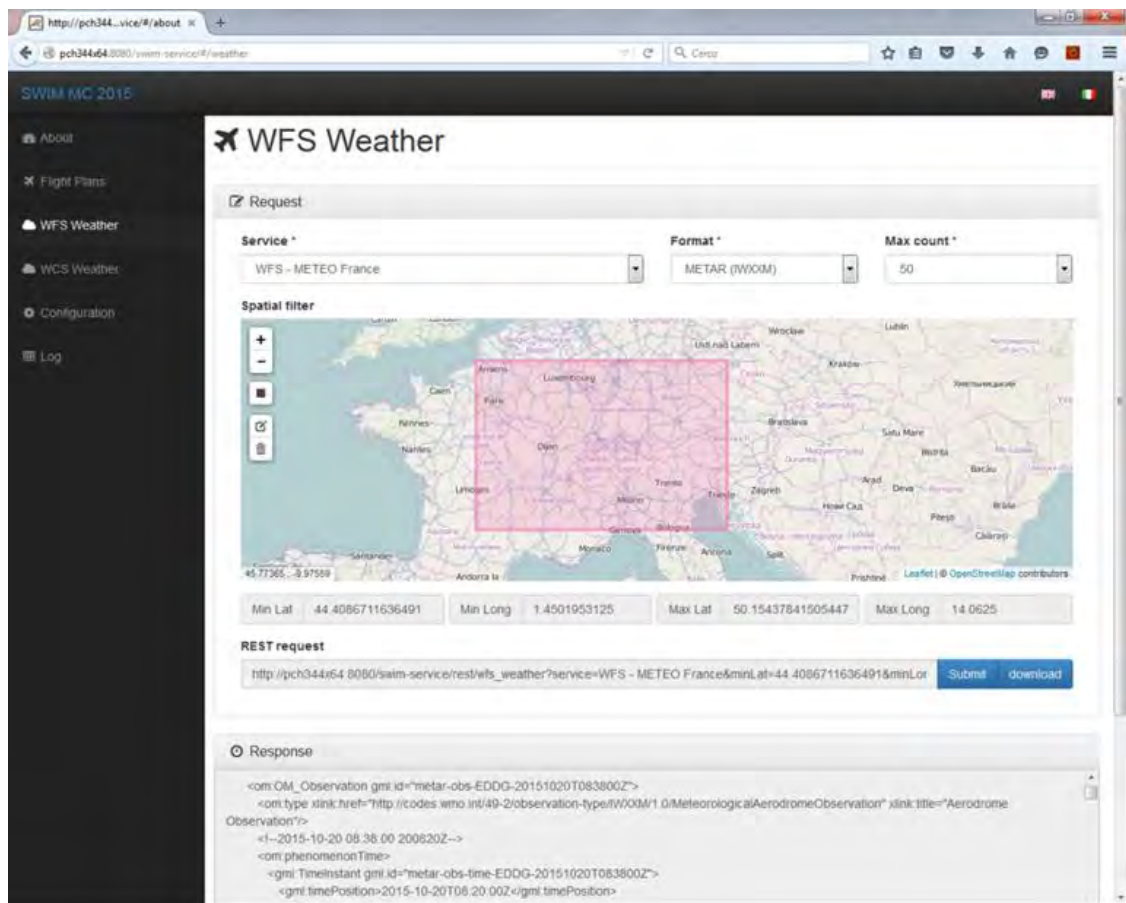


Figure 1: Example of use of EUMETNET SWIM services in IDS application

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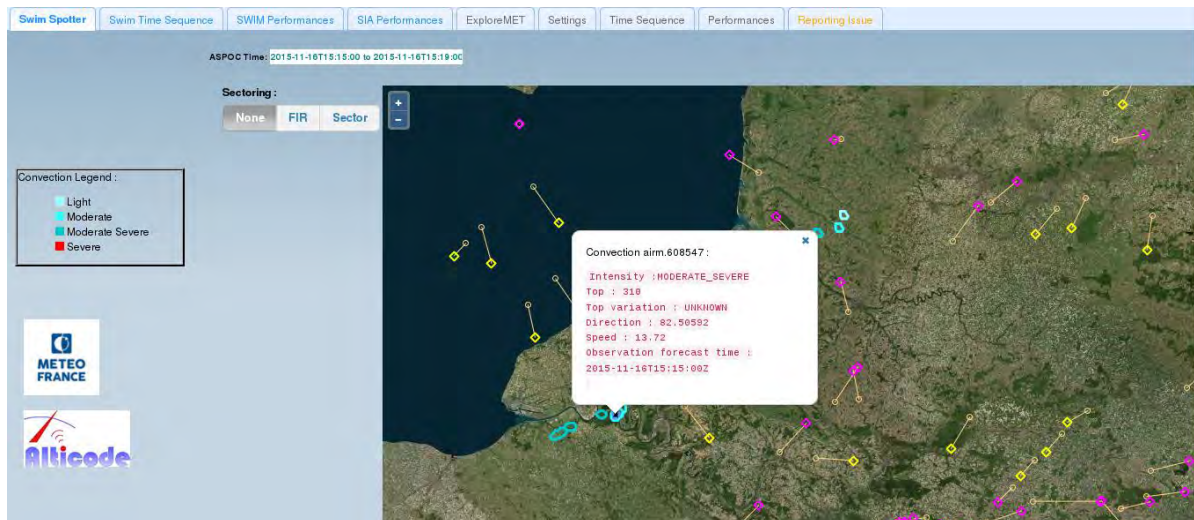


Figure 2: Example of use of EUMETNET SWIM services in Meteo France and Alticode application

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Solution name: NM B2B

Efficient business-to-business data exchange across the "ATM value chain"

EUROCONTROL's operational stakeholders not only need to exchange network operations information via applications but they also need computer-to-computer interfaces. This interoperability with EUROCONTROL's partners is vital in order to ensure fast and efficient data sharing across the "ATM value chain" and more dynamic operations, as specified in the SESAR Network Operations Plan Programme

How does NM B2B Web Services work?

With NM B2B Web Services, EUROCONTROL gives to eligible operational stakeholders a set of programming interfaces enabling the development of applications using web services for establishing direct interfaces with the Network Manager's operational systems and data.

For interoperability reasons, NM B2B Web Services is based on open web services technologies that do not require the installation of proprietary software on the User's side and follows the architecture standards recommended by the SWIM concept. The NM B2B Web Services is provided in two "flavours": SOAP web services and non-SOAP web services. The payload is always XML. The data exchanged follows standard data models, when available. This is the case for airspace data, where the model (and format) used is AIXM 5.1. All services make use of HTTPS. Access to NM B2B web services requires strong authentication with digital certificates (PKI).

Which services are accessible via NM B2B today?

The available NM B2B Web Services have been grouped into various operational domains:

- Flight Services
 - **FPL Preparation** (Flight PAn Preparation) which includes the generation of available routes and FPL Validation. It provides the web services necessary for the preparation of a flight plan, before filing it to the EUROCONTROL Network Manager Operations Centre (NMOC).
 - **FPL Management** which provides multiple functions to support initial FPL Filing, FPL Updates, Cancellations and associated operations.
 - **Flight Data Retrieval** which provides web services to query and retrieve information on flight plans and flights.

- **Airspace Services**
 - **e-AMI** (electronic Airspace Management Information), for access to the consolidated European AUP/UUP (Airspace Use Plan/Updated Use Plan) using the Aeronautical Information Exchange Model, AIXM 5.1 with the ADR extension.
 - **FUA Service** for the creation and update of AUP/UUP, using AIXM 5.1, with the ADR extension.
 - **Airspace Data**, provides access to the most up to date and consistent network view of NM operational airspace data.
Consists of web services giving access to static & dynamic airspace data:
 - AIP sourced data (Points, Routes, Aerodromes and Airspaces) including changes resulting from NOTAM implementation and AUP/UUP implementation;
 - Restriction data i.e. primarily RAD and profile tuning restrictions, but also including other NM Restriction data.
Implemented using the AIXM 5.1 with the ADR extension.

- **Flow Services**
 - **Regulation List**; provides access to all the regulation information used in the NM Flow management system.
 - **ANM** (ATFCM Notification Messages) for accessing the information on regulations published in the ANMs. *(to be phased out (deprecated with NM Software Release 19.0 & removed with NM Software Release 20.0)).*

- **General information services**
 - **AIM** (ATFCM Information Messages) for accessing the general Network Operations information as published in the AIMS.

We also provide

- **Publish/Subscribe services**

Implemented in March 2015 (only in PRE-OPS and accessible by all B2B users); it allows a user to subscribe to a topic and receive asynchronous messages published on that topic. There are therefore two distinct aspects: the subscription management and the message consumption.

In general when a new subscription is created on a topic by a user, a corresponding queue is allocated on a B2B message broker on which NM will publish messages related to the subscribed topic and configured according to the subscription parameters. The

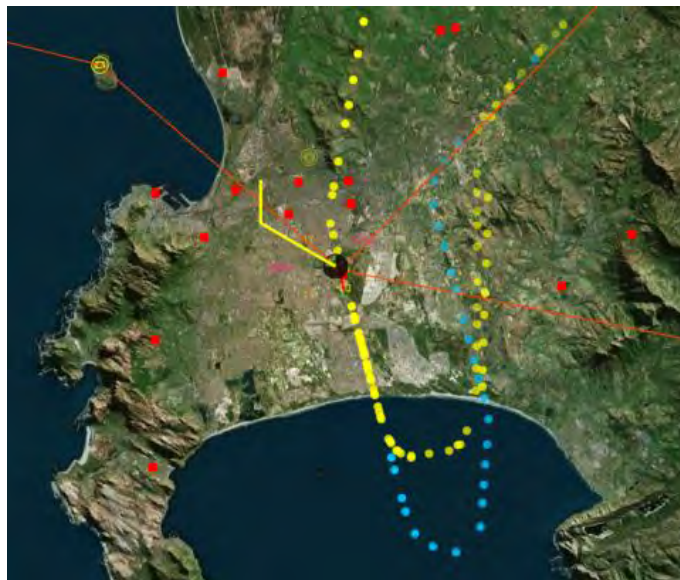
user can then consume these messages either via a pull or a push fashion. More information can be found in the NM B2B Reference Manuals accessible via OneSky NM B2B shared space.

Solution name: Jumpstart

Point of contact: Jan Van Meenen, jan.van-meenen@eurocontrol.int

A SWIM enabled application, demonstrating interoperability with distinct ATM information sources using standard mainstream technology and standardised physical data exchange models, leading to cost efficiencies, unconstrained and robust solutions. It handles various types of aeronautical data: airport, surveillance, meteorological, flight, navaid, etc.

Jumpstart is written in C# for the Microsoft .Net framework in the form of a desktop-class application, using OS-specific features (like threads and the .Net API for GUI). It allows web services consumption for integration and testing purpose, hence it is not designed for an operational usage. It also runs as a web service provider for in-house developed web services.



It is a rich and complex application on a specific development platform (.Net) which makes it very specific to Windows 7 and later OS. Jumpstart is the de facto main demonstrator for SWIM both as as an example of client application as well as a data integrator. By showing all the facets and potential of SWIM, Jumpstart stimulates organisations and teams to start developing their own SWIM enabled applications and services. Access the [Jumpstart User Documentation](#)

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How to obtain Jumpstart DC (Desktop Client) and details

The source code of the Jumpstart DC can be downloaded via the [SWIM Registry](#). The SWIM Registry platform requires prior registration. Once registered, you will find the information about Jumpstart by navigating to Implementations/Application Software/Jumpstart. Here you can accept the online license agreement (don't forget to log in, scroll to the application files sections and click on Source code Jumpstart. You will then see a screen that gives you the possibility to request access to this file, see screenshot) to get access to the source code of Jumpstart (After submitting your request we will review it and you will be notified when you are granted access to the source code). The handout, Installation manual and Jumpstart user manual can also be found in the Registry.



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Solution name: Integrated Digital Briefing Service

Point of contact for Frequentis: Markus Klopff, Markus.KLOPF@frequentis.com

The dawn of **SWIM-enabled services** for ATM has opened new perspectives for implementing flight-critical processes and procedures. With the development of the ATM information reference model (AIRM), the information service reference model (ISRM) and the SWIM technical infrastructure (SWIM-TI), service providers can now implement and offer their data products in a SWIM-compliant form. **SESAR project 13.02.02**, aeronautical information management managed by Frequentis has the goal to highlight the advantages offered by the SWIM approach by **aggregating and compiling data from existing SWIM services** and feed it to a pilot briefing prototype. This prototype application assists the user in the preparation and production of an **enhanced pre-flight information Bulletin (ePIB)**, containing critical digital NOTAM and meteorological information presented as text as well as aeronautical charts. The ePIB is then offered over the Integrated Digital Briefing Service as data machines can process.

Michael Holzbauer, Director European ATM Programs said: *“Once again Frequentis managed to demonstrate the power of SWIM with its solution prototype Integrated Digital Briefing Service aimed at Airspace Users.”*

Further improvement is achieved by integrating the work done in SESAR 13.02.02 in its sister research project semNOTAM.frequentis.com, which is also led by Frequentis and founded by the Austrian Research Promotion Agency (FFG) [grant number 839006]. **SemNOTAM** introduces a **knowledge-based framework that enables fine-grained intelligent semantic filtering** and provides a formal, explicit, and machine-readable prioritization of Digital NOTAMs based on associated business rules. Prioritisation functionality based on temporal, spatial, aircraft/equipment characteristics, user-defined aspects, and any combination thereof is being offered in the process, while various scenarios such as on-board briefing and/or flight planning briefing are being covered. Still, semNOTAM complies with regulations in place and does not hide away any available information from the airspace user.

Unlike currently available solutions, **SemNOTAM takes advantage of the possibilities introduced by Digital NOTAM and provides intelligent filtering exceeding their capabilities.** It

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supports user-defined filtering along with user-oriented prioritization and presentation. Thereby, SemNOTAM presents the airspace user with fewer low importance NOTAMs than what is presently being offered; thus reducing the information overload for the airspace user. The user's stress level is lowered by that, which in turn contributes to air traffic safety. Furthermore, this enables more effective airspace utilization and improvements in trajectory management.

Both solutions use data provided by multiple SWIM services over a SWIM-compliant infrastructure. The SWIM compliancy of the services used has been validated by the SESAR designated SWIM review panel. Frequentis is providing three of them as SWIM-compliant in-house built products: AIXM5.1 static, dynamic, digital NOTAM data, and meteorological information (iWXXM 1.1). The integrated digital briefing service is offered in a SWIM-compliant form based on AIRM and ISRM. Recently Frequentis took the lead role for this SESAR effort as the first company ever to develop such a service, which it demonstrated in concert with a Honeywell EFB device at the **2015 SESAR SWIM Master Class**. An improvement of this demonstration is foreseen for the SWIM Global Demo in 2016.

FREQUENTIS Integrated Digital Briefing

Welcome | ibriefing | logout

Generate ePIB

TEST01-IS KJFK - LOWW 15-12-01 12:44

- Overview
- Aerodromes
 - DEP : KJFK
 - Airport**
 - TMA
 - MET
 - ARR : LOWW
 - Alternate
 - Emergency
 - En-Route
 - Settings
 - Flight Plans

Time filter: 15-12-01 11:44 to 15-12-01 13:44 Edit

<input checked="" type="checkbox"/>	1 TWY Closure	Oct01 07:45 to Oct01 07:45	3414 A 2014
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Solution name: **STAIRWAY - IDS ATC SimulAtion enviRonment- sWim compAtible sYstem**
Point of Contact: Antonini Massimo m.antonini@idscorporation.com

Today, organisations in the air traffic management (ATM) industry are increasingly looking for SWIM compatible, SWIM-ready or SWIM-enabled solutions. The challenge for vendors is to demonstrate that their proposed solutions have SWIM capabilities or are SWIM compatible and can be implemented with very limited effort within modular and service oriented (SW) architectures.

The SESAR Joint Undertaking and its members have sought to overcome this challenge through a number of stakeholder engagement and demonstration activities, such as the **SESAR SWIM Master Class** (annual event) and the **SESAR SWIM Demo** (2013 World ATM Congress).

IDS has participated in these SESAR SWIM activities, presenting its SWIM-compliant applications and different operational use cases. Specifically, the company has presented the following:

- Digital NOTAM management and exchange
- Flight plan handling
- RPAS flight plan generation and exchange
- METEO services handling

Among these solution is the **IDS Digital NOTAM system**, which is based on a service-oriented architecture with information exchange aligned with SESAR SWIM requirements. Implementing the events creations in accordance with the Event Specification document issued by Eurocontrol, FAA NOTAM and standards AIXM 5.1 data formats.

In 2014, IDS participated in the SESAR SWIM Master Class with a service for the exchange of RPAS mission plans with relevant ATC units. The **service exchange and RPAS control station**, which were SWIM compliant aim to support activities for the integration of RPAS in the controlled airspaces.

“We believe that the SESAR SWIM Master Class and SESAR SWIM demo initiatives are valuable channels through which service and application vendors can test their solutions in a distributed SWIM environment and/or demonstrate SWIM compliance.”

Participating in these SESAR activities is worthwhile for two main reasons:

- It is a **proactive way for improving applied research** on interoperability between systems belonging to different organisations;
- Provides an **efficient way for testing the effectiveness of our AIM and ATM innovative solutions.**

IDS is currently participating in the **2015 SESAR SWIM Master Class**, presenting a SWIM compliant application for consuming flight plans and meteo services. The simulation platform uses SWIM-provided real data in order to set up a more realistic simulation environment. The IDS simulation platform is using the data provided by Eurocontrol (flight object in FIXM format) and Meteo data provided by EUMETNET/METEO France (METAR,SIGMET in IWXXM format) to set up the simulation environment for real-time specific validation exercises.

METÉO FRANCE/ALTICODE

Solution name: SWIM LAB

Point of contact: Kamel Rebai Kamel.Rebai@meteo.fr

There is a general lack of awareness within the ATM community about the availability and full potential of meteorological products, which have recently become available through the SESAR-funded **MET-GATE project**. Bringing together major MET actors (mainly UK MetOffice, DWD – Germany, and Meteo-France), the project has developed a prototype unique access point to all meteorological information from Europe. This collaboration with ATM partners in SESAR has demonstrated that **these products definitely have an operational potential**.

In 2015, the lack of visibility of MET solutions prompted [Météo France](#) and [ALTICODE](#), an ATM company based in Toulouse to collaborate with a view to bringing MET knowledge to the ATM community. In a similar way, they saw a need to bring SWIM knowledge to the MET community, especially regarding the Open Geospatial Consortium (OGC) standards. This primary objective was achieved through the willingness to explore cross MET-ATM-AIM services through SWIM.

Blending ATM and MET competences was the starting point of a partnership that led the partners to participate in the **2015 SESAR SWIM Master Class** in the category of “Application Software”. An innovative process was put in place: Fast agile programming, on-the-fly production requirements, daily coding sprint and software review every other day. **Météo France** brought in its experience with SWIM and the MET-GATE prototype for MET solutions. Contacts were quickly established with [Flightradar24](#) to establish a live ADS-B feed of France. An AIM service was provided by the French AIM service provider, DSNA/[SIA](#). A “design-to-cost” approach (40 man-days) was adopted resulting in the examination of two concepts:

- **SWIM SPOTTER:** displays the current AIM/ATM/MET situation all over France, a first attempt at cross-domain SWIM service.
- **ExploreMET:** allows the user to explore MET solutions in order to become familiar with state-of-the-art MET science. ExploreMET can be used after a potential MET situation has been identified in SWIM SPOTTER.

The two concepts have different time horizons: **ExploreMET** allows browsing through current and future MET situations, whereas **SWIM SPOTTER** focuses on the current

MET/AIM/ATM situation.

In a statement, Kamel Rebaï, Météo France head of development expressed: *"We are positively surprised by how we have succeeded in bringing visibility to our MET solutions, given the limited resources. Thanks to SWIM compliance and easy access to AIM and ATM data, we were able establish a mock-up within 3 days. The SWIM Master Class was a unique opportunity to bring together and meet all the relevant players. For future SESAR activities, versatility of SWIM services is full of promises in terms of improving ATM operational performance."*

Bruno Simmenauer, the ALTICODE Director, states, *"The challenge was high given the agile model of software development. Software developers were enthusiastic. We literally had to take the software out of their hands for the jury deadline. SWIM was definitely a major enabler for enabling remote systems to work quickly together. This evolution also opens new business opportunities for innovative companies."*

Envisioned next steps are to add recording and replay capabilities.

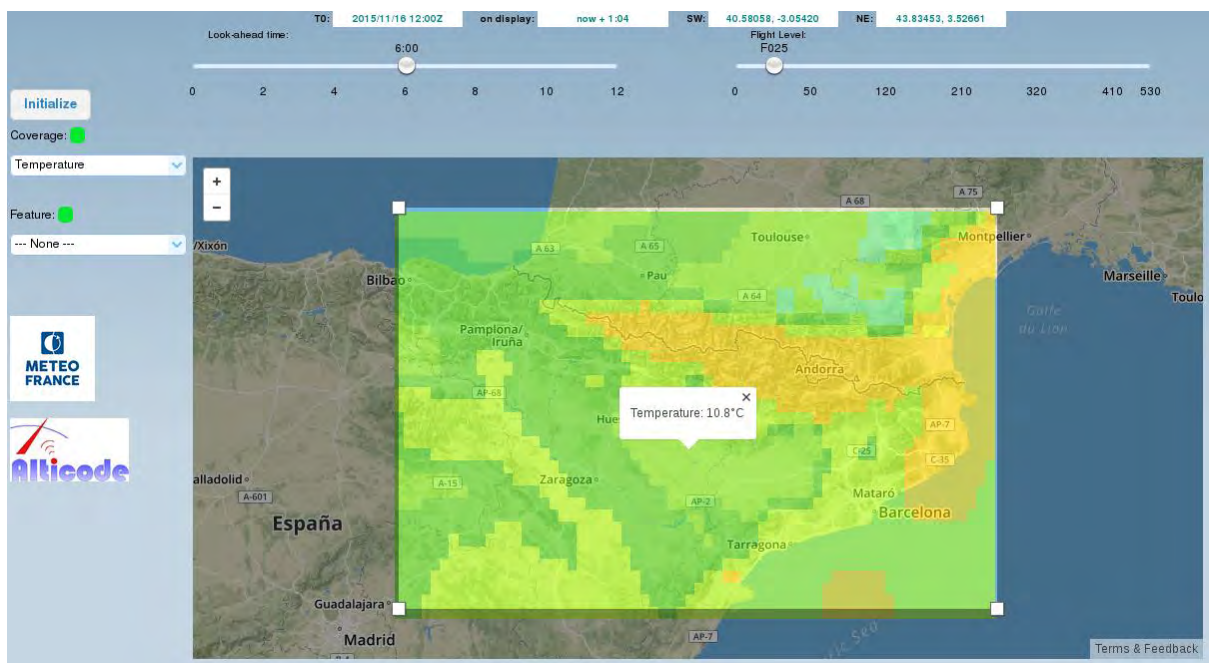


Figure 1: ExploreMET: Temperature at FL25 at current time + 1h

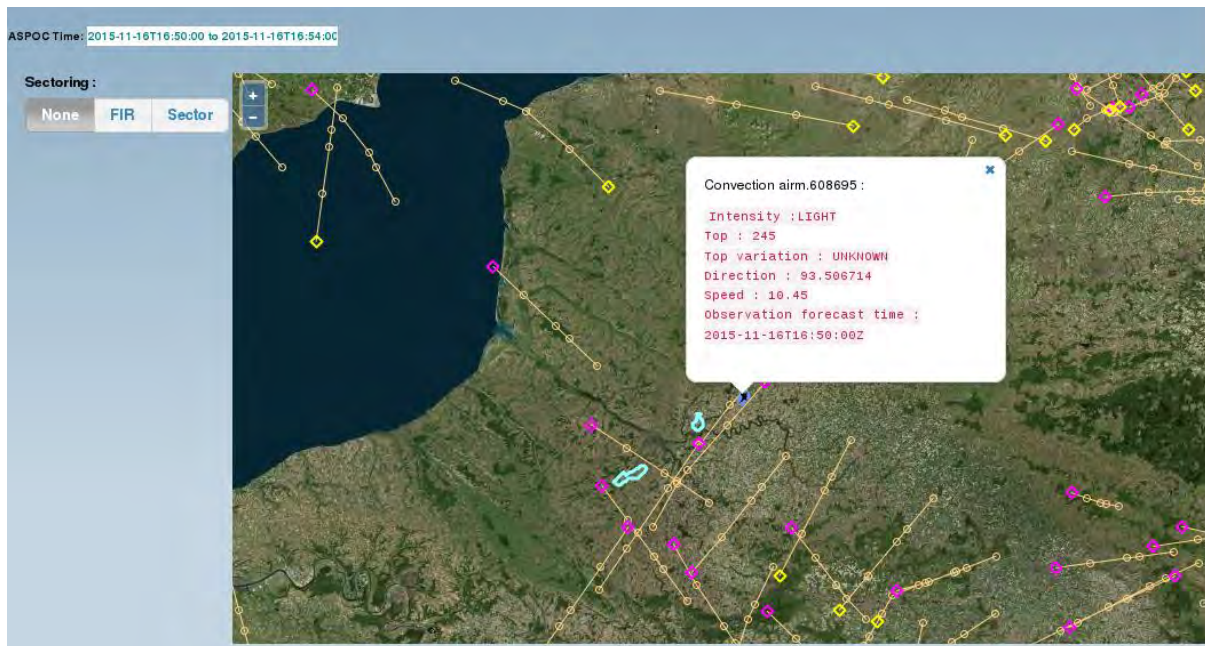


Figure 2: SWIM SPOTTER Convective cell and ADS-B flight track



Figure 3: SWIM Open Geospatial Consortium Webservices Time sequence

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Solution name 1: Skybridge

Point of contact: Robin Houtmeyers, robin.houtmeyers@luciad.com; Andres Van Swalm, Andres.vanswalm@unifly.aero

From smart farming to critical infrastructure, the civil use of remotely piloted aircraft systems (RPAS), or drones, is increasing rapidly. Currently, the lack of regulation for drones both hinders business and increases risk.

UniFly, a Belgian spin-off from the Flemish Institute of Technological Research VITO, was founded with the primary goal of facilitating the safe integration of drones into the aviation system.

Together with UniFly, Luciad developed the **SWIM-enabled Skybridge platform for to integrate very low level (VLL) UAS into today's aviation systems**. The software platform was the runner-up winner in the applications category of the 2014 SWIM Master Class.

Luciad provided the software components and development expertise for the SWIM-enabled application, which helps to **integrate drones flying at very low level into the European aviation system**. LuciadLightspeed serves as the geospatial engine behind UniFly, allowing users to safely plan a VLL RPAS operation. Additionally, users have an overview of all operations and can manage, control, police, reject and even cancel these operations. The use of SWIM standards enables this solution to be embedded directly into today's ATM systems.

"For Unifly, the SESAR SWIM Master Class was the ideal platform to develop a proof of concept for the Skybridge platform," said Unifly Chief Operating Officer Andres Van Swalm. "Drone users rely on the same ATM information as pilots of larger aircraft do and must take dedicated airspaces into account when operating their drones."

UniFly launched a beta version of Skybridge in 2015 following its success at the 2014 SESAR SWIM Master Class and was named one of the top 50 Belgian start-up companies by Trends-Tendances.

Solution name 2: Interactive pre-flight information bulletin (iPIB) and aviation common operating picture (COP) solutions

Point of contact: Robin Houtmeyers (robin.houtmeyers@luciad.com)

Luciad first participated in the SESAR SWIM Master Class in 2013. The company's partnership with organisations like the OGC and commitment to developing software components that use open standards make Luciad's software an ideal platform for developing SWIM-enabled solutions.

Luciad won the runner-up prize in the **2013 SWIM Master Class** for its interactive **pre-flight information bulletin** (iPIB) and aviation common operating picture (COP) solutions.

"The applications were developed in about four weeks by a junior developer," said Robin Houtmeyers, Luciad R&D Manager. "This proves how easy it is to develop applications with the standard, interoperable components available in LuciadLightspeed. We are pleased the jury recognised the innovative character of Luciad software."

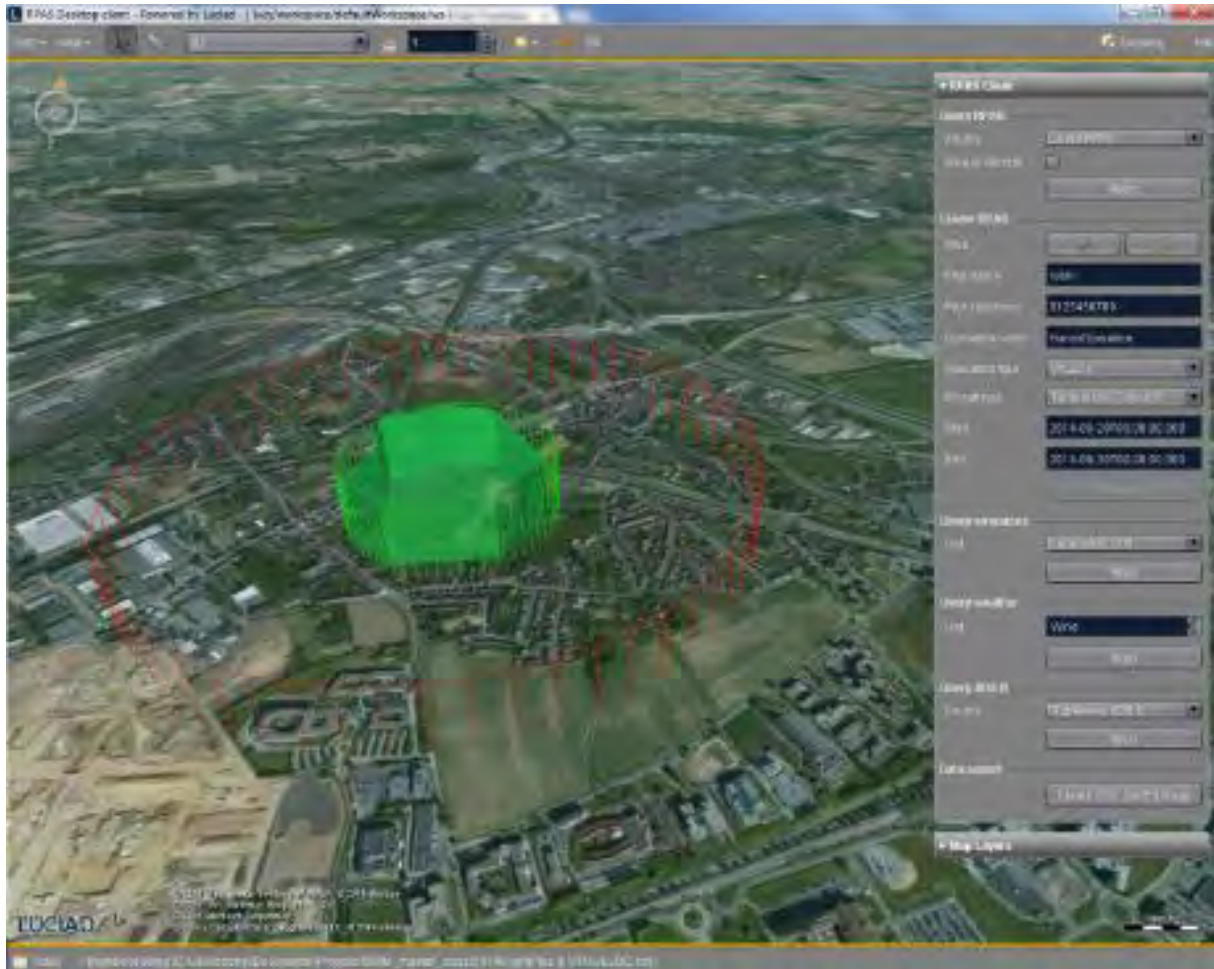
For every flight, daily NOTAM alerts, weather and other information are typically sent to the pilot in text and map formats. **Thanks to Luciad's iPIB functionality, pilots can visualise and annotate all the information graphically on a single screen.** The iPIB filters the relevant data for the planned flight, then merges and displays many different data types.

The integrated graphical display **increases the efficiency and situational awareness of the pilot**, leading to greater safety. The open architecture of the Luciad COTS software enabled easy integration of AIXM, FIXM, Digital NOTAM and custom data feeds to the iPIB.

The second innovation of the project, aviation COP, provides air traffic stakeholders a better **common operating picture (COP)** of the whole sky. Historical, real-time and projected or simulated traffic data are available for the user, who can **combine traffic data with airspace availability, weather information, NOTAMs or any other SWIM-compatible information available.** The user can also select any area of interest and time window and obtain an immediate graphical display of, for example, traffic density combined with NO_x and CO₂ emissions.

Luciad's development for the **award-winning SWIM solutions** helped the company's development team integrate various improvements in Luciad's COTS components. The improvements include increased support for SWIM standards such as FIXM and services including Eurocontrol NM B2B services. The development also allowed for improved visualisation of digital NOTAMs according to industry practices.

Following Luciad's success in the 2013 SWIM Master Class, the company has made its software freely available to participants of the **2014 and 2015 SESAR SWIM Master Classes**.



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LUCIAD and AIRBUS

Solution name: Collaborative airspace provision service (CAPS)

Point of contact: Robin Houtmeyers, robin.houtmeyers@luciad.com

Every day, some 30,000 flights move across Europe's skies on precise tracks through multiple airspaces. But some missions or unexpected situations like test flights, military fighter training missions or remotely piloted aircraft systems require dedicated airspace.

Together with **Airbus Defence** and Space, **Luciad** developed the **CAPS** application to tackle this difficult task using Luciad's flagship product LuciadLightspeed. Aligned with the concept of SWIM, CAPS allows users to create airspaces for specific purposes. **An airspace user can easily define the size of the necessary airspace, as well as the timeframe and the maximum acceptable transit distance of the airspace from home base.** The user can interactively manipulate the airspace in four dimensions (4D) and immediately see conflicting traffic or trajectories. To ensure visibility, the user can view cloud coverage and precipitation data.

"We believe that Luciad's continued success in the SESAR SWIM Master Class is thanks to our mission to provide geospatial components based on interoperability with other systems and open standards," said Frank Suykens, Luciad's Chief Technology Officer.

Users can also export the airspace in AIXM format for use with SWIM-enabled components such as Luciad's AIXM 5 Viewer. CAPS won the 2014 SESAR SWIM Master Class Best-in-Class Award for optimising use of airspace within the Single European Sky.

"We are proud to be able to contribute to this great European effort bringing ATM in the Single European Sky into a successful future," said Edwin Pittomvils, Head of Integrated Systems, Airbus Defence and Space. *"In this respect, we will continue to strive as competent partners in the SESAR initiative to further develop the abilities of SWIM."*

Both Luciad and Airbus Defence and Space demonstrated the CAPS application with ATM stakeholders and at events in 2015 including the **World ATM Congress** in Madrid and **AFCEA TechNet Europe** event in Berlin.

Airbus Defence and Space is working to commercialise CAPS by enhancing algorithms, modernising the HMI and creating additional functionalities.

See the video at:

<http://luciad.com/resources/videos/collaborative-airspaces-with-swim>



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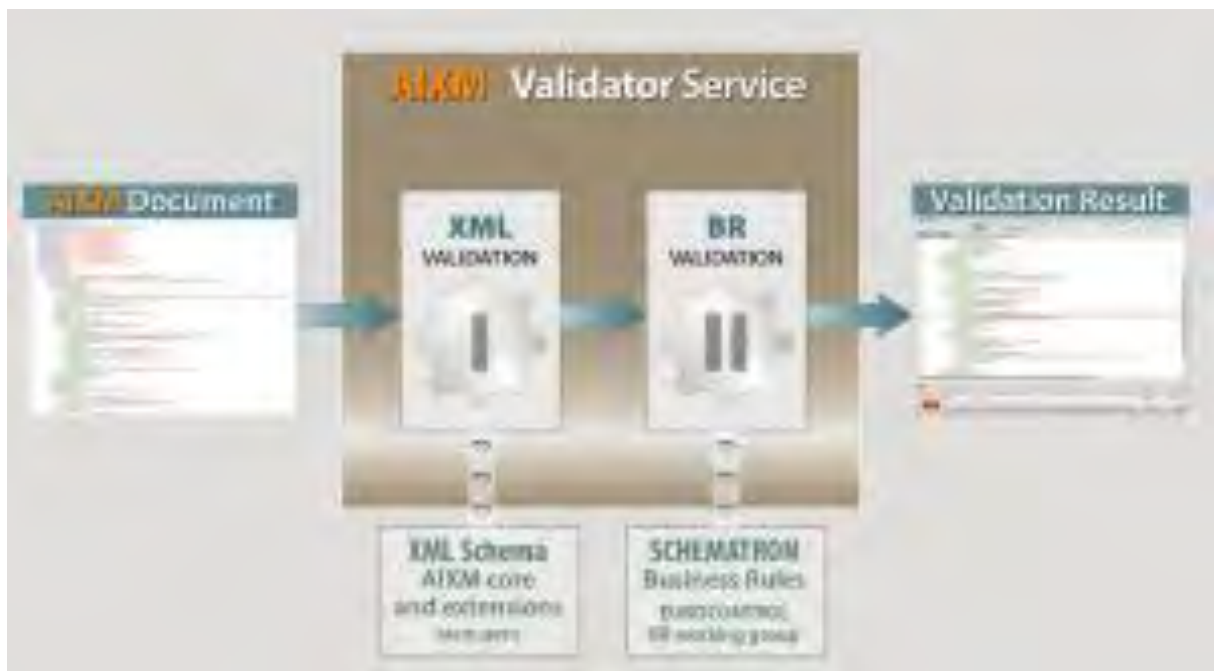
10 December 2015

M-CLICK

Solution name: AIXM Validator

Point of contact for M-CLICK: Aleksandar Balaban, aleksandar.balaban@m-click.aero

The AIXM Validator service tool to control and verify the AIXM data quality as required for ADQ. Besides schema-validity, the validator checks for domain specific AIXM business rules validity.



AIXM Validator Service

Business rules are complex dependencies and domain specific requirements that must be satisfied by AIXM datasets. These rules cannot be expressed using XML Schema (XSD), but are encoded using the Schematron language and custom XPath function. The validator uses Schematron rules based on the rule set from the ongoing efforts in the EUROCONTROL AIXM Business Rules community project.

The service is available on the web for testing. Try it today!

URL: swim.m-click.aero/validator



AIXM Validator Web Interface

Download the [AIXM Validator Service brochure](#)

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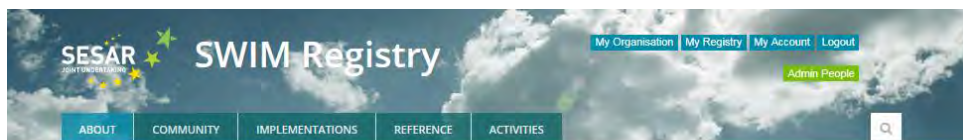
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10 December 2015

Solution name: SWIM Registry

Point of contact for Registry: Pedro Fernandez Sancho pedro.fernandez-sancho@eurocontrol.int

The **Registry** is the inventory of reference for service related resources in SWIM.



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“ The Registry is the inventory of reference for service related resources in SWIM. The SWIM concept aims at enabling direct ATM business benefits by assuring that the right information will be available with the right quality to the right person at the right time. Given its transversal nature, it covers all ATM information including aeronautical, flight, aerodrome, meteorological, air traffic flow, and surveillance. SWIM is an important driver for new and updated standards, infrastructure and governance, hence enabling the management of ATM information and its exchange between qualified parties via interoperable services.

The SWIM Registry provides access to documents and descriptions related to:

- > Service implementations and Application software (list of services and applications available in SWIM)
- > Reference Models (common models for the implementation of services i.e. ISRM, and information structures i.e. AIRM)
- > Standards (e.g. AIXM, WXXM, FIXM)
- > Policies (constraints to be respected in SWIM for security or other purposes)
- > Compliance declaration (conformity levels of the implementations)
- > Participants (e.g. service providers)



What kind of information needs to be shared?

- > Aeronautical – information resulting from the assembly, analysis and formatting of aeronautical data
- > Flight trajectory – the detailed route of the aircraft defined in four dimensions (4D), so that the position of the aircraft is also defined with respect to the time component.
- > Aerodrome operations – the status of different aspects of the airport, including approaches, runways, taxiways, gate and aircraft turn-around information.
- > Meteorological – information on the past, current and future state of earth's atmosphere relevant for air traffic.

The Registry contains descriptions of:

- Service Implementations (list of services available in SWIM from the various SWIM service providers)
- Reference Models (common models for the implementation of services i.e. ISRM, and information structures i.e. AIRM)
- Standards (e.g. AIXM, WXXM, FIXM)
- Policies (constraints to be respected in SWIM for security or other purposes)
- Certifications (describe levels of conformity e.g. SWIM compliance)
- Participants (e.g. service providers)

Solution name: Geodetics calculation services

Point of contact: Wolfgang Scheucher wscheucher@solitec.com

It started like a fairy tale..., *Once upon a time a little company named **SOLITEC** Software Solutions GesmbH decided to set forth and conquer the holy grail of aeronautical information management – the SESAR SWIM Master Class Best-in-Class Award.*

And the fairy tale became true. SOLITEC did win the **2014 SESAR SWIM Master Class** in the “Services” category with its **geodetic calculation services (GCS)**.

GCS is an OGC-compliant web processing service (WPS 1.0). It provides several calculation routines documented in FAA TERPS (8260.58) such as direct, inverse, intersections and much more. As a result of the calculations, GCS offers a range of processes for retrieving and validating geographical aeronautical data. One of these, the **route segment validation service allows an organisation to validate route segment data provided by another stakeholder from the aeronautical data chain.**

The route segment validation service makes manual validation of the geographic route segment data elements such as tracks and length obsolete. The operator of an AIM entity who wants to validate route segment data can simply send a corresponding AIXM 5.1 data file to the GCS Server and gets back the validation report using an automated process by defined and standardised interfaces.

Receiving and processing data in AIXM 5.1 format means that no data conversion is needed, bearing the uncertainty of some data loss or mapping issues. Since no human intervention is needed for the route segment validation, which uses system-to-system communication, errors that may occur by entering data manually can be avoided.

The General Civil Aviation Authority (GCAA) of United Arab Emirates, who provided the idea for the development of GCS and who is a business partner of SOLITEC has said of the solution: *“GCS automates a process that for an entire route network published in a State AIP may otherwise take days to perform.”*

Out of the three targeted benefits of SWIM (safety, cost efficiency and environmental impact), the **GCS WPS proves especially the cost efficiency of such a service**, as it is implemented with free and open source software. By following strictly the standards-based approach (data in a standardised exchange format through standardised interfaces), the GCS WPS supports the objective of the digital AIM.

Soon after winning the 2014 SWIM Master Class, GCS was officially released and since

June 2015 it is available for operational usage as part of SOLITEC's ADQsuite in different versions. One of them, a free web based trail version is available via <https://gcs.solitec.com/> (also check out our [video tutorial](#) on YouTube).

For SOLITEC the **SESAR SWIM Master Class provided the perfect framework to develop and present their ideas and concepts for SWIM compliant products and services.**

The SESAR SWIM Master Class offered an excellent opportunity for receiving feedback, validate use cases and share experiences gained throughout its development with other participants and the SWIM community as a whole. It is a valuable platform for partnering. Finding the right partners is an important keystone to reach a common goal and to ensure that the solutions and services developed finally fit the real needs of the end users.

The screenshot displays the SOLITEC ADQsuite:GCS web application interface. The main content area is titled "Route Validation" and shows the following details:

- ADXM input:** A section for uploading ADXM 5.1 files, with a file named "GCAA_dataset.xml" already uploaded and a "Done" status.
- Select Route Segment:** A dropdown menu currently set to "ATBOR - NADIL".
- Curve Check:** A button labeled "error".
- Export PDF:** A button to export the results.
- Table of Metrics:**

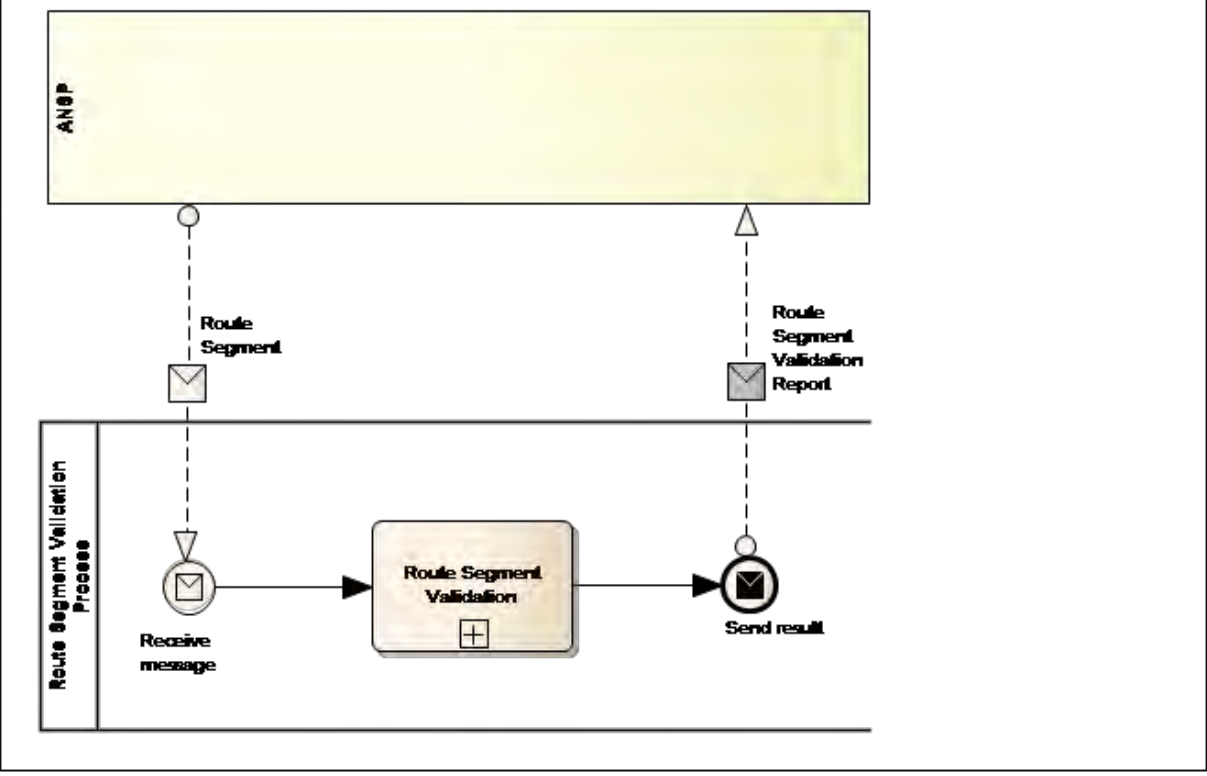
	given	calculated	difference
length [NM]	32.088671	32.0886704	0.0000006
true track	293.27	293.46	0.19
magnetic track	291.47	291.52	0.05
reverse true track		113.23	
reverse magnetic track		111.19	

On the right side of the interface, there is a map showing the flight route from ATBOR to NADIL. A blue pin is placed at the NADIL location, and a line indicates the flight path. The map includes labels for "ATBOR", "NADIL", "Dubai", "Ajman", "Sharjah", and "Ajman Village".

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SNOWFLAKE SOFTWARE/NATS

Solution name: Heathrow XMAN

Point of contact Snowflake: Jonathan Wootten

jonathan.wootten@snowflake.com

One of the main challenges for air navigation service providers (ANSPs) providing air traffic services to airlines is how to reduce costs while maintaining efficient operations, increasing safety and reducing the impact on the environment. In addition, an important aspect of the SESAR programme involves looking at how latest technologies can support concepts to optimise arrivals into airports; minimising aircraft “stack” holding, enabling reduced aircraft fuel burn and airline operating costs.

To address these challenges, **NATS** and **Snowflake Software** collaborated in the **2013 SESAR SWIM Master Class** and developed a prototype to demonstrate how reduced stack holding over London Heathrow could provide both economic and environmental savings. Snowflake provided a **SWIM-compliant information loading, management and distribution platform** via its GO Publisher software, installed in the NATS test and development infrastructure, and linked to Harris Orthogon’s arrival management (AMAN) system. GO Publisher enables the publication of arrival sequence and temporal information to the adjacent control centres via configurable schema adaptive web services. **By decoupling the arrival management from the data exchange service, Snowflake and NATS have been able to realise a key goal of SWIM; to store data once and reuse many times.**

The successful project, **now fully operational**, has enabled NATS to provide a new arrival sequence service - known as **Heathrow cross-border AMAN (XMAN)** - for Heathrow Airport. The new service is subscribed to by IAA Shannon, DSNR Reims, DSNR Brest, Eurocontrol Maastricht and NATS Prestwick air traffic control centres, and is the first deployment of a virtualised SWIM-enabled system using open standards in an operational environment at NATS.

Heathrow XMAN exchanges arrival information relating to aircraft landing at Heathrow airport with air traffic controllers in different European countries, enabling collaboration to reduce the time aircraft spend circling in “holding stacks” around London by slowing aircraft 350 nautical miles from the runway. The effect is a saving in fuel and carbon emissions as aircraft are more efficient when flying at high level, yielding a significant benefit to airline customers.

In its first 9 months of trial **XMAN had already made significant early savings in the form of 5000 tonnes of CO₂, EUR 1.25 million in cost savings to airlines**, and an increase in efficiency with a

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reduction in minimum stack delay thresholds over Heathrow from nine minutes to seven.

Kevin Loy, NATS Information Strategy Manager, commented: *“This is a demonstration of how SESAR concepts such as SWIM can provide early and significant benefits to the airspace user community.”*

The Heathrow XMAN system has demonstrated that the use of **SWIM concepts and technologies not only have tangible benefits in terms of providing economic and environmental savings, but also the ability to reduce development costs and a potential for new services through open information exchange between partners.** Consortium ANSPs have been able to implement their own client applications based on local requirements whilst complying with the XMAN concept.

“Bringing NATS’ first SWIM service to operational trial across European airspace is an important step forward for the AIM industry and is a world first for cross border management. This is also a powerful demonstration of how quickly Snowflake Software’s technology can help legacy systems become good SWIM citizens, saving money for the airlines and having a positive effect on the environment,” commented Alexis James Brooker, Professional Services Director at Snowflake Software.

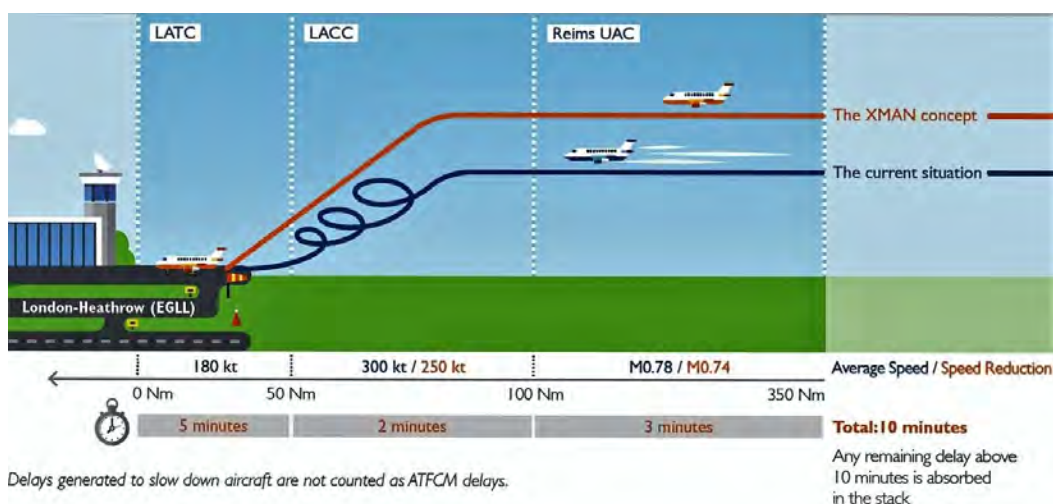
THALES/DSNA

Solution name: Cross-Border Arrival Management
Point of contact for Thales/DSNA: Gérald Regniau; gerald.regniaud@aviation-civile.gouv.fr

Developed together by the FABEC and the UK-Ireland FAB

Traditionally, the UK's air traffic service provider can only influence an aircraft's approach to Heathrow once it enters UK airspace, which is sometimes only 80 miles from the airport. This limits the opportunity to manage the inbound flow of traffic with the neighbouring units and can result in extra time spent in the holding stacks. This procedure burns more fuel, costs the airlines more and produces more CO₂ emissions.

Air traffic controllers can ask for pilots to slow down in the more efficient en-route phase of flight in order to minimise delays upon arrival



The **XMAN concept** (“Cross-Border Arrival Management”) developed together by the FABEC and the UK-Ireland FAB **introduces the ability for controllers to manage delays in the tactical phase of flight well before the top of descent.** When the destination airport is congested, air traffic controllers can ask for pilots to slow down in the more efficient en-route phase of flight in order to minimise delays upon arrival.

Reduce the impact on environment whilst maintaining safety and efficient operations

One of the main challenges for the implementation of the concept as described in the figure above is to

Open SWIM architecture

Saving airlines around €2.3 million in fuel and 6,000 tonnes of CO₂ per year

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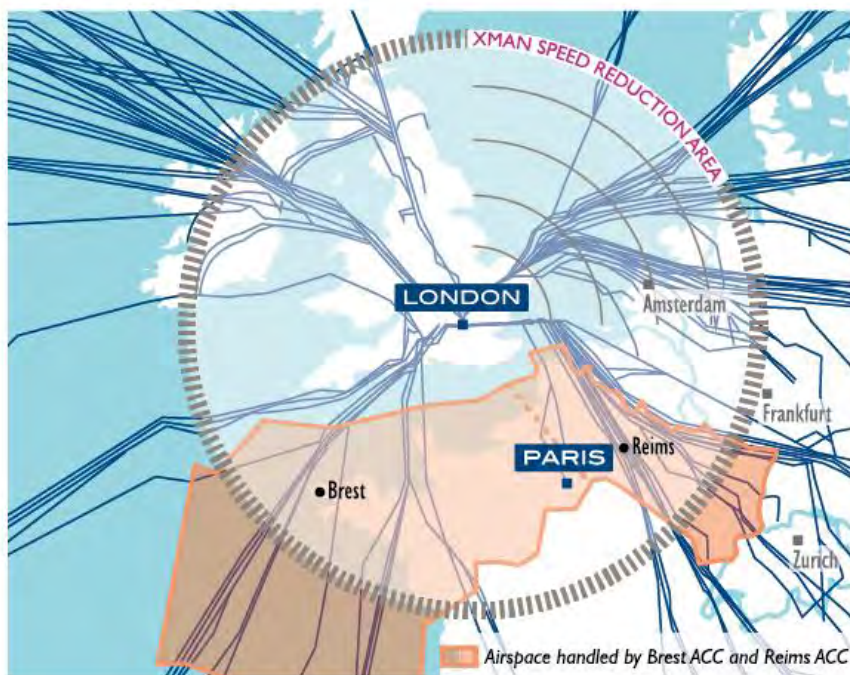
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ensure that neighbouring air navigation service providers will be able to provide an additional service to their customers to reduce the impact on the environment in a partner's airspace whilst maintaining safety and efficient operations within their own area of responsibility. Therefore, the arrival management information shall be shared in a manner that minimizes coordination between involved units.

This service is only possible thanks to the use of open SWIM architecture. Each ANSP has been able to connect its own technical system and HMI to a webserver that receives data from the **NATS Arrival Manager (AMAN)**. So, the concept has been tested in a context of interoperability with a range of ATM systems. Within the framework of the SESAR programme and its development of the Extended Arrival Management (E-AMAN) solution, **Reims UAC tested an XMAN prototype developed by Thales gathering NATS London AMAN and Radar Trajectory Prediction data through a SWIM node.**

Thales SWIM node also supports Flight Object exchange services between Air Traffic Controllers using Web services and data distribution technologies.



Based on the experience gained during the London Heathrow extended arrival management trial, it is expected that holding times can be cut by up to one minute for those flights which benefit from extended arrival management, saving airlines around **€2.3 million in fuel and 6,000 tonnes of CO₂ per year.** This procedure also

minimizes noise for the communities living beneath the holding stacks. Thus, following the live trial, the partner's involved (Reims, Brest, MUAC, Prestwick, Shannon and Swanwick) in extended arrival management services for London Heathrow decided to go for a full operational implementation