



European ATM Service Description for the ARESQuery Service

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Abstract

This document describes the logical model of the ARESQuery, a request/reply service that provides information on a specific ARES to sustain AFUA operations. The model has been designed in the ISRM repository (Ref [10]) and is compliant with the ISRM foundation. The purpose of this document is to allow non-Sparx EA literate audience to view the model in a static form. The reader who wants to have a complete dynamic view of the model should view it with a Sparx viewer and in the EATMA repository.

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Executive summary

The current document describes the logical model of the ARESQuery 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.

This document presents the logical model of the ARESQuery, a request/reply MEP service that provides information on a specific ARES to sustain AFUA operations (Ref [11]). It is part of the Commission Pilot Common Project in the SWIM section under the label “Query Airspace Reservation/Restriction (ARES) information” (Ref [13]).

The design complies with the ISRM Foundation 00.07.00 and it is part of the ISRM V2.0 (Ref [10]).

1 Introduction

1.1 Purpose of the document

This document provides a holistic view of the ARESQuery service and its building blocks complementary to the UML model of the service available in the ISRM (ref [10]).

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 [11] and the AFUA SPR [12] developed by P07.05.04.

1.4 Glossary of terms

All terms in this document are defined in the AFUA OSED [11].

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
OSD	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	OSD [11]

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Term	Definition	Source
	based on short-term needs.	
Airspace Reservation	A defined volume of airspace temporarily reserved for exclusive or specific use by categories of users.[7]	OSED [11]
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]

2 Service identification

Name	ARESQuery
ID	{631A9C06-5573-4222-A091-27F96BC50E1C}
Version	2.0
Keywords	AFUA, ARES, allocation, ASM, notification, deactivate
Architect(s)	██████████ EUROCONTROL

Lifecycle status	Date	References
Identified	06/07/2012	See reference [14]
Allocated	22/08/2012	See reference [15]
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

The concept of AFUA intends to provide more flexibility by allowing dynamic airspace management in all phases of the operations, from initial planning to the execution phase, taking into account local traffic characteristics. The aim is to establish a coherent collaborative decision making process supported by ASM systems to bring planning and execution phase closer together and to make them consistent and transparent.

For the execution phase the exchange of ARES status information will be performed in real time. The real time information will address pre-notification, activation, de-activation and modification of ARES use. This data should ideally be shared amongst the ASM Support Systems, the NM system, the ATC systems and further processed to potential users like AOs and FMP via ETFMS.

AFUA structures are designed to fulfil military needs and better share the constraints with other airspace users. For a full description of the operational and business context, please refer to the AFUA OSED (Ref [11]).

In this context, the ARESQuery Service provides the mean for the ASM systems to retrieve an Airspace Reservation using the reservation ID regardless of the Reservation status.

3.1 Information Exchange Requirements

The ARESQuery service covers the following IER (see section 6.2 of the OSED [11]):

Identifier	REQ-07.05.02-OSED-EL01.0017
Requirement	All users shall have access to information about RTSA ARES status (Activation/Deactivation/Modification) in real time.
Title	Activation/Deactivation/Modification

Table 1: REQ covered by the ARESQuery service

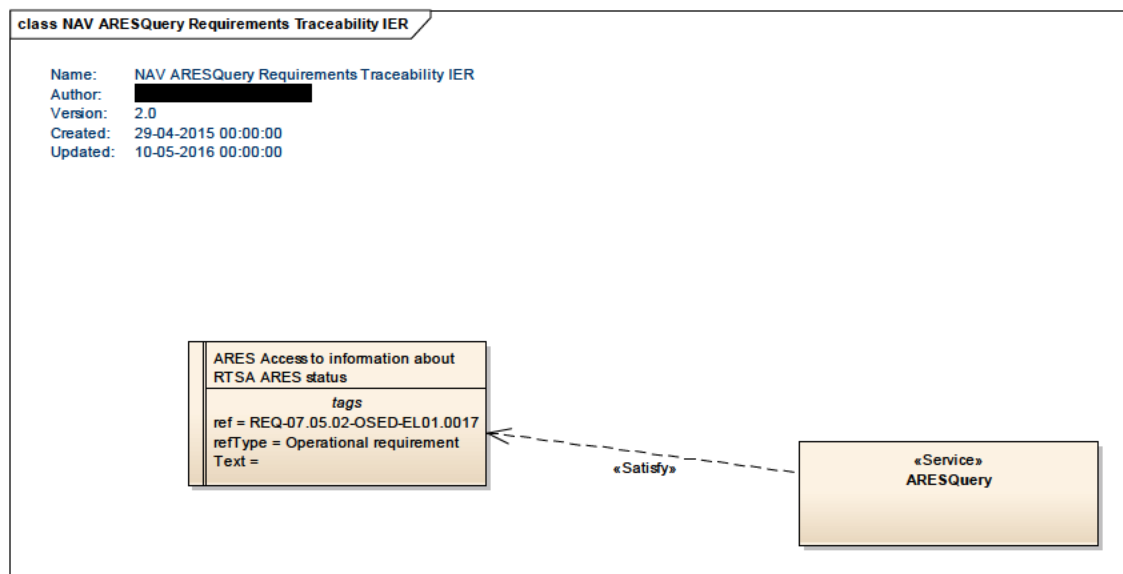


Figure 1: NAV ARESQuery Requirements Traceability IER diagram

3.2 Other Requirements

3.2.1 Non-Functional Requirements

The ARESQuery service complies with the following non-functional requirements (SPR [12]):

Identifier	REQ-07.05.02-SPR-SAFE.0011
Requirement	If one or several computers part of a system dedicated to airspace management and containing airspace activation/de-activation data do crash, after computers have been restarted the system shall ensure that: <ul style="list-style-type: none"> - no loss of data have occurred inside the system - no loss of data integrity with other systems have occurred - the system is able to automatically trigger sending/retrieving of external messages that did not occur because of the crash.
Title	Airspace management-dedicated computer crash recovery and airspace activation/de-activation data/messages
Identifier	REQ-07.05.02-SPR-SAFE.0003
Requirement	Relevant data exchanges between ASM, ATC, ATFCM and Air Defence shall undergo an encryption process.
Title	Encryption of transmitted data

Table 2: Non-functional requirements

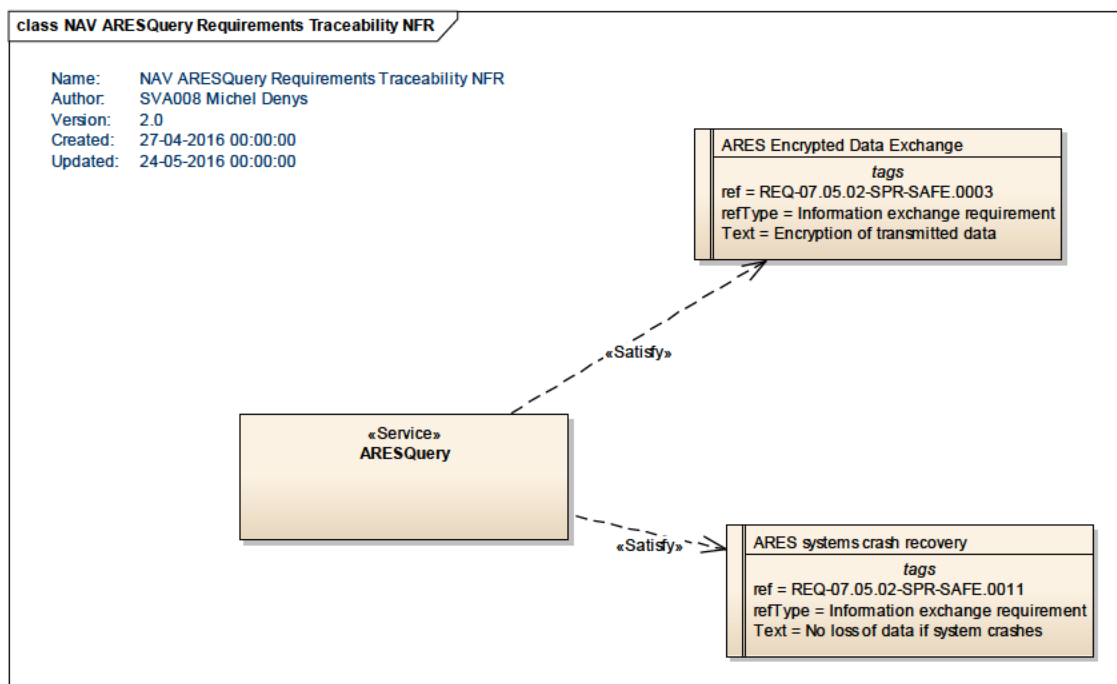


Figure 2: NAV ARESQuery Requirements Traceability Nfr diagram

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, nav aids, 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

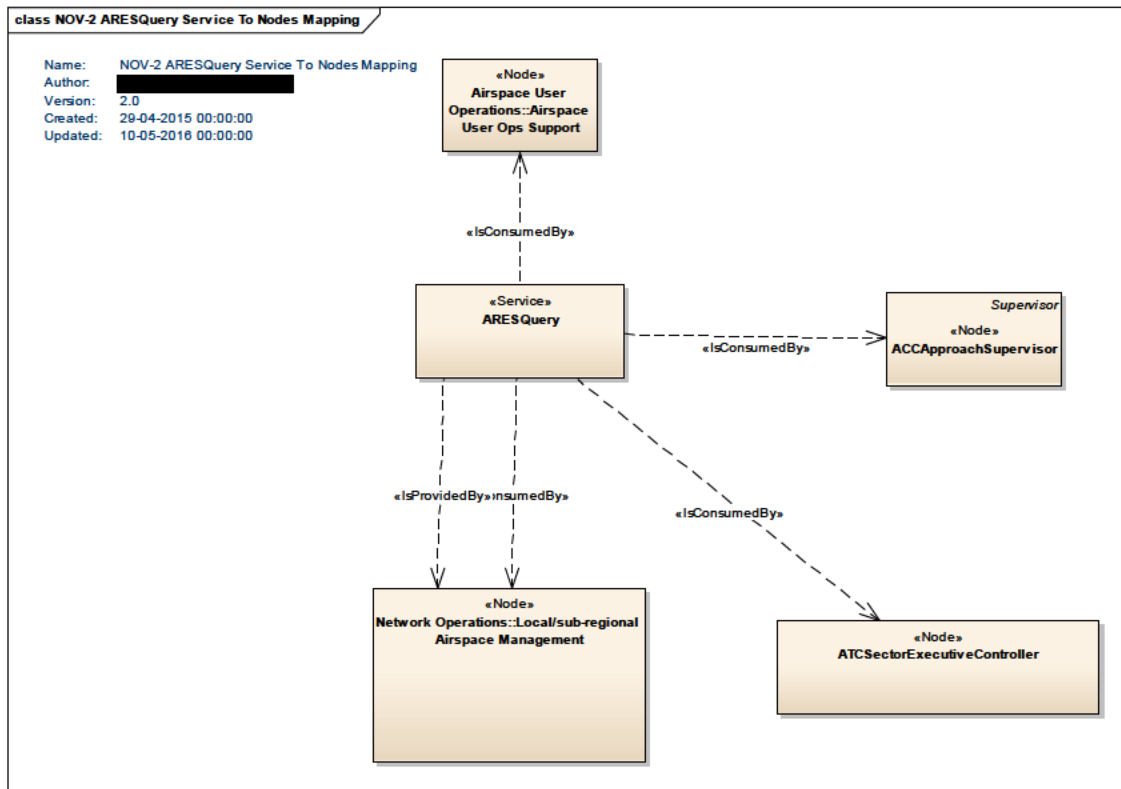


Figure 3: NOV-2 ARESQuery Service to Nodes Mapping diagram

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 [11], 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)

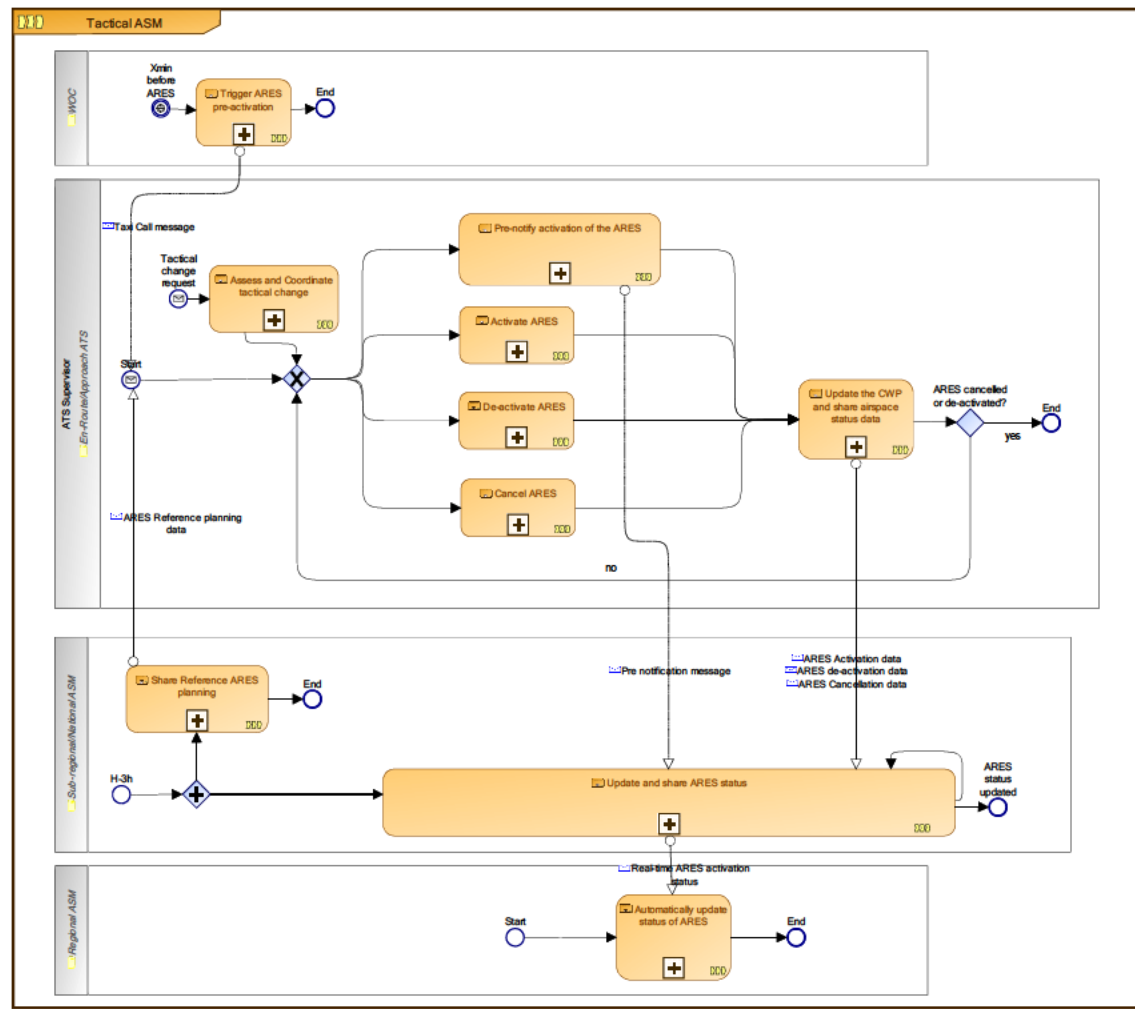


Figure 4: NOV-5 EATMA operational activity for the tactical ASM (ARES activation-deactivation)

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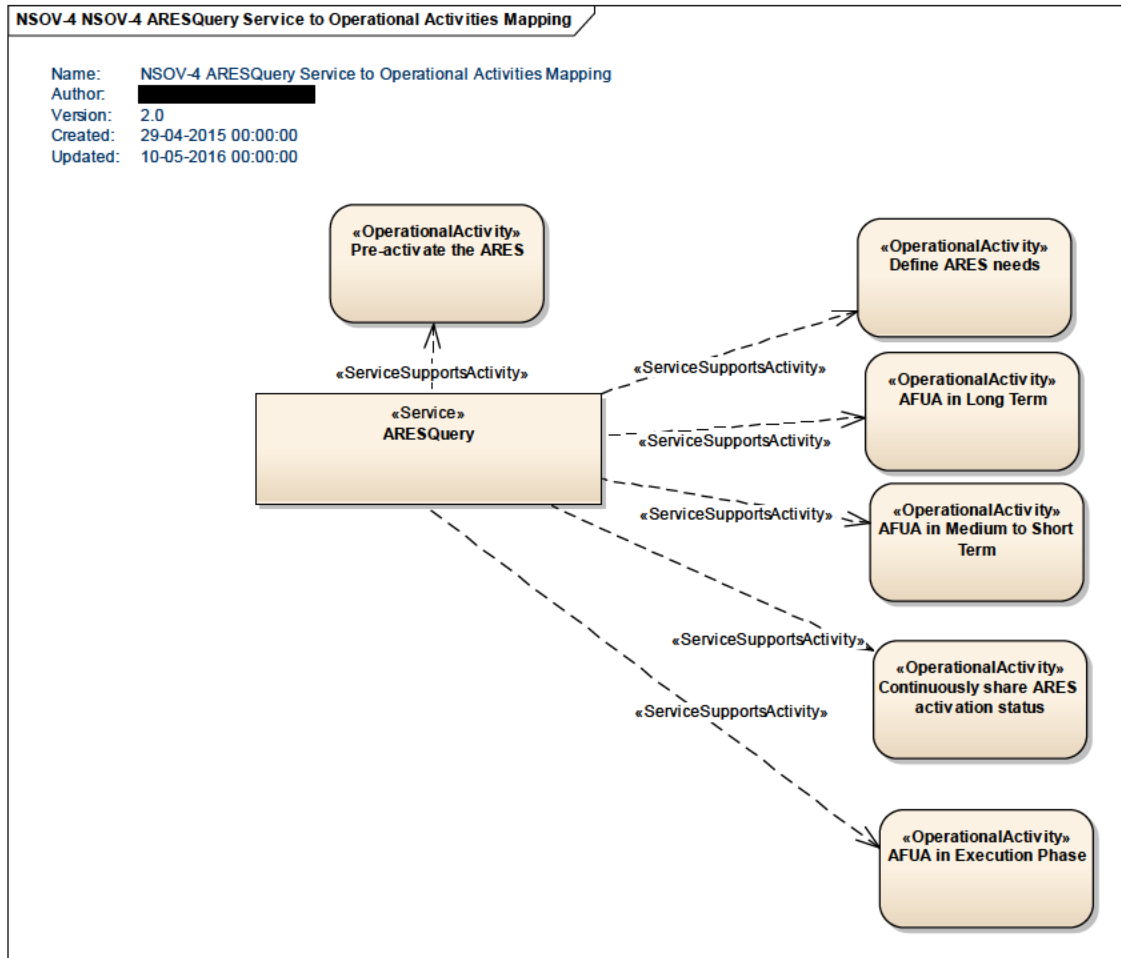


Figure 5: NSOV-4 ARESQuery Service to Operational Activities Mapping diagram

4.4 Service Interfaces

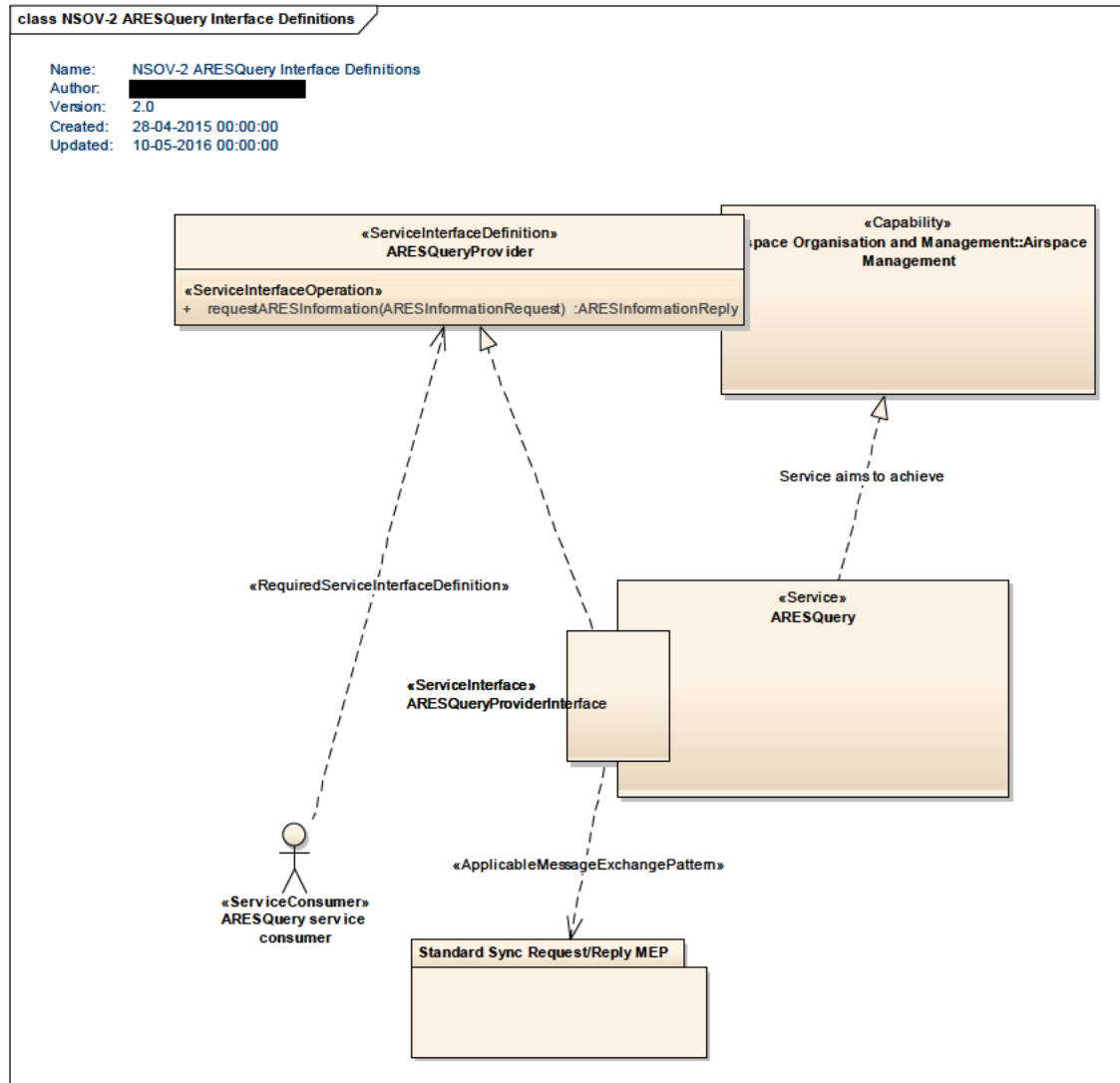


Figure 6: NSOV-2 ARESQuery Interface Definition diagram

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
ARESQueryProviderInterface	ARESQueryProvider	requestARESInformation	provided

Table 3: 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 ARESQuery service has a single interface with one operation.

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 ARESQueryProviderInterface

The purpose of this service Interface is to provide a service end-point for the appropriate authority to get information on an Airspace reservation, regardless of its ASM state. This Service Interface exposes one operation i.e. the requestARESInformation.

5.1.1 Service Interface Definition ARESQueryProvider

This Service Interface definition exposes a single operation:

5.1.1.1 Operation requestARESInformation

5.1.1.1.1 Operation Functionality

The AMC, owner of the ARES, provides a description of an ARES, in real-time.

5.1.1.1.2 Operation Parameters

Parameters

The input parameter is the ARESId of type ARESInformationRequest, which uniquely define the ARES across all systems. The operation output consists of the ARESInformationReply which consists of a Mission definition and the one or more AirspaceAllocation.

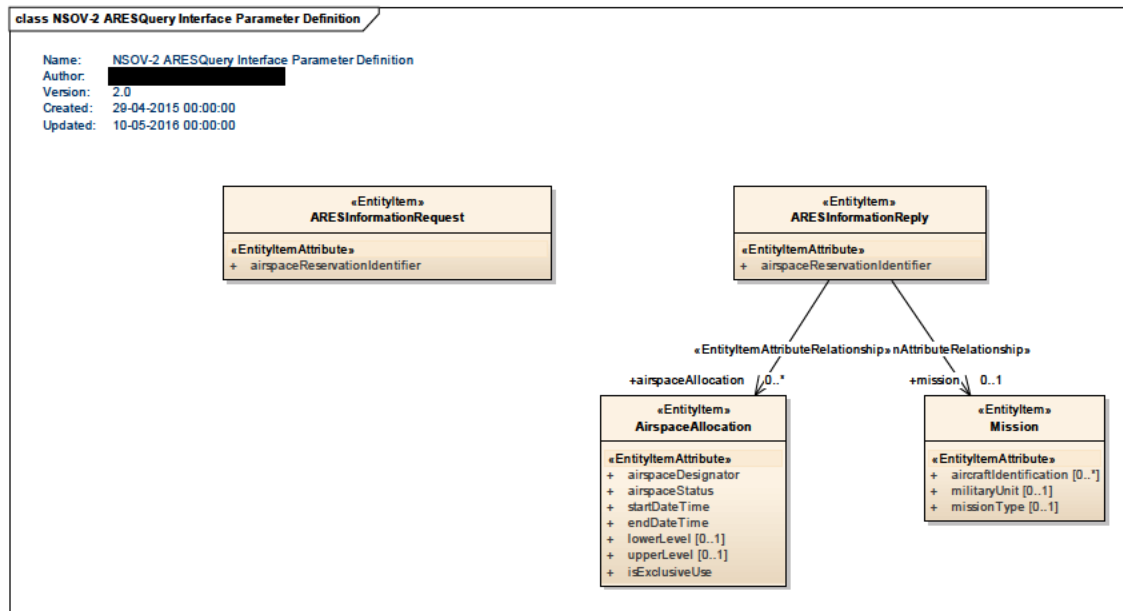


Figure 7: NSOV-2 ARESQuery Interface Parameter Definition diagram

Element Name	Author	Notes
ARESInformationReply	[REDACTED]	The definition of an ARES that specifies static and dynamic properties of an ARES.
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
airspaceReservationIdentifier		An Universal Unique Identifier (UUID) that identifies a single specific ARES
Tagged Value Name		Value
CLDMContextTrace		urn:x-sesaru:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceReservation
CLDMSemanticTrace		urn:x-sesaru:airm:v410:ConsolidatedLogicalDataModel:Abstract:Entity@identifier
Element Name	Author	Notes
ARESInformationRequest	[REDACTED]	An Universal Unique Identifier (UUID) that identifies a single specific ARES
Element Tagged Value Name		Value
CLDMSemanticTrace		CLDM_out_of_scope
Attribute Name	Type	Notes
airspaceReservationIdentifier		An Universal Unique Identifier (UUID) that identifies a single specific ARES
Tagged Value Name		Value
CLDMContextTrace		urn:x-sesaru:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceReservation
CLDMSemanticTrace		urn:x-sesaru:airm:v410:ConsolidatedLogicalDataModel:Abstract:Entity@identifier
Element Name	Author	Notes

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AirspaceAllocation		Qualification in time (time period) and level (level range) of the pieces of airspace infrastructure allocated to an airspace reservation.	
	Element Tagged Value Name	Value	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceReservation@airspaceAllocation	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation	
	IMDefinitionTrace	urn:x-ses:sesarju:airm:v410:InformationModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceAllocation	
	Attribute Name	Type	Notes
	airspaceDesignator		A published sequence of characters allowing the identification of the airspace. Description: Typical examples are the ID of the Danger, Prohibited, Temporary segregated Areas, etc.
	Tagged Value Name	Value	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@allocatedAirspace	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Airspace:Airspace@designator	
	Attribute Name	Type	Notes
	airspaceStatus		Status of the Airspace which can consist of following: NOT-ACTIVE, PRE-ACTIVATED or PENDING, ACTIVE.
	Tagged Value Name	Value	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@status	
	IMDefinitionTrace	urn:x-ses:sesarju:airm:v410:InformationModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceStatus	
	Attribute Name	Type	Notes
	startDateTime		Date and time at which the reservation starts to be effective.
	Tagged Value Name	Value	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:Abstract:TemporalEnabledEntity@startValidity	
	Attribute Name	Type	Notes
	endDateTime		Date and time at which the reservation ceases to be effective.
	Tagged Value Name	Value	
	CLDMSemanticTrace	urn:x-	

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Element Name	Author	Notes
ARESInformationReply		The definition of an ARES that specifies static and dynamic properties of an ARES.
Element Tagged Value Name	Value	
CLDMSemanticTrace	CLDM_out_of_scope	
Attribute Name	Type	Notes
		ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:Abstract:TemporalEnabledEntity@endValidity
Attribute Name	Type	Notes
lowerLevel		Lower limit of the allocated airspace. The data type also allows a special non-numerical value "FLOOR" meaning "the bottom of the airspace". This can useful in the case of Airspace that have a non-constant lower limit.
Tagged Value Name	Value	
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@level	
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Airspace:AirspaceLayer@lowerLimit	
Attribute Name	Type	Notes
upperLevel		Upper limit of the allocated airspace. The data type also allows a special non-numerical value "CEILING", meaning "the top of the airspace. This can useful in the case of Airspace that have a non-constant upper limit.
Tagged Value Name	Value	
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@level	
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Airspace:AirspaceLayer@upperLimit	
Attribute Name	Type	Notes
isExclusiveUse		An indication that the airspace has been activated for exclusive use. If false, it indicates that the airspace has been activated for specific use.
Tagged Value Name	Value	
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@isExclusiveUseOfTraffic	
Element Name	Author	Notes
Mission		One or more aircraft ordered to accomplish one particular task performing the mission as the individual flight(s) and/or formation(s).
Element Tagged Value Name	Value	
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceReservation@mission	

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	CLDMSemanticTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:MilitaryOperations:Mission
Attribute Name	Type	Notes
aircraftIdentification		A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications.
Tagged Value Name	Value	
CLDMContextTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:Flight:Flight@aircraftIdentification	
CLDMSemanticTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightIdentifier:AircraftIdentification	
IMDefinitionTrace	urn:x- ses:sesarju:airm:v410:InformationModel:SubjectFields:Flight:FlightIdentifier:AircraftIdentification	
Attribute Name	Type	Notes
militaryUnit		The full textual name of a unit. This name must be established according to the rules specified by ICAO, viz.: in the official language of the country, transposed into the Latin Alphabet where necessary.
Tagged Value Name	Value	
CLDMContextTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@user	
CLDMSemanticTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:Stakeholders:Stakeholder:Organisation@designator	
Attribute Name	Type	Notes
missionType		List of military activities (with a national specificity).
Tagged Value Name	Value	
CLDMContextTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirspaceOrganizationAndManagement:AirspaceActivation@militaryUse	
CLDMSemanticTrace	urn:x- ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:MilitaryOperations:MilitaryFlightActivity@militaryActivity	

Table 4: Payload tracing to AIRM

6 Service dynamic behaviour

6.1 Service Interface ARESQueryProviderInterface

The Service Behaviour consists of the following flow:

- The ARESQuery service consumer initiates the requestARESInformation operation, in synchronous mode, of the Relevant ACC / Authorised Authority Service End-Point to request the description of an ARES
- The ARESQuery service consumer gets the respond of the requestARESInformation operation with an appropriate ARESInformationReply

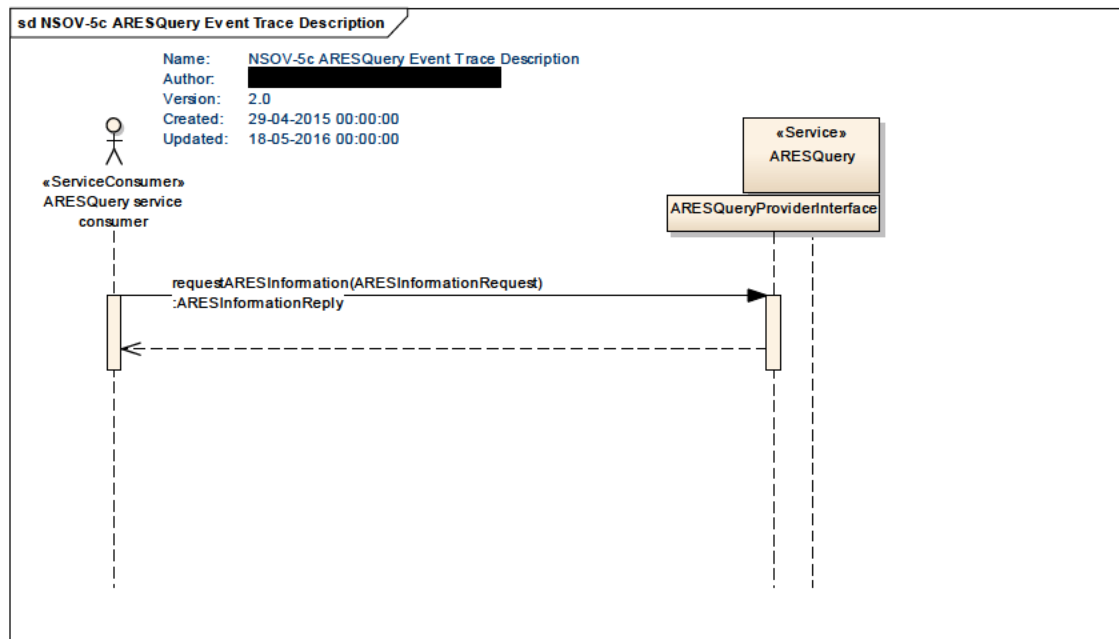


Figure 8: NSOV-5c ARESQuery Event Trace Description

7 Service provisioning (optional)

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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 - ARESQueryService	Date of Service Creation:	20140211-11:23:31
Service version:	2.0	Version of Verification Rules:	00.07.00
Phase:	2.0	Date of Verification:	20160425-04:56:41
Owner of service:		Passes:	115
Name of verifier:		Failures:	0
Overall comments:		Manual:	2
MDG Library Functions version:	29915	MDG ISRM Verification version:	29993

Table 5: Verification results overview

The verification reports for the service can be found in the Verification Reports directory located in the D65 delivery package [16].

Designed_Services_-_ARESQueryService.xls

Designed_Services_-_ARESQueryService_Common.xls

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

8.2 Validation

The service was not part of a verification 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] ISRM 2.0 SESAR EA Enterprise Architect model	2.0	08.03.10 D65 ISRM2.0-model
[11] Advanced Flexible Use of Airspace for Step 1 OSED	00.04.00	07.05.04 D45
[12] Advanced Flexible Use of Airspace Safety and Performance Requirements for Step 1	00.03.05	07.05.04 D47
[13] 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
[14] European ATM Service Identification for the Advanced Use of Flexible Use of Airspace	V1.0	08.03.05
[15] B.4.3 AFUA Service Allocation FT09	00.00.03	B.04.03
[16] Verification reports for the service	N/A	08.03.10 D65 Verification reports

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