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Founding Members



Authoring & Approval

Authors of the document

Name/Beneficiary	Position/Title	Date
Asa STANDAR/EUROCONTROL	Task Leader	06/03/2019
Serena Rubbioli/ENAV	Task Leader	02/04/2019
Richard Houdebert/THALES AS	PJ18-04a Member	25/04/2019
Yi Xiong/EUROCONTROL	PJ18-04 Deputy SL	02/04/2019

Reviewers internal/external to the project

Name/Beneficiary	Position/Title	Date
Serena Rubbioli/ENAV	Task Leader	17/01/2020
Richard Houdebert/THALES AS	PJ18-04a Member	22/01/2020
Yi Xiong/EUROCONTROL	PJ18-04 Deputy SL	22/01/2020
Patrizia Criscuolo/Technosky	PJ.09-02 PoC	17/03/2020
Dominique Latge/Thales Air Systems	PJ.24 PoC	17/03/2020

Approved for submission to the SJU By - Representatives of beneficiaries involved in the project

Name/Beneficiary	Position/Title	Date
Jan Reznicek/Honeywell	PJ.03a-04 member	30/01/2020 [Silent approval]
Tomas Beda/Honeywell	PJ.03a-04 member	30/01/2020 [Silent approval]
Patrizia Criscuolo/Technosky	PJ.09-02 PoC	30/01/2020 [Silent approval]
Dominique Latge/Thales Air Systems	PJ.24 PoC	30/01/2020 [Silent approval]
Juliette Engel/EUROCONTROL	PJ.19-03 member	30/01/2020 [Silent approval]
Radosveta/EUROCONTROL	PJ.19-03 member	30/01/2020 [Silent approval]
Yi Xiong/EUROCONTROL	PJ.18-04 Deputy SL	30/01/2020

Rejected By - Representatives of beneficiaries involved in the project

Name/Beneficiary	Position/Title	Date

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PJ.18-04a

IMPROVED AIM INFORMATION

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Abstract

This document is the technical specification of PJ.18-04a improved aeronautical (AIM) information. It provides an overview of AIM services developed by PJ.18-04a and the requirement specifications, covering functional, non-functional, and interface requirements. It also contains architecture views covering the various functional blocks, systems, services and interfaces. PJ18-04a proposes the developed Aeronautical Dataset Service as the solution targeting TRL6.

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1 Executive summary

This Technical Specification (TS/IRS) covers functional, non-functional and interface requirements related to PJ.18-04a. The project defines and delivers technically validated aeronautical (AIM) Information Services for identified Operational Solutions that require AIM Information Services in support of their operational validation.

In the context of PJ.18-04a, an Aeronautical Dataset Service has been developed that provides a solution for the provision of digital aeronautical datasets. The information service has been created with the objective to satisfy the need of the SESAR 2020 Solution PJ03a-04 and coupled with a wider scope which intends to meet the requirements set by ICAO regarding the provision of aeronautical datasets. **PJ.18-04a proposes the Aeronautical Dataset Service as the TRL6 solution in Wave 1.**

In addition, PJ18-04a has developed two D-NOTAM information services in support of other ATM solutions, PJ09-02 and PJ24. **These services are considered as activities supporting the validation exercises of the other ATM solutions, not as part of the solution PJ18-04a proposes for maturity assessment.**

The activities performed by PJ.18-04a were organised in domains which contribute to different ATM environments. These domains were meant to better structure the activities:

- 18-04a.IS.1 - AIM Information Services to support High Performing Airport Operations – Aeronautical Dataset service as TRL6 solution of PJ.18-04a
- 18-04a.IS.2 - AIM Information Services to support Optimised ATM Network Services – D-NOTAM Event information and D-NOTAM Distribution service as activities in support of other solutions.

With respect to architecture elements, one POI and two ENs have been created to cover the activities. The TRL6 solution addresses the EN SVC-41 (Provision of Aeronautical Dataset Service) as part of the Aeronautical Dataset Service to be assessed.

The results of the technical validation exercises showed that the services are technically feasible, where the system capabilities turned out to be functional, able to provide the output (data) as expected. Regarding the TRL6 solution, the Aeronautical Dataset service, the follow-up evaluation showed that the ATM solution considers it to be beneficial to use this information and its data in a manner that quality and consistency are maintained.

2 Introduction

2.1 Purpose of the document

This document is the technical specification of PJ.18-04a Improved AIM information. The purpose is to provide an overview of developments conducted by the solution and the requirement specifications, covering functional, non-functional and interface requirements. It also contains architecture views covering the various systems, services and interfaces addressed.

Furthermore, the technical specification intends to form the basis for industrialisation and deployment, thereby focusing on the functional description of the mature AIM services instead of physical design of the prototypes for implementation. The developed systems should also be considered as potential candidate to further standardisation development activities.

The document describes the Aeronautical Dataset Service which has been developed and matured in Wave 1 and presents this Service as the solution that will be assessed for TRL6. Other activities undertaken by PJ.18-04a are also included in this TS/IRS in order to maintain a clear view on the tasks performed by PJ.18-04a, but they have been considered as activities in support of other ATM solutions, therefore not subject to maturity assessment of PJ.18-04a.

2.2 Scope

This TS/IRS covers requirements and architecture elements related to activities undertaken by PJ.18-04a. It focuses on the Aeronautical Dataset Service which aims for TRL6 at the end of Wave 1 and also captures requirements and architecture elements of other information services developed by PJ.18-04a in order to present a full view of all PJ.18-04a activities.

The solution that is proposed for maturity assessment is the Aeronautical Dataset Service with the purpose to provide digital aeronautical datasets through a web service. The solution address the EN SVC-41 which has been created in Wave 1.

The Aeronautical Dataset service addresses requirements from PJ03a-04, but has a larger scope that also intends cover the ICAO Annex 15 requirement on digital datasets.

2.3 Intended readership

The intended readership of this document is PJ.18-04a partners and the operational solutions for which the developed AIM services primarily will serve (PJ.03a-04, PJ.09-02, PJ24), PJ.19 and the SJU and other project partners of PJ18 4D Trajectory Management who have an interest in aeronautical information service development.

2.4 Background

In SESAR 1, AIM activities mainly focussed on the development of Digital Integrated Briefing [51] which addressed provision of AIS and MET information to pilots and dispatchers in the form of briefing products and services.

Regarding the D-NOTAM Event information service, this technical specification takes into account the work done in SESAR 1 on D-NOTAM (see [44] and [45]).

The Aeronautical Dataset Service is a new activity in SESAR 2020. The objective is to develop a SWIM service providing (ICAO) Datasets. The service is defined and developed following the guidelines defined in the SWIM Specifications. The expected outcome is a web service that is sufficiently mature to be deployed (V3), therefore this service forms the core part of the solution PJ.18-04a targeting TRL6.

The D-NOTAM services developed for PJ.09-02 and PJ.24 are considered as activities in support of other solutions where maturity depends on the customer solutions.

2.5 Structure of the document

The document is structured as follows:

- Chapter 1 provides the executive summary of the PJ.18-04a technical specification.
- Chapter 2 provides the purpose, scope and other administrative aspects of the technical specification, common for the PJ.18-04a technological solutions.
- Chapter 3 provides an overview of the activities and the impact on architecture for each PJ.18-04a developed service.
- Chapter 4 provides the functional architecture and technical requirements for each PJ.18-04a developed service.
- Chapter 5 contains implementation options.
- Chapter 6 summarises the assumptions.
- Chapter 7 contains references and applicable documents
- Appendix A provides the Service Description Documentation
- Appendix B provides the Service Technical Design Document
- Appendix C provides the requirements related to TRL 4 service (D-NOTAM Event Information service)

2.6 Glossary of terms

Term	Definition	Source of the definition
Aeronautical data	A representation of aeronautical facts, concepts or instructions in a formalized manner suitable for communication, interpretation or processing.	ICAO Annex 15

Aeronautical information	Information resulting from the assembly, analysis and formatting of aeronautical data.	ICAO Annex 15
Air Traffic Flow and Capacity Management (ATFCM)	A service complementary to Air Traffic Control (ATC), the objective of which is to ensure an optimum flow of air traffic to or through areas within which traffic demand at times exceeds the available capacity of the ATC system.	EUROCONTROL, CFMU (2002), Air Traffic Flow Management Operations: ATFM Users Manual, Edition 8.0, 18.3.2002
Air Traffic Services (ATS)	A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).	ICAO Doc 4444
data product	Data set or data set series that conforms to a data product specification (ISO 19131*).	ICAO Annex 15
Dataset	<p>Identifiable collection of data --NOTE A Dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent</p> <p>or feature type, is located physically within a larger Dataset. Theoretically, a Dataset may be as small as a single feature or feature attribute contained within a larger Dataset. A hardcopy map or chart may be considered a Dataset.</p>	ISO 19131:2007
data set	<p>Identifiable collection of data (ISO 19101*)</p> <p>The two writings in use, Dataset in one word (ISO) or data set in two words (ICAO), refer to the same concept.</p> <p>This doc uses Dataset in one word, except when referring explicitly to ICAO data set.</p>	ICAO Annex 15

Dataset series	collection of Datasets sharing the same product specification	ISO
data set series	Collection of data sets sharing the same product specification (ISO 19115*).	ICAO Annex 15
feature	Abstraction of real-world phenomena --NOTE A feature may occur as a type or an instance. Feature type or feature instance shall be used when only one is meant.	ISO
geographic data	data with implicit or explicit reference to a location relative to the Earth NOTE Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.	[ISO 19109]
ICAO data set	A data set outlined in ICAO Annex 15.	ICAO Annex 15
metadata	Data about data (ISO 19115*). Note: A structured description of the content, quality, condition or other characteristics of data.	ICAO Annex 15

Table 1: Glossary

2.7 Acronyms and Terminology

Term	Definition
ADD	Architecture Description Document
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AMHS	ATS Message Handling System
ANSP	Air Navigation Service Provider
ASM	Airspace Management
ATFM	Air Traffic Flow Management

ATM	Air Traffic Management
ATS	Air Traffic Service
CC	Capability Configuration
CNS	Communication, Navigation and Surveillance
CVS	Combined Vision System
D-NOTAM	Digital NOTAM.
DCB	Demand Capacity Balancing
EATMA	European ATM Architecture
E-ATMS	European Air Traffic Management System
FAA	Federal Aviation Administration
FMP	Flow Management Position
ICAO	International Civil Aviation Organisation
IER	Information Exchange Requirement
INTEROP	Interoperability Requirements
IRS	Interface Requirements Specification
IS	Information Service
ISRM	Information Service Reference Model
NAF	NATO Architecture Framework
NM	Network Manager
NOTAM	Notice to Airmen
NSOV	NAF Service Oriented View
NOV	NAF Operational View
NSV	NAF System View
OSED	Operational Service and Environment Definition
PANS	Procedures for Air Navigation Services
PIRM	Programme Information Reference Model
QoS	Quality of Service
SARP	Standard and Recommended Practice

SDD	Service Description Document
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking
SoaML	Service Oriented Architecture Modelling Language
SPR	Safety and Performance Requirements
SWIM	System Wide Information Model
TRL	Technology Readiness Level
TS	Technical Specification
UML	Unified Modelling Language
V&V	Validation and Verification
WSDL	Web Services Definition Language
XSD	XML Schema Definition

Table 2: Acronyms and terminology

3 SESAR Solution Impacts on Architecture

3.1 Target Solution Architecture

3.1.1 SESAR Solution(s) Overview

This section presents an overview of activities undertaken by PJ.18-04a. It comprises technical specifications of developed AIM services and a view on the relevant architectural elements. Due to the various topics addressed by PJ.18-04a, the activities are grouped by project partners.

The solution that has been developed and validated is the Aeronautical Dataset Service with target maturity level of TRL6 at the end of Wave 1. In addition, two D-NOTAM information services have been developed in support of PJ.09-02 and PJ.24. These services provide a complete view of all developments performed by PJ.18-04a.

Each of the service is described in the following sections:

3.1.1.1 Aeronautical Dataset Service (TRL6)

The PJ.18-04a technological developments led by EUROCONTROL covers the development of the Aeronautical Dataset Service, which is providing the capability to provide and consume pre-defined digital data sets containing aeronautical data. The service has been defined and developed in conformance with the Specification for SWIM Service Definition and considers the use of SWIM Technical Infrastructure Yellow Profile. Definition of the Aeronautical Dataset Service is line with the requirements set out in the SWIM Specifications.

In addition, the Aeronautical Dataset Service supports the SESAR2020 PJ.03a-04 on Enhanced Visual Operations, by allowing the Combined Vision System (CVS) to access specified aerodrome data, terrain and obstacle data for defined aerodromes in accordance with specified quality requirements.

The Aeronautical Dataset service is developed for SESAR2020 purposes and in accordance with the data need of the dependency operational solution; however the Aeronautical Dataset service is defined with the larger ICAO digital data set provision scope in mind¹. Therefore, the Aeronautical Dataset service definition encompasses the larger scope and the requirements for the service developments are also targeting the SESAR2020 verification.

The developed service have the full query/reply capabilities as identified in the Service Definition (ref. Appendix A Service Description Document -SDD).

SESAR Solution ID and Title	Functional Blocks/Role impacted by the	Enabler ID (from EATMA)	Enabler (from EATMA)	Title	Enabler coverage
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¹ Reference ICAO Annex 15 and Doc 10066 (PANS-AIM), specifying digital data sets as AIP data set, terrain data sets, obstacle data sets, airport mapping data sets and instrument flight procedures data sets.

SESAR Solution (from EATMA)					
SESAR PJ.18-04a Improved AIM Information	Aeronautical Information Distribution	SVC-041	Provision of Aeronautical Dataset Service	• Fully	

Table 3: SESAR Solution PJ.18-04a EUROCONTROL Scope and related Functional Blocks/roles & Enablers

3.1.1.1.1 Deviations with respect to the SESAR Solution(s) definition

New EN SVC-041 [CR03591] has been created to more accurately represent the activities performed by the solutions. No deviation with respect to solution definition.

3.1.1.1.2 Relevant Use Cases

The diagram below illustrates the scope of the developed Aeronautical Dataset service within the red box, in the larger context of the aeronautical data chain. The Aeronautical Dataset service encompasses the provision of a predefined Dataset from an aeronautical information service (AIS) provider to a consumer (the next intended user) of the service.

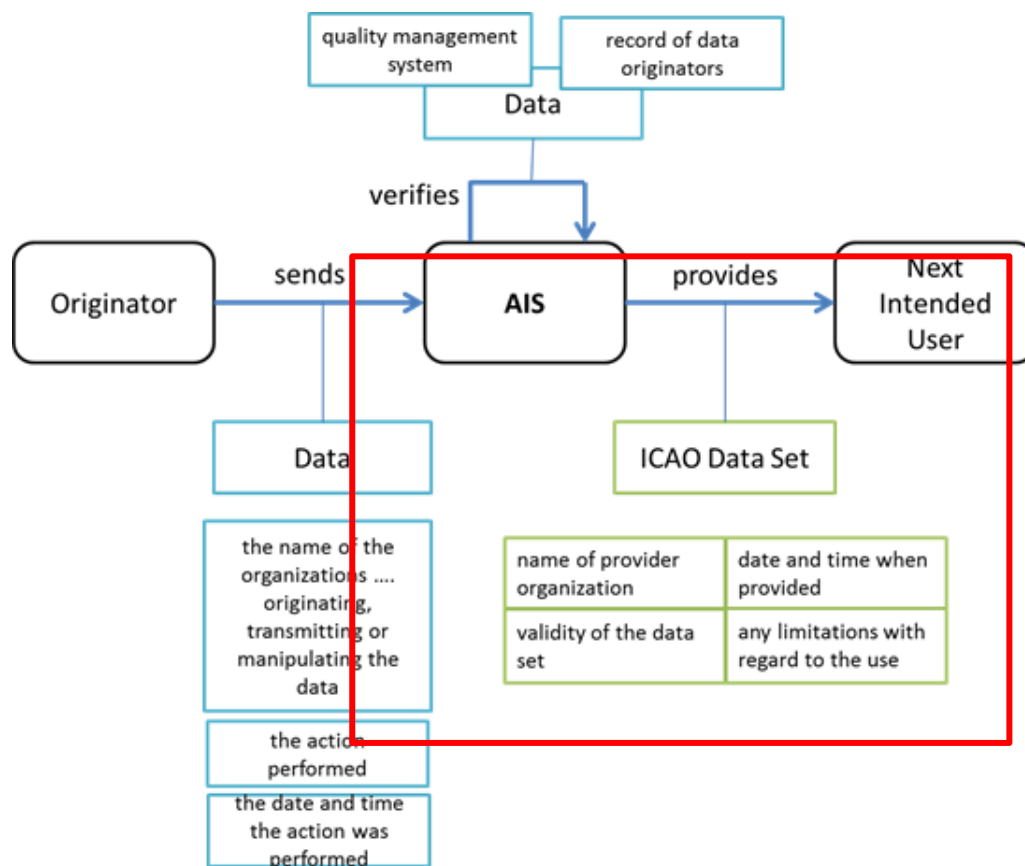


Figure 1: Aeronautical Dataset Service context diagram

In the coordinated dependency developments between the technological solution PJ.18-04a and operational solution PJ.03a-04, requirements by the operational solution were defined on improved

aeronautical data, made available as digital aeronautical Datasets supporting the operational solution activities as defined in the PJ.03a-04 Operational Service and Environment Definition.

The developed Aeronautical Dataset service thus enables use cases defined by PJ.03-04 (EFVS/CVS in Approach with HMD, CVS to 100ft above TDZE approach with HMD/HUD), through the provision of required aeronautical Datasets supporting the operational solution as a consumer of the service. The system using active sensor requires aerodrome data for target airport / runway to enable equivalent landing operation in low visibility condition. The implementation of the Aeronautical Dataset is regarded as one possibility for data acquisition required by system supporting enhanced landing operation. Another possibility for data acquisition required for the intended operation is a navigation data provider. The figure below illustrates the scenario where the on-board combined vision system and/or a navigation data provider are the consumer of the Aeronautical Dataset service (next intended user).

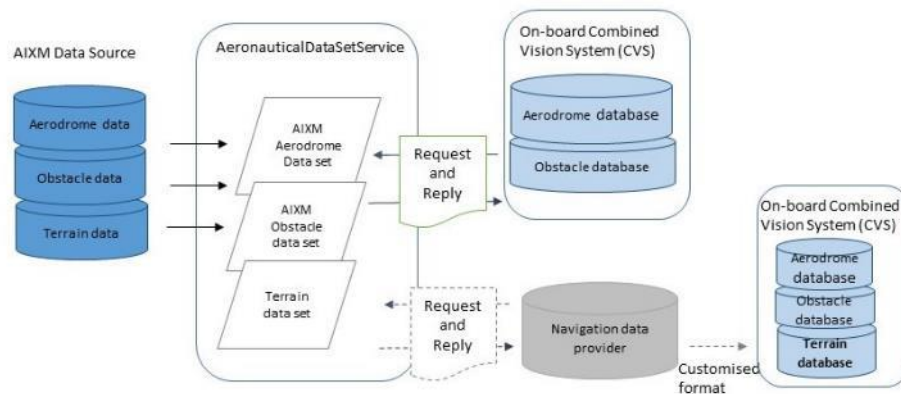


Figure 2: Aeronautical Dataset Service consumer scenario

3.1.1.1.3 Applicable standards and regulations

The list below identifies standards and regulation applicable for PJ.18-04a of the Aeronautical Dataset service developments.

- ICAO Annex 15 SAPRS (Ed. 16 July 2018)[38]
- ICAO PANS-Aeronautical Information Management (November 2018)[39]
- EUROCONTROL Specification for SWIM Service Description (Ed. 1.0)[40]
- EUROCONTROL Specification for SWIM Information Definition (Ed 1.0)[41]
- EUROCONTROL Specification for SWIM Technical Infrastructure Yellow Profile (Ed 1.0)[42]
- ATM Information Reference Model (v4.2.0)[43]

There is no identified need for new standards and/or regulation or updated of existing ones, as a result of these developments.

3.1.1.1.4 Capability Configurations required for the SESAR Solution

The following Capability Configurations are addressed by the Aeronautical Dataset Service:

Provision of Aeronautical Dataset			AirportEn-RouteNetworkTerminal Airspace	
CC	Op Env	Capability	Node	Stakeholder
Civil AU Operations Centre (PJ.18-04a)	Airport; En-Route; Network; Terminal Airspace;	Air Traffic Flow Management; Collaborative Trajectory Planning; Trajectory Information Synchronisation; User Driven Prioritisation Process;	Airspace User Ops Support; Flight Deck;	Civil Flight Operations Centre;
Communication Infrastructure		Airport Operations Management;	Aerodrome ATS;	Civil CNS Service Provider; Military CNS Service Provider;
National AIM (PJ18-04a)	Airport; En-Route; Terminal Airspace;	Aeronautical and Meteorological Information Management; Wake Turbulence Separation Provision;	ATS Operations;	Civil AIS Service Provider; Military AIS Service Provider;
Regional AIM (PJ18-04a)	Airport; En-Route; Network; Terminal Airspace;	Aeronautical and Meteorological Information Management; Wake Turbulence Separation Provision;	Aeronautical Information Service Provision;	Network Manager;

Table 4: List of Capability Configuration required for the SESAR Solution – EUROCONTROL

The following two information services are activities performed by PJ.18-04a in support of other solutions' validation exercises, the maturity of these services should be assessed in the operational context in which they were meant to support, therefore cannot be considered as standalone solutions within PJ.18-04a.

3.1.1.2 D-NOTAM Event information service

The PJ.18-04a technological developments led by ENAV covers the development of prototypes aimed at provide and consume the "extended" D-NOTAM containing as additional information the list of flights impacted by that specific D-NOTAM. The D-NOTAM Event Information service has been defined and developed in conformance with the Specification for SWIM Service Definition and considers the use of SWIM Technical Infrastructure Yellow Profile.

The developed service have the full query/reply capabilities as identified in the Service Definition (ref. Appendix A Service Description Document -SDD).

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	Enabler (from EATMA)	Title	Enabler coverage
SESAR PJ.18-04a Improved AIM Information	Aeronautical Information Distributin	SVC-042	Provision and Consumption of D-NOTAM services		• Fully

Table 5: SESAR Solution PJ.18-04a ENAV Scope and related Functional Blocks/roles & Enablers

3.1.1.2.1 Deviations with respect to the SESAR Solution(s) definition

New EN SVC-042 has been created to more accurately represent the activities performed by the solutions. No deviation with respect to solution definition.

3.1.1.2.2 Relevant Use Cases

D-NOTAM Event Information use case:

Validation exercise EXE 09-02.03 is a Real Time Simulation, based on the operational scenarios and use cases described in SESAR PJ.09S03 OSED (v. 00.00.02 – 04 July 2017 [46]).

This technical specifications document defines the requirements for the workflow for Ground Delay due to D-NOTAM reception described within [47] and reported in the table below:

Step #	Description	Note
1	User monitor Traffic Counts on active sectors within a look-ahead time.	<ul style="list-style-type: none"> • Active Sectors: EAST LIMMEN36, WEST LIMMWN36, LIMMUPP7 • Traffic sample from INNOVE: 25/07/2017 • Traffic sample includes flights impacting SWITZERLAND/ITALY (note: the flow from/to Milan ACC/Zurich ACC Geneva ACC is a subset).

		<ul style="list-style-type: none"> • Simulation consider only traffic with planned status with respect to current time of simulation (EOBT < current simulation time).
2	The user can query traffic load with a list of flight contributing to the load of the sector.	<ul style="list-style-type: none"> • The returned list contains the lists of flights ordered by criteria (e.g. airspace of interest ending and/or delay). • The list also contains the downstream AOR sector names according to flight data (planned only traffic).
3	The user is warned about an imbalance at one or more sectors and for a specific timeframe and counts.	N.A.
4	The user can drill down to view the flight list contributing to the load for the specific sector-time bin	<ul style="list-style-type: none"> • The returned list contains the lists of flights ordered by criteria (e.g. airspace of interest ending and/or delay). • The list also contains the downstream AOR sector names according to flight data (planned only traffic).
5	The user triggers level cap delay measure solution process	<ul style="list-style-type: none"> • The applicable flights are identified
6	The user can either accept the proposed level cap or optionally override the amount of delay.	<ul style="list-style-type: none"> • The list with delayed climb-out or early descend is visible to the user that can identify flights that have impact on Switzerland and need coordination
7	The user sends the measure proposal to Stakeholders.	<ul style="list-style-type: none"> • Stakeholders are NM and/or Skyguide for the ITA to SWISS flights only. <ul style="list-style-type: none"> o For ITA-originated flights, user propose a level cap on Italian departing flights affecting Skyguide airspace too. o For CH-originated flights, user propose a level cap on Swiss departing flights affecting Italian airspace too.
8	The user receive counterproposal, if any, from Stakeholder	<ul style="list-style-type: none"> • Feedback from Skyguide

9	The user evaluates the proposed feedback	• N.A.
10	The user decide to accept/refuse	• N.A.

Table 6: D-NOTAM Event Information Use Case

3.1.1.2.3 Applicable standards and regulations

The list below identifies standards and regulation applicable for the D-NOTAM Event Information service developments:

- EUROCONTROL Specification for SWIM Service Description (Ed. 1.0)[40]
- EUROCONTROL Specification for SWIM Information Definition (Ed 1.0)[41]
- EUROCONTROL Specification for SWIM Technical Infrastructure Yellow Profile (Ed 1.0)[42]
- The European Commission Regulation 73/2010 is applicable to the SESAR Solution PJ18-04a [48].
- The referenced standard for D-NOTAM is the Digital NOTAM Event Specification version 1.1 [49].

3.1.1.2.4 Capability Configurations required for the SESAR Solution

SESAR Solution ID and Title	Capability Configurations (CCs) (from EATMA)	Sub-Operating Environment(s) where the CCs operate	Capabilities (from EATMA)	Nodes (from EATMA)	Stakeholders (from EATMA)
PJ18-04a	Regional ATFCM		Information Management: Aeronautical Information Provision	Network Operations: Air Traffic Flow and Capacity Management	NM, ANSP
PJ18-04a	Regional ATFCM		Air Traffic Flow Management	Network Operations: Air Traffic Flow and Capacity Management	NM, FMP, ANSP

Table 7: List of Capability Configuration required for the SESAR Solution – ENAV

The following D-NOTAM Distribution Service has been fully integrated in PJ24. The description here below aims to provide information about the activities done in the context of PJ.18-04a, is not part of the solution that PJ.18-04a proposes for maturity assessment.

3.1.1.3 D-NOTAM Distribution Service

This section provides a high-level view of the D-NOTAM Distribution Service and more details about this activity can be found in PJ.24 deliverables [56][57].

SESAR Solution ID and Title	Functional Blocks/Role impacted by the SESAR Solution (from EATMA)	Enabler ID (from EATMA)	Enabler (from EATMA)	Title	Enabler coverage
SESAR PJ.18-04a Improved AIM Information	Aeronautical Information Distribution	SVC-042	Provision and Consumption of D-NOTAM services		<ul style="list-style-type: none"> Fully

Table 8: SESAR Solution PJ.18-04a – Thales Air Systems Scope and related Functional Blocks/roles & Enablers

3.1.1.3.1 Deviations with respect to the SESAR Solution(s) definition

No deviations with respect to the SESAR Solution definition.

New EN SVC-042 has been created to more accurately represent the activities performed by the solutions.

3.1.1.3.2 Relevant Use Cases

This technical specification document defines the requirements for the workflow for increase situation awareness by providing D-NOTAM and reported below:

1. A list of D-NOTAM messages is ready to be sent by the AMHS
2. The list of D-NOTAM messages is sent to the SWIM gateway using the interface between the AMHS and the SWIM gateway
3. THE FMP is informed of the new D-NOTAM messages pushed by the SWIM gateway using AMQP protocol
4. The FMP have a direct access to a list of relevant NOTAM in its local application

3.1.1.3.3 Applicable standards and regulations

The European Commission Regulation 73/2010 is applicable to the SESAR Solution PJ18-04a [48].

The referenced standard for D-NOTAM is the Digital NOTAM Event Specification version 1.1 [49].

3.1.1.3.4 Capability Configurations required for the SESAR Solution

Provision of D-NOTAM messages			En-RouteNetworkTerminal Airspace	
CC	Op Env	Capability	Node	Stakeholder
Communication Infrastructure	En-Route; Terminal Airspace;	D-NOTAM messages provision;	ATS Operations	Civil ANSP Service Provider;

APP ACC	En-Route; Terminal Airspace;	D-NOTAM messages management	ATS Operations;	Civil ANSP Service Provider;
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Table 9: List of Capability Configuration required for the SESAR Solution – Thales Air Systems

3.2 Changes imposed by the SESAR Solution on the baseline Architecture

No specific changes imposed on the baseline architecture.

4 Technical Specifications

4.1 Functional architecture overview

This section provides the functional architecture overview of the technical developments performed in the context of PJ.18-04a:

- Aeronautical Dataset Service [PJ.18-04a solution]
- D-NOTAM Event Information Service [PJ.18-04a activity in support of PJ.09-02]

The architecture elements presents a view of changes concerning AIM information services with inter-linked elements, therefore the architecture of these services are presented as an overall view, with no distinction between what is proposed as PJ.18-04a solution and activities supporting other solutions.

4.1.1 Aeronautical Dataset Service

4.1.1.1 Resource Connectivity Model

The PJ.18-04a technological developments led by EUROCONTROL covers the development of the Aeronautical Dataset Service, which is providing the capability to provide and consume pre-defined digital data sets containing aeronautical data. The service has been defined and developed in conformance with the Specification for SWIM Service Definition and considers the use of SWIM Technical Infrastructure Yellow Profile. Definition of the Aeronautical Dataset Service is line with the requirements set out in the SWIM Specifications.

In addition, the Aeronautical Dataset Service supports the SESAR2020 PJ.03a-04 on Enhanced Visual Operations, by allowing the Combined Vision System (CVS) to access specified aerodrome data, terrain and obstacle data for defined aerodromes in accordance with specified quality requirements.

The Aeronautical Dataset service is developed for SESAR2020 purposes and in accordance with the data need of the dependency operational solution; however, the Aeronautical Dataset service is defined with the larger ICAO digital data set provision scope in mind. Therefore, the Aeronautical Dataset service definition encompasses the larger scope and the requirements for the service developments are also targeting the SESAR2020 verification.

The developed service has the full query/reply capabilities as identified in the Service Definition (ref. Appendix A Service Description Document -SDD).

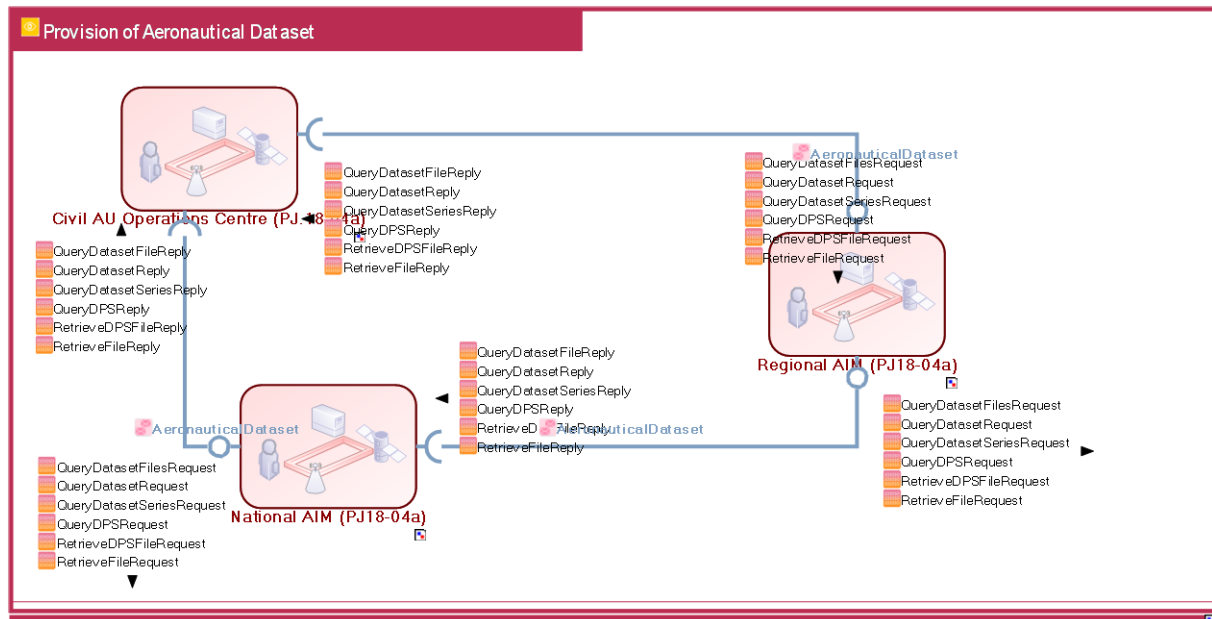


Figure 3: Resource Connectivity Model of the Aeronautical Dataset Service

4.1.1.2 Resource Orchestration view

The solution only addresses the service, without a defined operational layer with associated operational processes, therefore no NSV-4 diagram. Link with PJ03a-04 is done through Activity: **Verify CVS information consistency**.

4.1.1.3 Infrastructure connectivity model

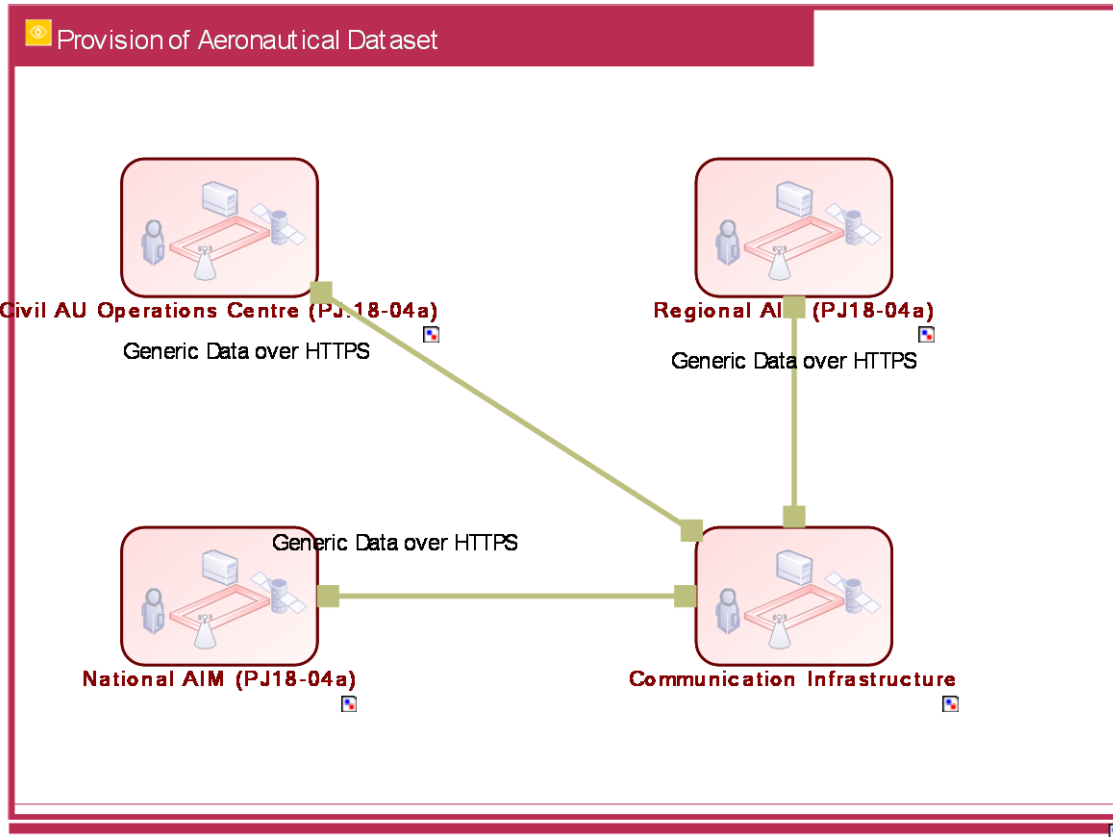


Figure 4: Infrastructure connectivity model of Aeronautical Dataset Service

4.1.1.4 Service view

This section provides a brief description of the Aeronautical Dataset service, the system context in which the service is deployed and the high-level technology used to realise the service. The detailed Service Description Document for the PJ.18-04a Aeronautical Dataset service is provided in [Appendix A](#) of this document.

4.1.1.4.1 Service description

The provider-independent Aeronautical Dataset service supports the provision of pre-defined digital Datasets containing aeronautical data. The Aeronautical Dataset service is developed for SESAR2020 purposes to enable a specified operational aeronautical information need, including provision of enhanced airport lighting data for a specific purpose.

In addition, the service accommodates the provision of the aeronautical information product *digital data set* as defined by ICAO Annex 15 and PANS-AIM². Therefore, the Aeronautical Dataset service definition encompasses the larger scope as well as the service prototype developments targeting the SESAR 2020 verification.

Note: “pre-defined” means that the Dataset content is specified in advance, it is not possible for the user of the service to define its own Dataset; only to choose between the Datasets made available.

4.1.1.4.2 Service Provisioning

The scope of the Aeronautical Dataset service is provision of a pre-defined Dataset from an AIS provider to the next intended user (service consumer) based on a number of metadata.

The service assumes the following four main entities:

entity	description
Dataset	Primary concept Datasets are temporal by nature. They are published regularly, e.g. once per AIRAC cycle.
Dataset File	A data set is typically composed of one file. For practical reasons, AIP Datasets may occasionally be composed of several files.
Dataset Series	A Dataset series allows linking related Datasets. The Datasets are time related (e.g. for various validity periods) or scope related (e.g. for subsets of the Dataset series locations). Each Dataset belongs to one Dataset series. A Dataset series indicates an intention of coverage, which may be only partly covered by the existing Datasets.
Data Production Specifications File	The intention is to link every Dataset series to a data product specification.

The typical service sequence for the Aeronautical Dataset Service is described below and illustrated in Figure 3.

² Reference ICAO Annex 15 and Doc 10066 (PANS-AIM), specifying digital data sets as AIP data set, terrain data sets, obstacle data sets, airport mapping data sets and instrument flight procedures data sets.

- The service consumer requests *Dataset series* based on a number of selection criteria and receives back a list with zero, one or more Dataset objects.
 - It is assumed that the service consumer has identified the Dataset series of interest in that list.
- The service consumer requests *Datasets based on the selected Dataset series* and possibly *additional selection criteria*, and receives back a list of zero, one or more Datasets.
 - It is assumed that the service consumer has identified the Dataset(s) of interest in that list.
 - For each such Dataset, the service consumer requests the *file information of the selected Dataset* and receives back a list of one or more file object.
 - For each file object, the service consumer retrieves the file and receives back the file content

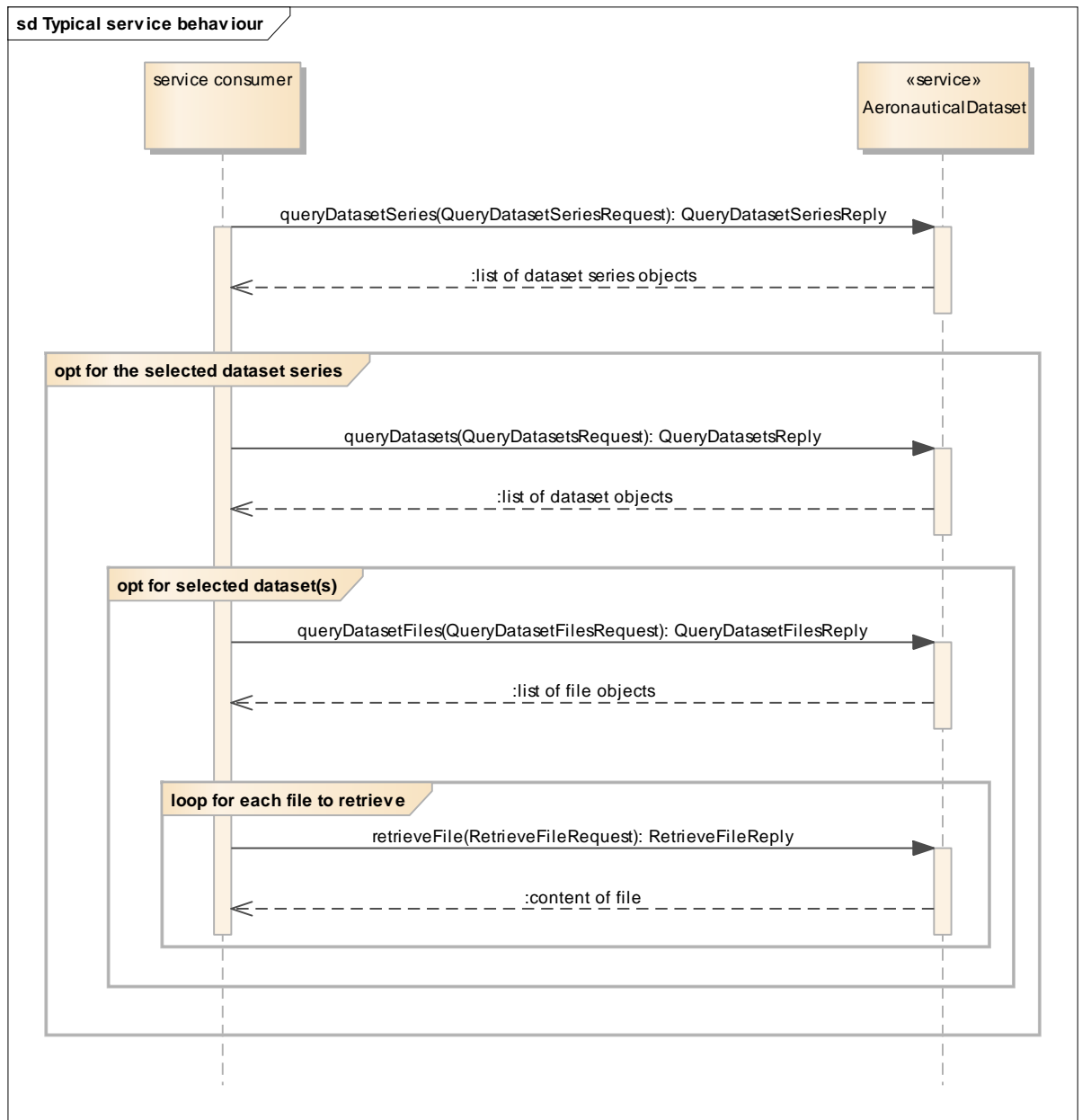


Figure 5: Aeronautical Dataset Service provisioning – Service Sequence

The following interactions of the services have been identified:

Interaction	Consumer CC	Consumer System	Provider CC	Provider System
AeronauticalDataset.Civil AU Operations Centre (PJ.18-04a)_CC and Regional AIM (PJ18-04a)_CC	Civil AU Operations Centre (PJ.18-04a)	Civil AU Flight Operations Centre (FOC);	Regional AIM (PJ18-04a)	AIM;

Interaction	Consumer CC	Consumer System	Provider CC	Provider System
AeronauticalDataset.Civil AU Operations Centre (PJ.18-04a)_CC and National AIM (PJ18-04a)_CC	Civil AU Operations Centre (PJ.18-04a)	Civil AU Flight Operations Centre (FOC);	National AIM (PJ18-04a)	AIM;
AeronauticalDataset.National AIM (PJ18-04a)_CC and Regional AIM (PJ18-04a)_CC	National AIM (PJ18-04a)	AIM;	Regional AIM (PJ18-04a)	AIM;

Figure 6: Interactions between CCs

4.1.1.4.3 Service Realization

The technology used to realise the Aeronautical Dataset service is high-level described below, and in detailed described in [Appendix A](#) (Service Description Document).

Service Interface:

- Aeronautical Dataset Provider for querying Dataset (series) and retrieving the Dataset files

Service interface protocols and data format:

transport/messaging protocols HTTP 1.1

protocol configuration HTTP Messages will indicate the payload content type using the content-type header

HTTP Messages that transport compressed payloads will use deflate/gzip as expressed in the content-encoding header

HTTP will use the chunked transfer encoding and indicate this in the transfer-encoding header.

HTTP will use the status header to indicate the status of the response using a code and corresponding meaning phrase. (see exception handling)

HTTP GET method is supported

security Server authentication based on X.509 certificates (maybe not used for testing purposes)

Client authenticates based on HTTP Basic (to be discussed)

TLS1.2

Cypher Suites: AES_128_GCM_SHA256, AES_256_CCM

exception handling The services make use of the standard HTTP status code (details to be defined)

SWIM TI Profile and interface bindings:

HTTP requests and responses.

profile name TI Yellow Profile specification

profile version Edition Number 1.0

selected binding WS Light

Standard:

System Port:

4.1.1.4.4 Interaction AeronauticalDataset.Civil AU Operations Centre (PJ.18-04a)_CC and National AIM (PJ18-04a)_CC

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: Generic Data over HTTPS at Civil AU Operations Centre (PJ.18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: Generic Data over HTTPS at National AIM (PJ18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

Service Interface Definition	
AeronauticalDatasetProvider	
Standard	MEP, Security Configuration, Interface Bindings
AeronauticalDatasetProvider.SWIM Yellow Profile.WS Light Binding	

4.1.1.4.5 Interaction AeronauticalDataset.Civil AU Operations Centre (PJ.18-04a)_CC and Regional AIM (PJ18-04a)_CC

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: Generic Data over HTTPS at Civil AU Operations Centre (PJ.18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: Generic Data over HTTPS at Regional AIM (PJ18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

Service Interface Definition	
AeronauticalDatasetProvider	
Standard	MEP, Security Configuration, Interface Bindings
AeronauticalDatasetProvider.SWIM Yellow Profile.WS Light Binding	

4.1.1.4.6 Interaction AeronauticalDataset.National AIM (PJ18-04a)_CC and Regional AIM (PJ18-04a)_CC

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
IP	

System Port: Generic Data over HTTPS at National AIM (PJ18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

System Port: IP_GND at Communication Infrastructure_CC

Protocol Stack	Protocol
----------------	----------

IP	
----	--

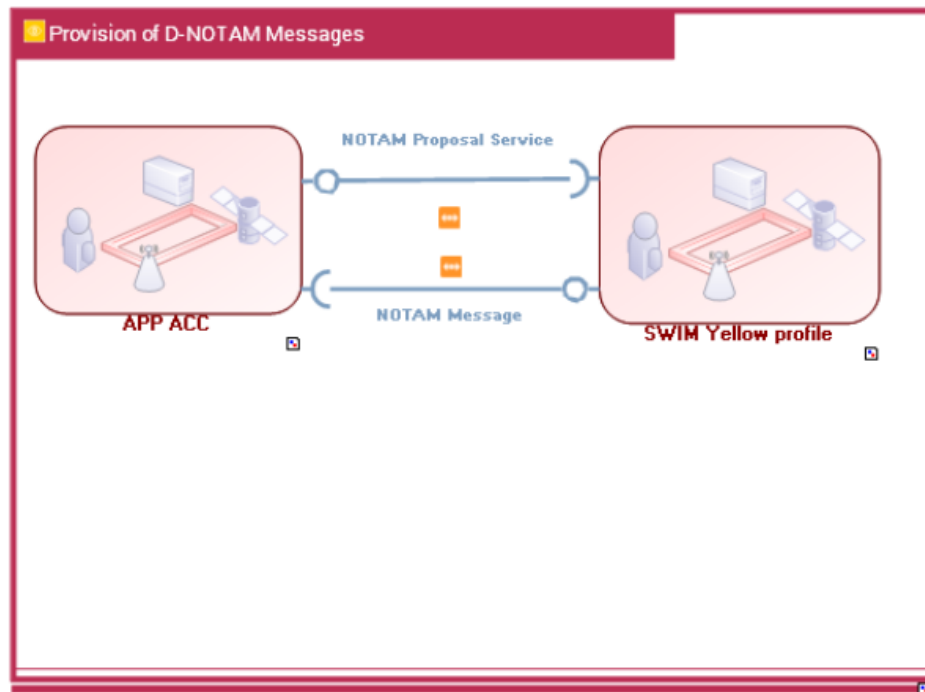
System Port: Generic Data over HTTPS at Regional AIM (PJ18-04a)_CC

Protocol Stack	Protocol
Generic Data over HTTPS	
	Generic Data (MIME)
	HTTP
	TLS
	TCP

Service Interface Definition	
AeronauticalDatasetProvider	
Standard	MEP, Security Configuration, Interface Bindings
AeronauticalDatasetProvider.SWIM Yellow Profile.WS Light Binding	

4.1.2 Digital NOTAM Event information service

4.1.2.1 Resource Connectivity Model



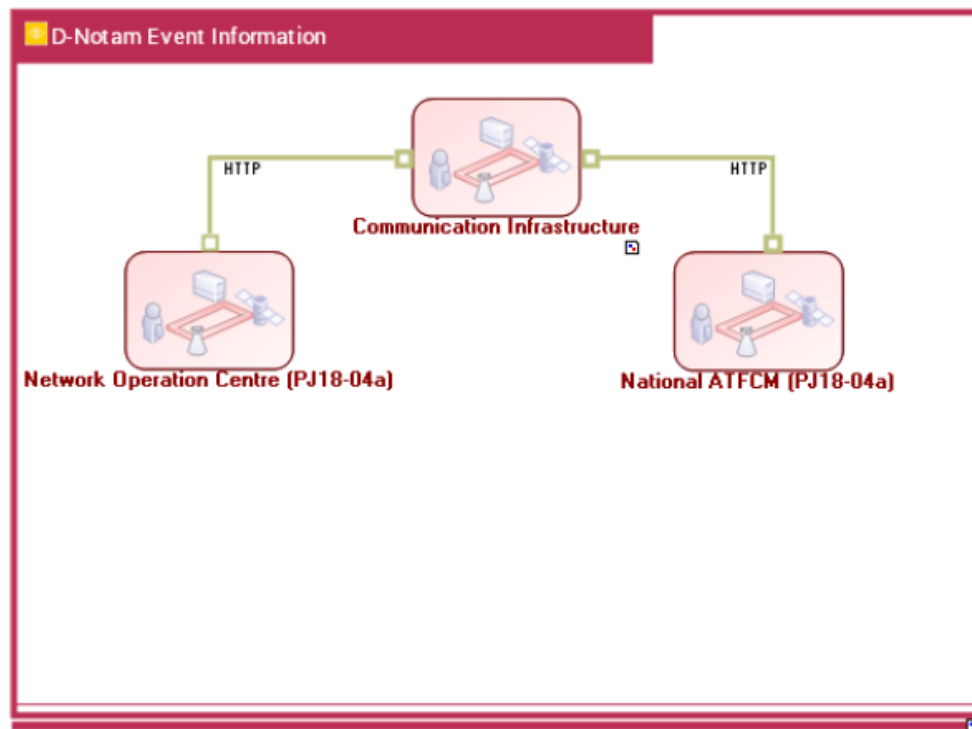
[SESAR Programme 2020]::Solution Architectures::Enabling Infrastructure::PJ.18::PJ.18-04a_Aeronautical Information Management (AIM) information::Provision of D-NOTAM Messages [*Resource Architecture*]
[NSV-1] Provision of D-NOTAM messages

Figure 7: Provision of D-NOTAM Messages

4.1.2.2 Resource Orchestration view

N/A

4.1.2.3 Infrastructure connectivity model





 [SESAR Programme 2020]::Solution Architectures::Enabling Infrastructure::PJ.18::PJ.18-04a_Aeronautical Information Management (AIM) information::D-Notam Event Information [*Resource Architecture*]
 [NSV-2] Infrastructure

Figure 8: D-NOTAM Event Information - Infrastructure connectivity model **Service view**

This section provides a brief description of the D-NOTAM Event Information service, the system context in which the service is deployed and the high-level technology used to realise the service.

4.1.2.4.1 Service description

The D-NOTAM Event Information service supports the service provider to send D-NOTAM message containing also information about the list of flights impacted by the D-NOTAM to the service consumers for which these messages are of interest.

4.1.2.4.2 Service Provisioning

The scope of the D-NOTAM Event Information service is the provision of a D-NOTAM containing also the information about the list of flights impacted by the same D-NOTAM through a subscription and push mechanism.

The service assumes the following main entities:

Entity	Description
D-NOTAMSubscriptionRequest	Subscription to D-NOTAM Event Information service
SubscriptionResponse	Subscription response

ImpactedFlights	List of flights impacted by the associated D-NOTAM
D-NOTAMMessage	Message with a D-NOTAM format
D-NOTAMUnsubscriptionRequest	Unsubscription request from D-NOTAM Event Information service
UnsubscriptionResponse	Unsubscription response

The dynamic behaviour of the D-NOTAM Event Information service is described below and illustrated in Figure 9.

- The service consumer send a request of subscription to the service provider;
- The service provider sends a subscription response (OK, NOK);
- In the first case (OK) the service consumer receives from the service provider notification of emission of a D-NOTAM jointly with the list of flights impacted by the same D-NOTAM.
- The service consumer can decide to unsubscribe from the D-NOTAM Event Information service.

NSOV-5c D-Notam Event Information Service Sequence
Serena Rubbioli

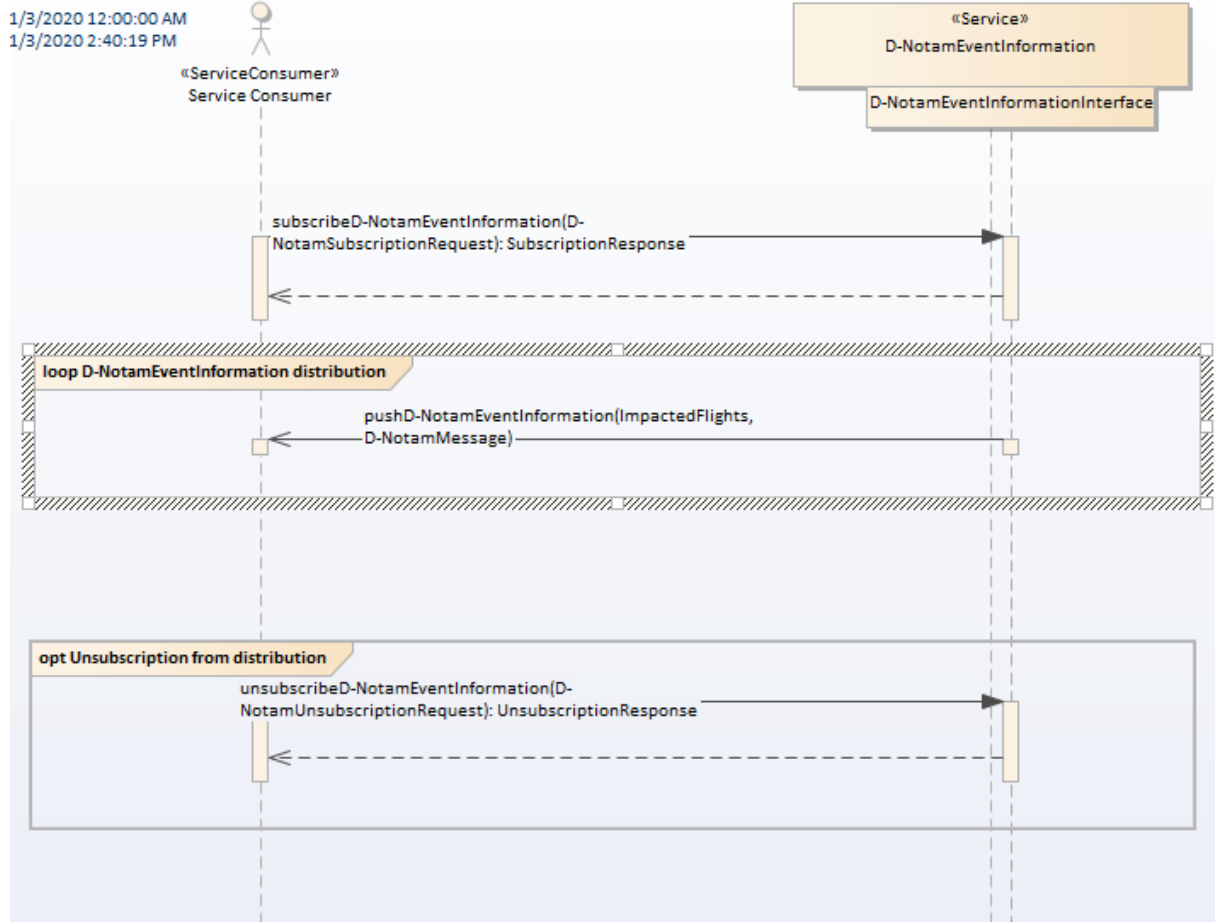


Figure 9: D-NOTAM Event Information Service - Sequence diagram

4.1.2.4.3 Service Realization

The technology used to realise the D-NOTAM Event Information service is high-level described below.

Service Interface (for more details see section C.5.2 Service Interfaces):

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
D-NOTAMEventInformationPublisherInterface	D-NOTAMEventInformationPublisher	subscribeToD-NOTAMEventInformation	provided
D-NOTAMEventInformationPublisherInterface	D-NOTAMEventInformationPublisher	unsubscribeFromD-NOTAMEventInformation	provided

D- NOTAMEventInformatio nPublisherInterface	D- NOTAMEventInformationC onsumer	pushD- NOTAMEventInformation	required
---	---	---------------------------------	----------

Service interface protocols and data format:

transport/messaging protocols HTTP

security Encryption, broker authentication (login, password)

SWIM TI Profile and interface bindings:

HTTP requests and responses.

profile name TI Yellow Profile specification

profile version Edition Number 1.0

Protocol Stack	Protocol
JSON over HTTP (REST)	
	Application/JSON (MIME)
	HTTP

4.1.3 Modified Systems View of Aeronautical Dataset Service

4.1.3.1 AIM (PJ18-04a)

Implements functionalities to collect, process, validate and verify, store, integrate, exchange and deliver quality-assured aeronautical data and aeronautical information (static and dynamic) as stipulated in the State obligations in ICAO Annex 15 (e.g. AIP, NOTAM).

4.1.3.1.1 Composition

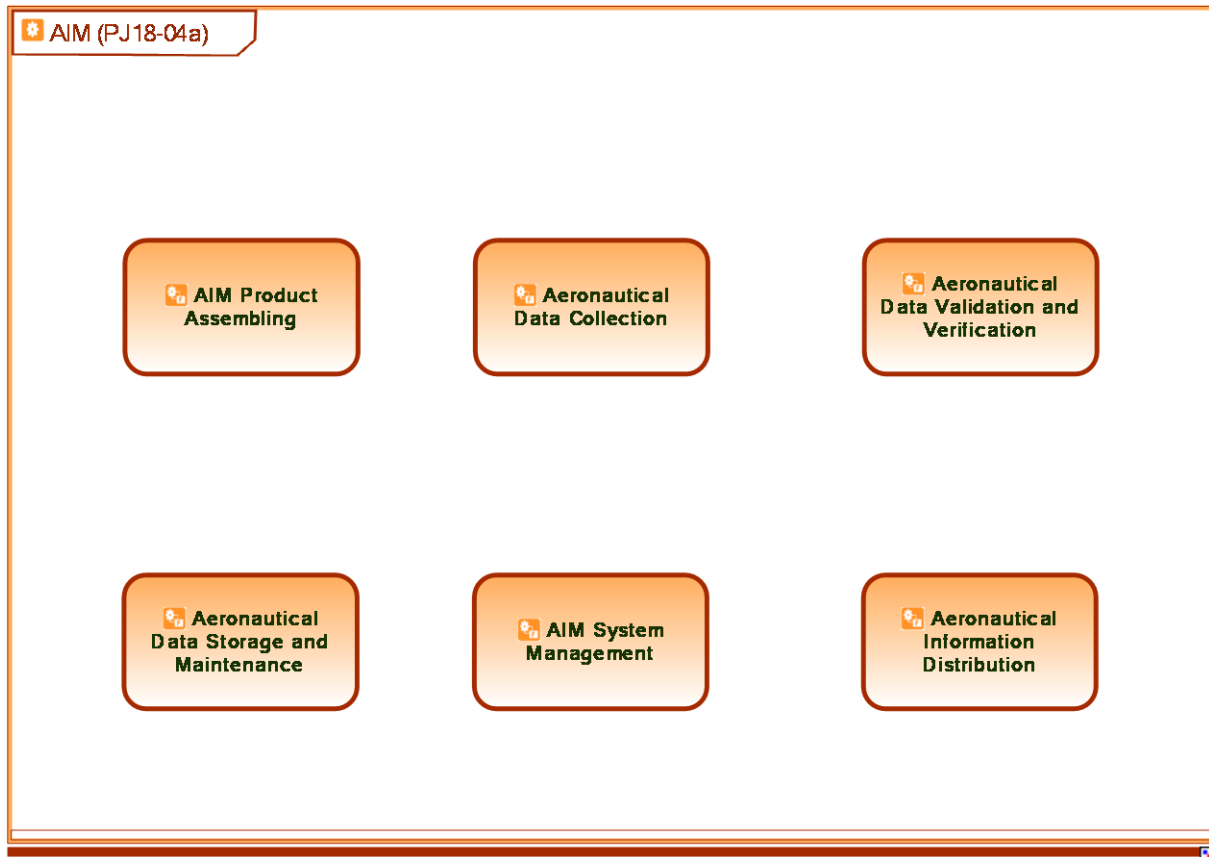


Figure 10: Composition of AIM

4.1.3.1.2 System Interfaces Diagram

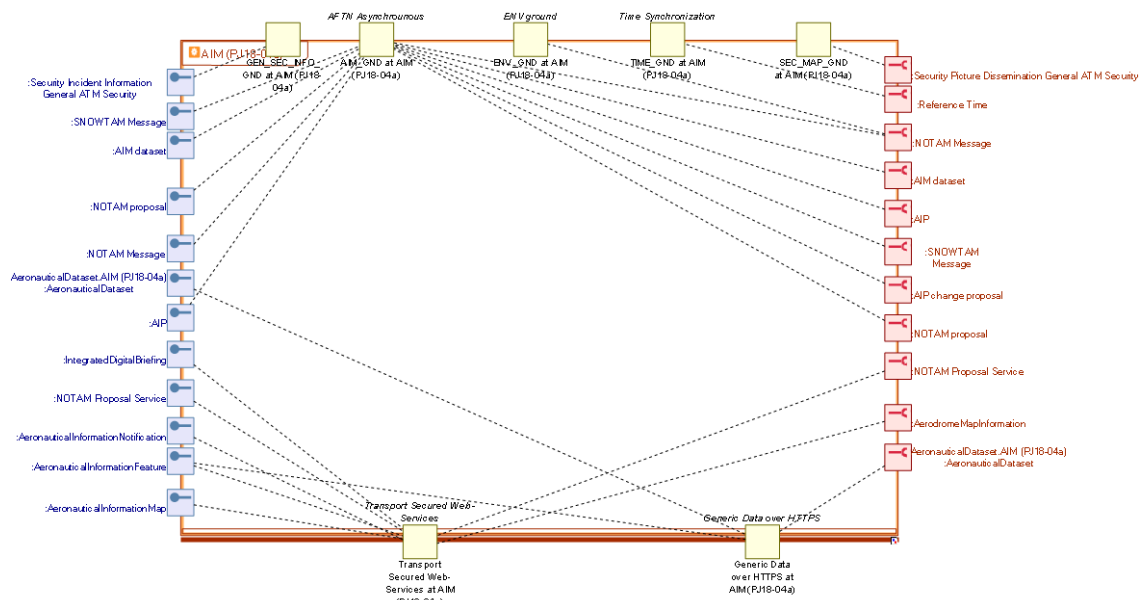


Figure 11: System interfaces diagram

<https://www.eatmportal.eu/working/data/diagrams/DA2EE4F25CE7B619>

4.1.3.2 Civil AU Flight Operations Centre (FOC) (PJ18-04a)

Supports Airspace Users performing manned or unmanned flight operations of civil aircraft (as defined by ICAO).

The FOC Technical System represents the 'Flight Operations' domain as part of the whole operations of the Airspace User. The domain 'Flight Operations' covers all activities that deal with the flights operated by the Airspace Users. These activities refer to the medium- and short-term planning and the execution phases of the flights.

4.1.3.2.1 Composition

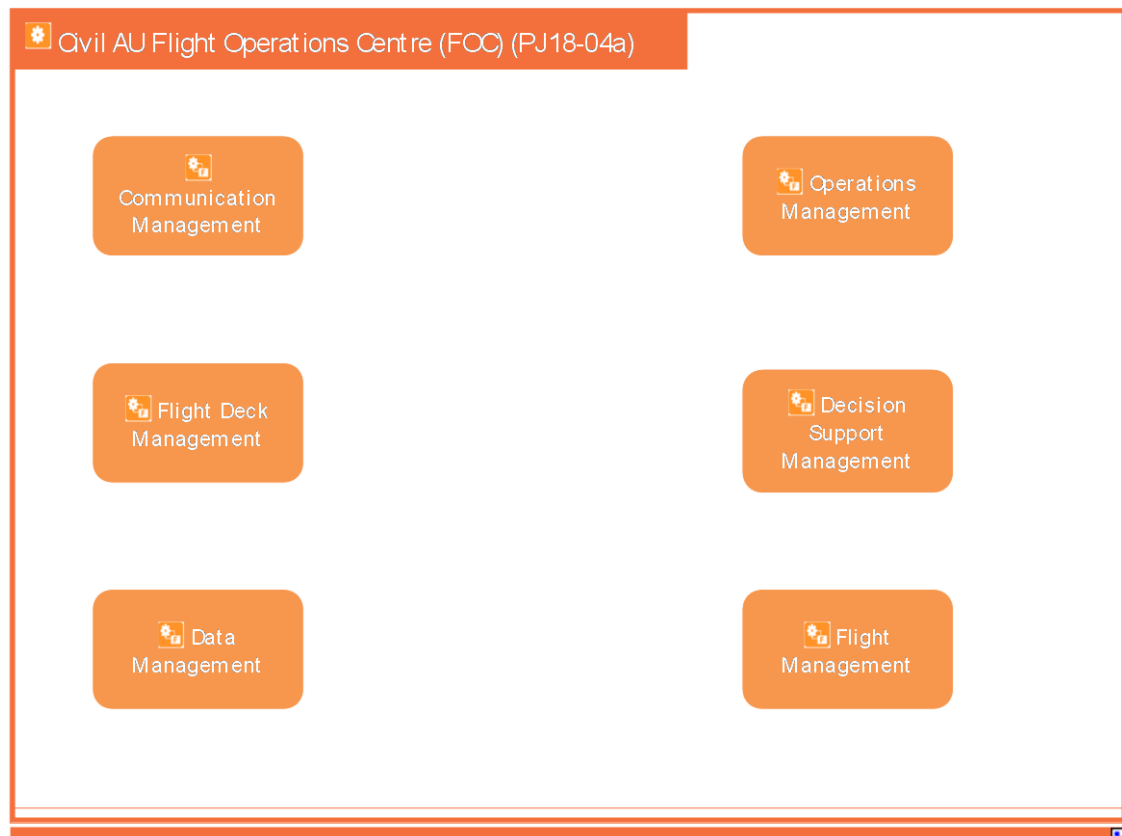


Figure 12: Composition of Civil AU FOC

<https://www.eatmportal.eu/working/data/diagrams/DA2EE20C5CE76811>

4.1.3.2.2 System Interfaces Diagram

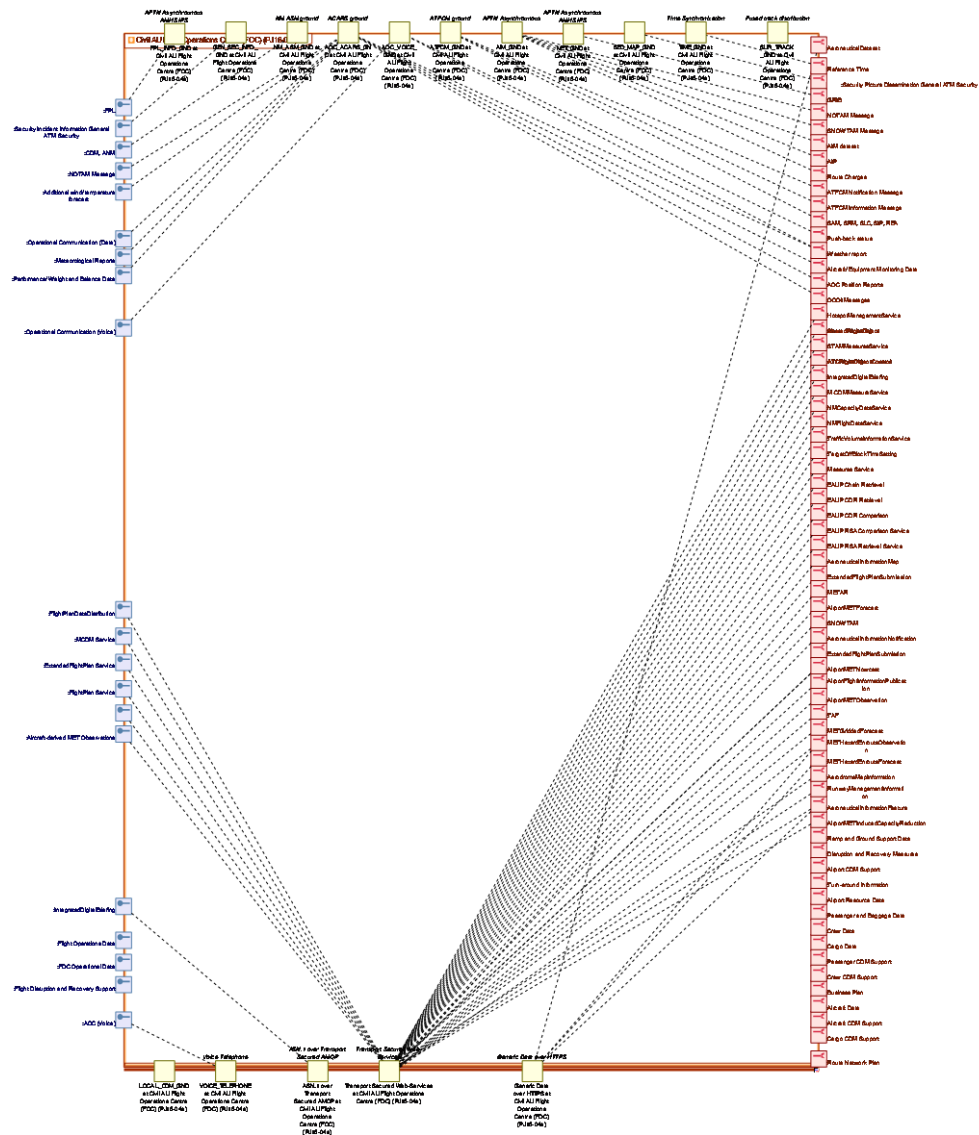


Figure 13: System interfaces diagram

4.2 Functional and non-Functional Requirements

This section provides the functional and non-functional requirements related to the TRL6 solution proposed by PJ.18-04a, which means only the requirements of Aeronautical Dataset Services are presented in this sections.

The requirements of D-NOTAM services can be found in Appendix C and Appendix D.

4.2.1 Aeronautical Dataset service Functional Requirements

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0010
Title	Query lists of Dataset series
Requirement	The Aeronautical Dataset service shall allow query of lists of Dataset series matching the criteria type, geographical scope and title.
Status	Validated
Rationale	The service consumer is allowed to query the lists of Dataset series matching a series of defined criteria.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0001
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0002
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0003
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<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0005
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0006
<SATISFIES>	<Enabler>	SVC-041
<SATISFIES>	<Service>	Aeronautical Dataset Service

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0020
Title	Reply Dataset series list
Requirement	The AeronauticalDataset service shall provide the matching Dataset series in return of the query of lists of Dataset series.

Status	Validated
Rationale	Allow a service consumer to receive the list of matching Dataset series objects in return of the query.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0001
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<SATISFIES>	<Enabler>	SVC-041
<SATISFIES>	<Service>	Aeronautical Dataset Service

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0030
Title	Query lists of Datasets
Requirement	The Aeronautical Dataset service shall allow to query the lists of Datasets matching a series of criteria including Dataset series, period of validity, geographical scope, limitations on use and title.
Status	Validated
Rationale	Allow a service consumer to query the lists of Datasets matching a series of defined criteria.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0001
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0002
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<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0005
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0006
<SATISFIES>	<Enabler>	SVC-041
<SATISFIES>	<Service>	Aeronautical Dataset Service

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0040
Title	Reply Dataset list
Requirement	The Aeronautical Dataset service shall provide the matching list of Dataset in return of the query of lists of Dataset.
Status	Validated
Rationale	Allow a service consumer to receive the list of matching Dataset objects in return of the query.
Category	<Functional>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0001
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0002
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<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0006
<SATISFIES>	<Enabler>	SVC-041
<SATISFIES>	<Service>	Aeronautical Dataset Service

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0050
Title	Retrieve data set content
Requirement	The Aeronautical Dataset service shall allow retrieval of content of a data set file.
Status	Validated
Rationale	The service consumer is allowed to retrieve the content of the data set file in return of the query.

Category	<Functional>
----------	--------------

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0001
<SATISFIES>	< ATMS Requirement>	REQ-03a.04-SPRINTEROP-IER.0002
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<SATISFIES>	<Enabler>	SVC-041
<SATISFIES>	<Service>	Aeronautical Dataset Service

4.2.1.1 Information exchange requirements from PJ03a-04

The following information exchange requirements were defined by PJ03a-04 to which the requirements of aeronautical dataset service are traced. These requirements are copied from PJ03a-04 OSED[55].

Identifier	REQ-03a.04-SPRINTEROP-IER.0001
Requirement	The onboard solution using an active sensor shall be able to receive the aeronautical data.
Title	Baseline Aeronautical data exchange
Status	<In Progress>
Rationale	Aeronautical data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A
Identifier	REQ-03a.04-SPRINTEROP-IER.0002
Requirement	The onboard solution using an active sensor shall be able to receive the baseline obstacle data.
Title	Baseline Obstacle data exchange
Status	<In Progress>

Rationale	Obstacle data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A

Identifier	REQ-03a.04-SPRINTEROP-IER.0003
Requirement	The onboard solution using an active sensor shall be able to receive the baseline terrain data
Title	Baseline Terrain data exchange
Status	<In Progress>
Rationale	Terrain data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A

Identifier	REQ-03a.04-SPRINTEROP-IER.0004
Requirement	The onboard solution using an active sensor shall be able to update onboard aeronautical database
Title	Update Aeronautical data exchange
Status	<In Progress>
Rationale	Update aeronautical data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A

Identifier	REQ-03a.04-SPRINTEROP-IER.0005
Requirement	The onboard solution using an active sensor shall be able to update onboard obstacle database
Title	Update Terrain data exchange
Status	<In Progress>
Rationale	Updated obstacle data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A

Identifier	REQ-03a.04-SPRINTEROP-IER.0006
Requirement	The onboard solution using an active sensor shall be able to update onboard terrain database
Title	Update Terrain data exchange
Status	<In Progress>
Rationale	Updated terrain data can be critical for correct system functionality and operation.
Category	<Interoperability>
Validation Method	N/A
Verification Method	N/A

4.2.1.2 Security requirement

[REQ]

Identifier	REQ-18-04a-TS-ECT1.0060
Title	Service provider access control
Requirement	The Aeronautical Dataset service shall contain features for managing the access and provision of the service

Status	<validated>
Rationale	Security features should be in place that prevents unauthorised access to the service and unauthorised management of data.
Category	<Security>

[REQ Trace]

Relationship	Linked Element Type	Identifier
<SATISFIES>	<SESAR Solution>	PJ.18-04a

5 Implementation Options

The scope of the Aeronautical Dataset Service within PJ.18-04a is the provision of runway light data required by PJ.03a-04. As an optional extended scope, the service also met the requirements for the provision of other type of digital datasets (e.g. ICAO datasets)

The Aeronautical Dataset service is considered of sufficient maturity to be implemented in the short term in order to meet requirements defined by ICAO Annex 15.

The defined service does not specify the provider, which could be any stakeholder that wishes to provide digital dataset. Mostly likely, a national AIS could be the implementer of such a service. The service could be offered to any service consumer who requires dataset information.

The information service developed by the solution comprises a web interface where query is performed. It should be also envisaged that a machine readable interface could be implemented that enables exchanges between systems.

6 Assumptions

Aeronautical Dataset service:

Exchange of dataset information should be based on standardised exchange format to achieve interoperability. In this case, the AIXM 5.1 was considered as the exchange format that should be adopted. In future, the exchange format should follow the evolution of (AIXM) standards.

7 References and Applicable Documents

7.1 Applicable Documents

Content Integration

- [1] B.04.01 D138 EATMA Guidance Material
- [2] EATMA Community pages
- [3] SESAR ATM Lexicon

Content Development

- [4] B4.2 D106 Transition Concept of Operations SESAR 2020

System and Service Development

- [5] 08.01.01 D52: SWIM Foundation v2
- [6] 08.01.01 D49: SWIM Compliance Criteria
- [7] 08.01.03 D47: AIRM v4.1.0
- [8] 08.03.10 D45: ISRM Foundation v00.08.00
- [9] B.04.03 D102 SESAR Working Method on Services
- [10] B.04.03 D128 ADD SESAR1
- [11] B.04.05 Common Service Foundation Method

Performance Management

- [12] B.04.01 D108 SESAR 2020 Transition Performance Framework
- [13] B.04.01 D42 SESAR2020 Transition Validation
- [14] B.05 D86 Guidance on KPIs and Data Collection support to SESAR 2020 transition.
- [15] 16.06.06-D68 Part 1 –SESAR Cost Benefit Analysis – Integrated Model
- [16] 16.06.06-D51-SESAR_1 Business Case Consolidated_Deliverable-00.01.00 and CBA
- [17] Method to assess cost of European ATM improvements and technologies, EUROCONTROL (2014)
- [18] ATM Cost Breakdown Structure_ed02_2014
- [19] Standard Inputs for EUROCONTROL Cost Benefit Analyses
- [20] 16.06.06_D26-08 ATM CBA Quality Checklist

[21]16.06.06_D26_04_Guidelines_for_Producing_Benefit_and_Impact_Mechanisms

Validation

[22]03.00 D16 WP3 Engineering methodology

[23]Transition VALS SESAR 2020 - Consolidated deliverable with contribution from Operational Federating Projects

[24]European Operational Concept Validation Methodology (E-OCVM) - 3.0 [February 2010]

System Engineering

[25] SESAR 2020 Requirements and Validation Guidelines

Safety

[26]SESAR, Safety Reference Material, Edition 4.0, April 2016

[27]SESAR, Guidance to Apply the Safety Reference Material, Edition 3.0, April 2016

[28]SESAR, Final Guidance Material to Execute Proof of Concept, Ed00.04.00, August 2015

[29]SESAR, Resilience Engineering Guidance, May 2016

Human Performance

[30]16.06.05 D 27 HP Reference Material D27

[31]16.04.02 D04 e-HP Repository - Release note

Environment Assessment

[32]SESAR, Environment Reference Material, alias, “Environmental impact assessment as part of the global SESAR validation”, Project 16.06.03, Deliverable D26, 2014.

[33]ICAO CAEP – “Guidance on Environmental Assessment of Proposed Air Traffic Management Operational Changes” document, Doc 10031.

Security

[34]16.06.02 D103 SESAR Security Ref Material Level

[35]16.06.02 D137 Minimum Set of Security Controls (MSSCs).

[36]16.06.02 D131 Security Database Application (CTRL_S)

7.2 Reference Documents

- [37] ED-78A GUIDELINES FOR APPROVAL OF THE PROVISION AND USE OF AIR TRAFFIC SERVICES SUPPORTED BY DATA COMMUNICATIONS.³
- [38] ICAO Annex 15 SAPRS (Ed. 16 July 2018)
- [39] ICAO PANS-Aeronautical Information Management (November 2018)
- [40] EUROCONTROL Specification for SWIM Service Description (Ed. 1.0)
- [41] EUROCONTROL Specification for SWIM Information Definition (Ed 1.0)
- [42] EUROCONTROL Specification for SWIM Technical Infrastructure Yellow Profile (Ed 1.0)
- [43] ATM Information Reference Model (v4.2.0)
- [44] SESAR 1 PJ13.02.02 D10 OSED for Step 2
- [45] SESAR 1 08.03.10 D65 European ATM Service Description for Aeronautical Information Notification Service Edition 00.01.03.
- [46] PJ.09 OSED for V2- Part I v.00.00.02
- [47] PJ.09-02 Validation Plan for V2 - Part I v.00.01.08
- [48] European Commission Regulation 73/2010 (ADQ IR)
- [49] Digital NOTAM Event Specification version 1.1
- [50] SESAR 2020 – PJ09 DCB - EXE09.02-03 - Availability Note
- [51] SESAR 1 Solution#34 Release 5 Digital Integrated Briefing
- [52] PJ09-02 VALR, edition 01.00.00
- [53] D4.1.070 PJ.18-04a TVALP, Ed.00.01.02, Date 15 March 2019
- [54] D4.1.130 PJ.18-04a TVALR, Ed.00.00.05, Date 25 November 2019
- [55] D4.1.010 SESAR PJ03a-04 SPR-INTEROP/OSED for V3 - Part I, July 2019
- [56] PJ.24 Demo Plan PJ24 NCM D1.1, edition 01.02.05, dated 25 Feb 2019
- [57] D1.2 PJ24 NCM Demonstration Report, Edition 00.01.00, date 30 October 2019

Appendix A Service Description Document (SDD)

This Appendix contains the SDDs of the services developed by the solution and a detailed service definition document of Aeronautical Dataset service.



Aeronautical
Dataset service SDD



AeronauticalDataset
t_ServiceDefinition_

Appendix B Service Technical Design Document (STDD)

N/A.

Appendix C D-NOTAM Event Information service

C.1 Service Identification

Name of the Service	D-NOTAMEventInformation
Identifier	1edszmj(QfX9
Version	EATMA Draft
Architect(s)	RUBBIOLI Serena
Last Modification Date	12/02/2019

Table 10: D-NOTAMEventInformation Service identification

C.2 Operational and Business Context

In the context of SESAR 2020 the objectives of the R&D need related to the identified **D-NOTAM Event Information** service are to demonstrate the exchange of information ('extended' D-NOTAM, list of Flight Plans, sectors configurations) between different platforms on SWIM and provide a gap with SESAR 1 that is the list of flight plan impacted by the Digital NOTAM. This additional information shall be evaluated in the context of the integration of ASM into DCB, taking into account the relationship among functionalities, systems and DCB actors. This integration will also generate an extra need related to the synchronization and coordination between STAM measures and ASM measures as well as the reconciliation of local DCB measures with traffic synchronisation activities.

Below a picture that describes the involved SESAR nodes and after a picture with the service definition reported in MEGA:

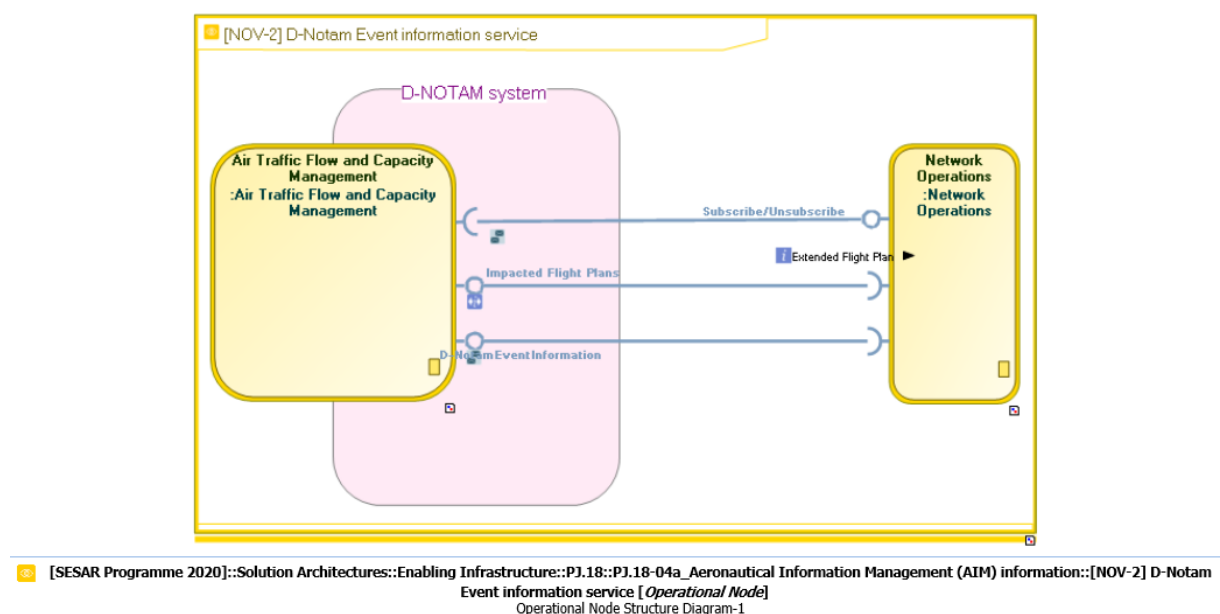


Figure 14: D-NOTAM Event Information service -Operational Nodes

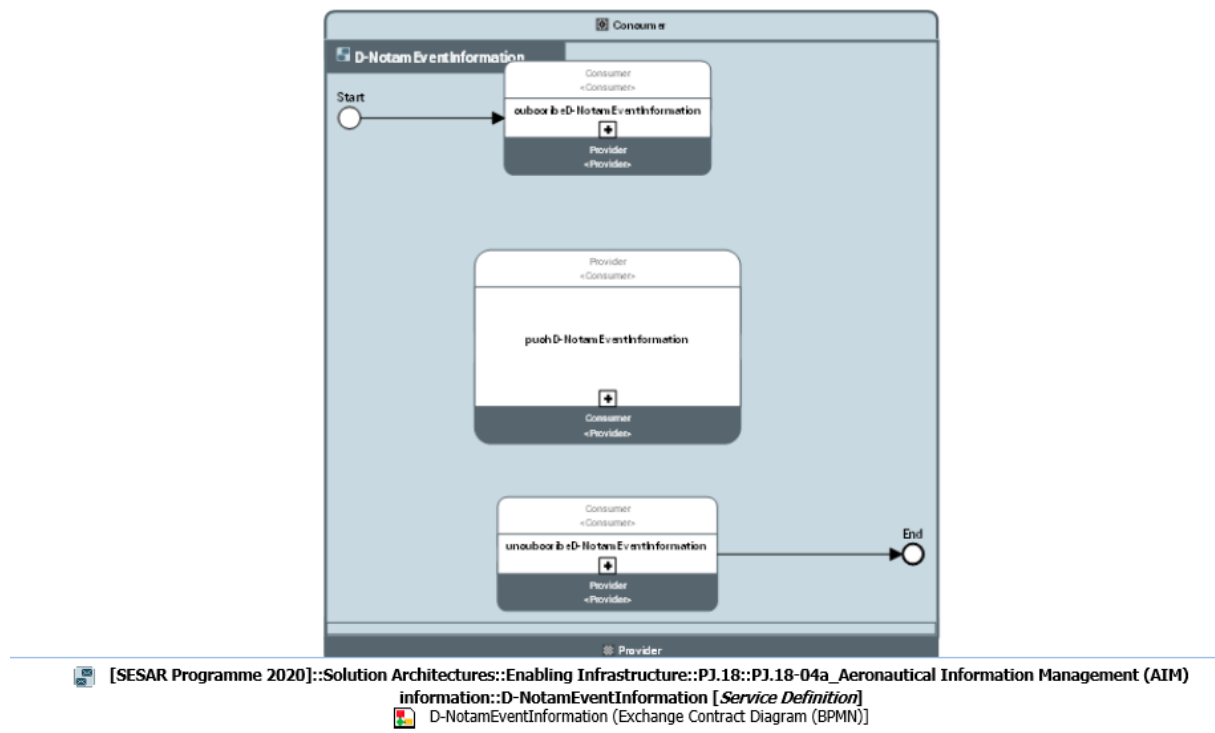


Figure 15: D-NOTAM Event Information service – Service Definition

C.3 Information Exchange Requirements

No Information Exchange Requirements have been specified within the referenced OSED (see [54]).

C.4 Other requirements - Functional and Non-Functional requirements – NFR (TRL4)

This Appendix lists the functional and non-functional requirements of D-NOTAM Event Information Service.

Requirements in relation to the operational context are collected from [46].

Below the operational requirement within the PJ09 OSED (see [46]) that is the input for the D-NOTAM Event Information service:

Identifier	REQ-09.01-OSED-CPX.0310
Title	Airspace information for complexity assessment
Requirement	The LTM ⁴ /EAP ⁵ shall have available all the updated information regarding airspace configurations, including airspace availability limitations due to weather or special use of airspace reservations (e.g. events) for complexity assessment purposes
Status	<in progress>
Rationale	Airspace configuration information and airspace availability limitations are needed so as to obtain accurate complexity estimations (for both predicted/actual complexity values and during what-if assessments).
Category	<Operational>

Not very detailed and precise **Information Exchange Requirements** (IERs) where explicitly present within the PJ09-02 reference documents, coordination with PJ09-02 operational project has allowed a better understanding of the needs and a proposal of a service was formulated and agreed during the service identification phase.

The implementation of D-NOTAM Event Information service involved both CRONOS tool (for the calculation of the flight plans impacted by a specific D-NOTAM) and ATFM Tool/ENAV Local Tool (that retrieves the list of flight plans from INNOVE, shares it with CRONOS and shows the "extended" D-NOTAM to the final user). Below the requirements listed for tool.

Service Consumer (ATFM Tool) - Functional Requirements

Note: The following functional requirements have not been mapped with the Validation Objectives of the D-NOTAM Event Information service and these are linked with the systems used by PJ.09-02 (see [53]).

Identifier	REQ-18-04a-TS-ENAV.0010
Requirement	The system shall display the notification of reception of a D-NOTAM.

⁴ LTM: Locate traffic Manager

⁵ EAP: Extended ATC Planning

Title	Notification of reception of a D-NOTAM
Status	<Validated>
Rationale	The service consumer is aware of the emission of a D-NOTAM.
Category	<Functional>

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-09.01-OSED-CPX.0310
< ALLOCATED_TO >	<Enabler>	SVC-042
<ALLOCATED_TO>	<Service>	D-NOTAM Event Information service

Service Provider (CRONOS) – Functional and Non-Functional Requirements

Note: The following functional requirements have been mapped with the Validation Objectives of the D-NOTAM Event Information service (see [53])

Identifier	REQ-18-04a-TS-ENAV.0040
Title	D-NOTAM Creation
Requirement	The system shall allow to create D-NOTAM.
Status	<Validated>
Rationale	The service provider is able to create D-NOTAM. It is a prerequisite for the validation of the D-NOTAM Event information service
Category	<Functional>

Relationship	Linked Element Type	Identifier
< ALLOCATED_TO >	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-09.01-OSED-CPX.0310
< ALLOCATED_TO >	<Enabler>	SVC-042
<ALLOCATED_TO>	<Service>	D-NOTAM Event Information service

Identifier	REQ-18-04a-TS-ENAV.0050
Title	Calculation of flights impacted by a specific D-NOTAM
Requirement	The system shall allow to calculate the list of flights impacted by a specific D-NOTAM.
Status	<Validated>
Rationale	The service provider is able to calculate the flights impacted by a specific D-NOTAM. This functionality is needed to provide the core of the information focused the service on.
Category	<Functional>

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO >	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-09.01-OSED-CPX.0310
<ALLOCATED_TO >	<Enabler>	SVC-042
<ALLOCATED_TO>	<Service>	D-NOTAM Event Information service

Identifier	REQ-18-04a-TS-ENAV.0060
Title	Extended D-NOTAM creation
Requirement	The system shall allow to create an 'extended' D-NOTAM containing also the list of the flights impacted by the specific D-NOTAM.
Status	<Validated>
Rationale	The service provider is able to connect information about the list of flights impacted by one specific D-NOTAM with the same D-NOTAM.
Category	<Functional>

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-09.01-OSED-CPX.0310
<ALLOCATED_TO>	<Enabler>	SVC-042
<ALLOCATED_TO>	<Service>	D-NOTAM Event Information service

Identifier	REQ-18-04a-TS-ENAV.0070
Title	Dispatch of extended D-NOTAM
Requirement	The system shall allow to send an extended D-NOTAM to the service consumer.
Status	<Validated>
Rationale	The service provider is able to dispatch the D-NOTAM (containing information about the list of impacted flights) to the service consumer.
Category	<Functional>

Relationship	Linked Element Type	Identifier
<ALLOCATED_TO>	<SESAR Solution>	PJ18-04a
<SATISFIES>	<ATMS Requirement>	REQ-09.01-OSED-CPX.0310
<ALLOCATED_TO>	<Enabler>	SVC-042
<ALLOCATED_TO>	<Service>	D-NOTAM Event Information service

Note: The following functional requirements have NOT been mapped with the Validation Objectives of the D-NOTAM Event Information service (see [53])

Identifier	REQ-18-04a-TS-ENAV.0040
Title	D-NOTAM Creation

Requirement	The system shall allow to create D-NOTAM.
Status	N.A. (Out of the scope of the validation exercise)
Rationale	The creation of D-NOTAM by the service provider is a prerequisite for the D-NOTAM Event Information service validation.
Category	<Functional>

Identifier	REQ-18-04a-TS-ENAV.0080
Title	Reception of Flight Plan information
Requirement	The System allow to receive information on Flight Plans from the ATFM Tool.
Status	N.A. (Out of the scope of the validation exercise)
Rationale	Prerequisite
Category	<Functional>

Identifier	REQ-18-04a-TS-ENAV.0090
Title	Security permissions for NOTAM Proposals
Requirement	The System shall have the capability to configure a selective users' access and permissions to NOTAM Proposal functions and NOTAM proposal data (according to the statuses a NOTAM proposal can have)
Status	N.A. (out of the scope of the service validation)
Rationale	Selective user' access to specific functionalities
Category	<Security>

Identifier	REQ-18-04a-TS-ENAV.0100
Title	NOTAM Proposal Workflow

Requirement	The System shall have the capability to implement an approval process for NOTAM proposals based on the NOTAM proposal statuses (initial-draft, pending draft, pending, pre-approved, approved, rejected, removed, and emergency) so that at each transition status all actors involved into the workflow shall receive a notification.
Status	N.A. (out of the scope of the service validation)
Rationale	Awareness of all stakeholders on the NOTAM proposal status.
Category	<Security>

Identifier	REQ-18-04a-TS-ENAV.0110
Title	System Access
Requirement	The System shall provide authentication and users' authorization mechanisms.
Status	N.A. (out of the scope of the service validation)
Rationale	System access shall be available only to authorized users.
Category	<Security>

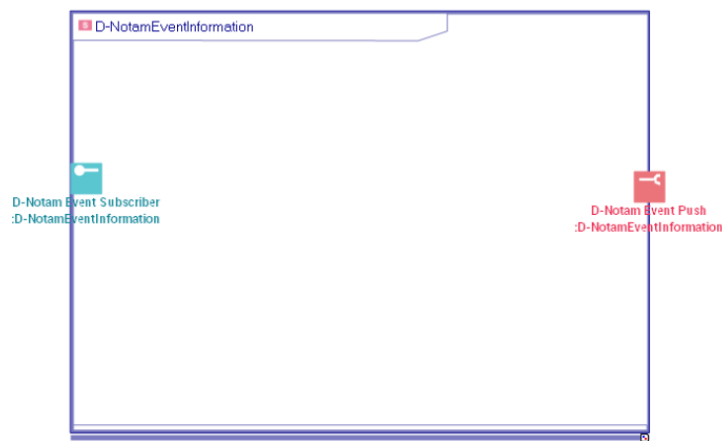
Identifier	REQ-18-04a-TS-ENAV.0120
Title	Web Access
Requirement	The service provider system shall provide a login interface that allow an accounted user to access system web application by means of username and password, if an Internet Connection and a Web Browser are available.
Status	N.A. (out of the scope of the service validation)
Rationale	Login interface to allow only authorized users to access system web application.
Category	<Security>

C.5 Service Overview

C.5.1 Service Levels (NfRs)

Please see section C.4 - Other requirements - Functional and Non-Functional requirements – NFR (TRL4)

C.5.2 Service Interfaces



 [SESAR Programme 2020]::Solution Architectures::Enabling Infrastructure::PJ.18::PJ.18-04a_Aeronautical Information Management (AIM)
information::D-NotamEventInformation [Service]
 Service Structure Diagram

Service Name	Description
D- NOTAMEventInformati on	The D-NOTAM Event Information service supports the service provider to send D-NOTAM message containing also information about the list of flights impacted by the D-NOTAM to the service consumers for which these messages are of interest.

Service Interface Definition	Description
D-NOTAMEventSubscriber	The provider of the D-NOTAM Event Information service
D-NOTAMEventInformationPush	The consumer of the D-NOTAM Event Information service

C.5.3 Service interface specifications

The purpose of the D-NOTAMEventSubscriber service interface definition is to implement those service operations enabling the service consumers to subscribe / unsubscribe to the Service. The architecture of the D-NOTAMEventSubscriber interface definition includes the following operations:

- **subscribeToD-NOTAMEventInformation**

- **unsubscribeFromD-NOTAMEventInformation**

The purpose of the D-NOTAMEventInformationPush service interface definition is to implement those service operations enabling the service consumers receive up-to-date D-NOTAM information from the service provider.

The architecture of the D-NOTAMEventInformationPush interface definition includes the following operations:

- **pushD-NOTAMEventInformation**

These operations are described in the next paragraphs.

Operation subscribeToD-NOTAMEventInformation

The operation **subscribeToD-NOTAMEventInformation** provides the service consumer with the functionality to subscribe to the D-NOTAM Event Information service in order to receive D-NOTAM jointly with the list of flights impacted by the D-NOTAM.

Operation unsubscribeFromD-NOTAMEventInformation

The operation **unsubscribeFromD-NOTAMEventInformation** provides the service consumer with the functionality to unsubscribe to the D-NOTAM Event Information service in order to not receive anymore D-NOTAM jointly with the list of flights impacted by the D-NOTAM.

Operation pushD-NOTAMEventInformation

The service operation *pushD-NOTAMEventInformation* enables the subscribed service consumer to receive the D-NOTAM jointly with the list of flights impacted by the D-NOTAM.

-END OF DOCUMENT-



Honeywell

THALES

