European ATM Service Description for the ARESActivation Service

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Abstract

The ARESActivation service provides the CDM to coordinate the activation of a pre-activated 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 ARESActivation 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 ARESActivation service supports the coordination of the Activation of an ARES between the responsible 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 “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]).

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1 Introduction

1.1 Purpose of the document

This document provides a holistic view of the ARESActivation 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 the 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
ACC	Area Control Centre
ADD	Architecture Description Document
ARES	Airspace Reservation/Restriction
ASM	Airspace Management
AUP	Airspace Use Plan
ATC	Air Traffic Control
ATM	Air Traffic Management
BPMN	Business Process Modelling Notation
CCB	Change Control Board
CDM	Collaborative Decision Making
CONOPS	Concept of Operations

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

1.5.2 Terminology

Term	Definition	Source
Airspace Management	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 based on short-term needs.	OSED [12]
Airspace	A defined volume of airspace temporarily reserved for exclusive or	OSED [12]

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Term	Definition	Source
Reservation	specific use by categories of users.[7]	
Capability	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]
Capability Configuration	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]
Node	A logical entity that performs Activities. Note: nodes are specified independently of any physical realisation.	EATMA Guidance Material [8]
Service	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]
Service function	A type of activity describing the functionality of a Service.	EATMA Guidance Material [8]
Service interface	The mechanism by which a service communicates	EATMA Guidance Material [8]

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2 Service identification

Name	ARESActivation
ID	{16E51BEC-F817-4fc0-8331-8FB834404968}
Version	2.0
Keywords	AFUA, ARES, allocation, ASM, notification, Activation
Architect(s)	[redacted] 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	*Date when validated. Filled by WP3*	*Name of protocol documenting the decision*
IOC	*Date for Initial Operational Capability*	*Reference to technical enabler hosting the service in the ATM master plan*
FOC	*Date for Full Operational Capability*	*Reference to technical enabler hosting the service in the ATM master plan*

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3 Operational and Business context

Once the confirmation-acknowledgement process is completed and the current time reaches the start time of the ARES, the ASM System Support displays the ARES as active, i.e. the status of the ARES is changed to “Active” and sends a message to the ATC system to update the status of the ARES on the CWP.

Limitations:

The current **OSED** does not cover the following

- Appropriate Authority – not clear if this is an authorised airspace user and / or supervisor
- Not clear if an activation can be refused after the pre-activation has been successful
- Process to be initiated when acknowledgement of activation is not received, is not described
- This service contract safety criticality level

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

- Acknowledgment of activation (accept)
- Response to notification of activation (i.e. if refusal is possible)
- Updating of Airspace Status to Activated (and subsequent marking of the ARES)
- Frequency of usage of this service

3.1 Information Exchange Requirements

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

IER id	Name	Issuer	Addressees	Information element
IER-07.05.02-OSED-AcAS.0002	Real time Activation of an Airspace	Airspace Manager	ACC/Approach Supervisor	Reference location - ARES (specified in the AUP).(Messages in OLDI)
IER-07.05.02-OSED-AcAS.0003	Activation Refusal	ACC/Approach Supervisor	Airspace Manager	Reference location - ARES (specified in the AUP).(Messages in OLDI)

Table 1: IERs covered by the ARESActivation service

Additional operational requirements applicable to this information exchange(AFUA SPR ([13]):

Id	Name
REQ-07.05.02-SPR-PERF.0770	Activation and deactivation acknowledgement
REQ-07.05.02-SPR-PERF.0740	Confirmation receipt for messages sent by the Military ATC / Air Defence Systems

Table 2: REQs covered by the ARESActivation service

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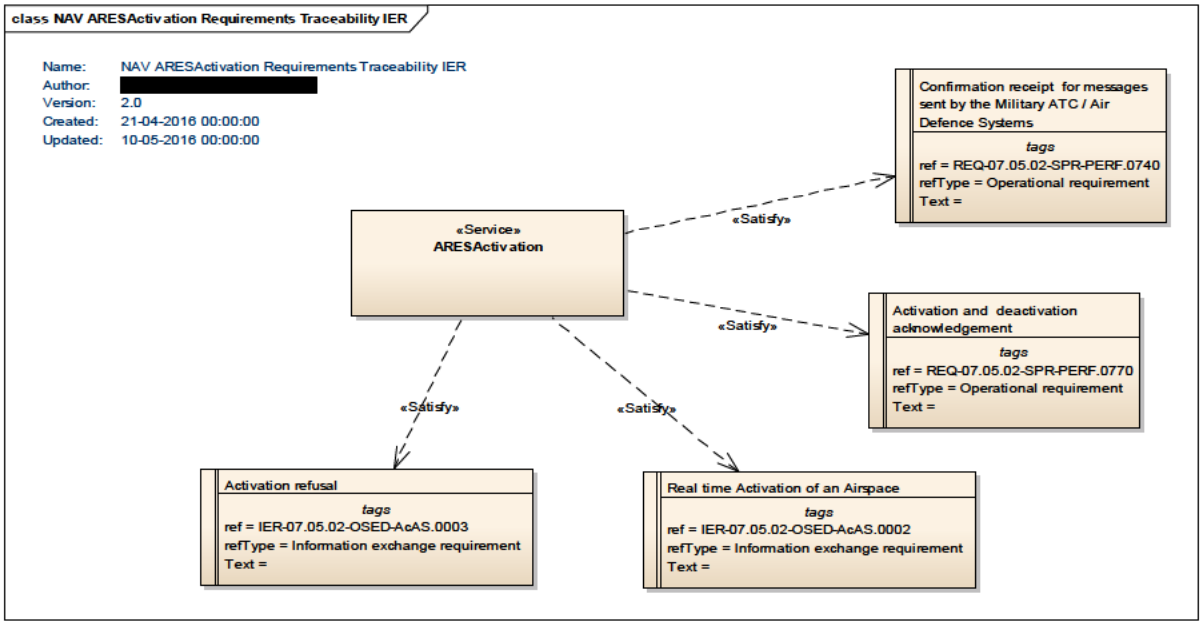

Figure 1: NAV ARESActivation Requirements Traceability IER diagram

3.2 Other Requirements

3.2.1 Non-Functional Requirements

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

Identifier	Name	Frequency	Safety Criticality	Confidentiality	Maximum Time of Delivery	Interaction Type
IER-07.05.02-OSED-AcAS.0002	Activation of an Airspace	1	Severe	Restricted	Immediate	Collaboration
IER-07.05.02-OSED-AcAS.0003	Activation Refusal	1	Severe	Restricted	Immediate	Collaboration
REQ-07.05.02-SPR-SAFE.0003	ARES Encrypted Data Exchange	N/A				

Table 3: Non-functional requirements

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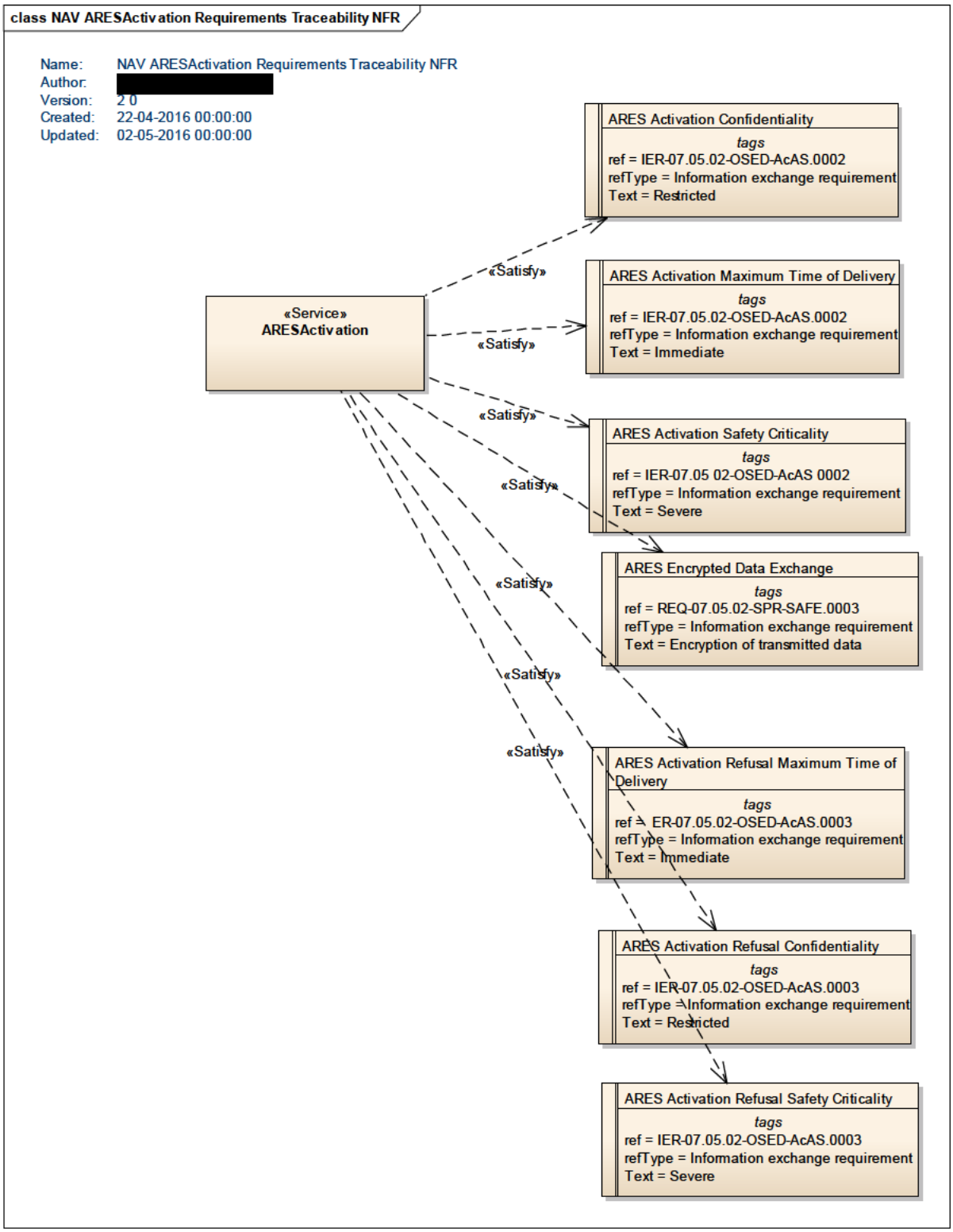

Figure 2: NAV ARESActivation Requirements Traceability NfR diagram

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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.
- 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.

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3.2.3 Nodes

The mappings from the service to the nodes are shown below

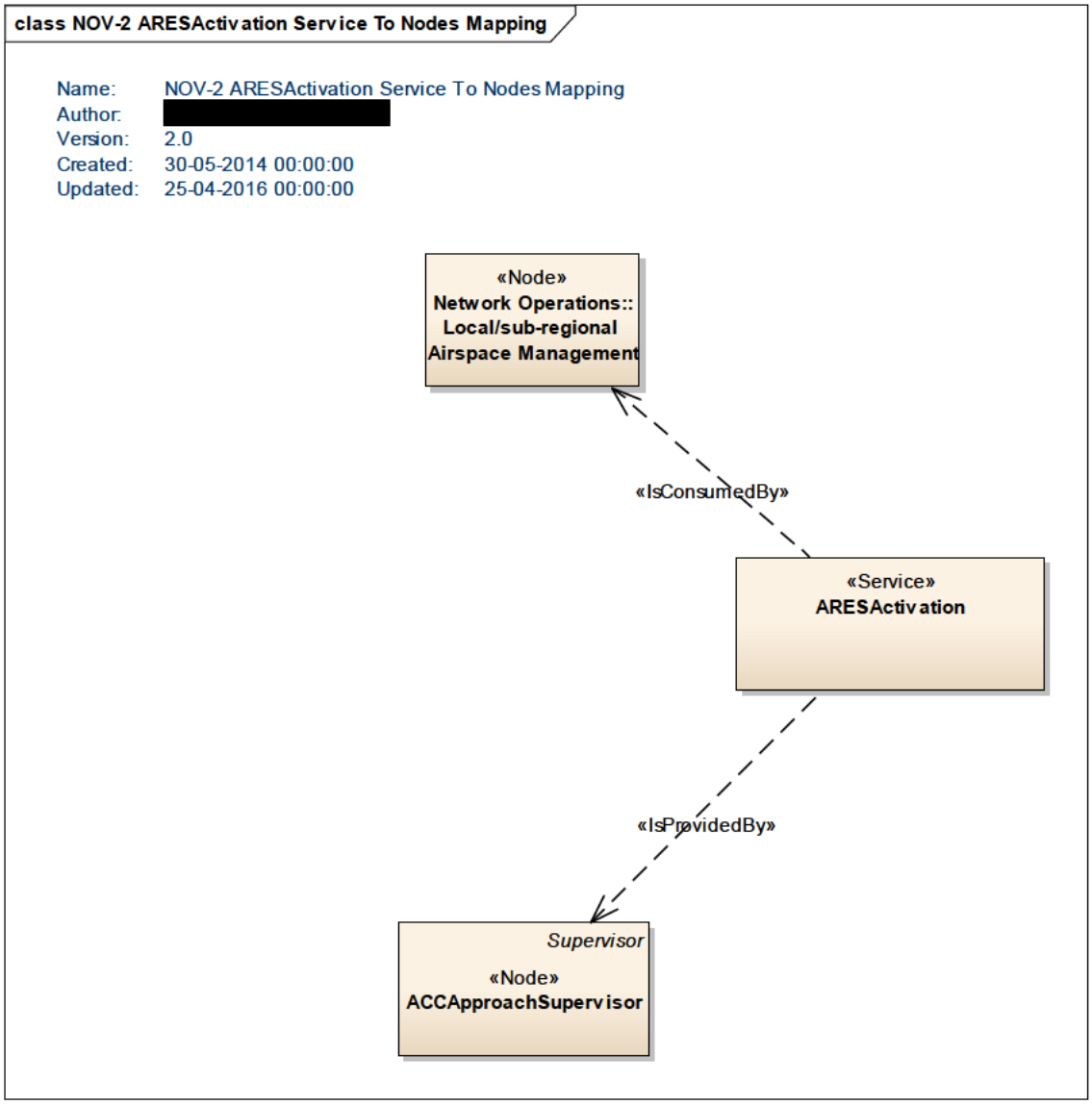

Figure 3: NOV-2 ARESActivation Service to Nodes Mapping diagram

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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 depecticed in the follwng two diagrams:

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

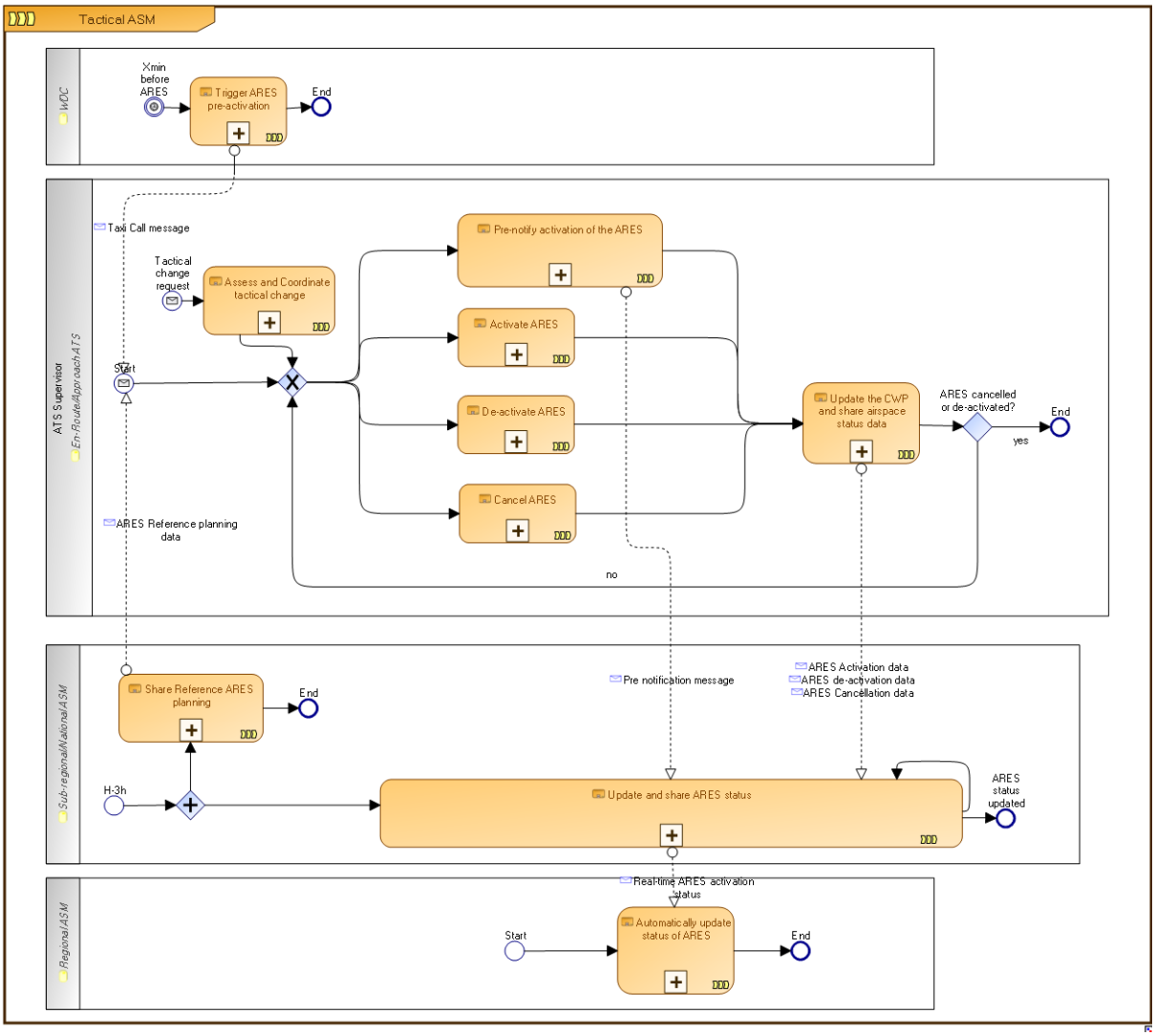

Figure 4: NOV-5 EATMA operational activity for the tactical ASM (ARES activation-deactivation)

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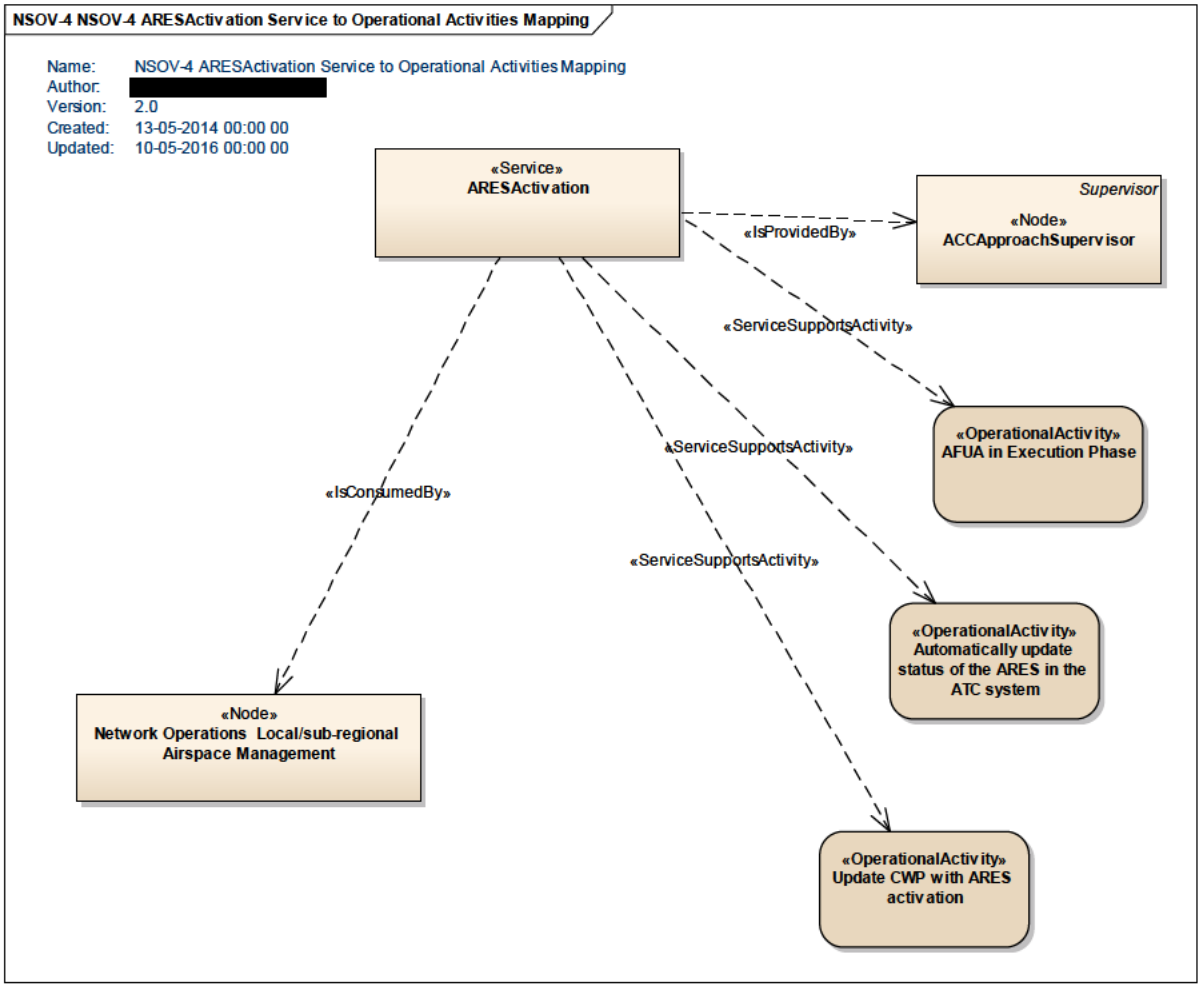

Figure 5: NSOV-4 ARESActivation Service to Operational Activities Mapping diagram

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4.4 Service Interfaces

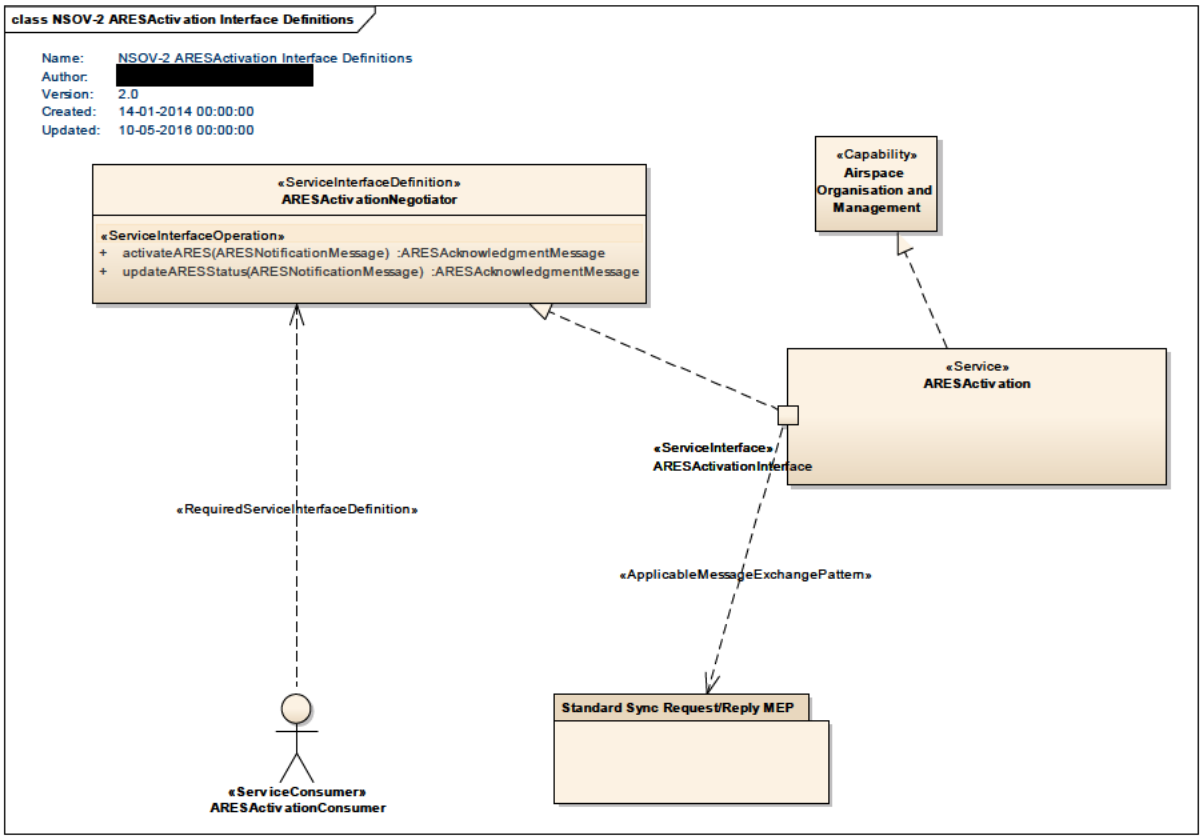

Figure 6: NSOV-2 ARESActivation Interface Definition diagram

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
ARESActivationInterface	ARESActivationNegotiator	activateARES	provided
ARESPActivationInterface	ARESActivationNegotiator	updateARESStatus	provided

Table 4: Service Interfaces

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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 ARESActivation 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 ARESActivationInterface

The purpose of this Service Interface is to provide a service end-point for the appropriate authority or the actions allocated to it for the ARESActivation sequence. This Service Interface exposes two operations i.e the activateARES and the updateARESStatus.

5.1.1 Service Interface Definition ARESActivationNegotiator

This Service Interface definition exposes 2 operations:

5.1.1.1 Operation activateARES

The purpose of this operation is to receive an ARES activation notification and acknowledge that the message has been received to the Notifier.

5.1.1.1.1 Operation Functionality

The operation will check if the ARESNotificationMessage contains a valid request that relates to a pre-activated ARES that is covered by the ACC. 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 preactivated.

Post-Condition

The ARES is activated.

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 Activation.

5.1.1.2.1 Operation Functionality

The operation will check if the ARESNotificationMessage contains a valid request that relates to an ARES that has been previously accepted for pre-activation by the ACC and that has been notified as being activated. 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 Activation in the ACC system.

5.1.1.2.2 Operation Parameters

Parameters

Input:: ARESNotificationMessage

Output:: ARESAcknowledgmentMessage

Pre-Condition

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

Post-Condition

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

Failure-Condition

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 ARESNotificationMessage. 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

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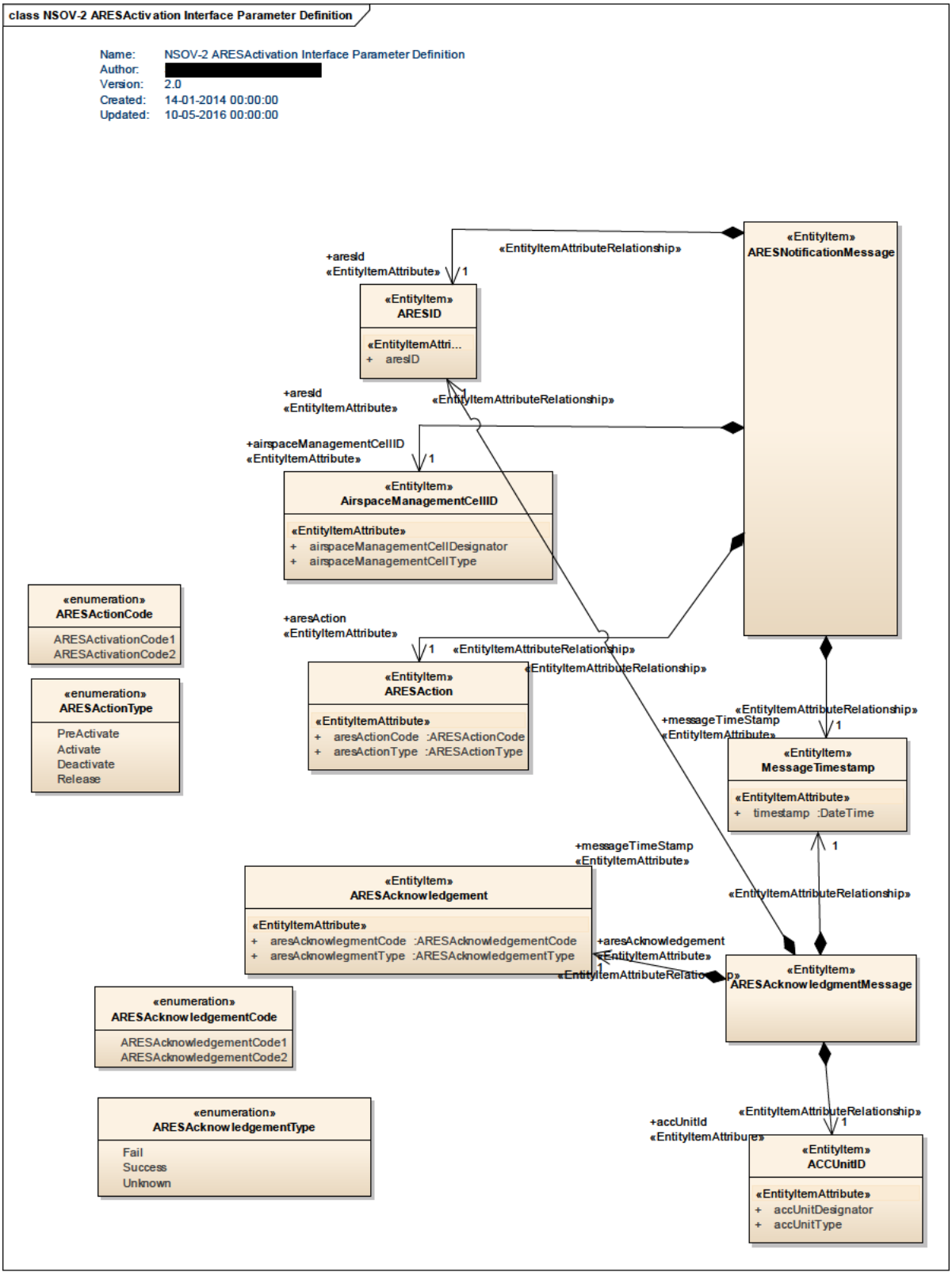

Figure 7: NSOV-2 ARESActivation Interface Parameter Definition diagram

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Element Name	Author	Notes
ARESAcknowledgementCode	[redacted]	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	[redacted]	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	[redacted]	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	[redacted]	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

Attribute Name	Type	Notes
Activate		

Tagged Value Name	Value

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	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

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6 Service dynamic behaviour

6.1 Service Interface ARESActivationInterface

The Service Behaviour consists of the following flow:

- The ARESActivationConsumer initiates the activateARES operation, in synchronous mode, of the Relevant ACC / Authorised Authority Service End-Point to request the Activation of an ARES
- The ARESActivationConsumer gets the respond of the activateARES operation with an appropriate ARESAcknowledgmentMessage
- The ARESActivationConsumer initiates the updateARESStatus operation, in synchronous mode, to update the status of the ARES at the Relevant ACC / Authorised Authority.
- The ARESActivationConsumer gets the respond of the updateARESStatus operation with the appropriate ARESAcknowledgmentMessage

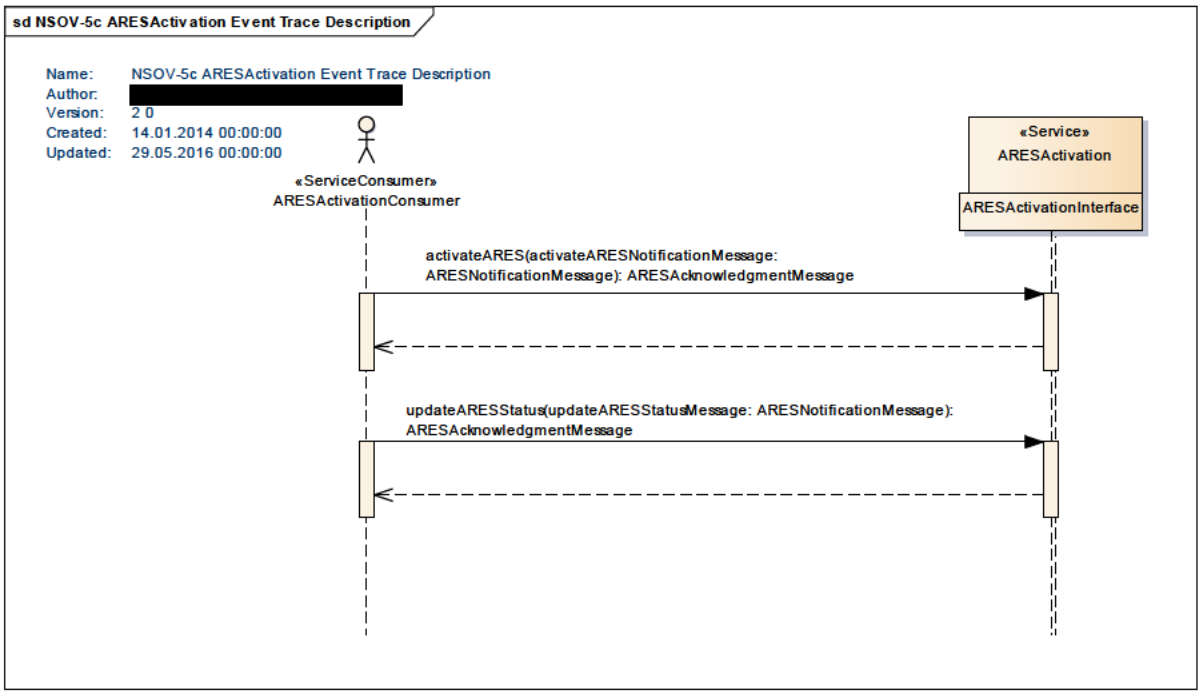

Figure 8: NSOV-5c ARESActivation Event Trace Description

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7 Service provisioning (optional)

N/A

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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 - ARESActivationService	Date of Service Creation:	20140211-09:58:46
Service version:	2.0	Version of Verification Rules:	00.07.00
Phase:	2	Date of Verification:	20160525-04:42:02
Owner of service:	[redacted]	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_-_ARESActivationService.xls

Designed_Services_-_ARESActivationService _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

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addressed further on in the SWIM compliance report. Different service design methodology 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.

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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	http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.190.01.0019.01.ENG
[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

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

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