



# European ATM Service Description for the ARESPreActivation Service

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## Abstract

The ARESPreActivation service provides the CDM to coordinate the pre-activation of an ARES between the ASM and the concerned ACCs. This document is based on the service model designed in the ISRM repository (Ref [11]).

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## Executive summary

The current document describes the logical model of the ARESPreActivation service. It is the result of the “Service Design” step of the B.4.3 Working Method on Services. The Service Design has been performed in the context of Service Activity SV008 entailing Airspace Management and Advanced Flexible Use of Airspace.

The ARESPreActivation service supports the coordination of the pre-activation of an ARES between the ASM and the concerned ACCs in SESAR Step 1 as described in the AFUA OSED (Ref [12]). It is part of the Commission Pilot Common Project in the SWIM section under the label “Pre-notification of the activation of an Airspace Reservation/Restriction (ARES)” (Ref [14]).

The design complies with the ISRM Foundation 00.07.00 and it is part of the ISRM V2.0 (Ref [11]).

# 1 Introduction

## 1.1 Purpose of the document

This document provides a holistic view of the ARESPreActivation service and its building blocks complementary to the UML model of the service available in the ISRM (ref [11]).

The service is part of the ISRM Service Portfolio (ref [9]) where all services are presented at a high level.

Additionally this document supports the configuration management process by providing well-defined baselines of the service.

## 1.2 Intended readership

This document 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

Step 1 AFUA OSED [12] and the AFUA SPR [13] developed by P07.05.04.

## 1.4 Glossary of terms

All terms in this document are defined in the AFUA OSED [12].

## 1.5 Acronyms and Terminology

### 1.5.1 Acronyms

Term	Definition
<b>ACC</b>	Area Control Centre
<b>ADD</b>	Architecture Description Document
<b>ARES</b>	Airspace Reservation/Restriction
<b>ASM</b>	Airspace Management
<b>AUP</b>	Airspace Use Plan
<b>ATC</b>	Air Traffic Control
<b>ATM</b>	Air Traffic Management
<b>BPMN</b>	Business Process Modelling Notation
<b>CCB</b>	Change Control Board
<b>CDM</b>	Collaborative Decision Making
<b>CONOPS</b>	Concept of Operations

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Term	Definition
<b>CR</b>	Change Request
<b>CWP</b>	Controller Working Position
<b>DOD</b>	Detailed Operational Description
<b>EAEA</b>	European ATM Enterprise Architecture
<b>EAUP</b>	European Airspace Use Plan
<b>FOC</b>	Full Operational Capability
<b>IER</b>	Information Exchange Requirement
<b>IOC</b>	Initial Operational Capability
<b>ISRM</b>	Information Service Reference Model
<b>NAF</b>	NATO Architecture Framework
<b>NSOV</b>	NATO Service Oriented View
<b>NOV</b>	NATO Operational View
<b>NSV</b>	NATO System View
<b>OFA</b>	Operational Focus Group
<b>OSD</b>	Operational Service and Environment Definition
<b>QoS</b>	Quality of Service
<b>SESAR</b>	Single European Sky ATM Research Programme
<b>UML</b>	Unified Modelling Language
<b>UUP</b>	Updated Use Plan
<b>VPA</b>	Variable Profile Area
<b>WOC</b>	Wing Operation Centre

## 1.5.2 Terminology

Term	Definition	Source
<b>Airspace Management</b>	The Airspace Management (ASM) is a planning function with the primary objective of maximising the utilisation of available airspace by dynamic time-sharing and, at times, the segregation of airspace among various categories of users	OSD [12]

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Term	Definition	Source
	based on short-term needs.	
<b>Airspace Reservation</b>	A defined volume of airspace temporarily reserved for exclusive or specific use by categories of users.[7]	OSD [12]
<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	ARESPreActivation
ID	{3CC3A355-FBC5-4b4b-84D5-EED7C1F6AA21}
Version	2.0
Keywords	AFUA, ARES, allocation, ASM, notification
Architect(s)	 EUROCONTROL

Lifecycle status	Date	References
Identified	06/07/2012	See reference [15]
Allocated	22/08/2012	See reference [16]
Designed	30/9/2012	This document
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

Certain minutes before a planned activity starts in the ARES, the appropriate AMC authority pre-notifies the activation to the ACC supervisors impacted by the activation. The ASM Support System sends a message to pre-activate the ARES. The ASM Support System selects automatically the controlling units affected by the activation and sends the message only to those supervisors. The supervisors receive a warning on their ASM Support System position to accept or refuse the activation.

After acknowledgment by all ACC supervisor(s), the ASM Support System sends a message to the ATC systems to automatically update the status of the ARES in the system and update the Controller Working Position. The controllers, civil and military, can see that information on their working position. The outlines of this ARES are now visualised as pending on both, CWP and ASM Support System. The ATFCM system is updated with the new status.

#### Limitations:

The **OSD/SPR** do not cover the following

- Appropriate Authority – not clear if this is an authorised airspace user and / or supervisor (or in the event there is more than one supervisor, if there is a coordinating supervisor identified)
- Process to be initiated when pre-notification of activation is refused, is not described
- Process to be initiated when acknowledgement of pre-notification of activation is not received, is not described
- This service contract safety criticality level
- The CDM between the civil and military supervisor is not clear.

The **IER** does not cover the following Information exchanges:

- Acknowledgment of pre-notification of activation (accept)
- Response to pre-notification of activation (refuse)
- Updating of Airspace Status to Pending
- Frequency of usage of this service

### 3.1 Information Exchange Requirements

The ARESPreActivation service covers the following IER (see section 6.2 of the OSD ([12]):

IER id	Name	Issuer	Addressees	Information element
IER-07.05.02-OSD-AcAS.0001	notification of pre-activation	Airspace Manager	ACC/Approach Supervisor	Reference location - ARES (specified in the AUP). ATC can confirm or reject the allocation.

**Table 1: IERs covered by the ARESPreActivation service**

The ARESDeactivation service complies to the following requirement (SPR [13] ):

Confirmation receipt for messages sent by the Military ATC / Air Defence Systems	REQ-07.05.02-SPR-PERF.0740
--	----------------------------

**Table 2: REQ covered by the ARESPreActivation service**

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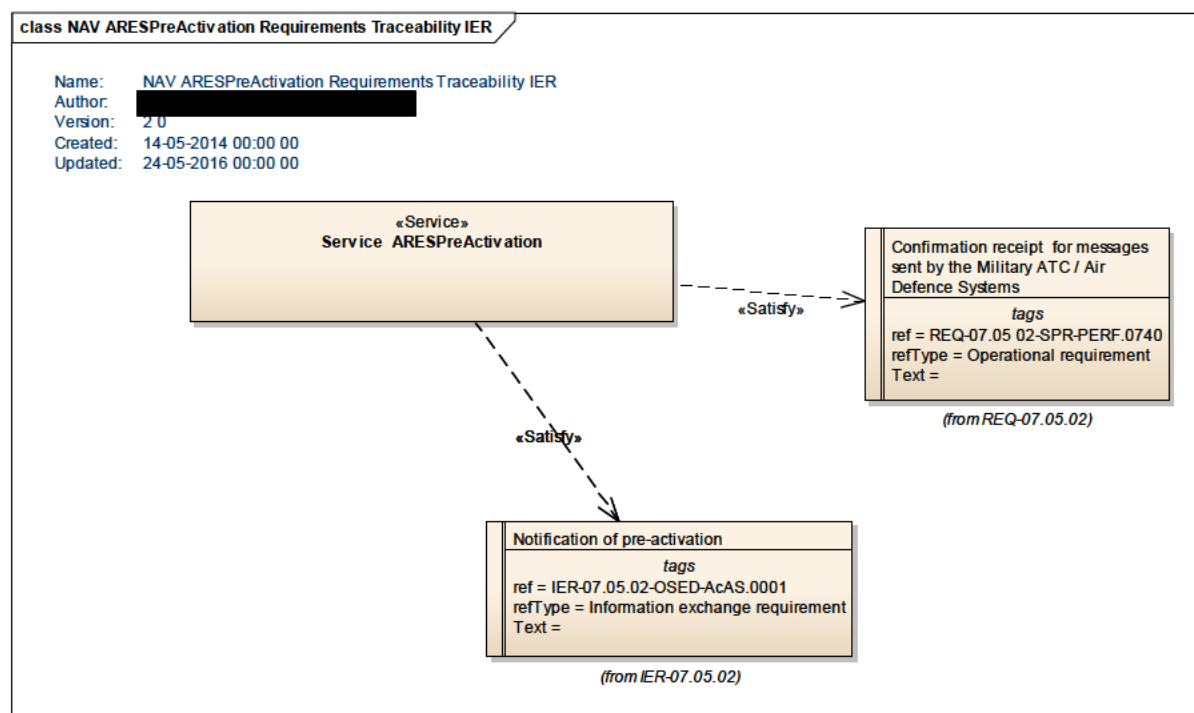


Figure 1: NAV ARESPreActivation Requirements Traceability IER diagram

## 3.2 Other Requirements

### 3.2.1 Non-Functional Requirements

The AFUA SPR ([13]) contains the following requirements for the preactivation of an ARES:

Identifier	<b>REQ-07.05.02-SPR-PERF.0550</b>
Requirement	The ASM Support System of the appropriate controlling units shall send a message <Pre_Notification_Delay> minutes before the activity starts in an ARES.
Title	Pre-notification delay
Rationale	Necessary for the ARES being clean of non-authorized aircraft. 20 minutes seems to be an appropriate value for <Pre_Notification_Delay>.
Identifier	<b>REQ-07.05.02-SPR-SAFE.0003</b>
Requirement	Relevant data exchanges between ASM, ATC, ATFCM and Air Defence shall undergo an encryption process.
Title	Encryption of transmitted data

Identifier	Name	Content Type	Frequency	Safety Criticality	Confidentiality	Maximum Time of Delivery	Interaction Type	Free
IER-07.05.02-OSED-AcAS.0001	notification of pre-activation		1	Severe	Restricted	Immediate	Collaboration	

Table 3: Non-functional requirements

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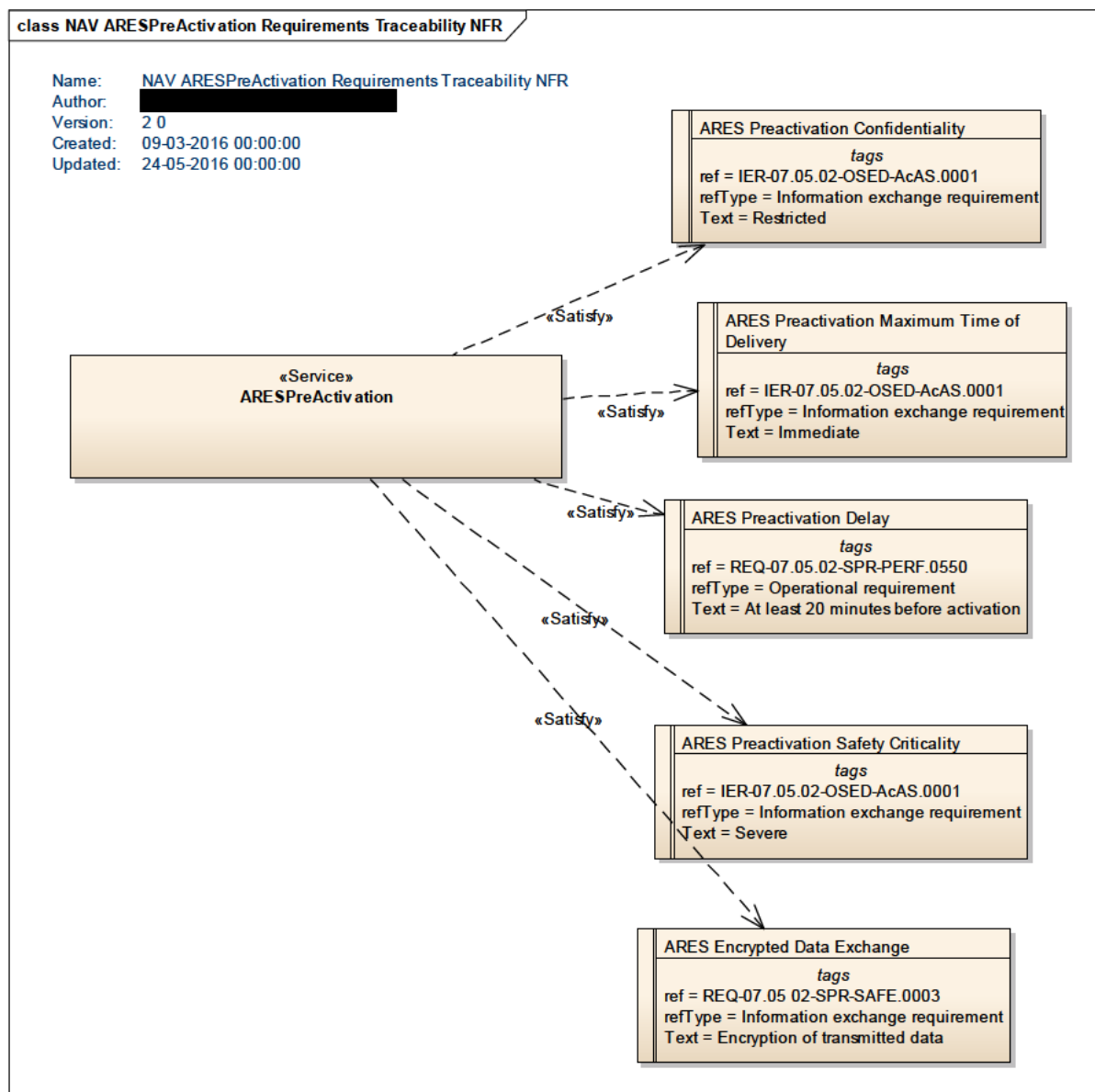


Figure 2: NAV ARESPreActivation Requirements Traceability Nfr diagram

### 3.2.2 Relevant Industrial Standards

AIXM 5.1 and its e-ASM extension:

- AIXM is a data exchange specification that uses the Extensible Markup Language (XML) technology in order to define features and messages used to exchange information about the aeronautical data contained in AICM. AIXM 5.1 provides an extensible, modular aeronautical information exchange standard that can be used to satisfy information exchange requirements for current and future aeronautical information applications.
- AICM is a conceptual/logical model that uses entities, attributes and relationships in order to describe aeronautical features such as airports, runways, navaids, obstacles, routes, terminal procedures, airspace structures, services and related aeronautical data.

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- e-ASM is an extension to AIXM 5.1 that supports European Airspace Management. The eASM specification has been developed to provide a common data model and a common data encoding format for data that needs to be exchanged digitally between tools and systems involved in the dynamic airspace management process.

### 3.2.3 Nodes

The mappings from the service to the nodes are shown below

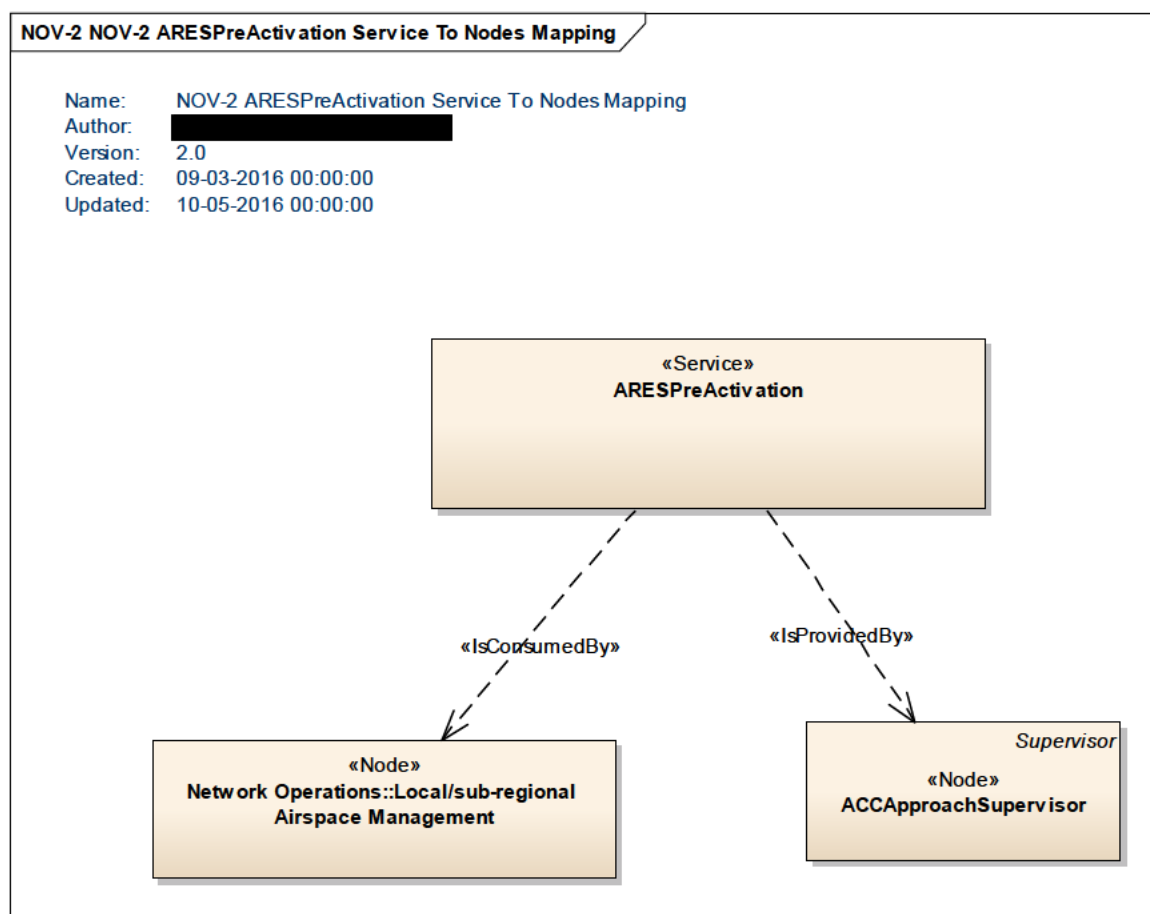


Figure 3: NOV-2 ARESPreActivation Service to Nodes Mapping diagram



## 4 Service overview

### 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 operational architecture for the tactical ASM, based on the OSED [12], is depicted in the following two diagrams:

- the EATMA operational activity diagram (NOV-5 view)
- the services to operational activities mapping diagram (NSOV-4 view)

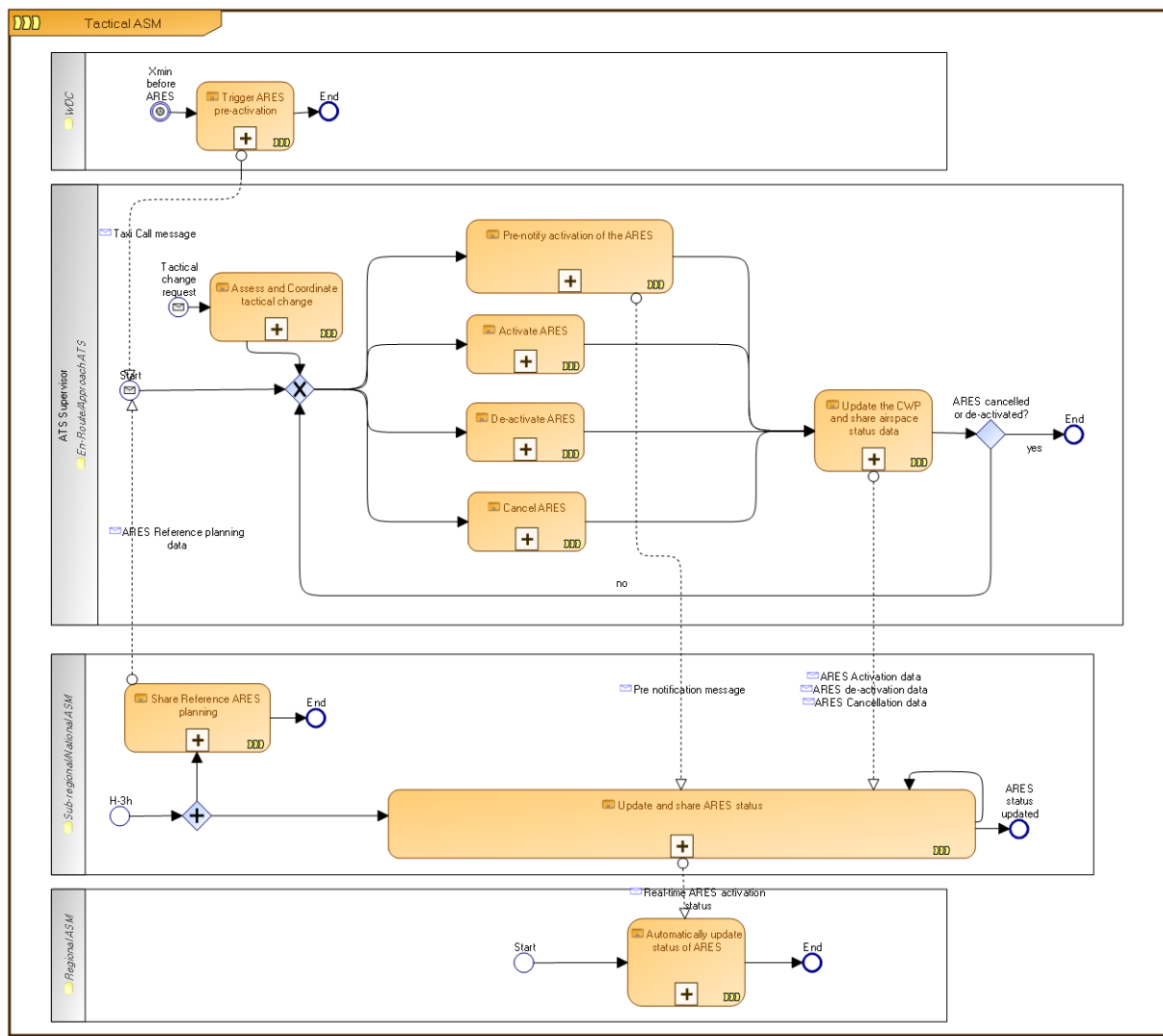


Figure 4: NOV-5 EATMA operational activity for ARES activation-deactivation (Tactical ASM)



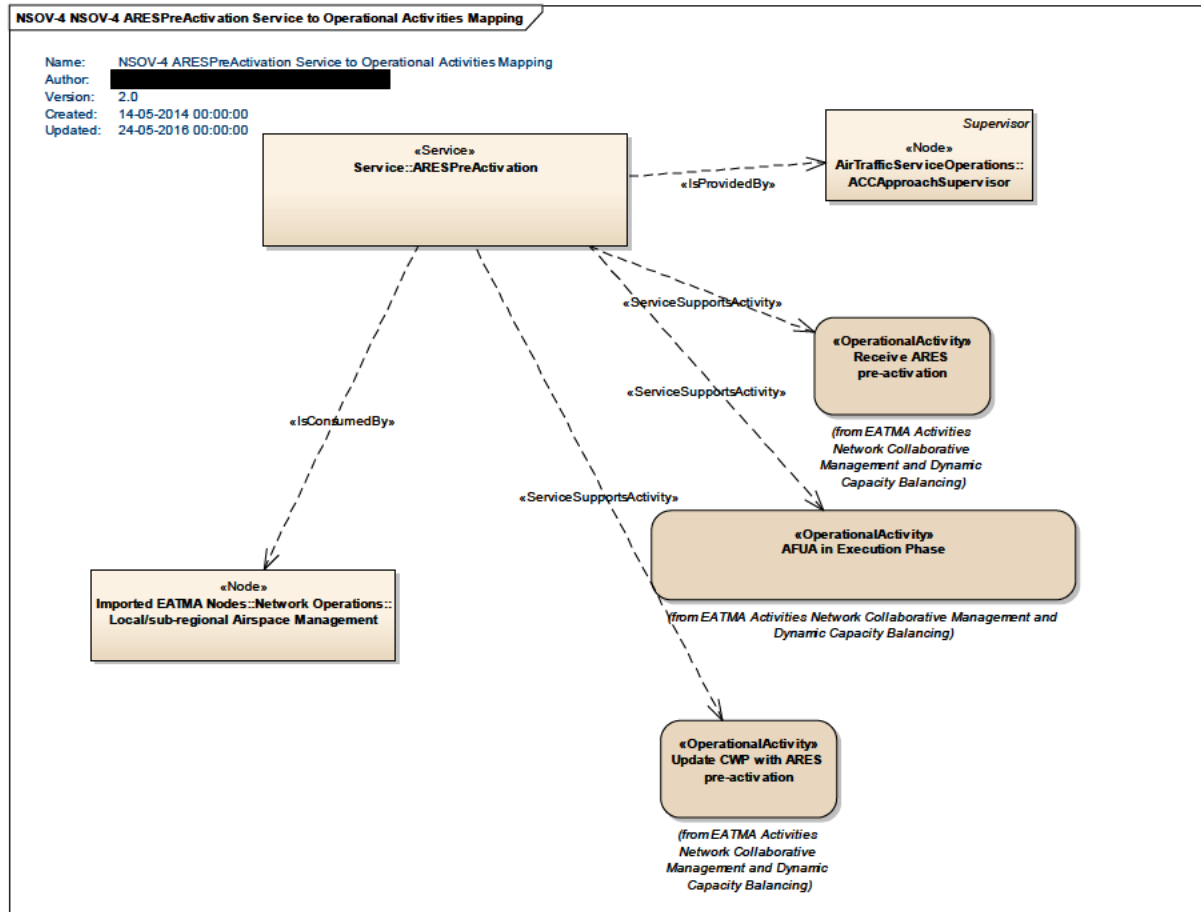


Figure 5: NSOV-4 ARESPreActivation Service to Operational Activities Mapping diagram

## 4.4 Service Interfaces

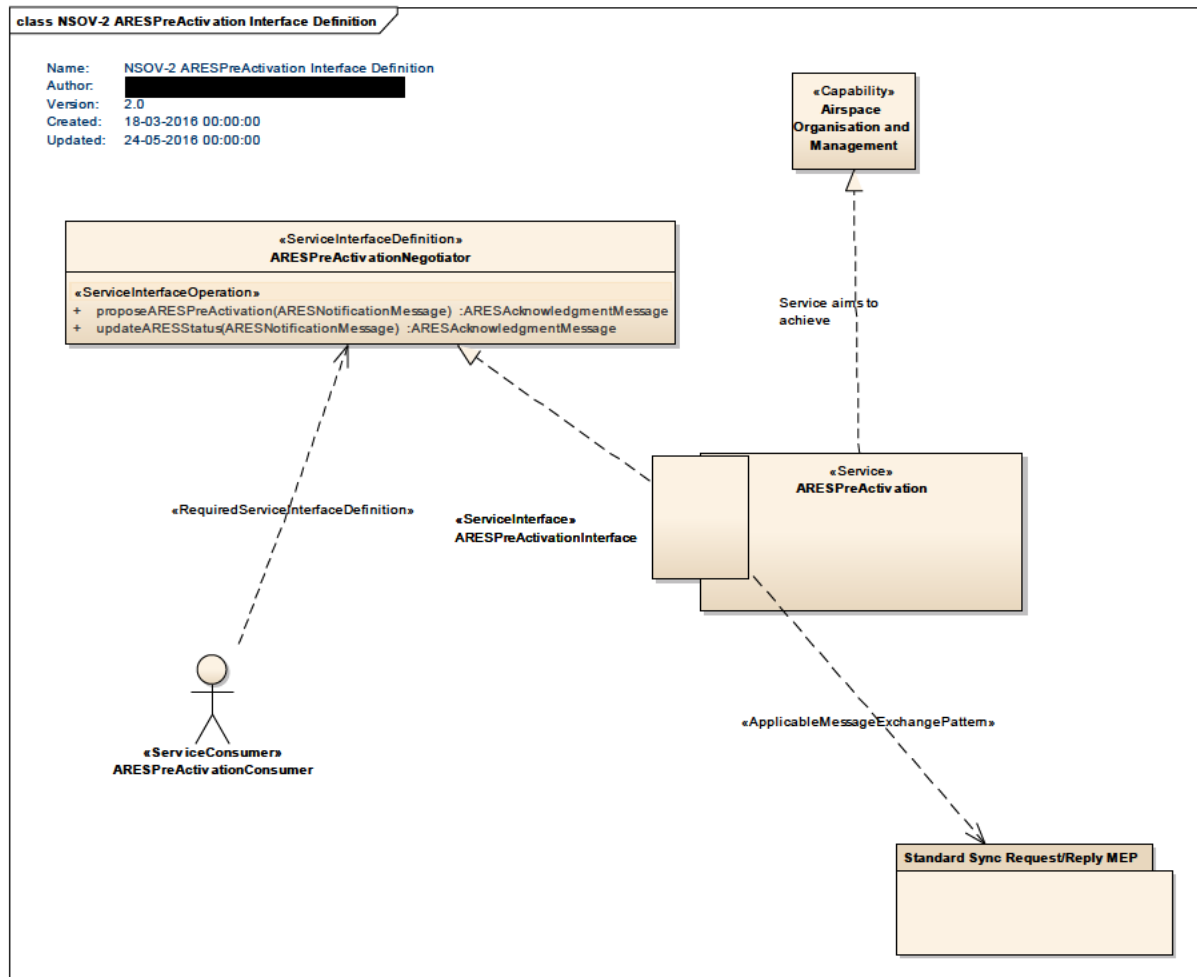


Figure 6: NSOV-2 ARESPreActivation Interface Definition diagram

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
ARESPreActivationInterface	ARESPreActivationNegotiator	proposeARESPreActivation	provided
ARESPreActivationInterface	ARESPreActivationNegotiator	updateARESStatus	provided

Table 4: Service Interfaces

## 5 Service interface specifications

This section covers the static design description of the interface while the dynamic design (behaviour) is described in chapter 6.

The ARESPreActivation service has a single interface with two operations.

The static interface description includes the following architectural elements:

- Service Interface (a single interface for this service)
- Service Interface Definition
- Operations
- Parameters

Constants or variables passed into or out of a Service interface as part of the execution of an Operation.

### 5.1 Service interface ARESPreActivationInterface

The purpose of this Service Interface is to provide a service end-point for the Airspace Manager to initiate the ARESPreActivation sequence.

#### 5.1.1 Service Interface Definition ARESPreActivationNegotiator

This Service Interface definition exposes 2 operations:

##### 5.1.1.1 Operation proposeARESPreActivation

The purpose of this operation is to receive an ARES preactivation proposal and to accept it or refuse it.

###### 5.1.1.1.1 Operation Functionality

The operation will check if the ARESNotification Message contains a valid request that relates to an allocated ARES that is covered by the ACC and that the ACC can accept it. If both conditions are met, the operation will return an acknowledgment of type Success, otherwise Fail.

###### 5.1.1.1.2 Operation Parameters

###### Parameters

Input:: ARESNotificationMessage

Output:: ARESAcknowledgmentMessage

###### Pre-Condition

Concerned ARES i.e. ARES referred to in the ARESNotificationMessage should already have been Allocated / Reserved.

###### Post-Condition

No change

###### Failure-Condition

No Acknowledgement message received within the defined response time

For more details on the operation parameters see section 5.2

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### 5.1.1.2 Operation UpdateARESStatus

The purpose of this operation is to receive the notification about the preactivation: to confirm or reject it.

#### 5.1.1.2.1 Operation Functionality

The operation will check if the ARESNotification Message contains a valid request that relates to a ARES that has been previously accepted as PreActivated by the ACC. If it is the case, the operation will return an acknowledgment of type Success, otherwise Fail. It will change the status of this ARES to Prenotified in the ACC system.

#### 5.1.1.2.2 Operation Parameters

##### Parameters

Input:: ARESNotificationMessage

Output:: ARESAcknowledgmentMessage

##### Pre-Condition

Valid ARESNotificationMessage for preactivation should have been received and the preactivation should have been accepted.

##### Post-Condition

The ARES status is set to Pre Activated on All affected CWP if the AcknowledgementType is 'Success'

##### Failure-Condition

The ARES status is not set to PreActivated on all affected CWP and the AcknowledgementType is Not 'Success'.

For more details on the parameters, see section 5.2

## 5.2 Service Interface parameter definition

As the interface parameters are shared by both operations, they are described in this subsection.

### 5.2.1 ARESNotificationMessage

This is a message of the type ARESNotification Message. All ARESNotification Messages must have the following Attributes:

ARESID : String :: possible values : Unique ARES Name

ARESActionType : Enumeration :: possible values : Preactivate | Activate | Deactivate | Activation

ARESActionCode : Enumeration :: possible values : Unique Operational Code derived from OSED

airspaceManagementCellDesignator : String :: possible values : Unique Airspace User Name

airspaceManagementCellType: String:: possible values: The type of Airspace Management Cell

timestamp: UTCTimeCode :: possible values : Unique Date and Time to a defined level of granularity

### 5.2.2 ARESAcknowledgmentMessage

This is a message of the type ARESAcknowledgmentMessage. All ARESNotification Messages must have the following Attributes:

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ACCUnitDesignator : String :: possible values : Unique ACC Unit Name

ACCUnitType: String :: possible values: Type of ACC Unit

AcknowledgementType ; Enum :: possible values : Success | Fail | Unknown

AcknowledgementCode : Enum :: possible values : Unique Operational Code derived from OSED

ARESID : String :: possible values : Unique ARES Name

Timestamp: UTCTimeCode :: possible values : Unique Date and Time to a defined level of granularity

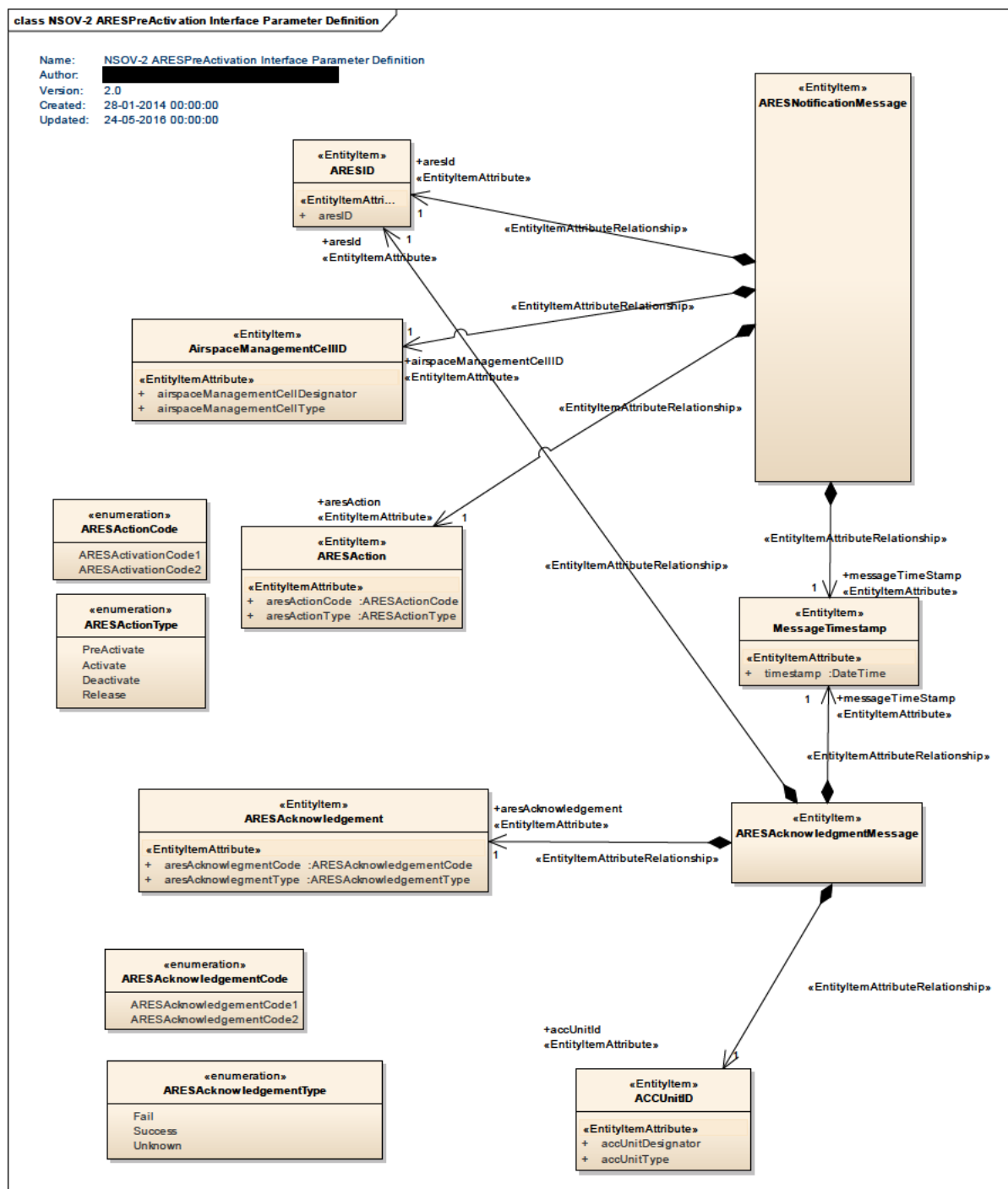


Figure 7: NSOV-2 ARESPreActivation Interface Parameter Definition diagram

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Element Name	Author	Notes
ARESAcknowledgementCode		possible values : Unique Operational Code to be defined in the OSED
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
ARESAcknowledgementCode1		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
ARESAcknowledgementCode2		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Element Name	Author	Notes
ARESAcknowledgementType		Codes for ARES acknowledgment types.
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
Fail		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
Success		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
Unknown		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Element Name	Author	Notes
ARESActionCode		Unique Operational Codes for actions to be performed by ARES derived from OSED.
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
ARESActivationCode1		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
ARESActivationCode2		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Element Name	Author	Notes
ARESActionType		Codes for the type of action to be performed on a ARES.
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
PreActivate		
Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope

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Attribute Name	Type	Notes
Activate		
Tagged Value Name	Value	
CLDMSemanticTrace	CLDM_out_of_scope	
Attribute Name	Type	Notes
Deactivate		
Tagged Value Name	Value	
CLDMSemanticTrace	CLDM_out_of_scope	
Attribute Name	Type	Notes
Release		
Tagged Value Name	Value	
CLDMSemanticTrace	CLDM_out_of_scope	

Table 5: Payload tracing to AIRM



## 6 Service dynamic behaviour

### 6.1 Service Interface ARESPreActivationInterface

The Service Behaviour consists of the following flow:

- The ARESPreactivationConsumer initiates the proposeARESPreActivation operation, in synchronous mode, of the Relevant ACC / Authorised Authority Service End-Point to request the pre-activation of an ARES
- The ARESPreActivationConsumer gets the respond of the proposeARESPreActivation operation with an appropriate ARESAcknowledgmentMessage
- The ARESPreActivationConsumer initiates the UpdateARESStatus operation, in synchronous mode, to update the status of the ARES at the Relevant ACC / Authorised Authority.
- The ARESPreActivationConsumer gets the respond of the UpdateARESStatus operation with an appropriate ARESAcknowledgmentMessage

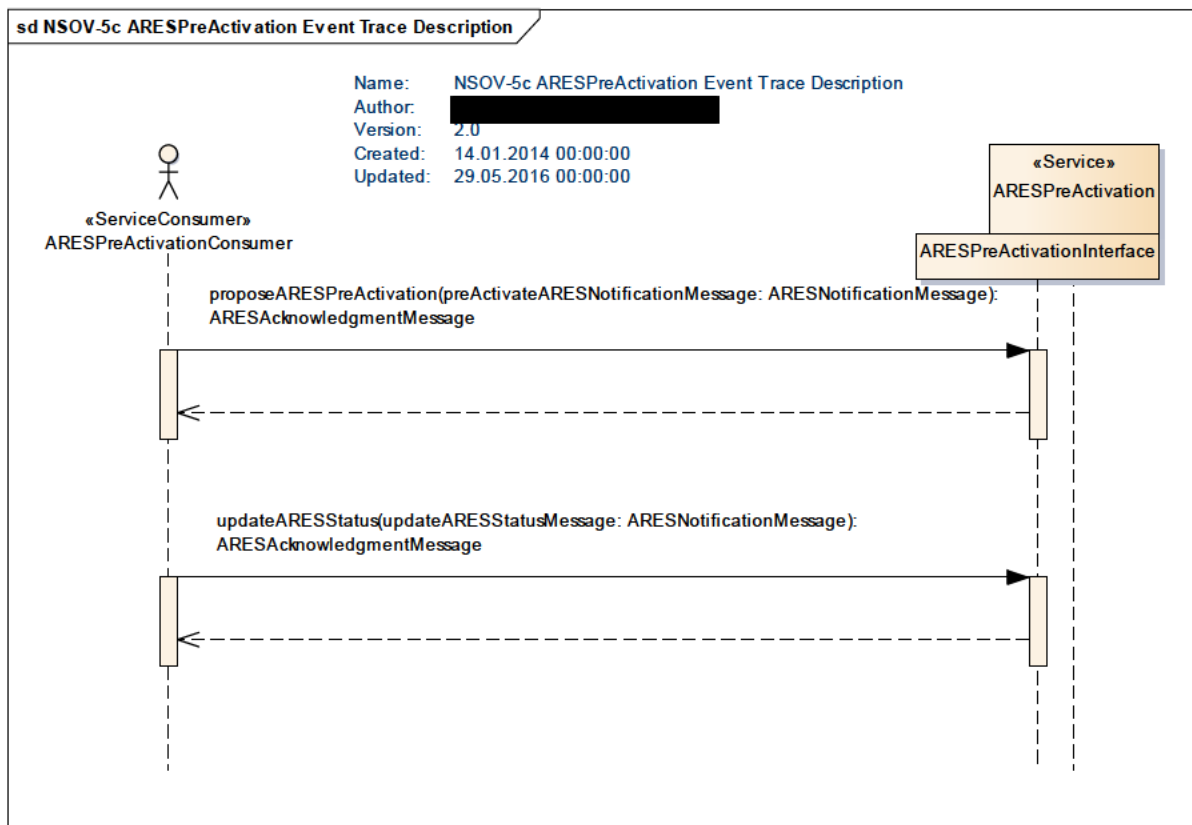


Figure 8: NSOV-5c ARESPreActivation Event Trace Description

## 7 Service provisioning (optional)

N/A

## 8 Validation and Verification

### 8.1 Verification

Verification performed according to the ISRM Rulebook [6] following the ISRM Verification Guidelines [7]. This includes use of verification scripts. Verification is partly automatic, partly semi-automatic and partly manual.

#### 8.1.1 Verification Results

Service name:	Designed Services - ARESPreActivationService	Date of Service Creation:	20140211-11:47:55
Service version:	2.0	Version of Verification Rules:	00.07.00
Phase:	2.0	Date of Verification:	20160525-05:32:25
Owner of service:		Passes:	81
Name of verifier:		Failures:	0
Overall comments:		Manual:	17
MDG Library Functions version:	29915	MDG ISRM Verification version:	29993

**Table 6: Verification results overview**

The verification reports for the service can be found in the Verification Reports directory located in the D65 delivery package [17]:

Designed\_Services\_-\_ARESPreActivationService.xls

Designed\_Services\_-\_ARESPreActivationService\_Common.xls

Based on the results in the verification reports the service has been successfully verified.

### 8.2 Validation

The validation exercise EXE-07.05.02-VP-017 was a Live Trial on the integration of ASM and ATC processes for automated airspace status update in real time and automated display in the referenced CWP in ADEXP format carried out in 2012.

VP-017 validated the automated process of activation and/or deactivation of ARES in ATC systems by interfacing an ASM Support System with ATC systems. The exercise also demonstrated the automatic update of ATC systems with RTSA via ASM Support Systems (LARA), and that this process is safe..

The VP-017 exercise used the LARA software release currently deployed and operational in Belgium. A dedicate FMTP (flight message transfer protocol) client has been developed to connect the Airspace Status module of LARA with the N-FDPS (new flight data processing system) of MUAC. This FMTP client was configured as a subscriber to the airspace status events of the LARA server.

Since the prototype systems such as ASM support systems LARA and the N-FDPS involved in the exercise were developed outside the scope of SESAR activities, the validation exercise was based on OLDI/ADEXP.

It was recognised by stakeholders and respective WP8 experts that the services designed within SVA-008 activities have the same or similar functionalities versus services used by the systems in the validation activities but they cannot be compliant with SWIM criteria and addressed further on in the SWIM compliance report. Different service design methodology

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and semantic aspects make these services non SWIM compliant whereas these services satisfy operational needs for information exchange within SWIM profile utilising XML data exchange standard. Nevertheless no SWIM compliance was performed on these services since the SWIM compliance matrix was not available at the time of the development of the exercise.

## 9 References

Name	Version	Document ID / Location
[1] Project deliverables template	03.00.00	SJU templates & guidelines package, Project deliverables template
[2] SESAR Operational Service and Environment Definition	03.00.00	SJU templates & guidelines package, OSED template
[3] SESAR Safety and Performance Requirements	03.00.00	SJU templates & guidelines package, SPR template
[4] ISRM Tooling Guidelines	00.07.00	08.03.10 D44
[5] ISRM Modelling Guidelines	00.07.00	08.03.10 D44
[6] ISRM Foundation Rulebook	00.07.00	08.03.10 D44
[7] ISRM Verification Guidelines	00.07.00	08.03.10 D44
[8] European ATM Architecture (EATMA) Guidance Material v4	00.04.02	B.04.01 D66
[9] ISRM Service Portfolio	00.08.01	08.03.10 D65
[10] Step 1 Flexible Airspace Management Validation Report for EXE VP-015 VP-016 VP-017	00.00.04	07.05.04 D67
[11] ISRM 2.0 SESAR EA Enterprise Architect model	2.0	08.03.10 D65 ISRM2.0-model
[12] Advanced Flexible Use of Airspace for Step 1 OSED	00.04.00	07.05.04 D45
[13] Advanced Flexible Use of Airspace Safety and Performance Requirements for Step 1	00.03.05	07.05.04 D47
[14] COMMISSION IMPLEMENTING REGULATION (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan	27 June 2014	<a href="http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_2014.190.01.0019.01.ENG">http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_2014.190.01.0019.01.ENG</a>
[15] European ATM Service Identification for the Advanced Use of Flexible Use of Airspace	V1.0	08.03.05
[16] B.4.3 AFUA Service Allocation FT09	00.00.03	B.04.03

Name	Version	Document ID / Location
[17]Verification reports for the service	N/A	08.03.10 D65 Verification reports

**-END OF DOCUMENT-**

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