



# European ATM Service Description for the Aeronautical Information Notification Service

## Document information

Project Title	Information Service Modelling deliverables
Project Number	08.03.10
Project Manager	NORACON
Deliverable Name	European ATM Service Description for the Aeronautical Information Notification Service
Deliverable ID	D65
Edition	00.02.01
Template Version	02.00.02

## Task contributors

DFS, EUROCONTROL, NORACON, NATMIG, FINMECCANICA, FREQUENTIS, THALES, ENAIRE, DSNA, INDRA, SEAC and ENAV

## Abstract

The Aeronautical Information Notification service provides the CDM for the provision of aeronautical information alerts about new information being available. This document is based on the service model designed in the ISRM repository. The purpose of the service is the provision of digital alerts about new information being available (NOTAM, AIP amendment, SUP, etc.) together with the information itself through a subscription and push mechanism.

## Authoring & Approval

Prepared By - Authors of the document.		
Name & Company	Position & Title	Date
██████████ Aena	████████████████████	16/05/2014
██████████ ENAIRE	████████████████████	26/04/2016
██████████ NORACON	████████████████████	06/05/2016
Reviewed By - Reviewers internal to the project.		
Name & Company	Position & Title	Date
██████████ NORACON	████████████████████	28/05/2014
██████████ DFS	████████████████████	12/05/2016
Reviewed By - Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.		
Name & Company	Position & Title	Date
██████████ Frequentis	████████████████████	22/05/2014
██████████ EUROCONTROL	████████████████████	22/05/2014
██████████ Sabre	████████████████████	22/05/2014
Approved for submission to the SJU By - Representatives of the company involved in the project.		
Name & Company	Position & Title	Date
██████████ NORACON	████████████████████	31/05/2016
██████████ NORACON	████████████████████	31/05/2016
Rejected By – Representatives of the company involved in the project.		
Name & Company	Position & Title	Date
<i>Name / Company</i>	<i>&lt;Position / Title&gt;</i>	<i>DD/MM/YYYY</i>
Rational for rejection		
<i>None.</i>		

## Document History

Edition	Date	Status	Author	Justification
00.00.01	16/05/2014	Draft	████████████████████	First draft version. Distributed for initial review.
00.00.02	19/05/2014	Draft	████████████████████	After ██████████ (AINS SA) review
00.00.03	22/05/2014	Draft	████████████████████	After comments received on first draft review
00.00.04	29/05/2014	Draft	████████████████████	After comment from ██████████ review
00.01.00	30/05/2014	Final	████████████████████	Final Delivery version
00.01.01	25/08/2014	Draft	████████████████████	After Assessment Report
00.01.02	26/04/2016	Draft	████████████████████	Update to ISRM 2.0
00.01.03	06/05/2016	Draft	████████████████████	Corrections needed throughout document.
00.02.00	31/05/2016	Final	████████████████████	Final version for ISRM 2.0 delivery.
00.02.01	20/07/2016	Final update	████████████████████	Updated according to 08.03.10-D65_SJU_Assessment_report_reponse

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

2 of 33

## Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.



## Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	<b>6</b>
<b>1 INTRODUCTION</b> .....	<b>7</b>
1.1 PURPOSE OF THE DOCUMENT.....	7
1.2 INTENDED READERSHIP.....	7
1.3 INPUTS FROM OTHER PROJECTS.....	7
1.4 GLOSSARY OF TERMS.....	7
1.5 ACRONYMS AND TERMINOLOGY .....	7
1.5.1 <i>Acronyms</i> .....	7
1.5.2 <i>Terminology</i> .....	9
<b>2 SERVICE IDENTIFICATION</b> .....	<b>10</b>
<b>3 OPERATIONAL AND BUSINESS CONTEXT</b> .....	<b>11</b>
3.1 INFORMATION EXCHANGE REQUIREMENTS.....	11
3.2 OTHER REQUIREMENTS.....	14
3.2.1 <i>Non-Functional Requirements</i> .....	15
3.2.2 <i>Relevant Industrial Standards</i> .....	15
3.2.3 <i>Nodes</i> .....	16
<b>4 SERVICE OVERVIEW</b> .....	<b>18</b>
4.1 SERVICE TAXONOMY .....	19
4.2 SERVICE LEVELS (NFRs) .....	19
4.3 SERVICE FUNCTIONS AND CAPABILITIES.....	19
4.4 SERVICE INTERFACES.....	20
<b>5 SERVICE INTERFACE SPECIFICATIONS</b> .....	<b>21</b>
5.1 SERVICE INTERFACE AINSINTERFACEPULL .....	26
5.1.1 <i>Service Interface Definition</i> <i>ProvidedAeronauticalInformationNotificationInterfaceDefinitionPull</i> .....	26
5.2 SERVICE INTERFACE AINSINTERFACEPUSH .....	27
5.2.1 <i>Service Interface Definition</i> <i>ProvidedAeronauticalInformationNotificationInterfaceDefinitionPush</i> .....	27
5.2.2 <i>Service Interface Definition</i> <i>RequiredAeronauticalInformationNotificationInterfaceDefinitionPush</i> .....	27
<b>6 SERVICE DYNAMIC BEHAVIOUR</b> .....	<b>28</b>
<b>7 SERVICE PROVISIONING</b> .....	<b>29</b>
<b>8 VALIDATION AND VERIFICATION</b> .....	<b>30</b>
8.1 VERIFICATION.....	30
8.1.1 <i>Verification Results</i> .....	30
8.2 VALIDATION.....	30
<b>9 REFERENCES</b> .....	<b>31</b>

## List of tables

Table 1: Requirements tracing .....	14
Table 2 Non functional requirements .....	15
Table 3: Service Interfaces .....	20
Table 4 Payload mapping to the AIRM .....	25
Table 5 Operation parameters AINSPullRequest .....	26
Table 6 Operation parameters AINSSubscription .....	26
Table 7 Operation parameters AINSUnsubscription .....	27
Table 8 Operation parameters AINSPushNotification .....	27

## List of figures

Figure 1: NAV Aeronautical Information Notification Service Requirements Traceability IER diagram ..	12
Figure 2 Essential SWIM standards .....	16
Figure 3: NOV-2 Aeronautical Information Notification Service Service to Nodes Mapping diagram .....	17
Figure 4: NSOV-4 Aeronautical Information Notification Service Service to Operational Activities Mapping diagram .....	19
Figure 5: NSOV-2 Aeronautical Information Notification Service Interface Definition diagram .....	20
Figure 6: NSOV-2 Aeronautical Information Notification Service Interface Parameter Definition diagram .....	21
Figure 7: NSOV-5c Aeronautical Information Notification Service Event Trace Description .....	28

## Executive summary

The Aeronautical Information Notification service provides the CDM for the provision of aeronautical information alerts about new information being available. This document is based on the service designed in the ISRM model, part of the ISRM 2.0 delivery (Ref. [14]).

The main purpose of the Aeronautical Information Notification service is to provide notifications (alerts) to consumers providing them with a simple mechanism to maintain their systems updated to the latest information available.

The data scope of the service is all aeronautical information currently distributed by means of NOTAM and AIP amendments.

To accomplish this, the services will be based on a Publish/Subscribe mechanism.

# 1 Introduction

## 1.1 Purpose of the document

The purpose of this Service Design Description is to give an overview of the service, its operations and functions. The document should be seen as a complement to the service model itself, included as one part of the deliverable for ISRM.

The Aeronautical Information Notification Service (AINS) has been identified by P08.03.10 in the work of Fast Track 13 Digital Briefing.

The purpose of the service is the provision of digital alerts about new information being available (NOTAM, AIP amendment, SUP, etc.) together with the information itself through a subscription and push mechanism.

## 1.2 Intended readership

This service description is intended to be read by Enterprise Architects, Service Architects, Information Architects, System Engineers and Developers in pursuing architecting, design and development activities.

## 1.3 Inputs from other projects

This document covers previous work from projects P11.01.02 and P13.02.02.

## 1.4 Glossary of terms

*This section identifies terms not covered in one or more referenced documents and a proposed definition.*

## 1.5 Acronyms and Terminology

### 1.5.1 Acronyms

Term	Definition
<b>ADD</b>	Architecture Description Document
<b>AINS</b>	Aeronautical Information Notification Service
<b>AIP</b>	Aeronautical Information Publication
<b>AMDT</b>	AIP Amendment
<b>ATM</b>	Air Traffic Management
<b>CC</b>	Capability Configuration
<b>EATMA</b>	European Air Traffic Management Architecture
<b>E-ATMS</b>	European Air Traffic Management System
<b>FAA</b>	Federal Aviation Administration
<b>IER</b>	Information Exchange Requirement
<b>ISRM</b>	Information Service Reference Model

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

7 of 33

Term	Definition
<b>MEP</b>	Message Exchange Pattern
<b>MG</b>	ISRM Modelling Guidelines
<b>NAF</b>	NATO Architecture Framework
<b>NSOV</b>	NATO Service Oriented View
<b>NOTAM</b>	A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.
<b>NOV</b>	NATO Operational View
<b>NSV</b>	NATO System View
<b>OSED</b>	Operational Service and Environment Definition
<b>PIB</b>	Pre Flight Briefing
<b>QoS</b>	Quality of Service
<b>SDD</b>	Service Description Document
<b>SESAR</b>	Single European Sky ATM Research Programme
<b>SESAR Programme</b>	The programme which defines the Research and Development activities and Projects for the SJU.
<b>SJU</b>	SESAR Joint Undertaking (Agency of the European Commission)
<b>SJU Work Programme</b>	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
<b>SoaML</b>	Service Oriented Architecture Modelling Language
<b>SUP</b>	AIP Supplement
<b>SWIM</b>	System Wide Information Management
<b>UML</b>	Unified Modelling Language
<b>V&amp;V</b>	Validation and Verification
<b>WSDL</b>	Web Services Definition Language
<b>XSD</b>	XML Schema Definition

## 1.5.2 Terminology

Term	Definition	Source
<b>Capability</b>	Capability is the ability of one or more of the enterprise's resources to deliver a specified type of effect or a specified course of action to the enterprise stakeholders.	EATMA Guidance Material [8]
<b>Capability Configuration</b>	A Capability Configuration is a combination of Roles and Systems configured to provide a Capability derived from operational and/or business need(s) of a stakeholder type.	EATMA Guidance Material [8]
<b>Node</b>	A logical entity that performs Activities. Note: nodes are specified independently of any physical realisation.	EATMA Guidance Material [8]
<b>Service</b>	The contractual provision of something (a non-physical object), by one, for the use of one or more others. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or written processes and procedures.	EATMA Guidance Material [8]
<b>Service function</b>	A type of activity describing the functionality of a Service.	EATMA Guidance Material [8]
<b>Service interface</b>	The mechanism by which a service communicates	EATMA Guidance Material [8]

## 2 Service identification

Name	AeronauticalInformationNotification
ID	{EC2A4C8D-DC16-4de4-AACB-4478CF2E8108}
Version	2.0
Keywords	Alert users when new information is available; provide dynamic data updates to users.  Aeronautical Information, subscription, notification, Annex 15, AIM, AIS, Amendment, Fast Track 13
Architect(s)	██████████ NORACON

Lifecycle status	Date	References
Identified	19/02/2014	FT13 Service Identification Document [15] SCG11 meeting minutes [16]
Allocated	24/02/2014	FT13 service allocation report [17]
Designed	30/06/2014	ISRM1.1 Delivery_Report [18] (first delivery) This document (final delivery)
Validated	<i>Date when validated. Filled by WP3</i>	<i>Name of protocol documenting the decision</i>
IOC	<i>Date for Initial Operational Capability</i>	<i>Reference to technical enabler hosting the service in the ATM master plan</i>
FOC	<i>Date for Full Operational Capability</i>	<i>Reference to technical enabler hosting the service in the ATM master plan</i>

## 3 Operational and Business context

The ATM system is relying increasingly and at all levels on automated systems, which depend on correct and up-to-date information in order to perform their functions. However, the content of a database, be it on-board, at the flight operations centre, at the airport, or in an ATC system, may be 'modified by NOTAM'. The task of remembering which information is overridden becomes the pilot's or controller's burden. Weather is also a key factor that affects the operations and that must be taken into account by all the stakeholders involved in a flight.

Today in Europe NOTAM information is made available as semi formatted text messages, resulting in limited filtering capabilities. Also the graphical representation is quite limited, resulting in hard to interpret and sometimes misleading maps.

The pre-flight briefing is done mainly in the form of a 'bulletin' given to the pilot and containing the list of valid NOTAMs that might be relevant for the flight, together with the expected weather for the route. These bulletins usually grow beyond the limit where the pilot can effectively manage, which creates a risk of missing key information.

More and more complex information very relevant to the operation is being distributed by NOTAM, which implies difficulties with automated systems (FMS as an example) that cannot update their databases accordingly.

The solution to this problem is the replacement of the current text messages with digital data, which enables improved data quality and usability, with positive impact on the safety and efficiency of the ATM system. This will be achieved through direct electronic data transfer along the whole data processing chain, automatic validation and customised presentation, according to user needs.

With digital aeronautical information, the briefing could be radically improved through more precise automatic filtering, by replacing/supplementing the NOTAM text with graphical information. The pre-flight briefing could take place directly on the EFB, using data provided by digital briefing applications on the ground and updated over a data link during the flight.

Digital data can (apart from being used by machines to process automatically) be easily translated into the legacy bulletin format to avoid problems in human reception and to also continue to feed legacy systems as well (the latter will help in the transition phase).

The Aeronautical Information Notification service is a service that enables systems and End users to keep updated to the latest aeronautical information via Push or Pull Notifications.

This identified service will provide structured digital aeronautical information, thus enabling automatic filtering and processing of the data/messages. As examples, airline flight centres could efficiently use the latest information available to improve their decision making process thus positively impacting the efficiency of their planning and flight executions. Also on board navigational databases could be potentially updated on flight with new digital NOTAM messages being issued. The key difference with current digital message systems (like D-ATIS) is the structure of the messages, allowing automatic processing by onboard systems.

### 3.1 Information Exchange Requirements

Requirements in relation to the operational context are collected from:

- 13.02.02 D10 OSED for Step 2 (in particular Annex B "OSED IER") [19]
- 11.01.02 D01 OSED [20]

Not very detailed and precise information exchange requirements were explicitly present in the reference documents, coordination with the projects led to a better understanding of the needs and a common service proposals were formulated and agreed during the service identification phase (see 3.2)

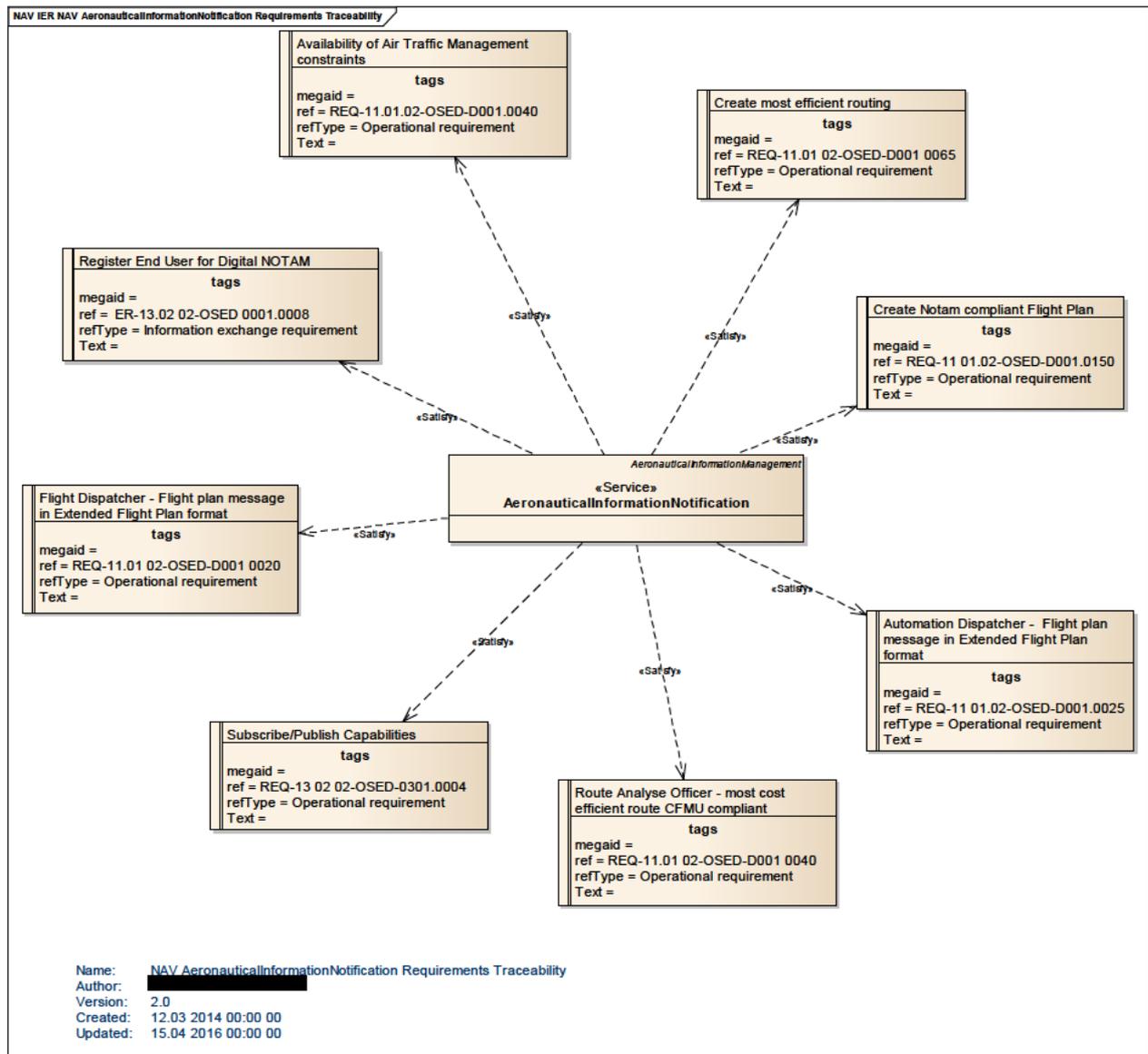


Figure 1: NAV AeronauticalInformationNotificationService Requirements Traceability IER diagram

Element Name	Author	Notes
Automation Dispatcher - Flight plan message in Extended Flight Plan format	██████████	When the Automation Dispatcher files a flight to the Network Manager the flight plan message shall be in the EFPL format. (In the absence of a 4D trajectory in the EFPL the aircraft performance data contained shall be used to check the planned flight trajectory against ATM constraints.)
	<b>Element Tagged Value Name</b>	<b>Value</b>
	megaid	
	ref	REQ-11.01.02-OSED-D001.0025
	refType	Operational requirement
	Text	

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
 www.sesarju.eu

Element Name	Author	Notes
Availability of Air Traffic Management constraints		Availability of Air Traffic Management constraints (RAD, CDR, Restricted Areas, NOTAM Restrictions, AIP published restrictions)
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-11.01.02-OSED-D001.0040
	refType	Operational requirement
	Text	

Element Name	Author	Notes
Create Notam compliant Flight Plan		The Flight Dispatcher shall create a flight plan that is compliant to every NOTAM immediately after reception of such without a manual pre-processing.
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-11.01.02-OSED-D001.0150
	refType	Operational requirement
	Text	

Element Name	Author	Notes
Create most efficient routing		The Route Analysis Officer shall create the most cost efficient routing using the Free Route Airspace data published in the AIP.
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-11.01.02-OSED-D001.0065
	refType	Operational requirement
	Text	

Element Name	Author	Notes
Flight Dispatcher - Flight plan message in Extended Flight Plan format		When the Flight Dispatcher files a flight to the Network Manager the flight plan message shall be in the EFPL format. (In order to improve the flight plan validation against air traffic restrictions an extended flight plan including a 4D trajectory has to be exchanged. That 4D trajectory shall be used to check the planned flight trajectory against ATM constraints.)
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-11.01.02-OSED-D001.0020
	refType	Operational requirement
	Text	

Element Name	Author	Notes
Route Analyse Officer - most cost efficient route CFMU compliant		The Route Analysis Officer shall create the most cost efficient CFMU compliant routing for every flight upon the reception of all ATM constraints from the Network Manager. (In order to deliver a 100% compliant 4D trajectory (at all times), all planning restrictions have to be known to the Route Analysis Officer and the Flight Dispatcher. To support an automatic processing the delivered data has to be in a machine readable format. All details of a restriction have to be in a fully machine readable format. No detail of the restriction must be written in sole human readable remark sections.)
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-11.01.02-OSED-D001.0040
	refType	Operational requirement
	Text	

Element Name	Author	Notes
Register End User for Digital NOTAM		Register End User for Digital NOTAM.
	Element Tagged Value Name	Value
	megaid	
	ref	IER-13.02.02-OSED.0001.0008
	refType	Information exchange requirement
	Text	

Element Name	Author	Notes
Subscribe/Publish Capabilities		The system of the digital NOTAM Provider shall provide a service "Register for Digital NOTAM" that allows Service Provider systems to register their interest in receiving published NOTAM for a given area. This shall result in published NOTAM being sent to the registered user system, both in digital and text format according to the request.
	Element Tagged Value Name	Value
	megaid	
	ref	REQ-13.02.02-OSED-0301.0004
	refType	Operational requirement
	Text	

Table 1: Requirements tracing

## 3.2 Other Requirements

ICAO has established requirements for Aeronautical Information in its Annex 15 and Annex 4.

It has been agreed by FT13 members and mainly by 13.02.02 and 11.01.02 projects where requirements come from, that whenever aeronautical information is mentioned without further details, it has to be understood that current standards apply, and thus Annex 15 and Annex 4 apply.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

As this analysis and series of proposed services partially rely on ICAO Annexes for the temporality concepts and data content, it should be considered by operational project the definition of the SESAR concept for the aeronautical data management. For example, Annex 15 and Annex 3 temporality aspects need to be reviewed and brought up to date with the new capabilities that digital data and services bring. The same applies to Annex 4 mapping requirements.

While not directly related to the service identification process, it has been detected and pointed out by 11.01.02 that one aspect that is worth mentioning is related to the legal framework for data distribution. To really achieve all benefits from digital data distribution, all aspects related to copyright, use rights of data and liabilities need to be clearly stated.

### 3.2.1 Non-Functional Requirements

The Information Exchange Requirements related to Safety and Performance (SPR) are detailed below, according to 13.02.02 and their D10 OSED.

These requirements have been very specifically defined for airport map data, and thus require further investigation and knowledge gain if they would also apply for other briefing services also.

Identifier	Name
IER-13.2.2-OSED.0001.0027	Request Airport Map with graphical NOTAM

**Table 2 Non functional requirements**

It should be noted that the column “Safety Criticality” defined in the SPR IER template has mostly been left blank in this section. The reason is that it is not appropriate to provide the requested values without a proper safety analysis of the Information Exchange Requirements based on a validated methodology.

For future update of these NFR requirements a consideration also could be done taking into account the Business Continuity Plan of EAD for instance, whose services are related to that we are defining. It could be stated that if, after 1 hour of outage, the duration is still unknown, the clients shall be advised to apply their fallback procedure, for example.

### 3.2.2 Relevant Industrial Standards

In addition to the SESAR related requirements above, industry standardization activities within EUROCAE/RTCA and ARINC, throughout the past 10 years, have defined User Requirements as well as Interchange Standard for aeronautical data.

Those requirements have not directly been referred to, or requested by the Operational/System projects identified by project P08.03.10. Nevertheless, WP8 projects shall consider and analyse applicability of standardization and harmonization activities towards interoperability outside SESAR research programme.

In this context, it has been pointed out by 11.01.02 that to ensure a smooth transition to SESAR SWIM, protect current investments and ensure international interoperability, support for these formats should be taken into account.

The ADD states the following in regard to Essential SWIM standards:

**SYSTEM WIDE INFORMATION MANAGEMENT (ESSENTIAL)**

Electronic terrain and obstacle database (eTOD)	2012	Ongoing ICAO Annex 15
Data Exchange specification for Airport Mapping Database	2012	Ongoing WG-44 ED-99c ED-119b ARINC816 ICAO Annex 15
AIS and MET Data-link Services	2013	Ongoing WG76/SC206 OSED
Guidelines for Electronic AIP	2014	Ongoing ICAO Doc8126
Aeronautical Information Exchange data model (AIXM)	2016	Ongoing ICAO Annex 15
Digital NOTAM at global level	2018	Ongoing EUROCONTROL/FAA ICAO Annex 15
ATC to ATC flight data exchange updated following validation results	2013	Planned ED-133a
Weather information exchange model	2014	Ongoing EUROCONTROL/FAA WXXM
Use of military surveillance data by civil aviation	2018	TBD

**Figure 2 Essential SWIM standards**

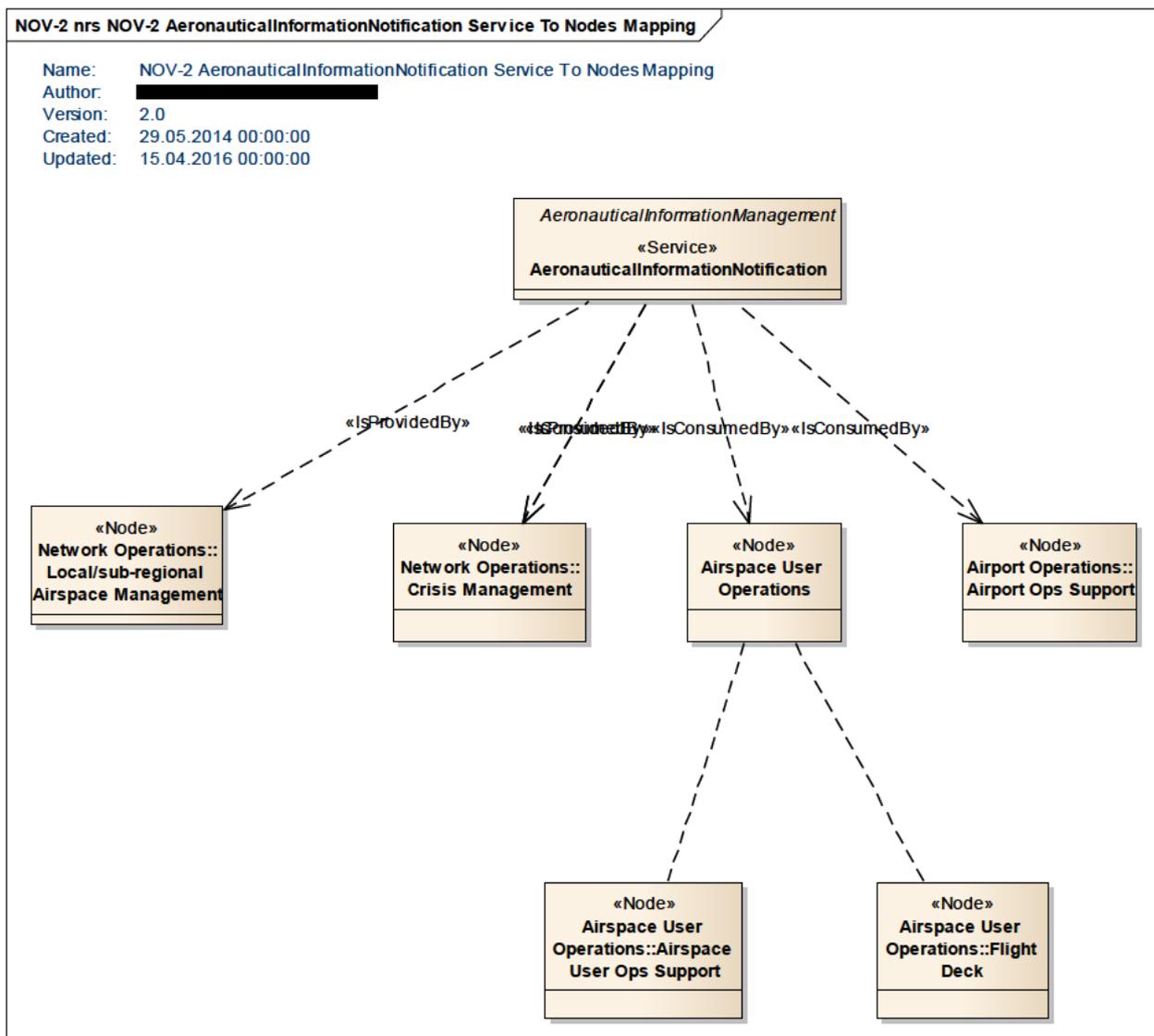
### 3.2.3 Nodes

The consumers and provider nodes are depicted below.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu



**Figure 3: NOV-2 AeronauticalInformationNotificationService Service to Nodes Mapping diagram**

## 4 Service overview

The main purpose of the Aeronautical Information Notification service is to provide notifications (alerts) to consumers providing them with a simple mechanism to maintain their systems updated to the latest information available.

To accomplish this, the services will be based on a Publish/Subscribe mechanism.

The following requirements apply to this framework:

- There shall be a mechanism to subscribe/unsubscribe
- There shall be filtering mechanisms to only subscribe to specific contents.
- When new data is available, it shall be distributed to the subscribers.
- There shall be a mechanism by which a given subscriber can check if he has received all sent notifications.
- There shall be a mechanism by which a subscriber requests a notification reissue (due to not reception, lose, etc.)

In general, the Aeronautical Information Notification service will only send updates to current features properties or new features. Thus, to properly interpret the data received, it is paramount that a previous call to appropriate service operation to obtain the data is performed. The Aeronautical Information Notification service shall expose such an operation and provide to immediately start the notifications messages after its call. So the process will look like this: The consumer subscribes, the subscription is then moved to a latency state. Then the consumer retrieves the latest available baseline data, together with currently available notifications that apply to that baseline. At that moment, new data changes will be notified, the subscription moves to an active status.

### *Scheduled Information.*

It is foreseen, the data content of the schedule information (typically AIP amendment) service to be big (in the number of features). Thus the pushed or pulled data has to be selected using the earlier mentioned filter included in the subscription message.

This service operation will only provide the updates to the information due to scheduled dates overlapping the current date or in the future. For retrieving the full data a call to the Aeronautical Feature Service will need to be performed.

### *Digital NOTAMs*

As the data content is supposed to be small, but the number of updates significant, this service will provide the complete data change within the notification message.

It is foreseen that notifications can be sent that supersede previous notifications (error correction mechanism, cancelation, etc): It is to be determined if this will be performed based on the framework capabilities or specific operational data management processes on the service data content must be defined.

Publisher/Subscribe Pull and Push MEPS fit the Aeronautical Information Notification service messaging requirements: A publisher sends event data in the messaging service. The messaging service either pushes data to subscribers who manifested their interest or waits for them to pull data. The publisher and subscribers do not have to know of each other. The messaging service maintains the subscriptions. Publisher and subscribers do not need to be simultaneously present.

The additional condition requested for this Publisher/Subscriber Pull Mechanism to fit in a perfect way to Aeronautical Information Notification service is that a notification of the presence of a new event (the nature of the data, new scheduled information or digital NOTAM, but not the data itself) must be always sent to all subscribers as soon as it is available, not just “possibly”.

### 4.1 Service Taxonomy

The service taxonomy is described in the ISRM Service Portfolio document [9].

### 4.2 Service Levels (NfRs)

Non Functional Requirements are described in section 3.2.1.

### 4.3 Service Functions and Capabilities

The service provides aeronautical information which main purpose is enabling a common infrastructure picture (airspace availability, airport infrastructure availability, etc.) to be used in planning and during operations.

The AeronauticalInformationNotification service as a means to be updated with latest available aeronautical information will potentially be useful for many other Nodes, the map has been performed with the major ones to maintain diagram readability.

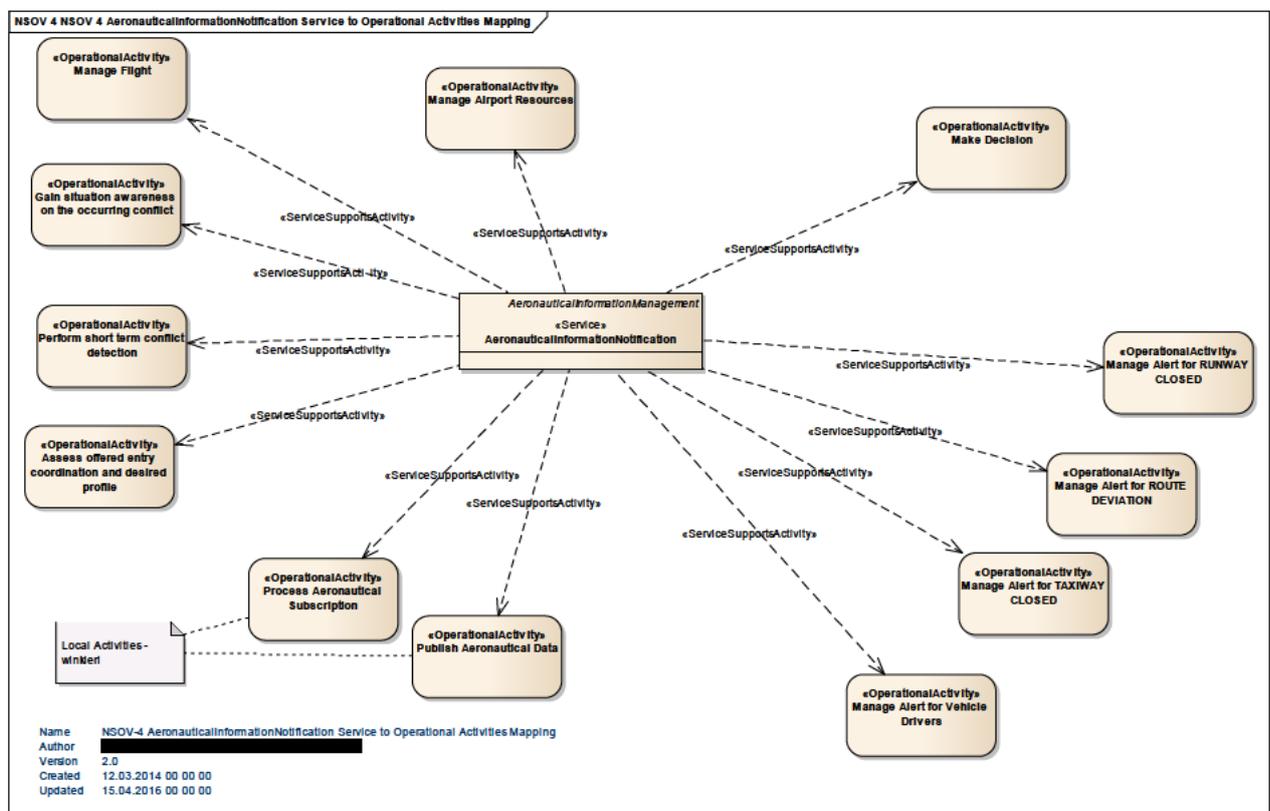


Figure 4: NSOV-4 AeronauticalInformationNotificationService Service to Operational Activities Mapping diagram

### 4.4 Service Interfaces

The AeronauticalInformationNotification service provides two interfaces:

- AINSInterfacePull implements Publish/Subscribe Pull MEP.
- AINSInterfacePush implements Publish/Subscribe via Push messages.

Both Interfaces follow the default MEP's defined in the ISRM standard MEP library.

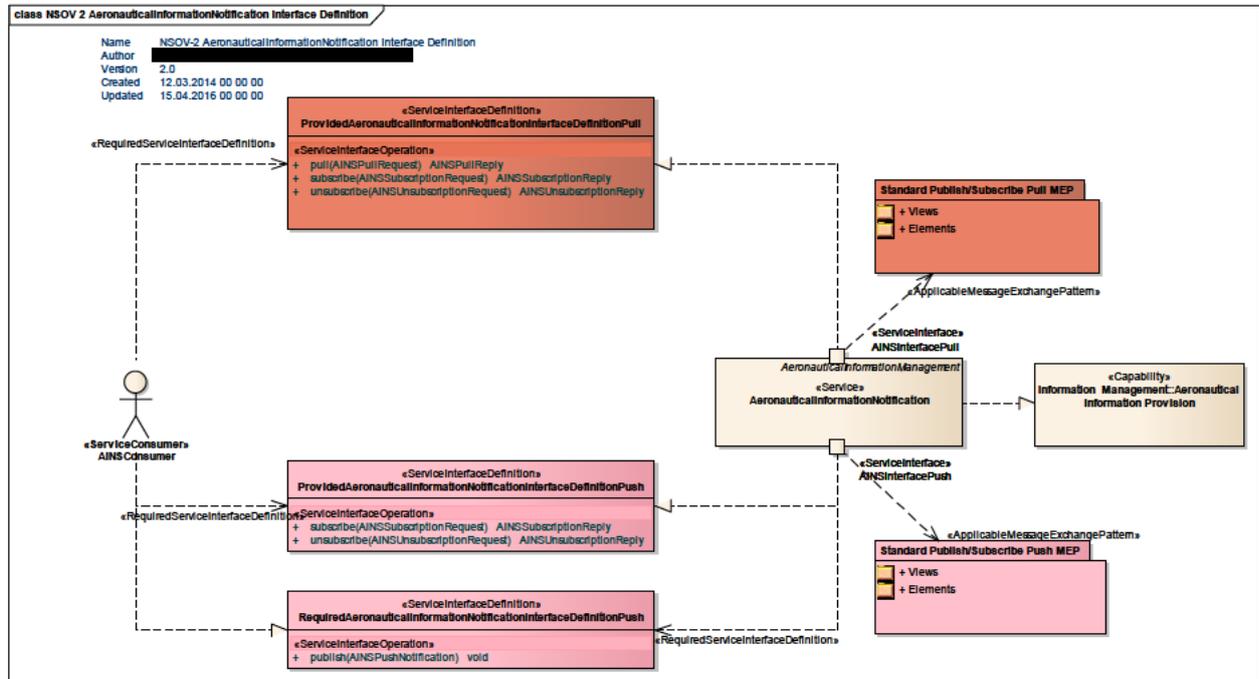


Figure 5: NSOV-2 AeronauticalInformationNotificationService Interface Definition diagram

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
AINSInterface Pull	ProvidedAeronauticalInformationNotificationInterfaceDefinitionPull	pull	provided
AINSInterface Pull	ProvidedAeronauticalInformationNotificationInterfaceDefinitionPull	subscribe	provided
AINSInterface Pull	ProvidedAeronauticalInformationNotificationInterfaceDefinitionPull	unsubscribe	provided
AINSInterface Push	ProvidedAeronauticalInformationNotificationInterfaceDefinitionPush	subscribe	provided
AINSInterface Push	ProvidedAeronauticalInformationNotificationInterfaceDefinitionPush	unsubscribe	provided
AINSInterface Push	RequiredAeronauticalInformationNotificationInterfaceDefinitionPush	publish	required

Table 3: Service Interfaces

## 5 Service interface specifications

The AeronauticalInformationNotification service relies on AIXM 5.1 standard for data exchange of aeronautical information; this has also an important impact that will be detailed in the different operations and parameters.

A general parameters diagram is provided below

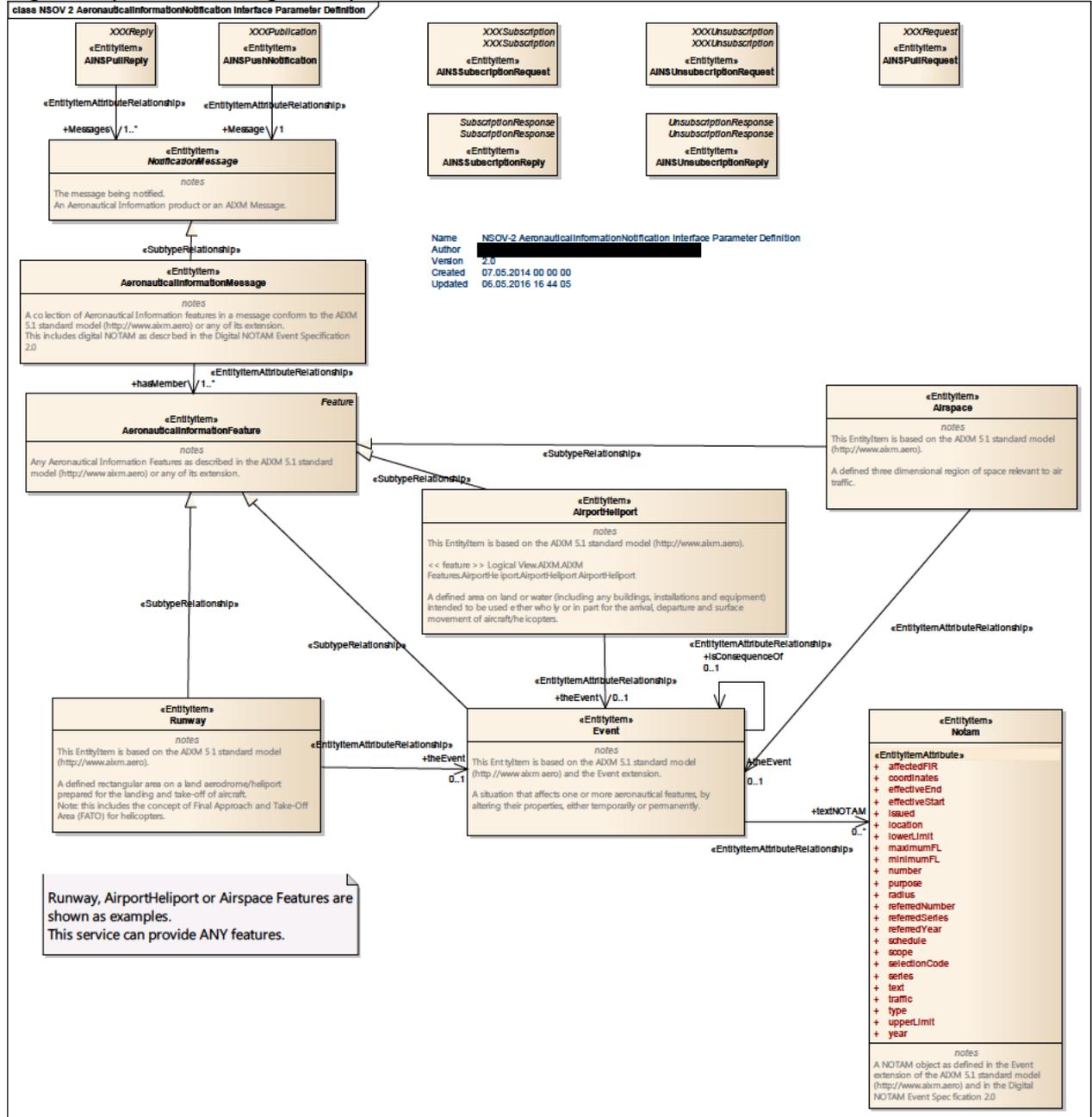


Figure 6: NSOV-2 AeronauticalInformationNotificationService Interface Parameter Definition diagram

The actual service payload is shared by both interfaces. Because of this the payload will be described here instead of in a specific interface operation section:

An event, as bundled in a NotificationMessage, is a logical grouping of aeronautical entities that together represent real world phenomena (like the close of a RWY, a navaid out of service, a new TWY available for operations).

Moving to the digital sharing of aeronautical information, a NOTAM will be an event (as AIP AMDTs and SUPs will also be), for easing the transition period to a digital environment, the event that represent the digital NOTAM is linked to the traditional NOTAM that is provided as text.

Element Name	Author	Notes
NotificationMessage		The message being notified. An Aeronautical Information product or an AIXM Message.
	Element Tagged Value Name	Value
	CLDMSemanticTrace	CLDM_out_of_scope

Element Name	Author	Notes
AeronauticalInformationMessage		A collection of Aeronautical Information features in a message conform to the AIXM 5.1 standard model ( <a href="http://www.aixm.aero">http://www.aixm.aero</a> ) or any of its extension. This includes digital NOTAM as described in the Digital NOTAM Event Specification 2.0
	Element Tagged Value Name	Value
	CLDMSemanticTrace	CLDM_out_of_scope

Element Name	Author	Notes
AeronauticalInformationFeature		Any Aeronautical Information Features as described in the AIXM 5.1 standard model ( <a href="http://www.aixm.aero">http://www.aixm.aero</a> ) or any of its extension.
	Element Tagged Value Name	Value
	CLDMSemanticTrace	CLDM_out_of_scope

Element Name	Author	Notes
Airspace		This EntityItem is based on the AIXM 5.1 standard model ( <a href="http://www.aixm.aero">http://www.aixm.aero</a> ).  A defined three dimensional region of space relevant to air traffic.
	Element Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Airspace:Airspace

Element Name	Author	Notes
--------------	--------	-------

AirportHeliport		<p>This EntityItem is based on the AIXM 5.1 standard model (<a href="http://www.aixm.aero">http://www.aixm.aero</a>).</p> <p>&lt;&lt; feature &gt;&gt; Logical View.AIXM.AIXM Features.AirportHeliport.AirportHeliport.AirportHeliport</p> <p>A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft/helicopters.</p>
	<b>Element Tagged Value Name</b>	<b>Value</b>
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:Aerodrome

Element Name	Author	Notes
Runway		<p>This EntityItem is based on the AIXM 5.1 standard model (<a href="http://www.aixm.aero">http://www.aixm.aero</a>).</p> <p>A defined rectangular area on a land aerodrome/heliport prepared for the landing and take-off of aircraft.</p> <p>Note: this includes the concept of Final Approach and Take-Off Area (FATO) for helicopters.</p>
	<b>Element Tagged Value Name</b>	<b>Value</b>
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:Runway

Element Name	Author	Notes
Event		<p>This EntityItem is based on the AIXM 5.1 standard model (<a href="http://www.aixm.aero">http://www.aixm.aero</a>) and the Event extension.</p> <p>A situation that affects one or more aeronautical features, by altering their properties, either temporarily or permanently.</p>

Element Name	Author	Notes	
Notam		A NOTAM object as defined in the Event extension of the AIXM 5.1 standard model ( <a href="http://www.aixm.aero">http://www.aixm.aero</a> ) and in the Digital NOTAM Event Specification 2.0	
	<b>Element Tagged Value Name</b>	<b>Value</b>	
	IMDefinitionTrace	urn:x-ses:sesarju:airm:v410:InformationModel:SubjectFields:AirTrafficOperations:InformationServicesProducts:AeronauticalInformationProduct:NOTAM	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	affectedFIR		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	coordinates		

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

Element Name	Author	Notes	
Notam		A NOTAM object as defined in the Event extension of the AIXM 5.1 standard model ( <a href="http://www.aixm.aero">http://www.aixm.aero</a> ) and in the Digital NOTAM Event Specification 2.0	
	<b>Element Tagged Value Name</b>	<b>Value</b>	
	IMDefinitionTrace	urn:x- ses:sesarju:airm:v410:InformationModel:SubjectFields: AirTrafficOperations:InformationServicesProducts:Aero nauticalInformationProduct:NOTAM	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	effectiveEnd		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	effectiveStart		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	issued		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	location		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	lowerLimit		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	maximumFL		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	minimumFL		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	number		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	purpose		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	radius		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	referredNumber		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	referredSeries		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	referredYear		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	schedule		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	scope		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

Element Name	Author	Notes	
Notam		A NOTAM object as defined in the Event extension of the AIMX 5.1 standard model ( <a href="http://www.aimx.aero">http://www.aimx.aero</a> ) and in the Digital NOTAM Event Specification 2.0	
	<b>Element Tagged Value Name</b>	<b>Value</b>	
	IMDefinitionTrace	urn:x-ses:sesarju:airm:v410:InformationModel:SubjectFields:AirTrafficOperations:InformationServicesProducts:AeronauticalInformationProduct:NOTAM	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	selectionCode		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	series		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	text		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	traffic		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	type		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	upperLimit		
	<b>Tagged Value Name</b>	<b>Value</b>	
	<b>Attribute Name</b>	<b>Type</b>	<b>Notes</b>
	year		
	<b>Tagged Value Name</b>	<b>Value</b>	

Table 4 Payload mapping to the AIRM

## 5.1 Service Interface AINSInterfacePull

The AINSInterfacePull Service Interfaces implements a Standard Publish/Subscribe Pull MEP. Thus a client can subscribe to the service and actively pull information via a request operation.

### 5.1.1 Service Interface Definition

#### ProvidedAeronauticalInformationNotificationInterfaceDefinitionPull

#### 5.1.1.1 Operation pull

##### 5.1.1.1.1 Operation Functionality

A synchronous call to obtain specific notifications that were published in the past.

##### 5.1.1.1.2 Operation Parameters

The input parameter is a generic request. The output parameter contains the payload described at the beginning of this section for past notifications, see Table 5.

Element Name	Author	Notes
AINSPullRequest		Request for pending notifications (pull mode) for AINS.
	Element Tagged Value Name	Value
	IMDefinitionTrace	N/A

Element Name	Author	Notes
AINSPullReply		Reply to pull request (pull mode). It contains the pending notification messages.

Table 5 Operation parameters AINSPullRequest

#### 5.1.1.2 Operation subscribe

##### 5.1.1.2.1 Operation Functionality

This operation enables the service consumer to subscribe to notifications. It can also be called to modify the filtering of an existing subscription.

##### 5.1.1.2.2 Operation Parameters

The input and output parameters are generic request and reply messages respectively, see Table 6.

Element Name	Author	Notes
AINSSubscriptionRequest		Subscription to AINS.

Element Name	Author	Notes
AINSSubscriptionReply		Subscribe response for AINS.

Table 6 Operation parameters AINSSubscription

#### 5.1.1.3 Operation unsubscribe

##### 5.1.1.3.1 Operation Functionality

This operation enables the service consumer to unsubscribe from notifications.

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
www.sesarju.eu

### 5.1.1.3.2 Operation Parameters

This input parameter provides the details needed to cancel a specific subscription. The input and output parameters are generic request and reply messages respectively, see Table 7.

Element Name	Author	Notes
AINSunsubscriptionRequest		Unsubscription to AINS

Element Name	Author	Notes
AINSunsubscriptionReply		Unsubscribe response from AINS.
Element Tagged Value Name	Value	
IMDefinitionTrace	N/A	

**Table 7 Operation parameters AINSUnsubscription**

## 5.2 Service Interface AINSInterfacePush

This interfaces differs from the one described above only in one way. It implements Publish/Subscribe via push notifications instead of client triggered requests. Hence the interfaces are very similar.

### 5.2.1 Service Interface Definition

#### ProvidedAeronauticalInformationNotificationInterfaceDefinitionPush

#### 5.2.1.1 Operation subscribe

See 5.1.1.2.

#### 5.2.1.2 Operation unsubscribe

See 5.1.1.3

### 5.2.2 Service Interface Definition

#### RequiredAeronauticalInformationNotificationInterfaceDefinitionPush

#### 5.2.2.1 Operation publish

##### 5.2.2.1.1 Operation Functionality

This operation enables the service to push notifications to clients if there is a relevant subscription.

##### 5.2.2.1.2 Operation Parameters

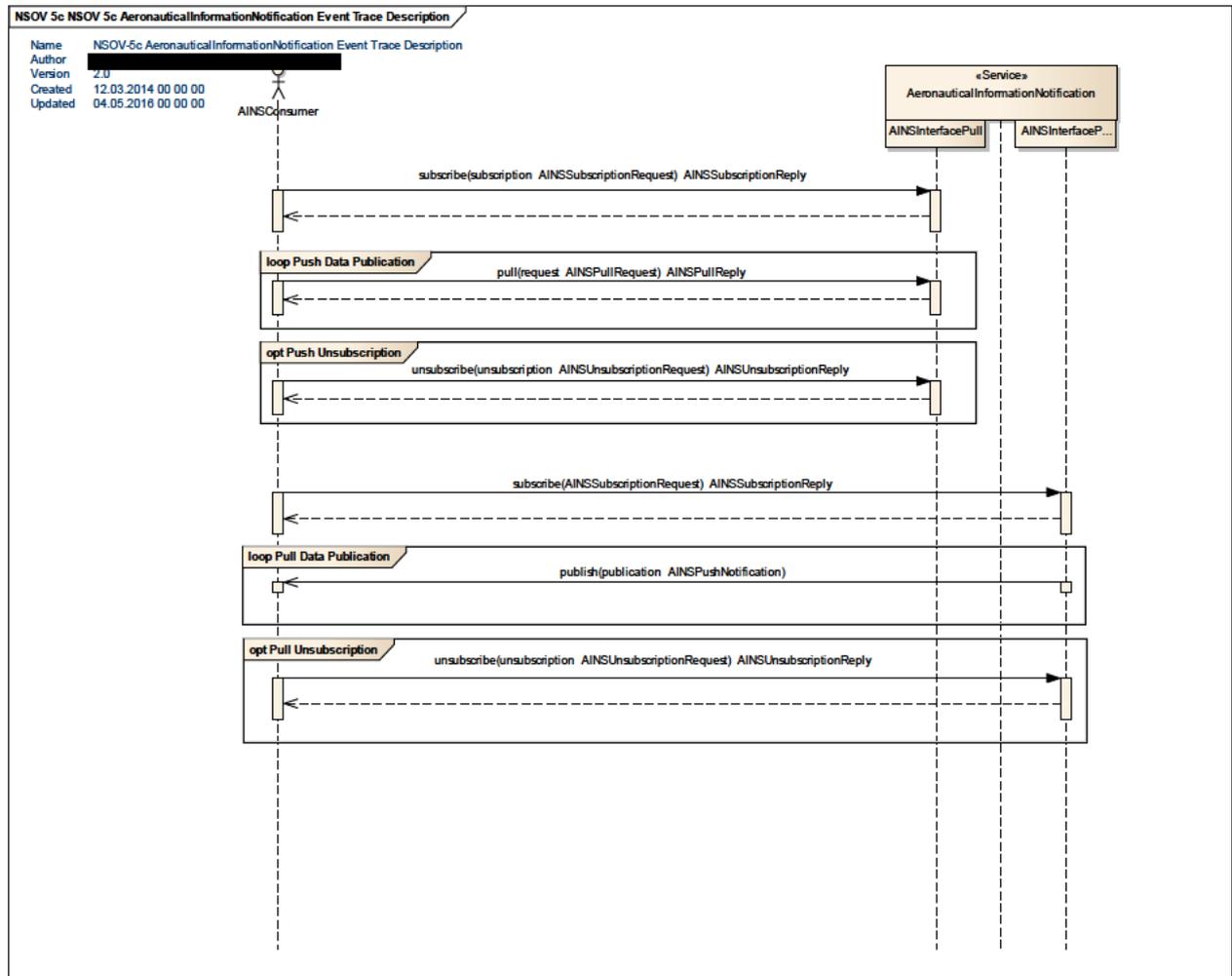
The input parameter is the payload described at the beginning of this section. This operation has no output, see Table 8.

Element Name	Author	Notes
AINSPushNotification		Notification in push mode.

**Table 8 Operation parameters AINSPushNotification**

## 6 Service dynamic behaviour

The diagram below depicts the service dynamic behaviour of both interfaces.



**Figure 7: NSOV-5c AeronauticalInformationNotificationService Event Trace Description**

Both interfaces follow the dynamic behaviour of the inherited MEP's (Message Exchange Patterns) which have been chosen as explained in chapter 4.

While a push based subscription has a more natural flow of data the pull interface offers the option to explicitly check if there are no new notifications instead of assuming which is essential in critical systems.

## 7 Service provisioning

N/A

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
[www.sesarju.eu](http://www.sesarju.eu)

## 8 Validation and Verification

### 8.1 Verification

Aeronautical Information Notification service has been verified following P08.03.10 standard working methods.

A verification report is available Ref.[21].

#### 8.1.1 Verification Results

A verification report is available Ref.[21].

<b>Service Name:</b>	Service Aeronautical Information Notification	<b>Date of Verification:</b>	150416
<b>Service Version:</b>	2	<b>Version of Verification</b>	00.07.00
<b>Phase:</b>	2	<b>Rules used:</b>	
<b>Owner of Service:</b>	██████████	<b>Manual</b>	47
<b>Name of Verifier:</b>		<b>Passes:</b>	155
<b>Overall Comments:</b>		<b>Failures:</b>	
		<b>Warnings:</b>	

### 8.2 Validation

The Service has not been part of a validation exercise.

## 9 References

Name	Version	Document ID / Location
[1] Project deliverables template	03.00.00	SJU templates & guidelines package, Project deliverables template.dot
[2] OSED template	03.00.00	SJU templates & guidelines package, SESAR Operational Service and Environment Definition.dot
[3] SPR template	03.00.00	SJU templates & guidelines package, SESAR Safety and Performance Requirements.dot
[4] ISRM Tooling Guidelines	00.07.00	08.03.10 Deliverable D44
[5] ISRM Modelling Guidelines	00.07.00	08.03.10 Deliverable D44
[6] ISRM Rule Book	00.07.00	08.03.10 Deliverable D44
[7] ISRM Verification Guidelines	00.07.00	08.03.10 Deliverable D44
[8] EATMA Guidance Material	00.04.02	B.04.01 D66
[9] ISRM service portfolio	00.08.01	Deliverable D65
[10] FAA Web Service Description Document	July 15, 2013	<a href="http://www.faa.gov/nextgen/programs/swim/governance/standards/media/wsdd%20fps%20example%20v2%2007152013.pdf">http://www.faa.gov/nextgen/programs/swim/governance/standards/media/wsdd%20fps%20example%20v2%2007152013.pdf</a>
[11] NATO Architecture Framework	v3.0 & 3.1	<a href="https://nhqc3s.hq.nato.int/">https://nhqc3s.hq.nato.int/</a>
[12] Working Method on Services (edition 2014)	00.05.00	B.04.03 Deliverable D100
[13] ADD Step 1 – pre-released version	00.01.09	B.04.03 Deliverable D73
[14] ISRM 2.0 delivery report	00.01.00	08.03.10 Deliverable D65
[15] FT13 Service Identification Document	00.00.03	08.03.10 internal doc. Service Identification Document for the Digital Briefing focus area (FT13).docx
[16] SCG11 Meeting minutes	N/A	B.04.03 internal doc. 20140211 SCG11 Minutes.doc
[17] FT13 Service Allocation Report	00.00.09	B.04.03 internal doc. Digital Briefing Service Allocation FT13.doc
[18] ISRM 1.1 Delivery Report	00.01.01	08.03.10 Deliverable D61
[19] OSED for Step 2	00.07.00	13.02.02 Deliverable D10:

Name	Version	Document ID / Location
[20] OSED Step 1	00.01.04	11.01.02 Deliverable D01:
[21] Aeronautical Information Notification Service Verification Report	N/A	08.03.10 Deliverable D65 Verification report.

**-END OF DOCUMENT-**

founding members



Avenue de Cortenbergh 100 | B -1000 Bruxelles  
[www.sesarju.eu](http://www.sesarju.eu)