PJ.15-11 TRL6 Service Definition Documentation Aeronautical Digital Map Service

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Copyright Statement

COSER

PJ15 COMMON SERVICES

This Service Description Document is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 734160 under European Union's Horizon 2020 research and innovation programme.

Abstract

This document provides the description of the Aeronautical Digital Map Service.

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Appendix A Service Description Document (SDD)

A.1 Introduction

A.1.1 Purpose of the document

The purpose of this Service Description Document (SDD) is to provide a description of the services designed within SESAR2020.

The purpose of the SDD is to provide a complete design description of the Aeronautical Digital Map service identified by the Solution PJ.15-11, to describe the service to such a level that it is possible to make decisions in activities such as Service Implementation and evolution planning. The document serves as a complement to a model based description, which can be found in the EATMA Repository (MEGA).

A.1.2 Scope

The scope of this document is to provide the logical service definition that aims to support, together with other services, the provision as defined by PJ.15-11. It includes artefacts such as service interfaces, service operations and service payload (data elements and entities), while maintaining a technology-agnostic nature, meaning that the definition of the service does not recommend or constrain any specific technology choices.

Both the Business Model and the High-Level Architecture description for TRL6 provide the necessary background information to fully understand the context of the service described in this document. The most relevant parts of these documents are referenced to enable a better understanding.

A.1.3 Intended readership

The intended audience for this document is the SESAR Joint Undertaking, the partners in the SESAR 2020 programme, the ATM stakeholders (e.g. Airspace Users, ANSPs, Airports and manufacturing industry) with those third parties directly affected by its findings and the contributors having dependencies with the solution.

PJ19.03, as responsible for the coordination of Systems and Service development in the programme, and other transversal projects, may also have an interest.

In addition, it is expected that those PJ.15-11 Solution partners that are involved in Technical Validation exercises for TRL6 used this document as guidance for their development activities.

A.1.4 Structure of the document

The SDD is originally an annex of the TS/IRS document. However, given the specific nature of PJ.15 and after coordination with SJU, it was agreed that PJ15 Solutions would provide the SDD(s) as independent deliverable(s), by producing one SDD per service.

An initial skeleton of the document, including its structure and most of the diagrams and tables, was produced by using the automatic document generation capability of the MEGA tool. Later, the structure was tailored by PJ.15-11 to adapt it to its needs, and some of the sections were completed with textual descriptions and non-MEGA diagrams.

The structure of the document is as follows:

- Section A.1 introduces the document, by providing an explanation of the scope and purpose.

- Section A.2 describes how the service has been identified.
- Section A.3 provides a description of the business and operational context of the service.
- Section A.4 gives an overview of the service functionality.
- Section A.5 depicts the interfaces and operations of the service.
- Sections A.6 and A.7 depict the payload exchanged through the service.
- Section A.8 provides the reference documents.

A.1.5 Glossary of terms

Term	Definition	Source
Business model	A framework for creating economic, social, and/or other forms of value. The term' business model' is thus used for a broad range of informal and formal descriptions to represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies.	EUROCONTROL ATM Lexicon
Capability	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.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Centralised (service) - a particular type of Common Service	A Centralised Service is an ANS support service exercised at pan-European and central network level for harmonisation and cost-efficiency purpose avoiding multiplication of investments, leading to reduced infrastructure costs, supporting the ANSPs and the Member States of the EU to come closer or actually achieving the EU cost efficiency performance targets.	EUROCONTROL
Common Service	A service providing a capability in the same form to consumers that might otherwise have been undertaken by themselves'	SESAR B04.05 D02
Consumer	A user of a service	SESAR B04.05 D02
Customer	A consumer of a service under a specific contract.	SESAR B04.05 D02
Data Element	A formalized representation of data. Data Elements are exchanged by Technical Systems when invoking Service Operations in Service Interfaces or using System Ports.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Data Entity	A definition (type) of an item of interest. Data Entities are the building blocks used to define Data Elements.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Node	A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10

Term	Definition	Source
Security and safety in the context of a Common Service	Non-Functional Requirements (NFR) and Quality of service (QoS) requirements can be specified at various levels of maturity and from different viewpoints such as from the collaborative enterprise, the logical level, technology and engineering perspectives. Conceptually, NFR and QoS are not always distinguishable. Common Services will focus at the first two viewpoints	ISRM – Modelling guidelines
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.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Service contract (SLA)	A service contract represents an agreement between the stakeholders involved for how a service is to be provided and consumed. A service contract is specified through the service interface, the QoS and Service policies.	SESAR B.04.03 – Working method on service
Service Interface	The mechanism by which a service communicates. Note: a Service Interface specifies the Service Interface Definition provided and required by the Service.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Service Operation	A function or procedure which enables programmatic communication with a Service via a Service Interface.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10
Service Provider	An organisation supplying services to one or more internal or external consumers.	SESAR B.04.05 – D02
Service taxonomy	The service taxonomy describes the categorisation of services provided between ATM stakeholders. It is used to organise the responsibilities of the service design as well as to provide a means of identifying services in the run-time environment.	SESAR B.04.03 – Working method on service
Stakeholder	A stakeholder is an individual, team, or organization (or classes thereof) with interest in, or concerns relative to, an enterprise (e.g. the European ATM). Concerns are those interests, which pertain to the enterprise's development, its operation or any other aspect that is critical or otherwise important to one or more stakeholders.	SESAR2020 PJ19.05 EATMA Guidance Material Version 10

Table 1: Glossary of Terms

A.1.6 Acronyms and Terminology

Term	Definition
ACC	Area Control Centre
A-CDM	Airport Collaborative Decision Making

Term	Definition
ADQ	Aeronautical Data Quality
AIC	Aeronautical Information Circulars
AIM	Aeronautical Information Management
AIMSL	AIM Service Layer
AIP	Aeronautical Information Publication
AIRAC	Aeronautical information regulation and control
AIRM	ATM Information Reference Model
AIS	Aeronautical Information Service
AIXM	Aeronautical Information Exchange Model
AMC	Airspace Management Cell
AMDT	Amendment
ANSP	Air Navigation Service Provider
AO	Airport Operator
AOR	Area of Responsibility
APP	Approach
ARES	Airspace Reservation
A-SMGCS	Advanced Surface Movement Guidance and Control System
ATCO	Air Traffic Controller
ATM	Air Traffic Management
ATS	Air Traffic Services
AU	Airspace Users
AUP	Airspace Use Plan
CADF	Centralised Airspace Data Function
CDR	Conditional Route
COSER	Common Service
CTA	Controlled Airspace or Controlled Time of Arrival

Term	Definition
CWP	Controller Working Position
DCB	Demand and Capacity Balancing
DMAN	Departure Manageer
EAD	European AIS Database
EATMA	European ATM Architecture
eAUP	Electronic AUP
EFB	Electronic Flight Bag
EIBT	Estimated In-Block Time
E-TMA	Dynamic Extended TMA
eUUP	Electronic UUP
FAB	Functional Airspace Block
FMS	Flight Management System
GIS	Geographical Information System
GML	Geographical Markup Language
IER	Information Exchange Requirement
IFR	Instrument Flight Rules
INO	International NOTAM Operations
IRS	Interface Requirements Specification
ISRM	Information Services Reference Model
iSWIM	Initial System Wide Information Management
MEP	Message Exchange Pattern
NAF	NATO Architecture Framework
NFR	Non-Functional Requirement
NM	Network Manager
NOP	Network Operations Plan
NOTAM	Notice to Airmen

Term	Definition
NOV	NAF Operational View
NSOV	NAF Service-Oriented View
NSV	NAF System View
OPMET	Operational aeronautical meteorological data
PAMS	Published AIP Management System
PCP	Pilot Common Project
PCP IR	Pilot Common Project Implementing Regulation
PERM	Permanent
PJ	Project (in SESAR2020)
QoS	Quality of Service
RGA	Route Generation Algorithm
SaaS	System or Software as a Service
SDD	Service Definition Document
SDD	Static and Dynamic Data Management
SDO	Static Data Operations
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SID	Standard Instrument Departure
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
STAR	STandard ARrival
SUP	Supplement
SWIM	System Wide Information Management
TLDT	Target Landing Time
TRAMON	Temporary Restricted Aera Monitoring

Term	Definition
TRL	Technology Readiness Level
TS	Technical Specification
TSAT	Target Start Up Approval Time
TTL	Total Estimated Elapsed Time
TTOT	Target Take-Off Time
UUP	Updated Airspace Use Plan
VPA	Vertical Path Angle
XML	Extensible Markup Language

Table 2: Acronyms and Terminology

A.2 Service Identification

Name of the Service	AeronauticalDigitalMapService
Identifier	NYRLeC6HSj45
Version	EATMA Draft
Architect(s)	BRUNNER Hannes
Last Modification Date	1/20/2019

Table 3: Service identification (I)

A.3 Operational and Business Context

The concept of a Common Service was introduced in SESAR to address the need to reduce the cost of European Air Traffic Management (ATM). ATM is highly fragmented with each State having their own Air Navigation Service Providers (ANSP). Cross border provision of Air Traffic Services being limited to only a few local examples. As each ANSP provides much the same type of service, they all have similar capabilities and deployed systems. Common Services can potentially reduce the overall cost of ATM by making it possible for similar organisations to consume a service from one provider by giving them the same capability they would normally have provided themselves, but at a lower cost. This benefit can either be realised by the direct consumer, in many cases the ANSPs, or by their customers by broadening their choice of supplier.

The Aeronautical Digital Map Common Service provides users the capability to retrieve graphical representation of aeronautical data / information. The output is a standardized / harmonised graphic information that can be retrieved by individual requests demanding specific geographical areas. The retrieval can be performed through SWIM services.

PJ.15-11 explores ways of improving overall cost efficiency for delivering the necessary capability to the interested stakeholders under a COSER pattern.

The business case for Aeronautical Digital Map COSER has a link with the Pilot Common Project which mandates *Aeronautical information exchange* on iSWIM over the yellow profile among the ATM sub-functionalities that need to be implemented by a selected set of European ANSPs.

Assuming that users could consume the capability from a series of competing providers available within Europe, provision of Aeronautical Digital Map Service deploying a COSER could result in:

- the requirement to deploy fewer engineered capabilities - ANSPs will only bear a cost consistent with the services they receive,
- service improvement roadmap across Europe is consistent and the associated costs are spread across common service ANSP consumers,
- facilitation of the extension of the PCP requirements to other States not originally addressed by the Implementing Rule.

Consequently, the benefit relates to:

- cost reduction through lower number of system deployments and lower number of technical systems to be securely maintained in operation,
- synchronisation of the evolutionary roadmap enabling consistency of concept and

- increased geographical coverage of the Solution because new incentives for ANSPs appear.
- A harmonised representation of the information supports the safety as airspace users can rely on a standardised way of representing information

A.3.1 Operational Context

The Capabilities can be considered to be provided through standardisation, outsourcing, consolidation or partnerships. It can also be deployed at a single location (centralised service) or at multiple locations (distributed services).

The component architecture does not significantly differ between different service scenarios.

The following subsection describe the different deployment scenarios and architecture options.

The HLA for TRL2 included the following options, which were reduced as follows for TRL6:

- Local Deployment → no longer considered due to unfavourable risk / benefit ratio
- Sub-Regional Level Deployment → no longer considered due to unfavourable risk / benefit ratio
- Regional Level Deployment → chosen as most beneficial option
- Worldwide Level Deployment → currently not being considered due to the focus of SESAR 2020 on Europe

The results were that the commercially most favourable deployment is the Regional Level Deployment including a regional scope for end-users but a global data scope.

- Sub-Regional Deployment:
  A sub-regional deployment is in essence the same as a local deployment, however the regional deployment is covering multiple countries in a single installation. In a sub-regional deployment, there are two choices:
  A) each regional instance holds the complete data set as a replica of the others. An intelligent replication ensures that the national responsibilities are taken into account.
  B) each regional instance only holds the information of its own area of responsibility. In this case, a registry service within the SWIM infrastructure will support cross-border situations.
- Regional Deployment / European centralised deployment:
  In this scenario, a redundant, geographically distributed and horizontally and vertically scalable solution provides the service for all of Europe (as currently the EAD service does). This scenario offers the highest savings potential and best degree of harmonisation.

The following table is an extract or Mega describing the activities supported by the Aeronautical Digital Map Service, which have been mapped to it.

Please note that “supported activity” means that data provided by the service is required for the activities and the Aeronautical Information Service contributes to the execution of the activity. It does not mean that the activity is fully covered by the PJ.15-11. E.g. “Update the CWP and share airspace status data Update the CWP and share airspace status data” can utilize the airspace visualisation of

PJ.15-11 based on the geometry information in PJ.15-10. The relationship to dynamic changes also has to be understood in this light:

(1) Such activities that are purely related to static changes are covered with Static data and are marked below with “Static”
(2) Such activities that are in their nature dynamic, but require only static information from PJ15 (e.g. Activate ARES) are marked with “Static / Dynamic”
(3) Such activities that are dynamic and are also be supported with dynamic events are marked with “Dynamic”.

Supported Activity	Static / Dynamic Information	Activity Description
Update CWP with ARES activation Update CWP with ARES activation	Dynamic	The activity description is not available in EATMA at the creation of this document.
Update CWP with ARES activation status Update CWP with ARES activation status update	Dynamic	The activity description is not available in EATMA at the creation of this document.
Update CWP with ARES de-activation Update CWP with ARES de-activation	Dynamic	The activity description is not available in EATMA at the creation of this document.
Update CWP with ARES pre-activation Update CWP with ARES pre-activation	Dynamic	The activity description is not available in EATMA at the creation of this document.
Update the CWP and share airspace status data Update the CWP and share airspace status data	Static/Dynamic	Pre-notification: visualization of the allocated ARES outlines in the ASM Support Systems and at the CWPs in an appropriate way so the relevant ATCOs get aware, that the airspace is booked for a military mission arriving in X minutes. ATC will now get the airspace clear of civil traffic. This visualization will maintain until the status of the ARES gets changed. Activation: The outlines of the ARES will now appear at the CWPs in an appropriate way signalling the usage. De Activation: The ATC sends a message to the ASM updating the status of the ARES. This

Supported Activity	Static / Dynamic Information	Activity Description
		leads to an automatic, highlighted change of the airspace status becoming "not used" in the ASM Support Systems giving an acoustical signal and also updating the predefined ATC System. The outlines of the ARES will now disappear at the CWP. Cancellation: In case the status of the ARES is "Pending" (i.e. the cancelation has happened when the status of the ARES is "Pending"), the ATC updates the status of the ARES on the CWP to "Inactive" and the status of the ARES in the become "Inactive".

A.3.2 Information Exchange Requirements

The Aeronautical Digital Map Service complies with the Information Exchange Requirements defined in SWIM Yellow Profile and the SWIM-TI.

Furthermore, all Information Exchange Requirements determined by the Operational Activities defined in chapter A.3.1 Operational Context are also applicable, and the Aeronautical Digital Map Service complies with them as well.

A.3.3 Other Requirements

In PJ15-11, a Security Risk Assessment has been performed following the guidance provided in SecRAM [3].

Three primary assets and 9 supporting assets were identified for PJ.15-10 and PJ.15-11. The outcome can be reviewed at Frequentis premises, as the results are subject to restricted access.

The following Security Requirements were identified (high level – details are available in the SecRAM):

1. Server Requirements:
    a. The Aeronautical Information Service shall have strictly defined interfaces in accordance with ISRM and payload in accordance with AIRM
    b. The Aeronautical Information Service shall have a strict definition of allowable ports, protocols, traffic directions and traffic initiation
    c. The Aeronautical Information Service shall require on server side policy the latest security updates
    d. The Aeronautical Information Service shall implement an intrusion detection and / or intrusion prevention system

e. The Aeronautical Information Service implementation shall be preferably stateless, where feasible

f. The Aeronautical Information Service shall implement session handling including a unique session ID

2. Client Requirements:

a. Client sites (AIM Data Provider B2C, B2B, Airspace users, Data Originators and Service provider) shall apply accreditation for 3rd party software that can be installed and executed on client servers or working positions.

b. Client sites shall apply a security policy for all connected clients to implement minimum security controls (e.g. anti-malware software, device control, patch management, generic end-point hardening and other best practice measures).

c. Clients shall implement a security policy for the client environment, which allows no replay tools.

d. Client shall implement VLAN separation in order to segregate users.

For all identified security risks, suitable measures were identified and are documented in SecRAM [3].

A.4 Service Overview

A.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability
Aerodrome Operations		
	[EATM Capabilities]	
Aeronautical and Meteorological Information Management		
	Information Management	
		[EATM Capabilities]
Aircraft Towing		
	Surface Guidance and Routing	
		Aerodrome Operations
Airport Capacity Information Provision (incl. Capacity Changes)		
	Demand and Capacity Balancing (airport)	
		Demand and Capacity Balancing
Airport Operations Management		
	Aerodrome Operations	
		[EATM Capabilities]
Airspace Classes Design		
	Airspace Design	
		Airspace Organisation and Management
Airspace Configuration Design		
	Airspace Design	
		Airspace Organisation and Management
Airspace Configuration Management		
	Airspace Management	
		Airspace Organisation and Management
Airspace Design		
	Airspace Organisation and Management	
		[EATM Capabilities]
Airspace Management		
	Airspace Organisation and Management	

Supported Capability	Parent Capability	Level 1 Capability
		[EATM Capabilities]
Airspace Organisation and Management		
	[EATM Capabilities]	
Airspace Reservation Design		
	Airspace Design	
		Airspace Organisation and Management
Airspace Reservation Management		
	Airspace Management	
		Airspace Organisation and Management
Airspace User Operations		
	[EATM Capabilities]	
Airspace User Situational Awareness		
	Execute Trajectory	
		Airspace User Operations
Demand and Capacity Balancing (airport)		
	Demand and Capacity Balancing	
		[EATM Capabilities]
Demand and Capacity Balancing (airspace)		
	Demand and Capacity Balancing	
		[EATM Capabilities]
Free Route Airspace Design		
	Airspace Design	
		Airspace Organisation and Management
Information Management		
	[EATM Capabilities]	
Navigation		
	CNS	
		[EATM Capabilities]
Remote Tower Operations Provision		
	ATM Service Management	
		Service Delivery Management
Surface Condition Awareness		
	Airport Operations Management	
		Aerodrome Operations

Supported Capability	Parent Capability	Level 1 Capability
Surface Guidance and Routing		
	Aerodrome Operations	
		[EATM Capabilities]
Surface Guidance Provision		
	Surface Guidance and Routing	
		Aerodrome Operations
Surface Route Management		
	Surface Guidance and Routing	
		Aerodrome Operations
SWIM-based Information Dissemination		
	Information Infrastructure Management	
		Information Management
Terminal Procedure Design		
	Airspace Design	
		Airspace Organisation and Management

A.4.2 Service Levels (NFRs)

In order to ensure that the service is designed in such a way that is ready to support the exchange of information between the stakeholders, and thus effectively contribute to the achievement of Aeronautical Digital Map Service, a set of indicators have been defined in PJ.15-11 to measure the Quality of Service (QoS).

For each of the indicators, a success threshold (minimum value to be achieved) has been set by expert judgement by taking into account the overall validation objectives for TRL6, as well as the context where the technical validation exercises will be taking place. These indicators will be used as driver for the development and integration activities, and the technical validation results should capture the degree of compliance regarding these indicators and the success thresholds.

Table 4 provides the list of the indicators defined in PJ.15-11 for TRL6 phase, along with their definition and their success thresholds. The table differentiates between the threshold for validation (during which a non-redundant, simplified architecture is used – “Threshold validation”) and operation (assumed target values for a future fully operational service – “Threshold validation ex.”). The validation system is not connected to the final network infrastructure, but is executed via public internet. It does not offer the same capacity and performance as the target architecture. Not all interfaces of the validation system are implemented following the target specifications yet. Therefore, less stringent thresholds are applied for the validation exercise than for the operational service.

Indicator	Definition	Threshold operation	Threshold validation ex.
Service availability	Percentage of time that the service is up and running	>= 99.95 %	>= 95%
Time of response	Time that it takes for the service to process a service request portraying a single feature, single object and generate the required output ready to be distributed to the consumer.	<= 1 second	<= 10 seconds
Time for Transmission	Time that it takes to transmit the map from the service provider to the service consumer.	<= 1 second	<= 10 seconds
Compliance of Payload	Percentage of payload messages that are not compliant with the AIXM 5.1.x schema accepted by the service or distributed by the service	<= 0.001 %	<= 0.1 %
Compliance with SWIM-TI	Percentage of the interfaces of the service that are compliant with the SWIM Yellow Profile / SWIM-TI specifications in terms of AIRM/AIXM and ISRM compliance.	>= 99 %	>= 60 %

Table 4: Quality of Service for Aeronautical Digital Map Service for TRL6

A.4.3 Service Functions and Capabilities

A.4.4 Service Interfaces

Service Name	Description
AeronauticalDigitalMap Service	An AeronauticalInformationService providing maps upon request. Following ISO "IS 19128:2005 Geographic information - Web map server interface" standard.

Service Interface Definition	Description
AccessMapService	AeronauticalInformationMapService access map interface

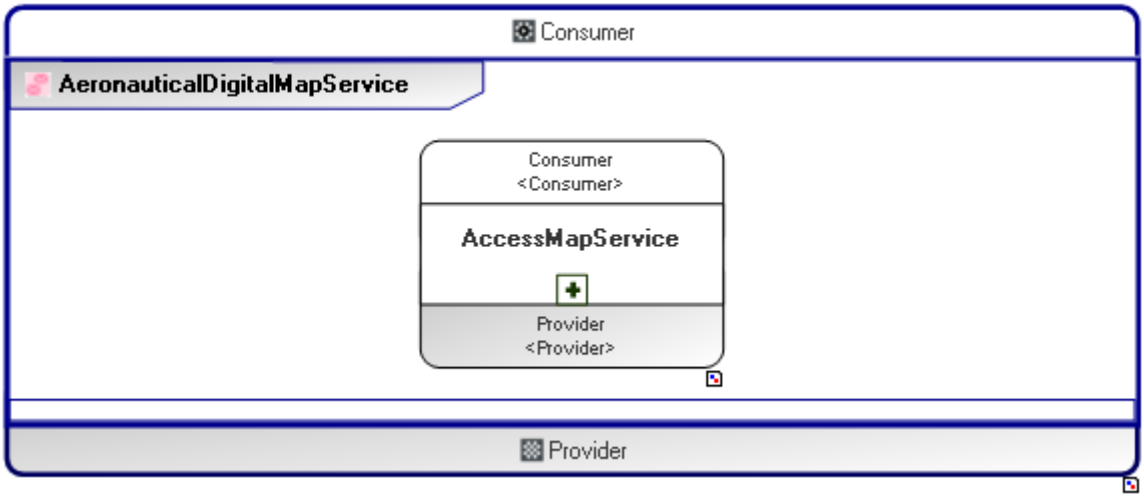

Figure 1: Service to Service Interface mapping

A.5 Service interface specifications

A.5.1 AccessMapService

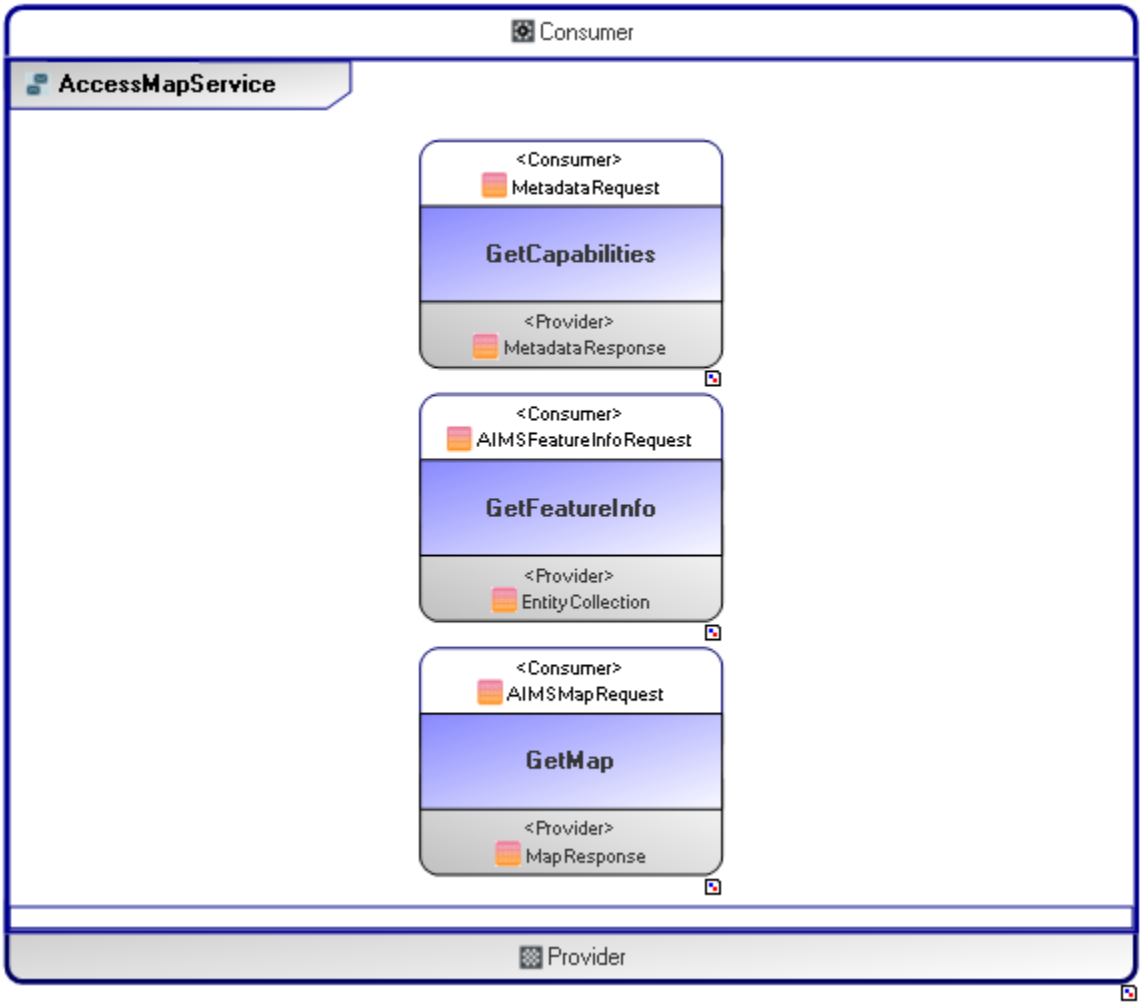

Figure 2: "AccessMapService" Interface Exchange diagram

A.5.1.1 1. Operation GetCapabilities

No Comment available.

Input	Service Payload	CLDM Data Entity
	MetadataRequest	
Return	**Service Payload**	**CLDM Data Entity**
	MetadataResponse	

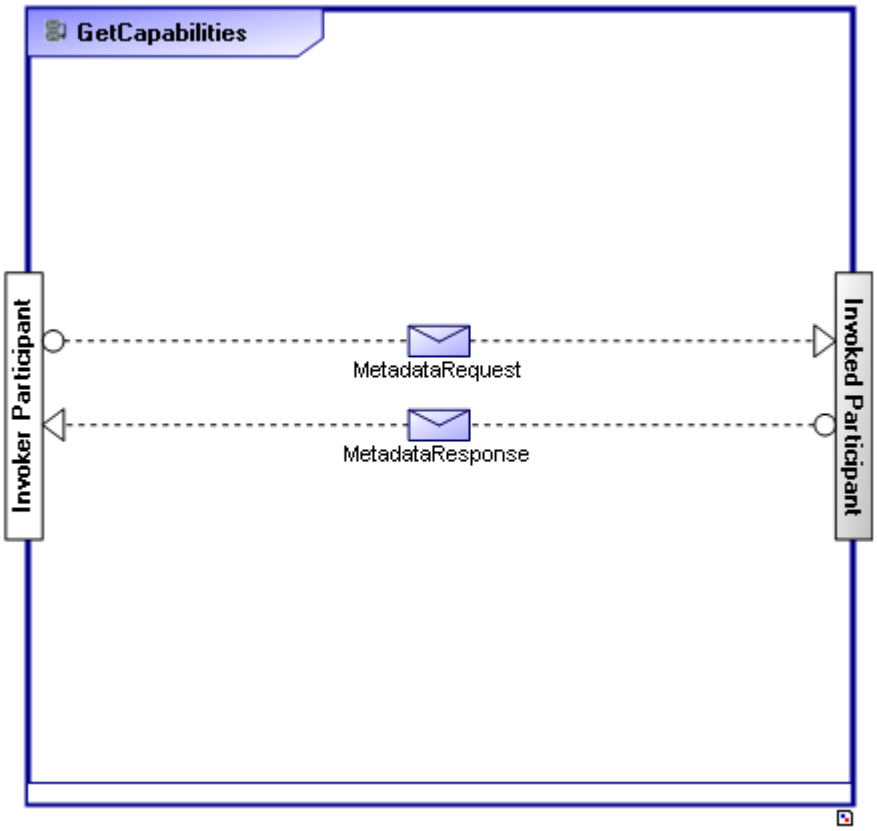

Figure 3: "GetCapabilities" Operation Exchange diagram

A.5.1.2 Operation GetFeatureInfo

No Comment available.

Input	Service Payload	CLDM Data Entity
	AIMSFeatureInfoRequest	
Return	**Service Payload**	**CLDM Data Entity**
	EntityCollection	

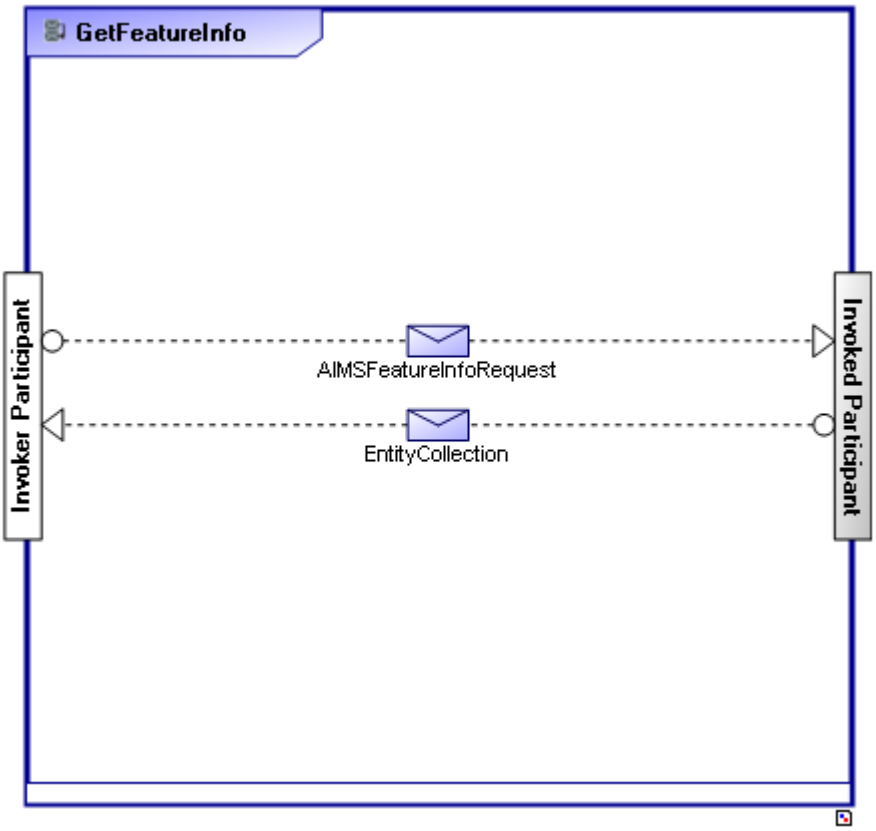

Figure 4: "GetFeatureInfo" Operation Exchange diagram

A.5.1.3 GetMap

No Comment available.

Input	Service Payload	CLDM Data Entity
	AIMSMapRequest	
Return	**Service Payload**	**CLDM Data Entity**
	MapResponse	

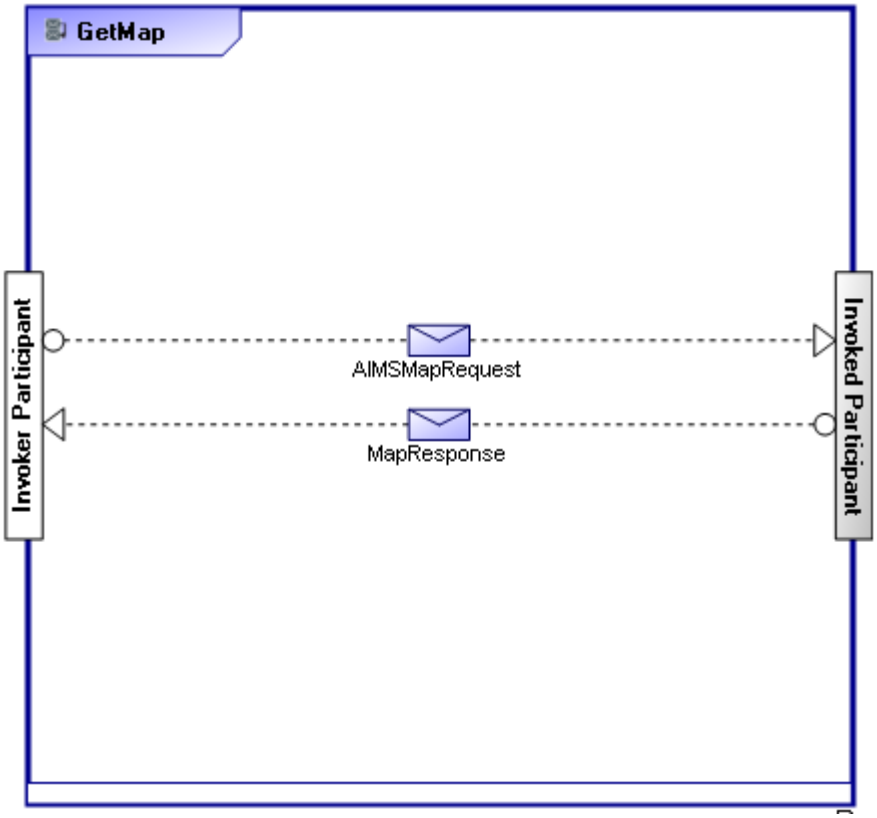

Figure 5: "GetMap" Operation Exchange diagram

A.6 Payload Data Diagrams

The Aeronautical Information Service payload follows the latest version of the AIXM standard.

A.7 Payload Data Types

The Aeronautical Information Service payload follows the latest version of the AIXM standard.

A.8 Reference documents

[1] SESAR2020 PJ19 D3.2 Service Portfolio 2017, Edition 00.01.00

[2] EATMA V11 DraftSESAR2020 PJ15-11 D7.2.050 Business ModelSESAR2020 PJ15-11 D7.2.070 High Level ArchitectureSESAR2020 PJ15-11 D7.2.030 TVALP

A.9 Appendix: Gap Analysis Aeronautical Information Service / EAD

1 Description of PJ15 and EAD

1.1 EAD

1.1.1 Services / Functions

EAD is the European AIS Database. It was originally established in 2003 and provides the following key services / functionalities (additional support services are available, but not listed below as they are not relevant for this gap analysis):

- Core services for Information Management / Editing / Insertion:
    - NOTAM Management (INO Data Provider) ➔ not explicitly included in PJ15, but implicitly via digital NOTAM in AIXM – to be defined
        - produces and validates NOTAM (Notices to Airmen) and weather information (OPMET)
    - AIXM Data Management (SDO Data Provider for AIXM 4.5 and SDD for AIXM 5.1) ➔ also covered by PJ15
        - produces and validates structured aeronautical information
        - Graphical visualisation in a GIS viewer is available as a support client application

          ➔in PJ15 Solution 11 a more sophisticated functionality is envisaged
    - Flight Plan submission to NM (Briefing Facilities) ➔ not in scope for PJ15
        - produces and validates flight plans / proposals
- Derived services for Information usage dependent on core services:
    - Pre-flight Information Briefing (INO Data User) ➔ specific type of output and filtering, not explicitly included in PJ 15 in this form
        - retrieves / filters NOTAM and OPMET information
    - AIXM Data Reporting (SDO Data User) ➔ covered in PJ15
        - retrieves / filters structured aeronautical information (AIXM)

- Publication Management for AIP, AIC, SUP, AMDT (PAMS) ➔ not in scope of PJ15
  - manages and publishes finished publication products
- Publication Authoring (Charting, AIP) ➔ AIP is not in scope of PJ15, but the visualisation of structured aeronautical information (not exactly with the same target functionality) is in scope of Solution 11
  - retrieves validated structured aeronautical information
  - produces publication products

As one of the constituents of the European ATM System, within EAD the collection, generation and processing of aeronautical data has to be performed in accordance with EU IR 73/2010.

This can be achieved by organisational, procedural and systemic measures to fulfil the regulatory requirements in order to achieve a high level of quality, integrity and reliability of the aeronautical data set. ➔ The same applies for PJ15 as well.

1.1.2 Interfaces

EAD offers client applications (➔ not in scope for PJ15), which can be used to manage the data, which are not relevant for this comparison, and a system-to-system interface called AIMSL (short for AIM Service Layer), which can be used to communicate with the system externally. (➔ in PJ15: SWIM)

The services above are provided as a “SaaS” (System as a Service) to Eurocontrol members (AIS / AIM units of the ANSPs) and their clients (e.g. airspace users, ATC, other ATM actors).

The clients either utilize their own systems connected to EAD via AIMSL or they utilize EAD directly using the EAD client applications.

EAD currently offers the possibility to connect to the system via AIMSL as a web-service based interface, which is oriented towards the SWIM Yellow Profile. However, currently EAD does not offer full SWIM compliance, as the standard definitions for SWIM are not fully finalized and the SWIM Technical Infrastructure still needs to be established in Europe.

EAD also offers a Web Feature Service, which is also a candidate in the Yellow Profile, but as the full SWIM Infrastructure is not defined and operational yet, the interface cannot be seen in the target state yet.

1.1.3 Data Model

The current release of EAD (R10) is fully compliant with AIXM 5.1 in its SDD module, which is part of AIRM and also offers full access to this AIXM database via web service interfaces. ➔ This is also in scope for PJ15

EAD additionally supports legacy data models / file formats like AIXM 4.5 and ARINC 424.

1.1.4 Operational Services

In addition to the purely technical service, EAD also comes with an operational service component. A service provider company called GroupEAD performs expert data clearance and consolidation for international data originating from outside the Eurocontrol area. ➔ Operational services are currently not in scope for PJ15

A team of operational experts processes – supported by a high degree of automation in the system – incoming international data, validates and corrects it in accordance with a set of business rules and makes the world-wide dataset available for its members. The operational services also include expert data quality reviews and coordination activities between clients in case conflicting data updates are provided, which contain cross-border data conflicts.

The EAD system automatically correlates aeronautical dynamic data with published aeronautical static and dynamic data and automatically detects potential inconsistencies. ➔ Automatic validation is also in scope for PJ15

1.2 PJ15

1.2.1 Services / Functions

The function of the Aeronautical Information Service is to provide static and dynamic aeronautical data in digital form to be used by different ATM systems (e.g. Safety Nets).

Input aeronautical data are collected from internal and external sources, conveniently validated, processed according to the regulatory requirements to ensure quality and integrity level and finally generated as dataset.

➔ The collection and validation of aeronautical data is also in scope of EAD. The scope of EAD is world-wide, where a fully automated approach is not feasible due to different levels of technical maturity. The degree of automation for European data within PJ15 can be much higher.

Configuration management tools should be implemented to better satisfy the consumers requirements.

➔ Configuration management tools are currently not in EAD

The accuracy and consistency of the data provided should be predictably enhanced, leading in turn to safety improvements, while the use of high-efficiency automated processes would allow cost reductions by a high margin.

➔ PJ 15 will have additional business rules that increase the automation of validation for European highly structured data in accordance with AIRM / AIXM and ISRM

The output is an AIXM-compliant dataset whose subsets can be retrieved by individual requests demanding specific geographical areas, attributes or functional features.

➔ The output of PJ15 is more technically oriented than in EAD, which also offers end-user products. PJ15 is a back-end service.

Function of the service: The service provides digital static and dynamic aeronautical data as scoped by AIXM for the usage in ATM System components like SDD and Safety Nets, as well for simulation systems and other systems using digital aeronautical data.

The data can be requested in terms of geographical coverage and specific features and can be tailored in terms of display attributes and individual structures of layers.

➔This is also covered in EAD

The functionality shall include the collection, generation and processing of aeronautical data according to EU IR 73/2010 by organisational, procedural and systemic measures to fulfil the regulatory requirements in order to achieve a high level of quality, integrity and reliability of the aeronautical data set.

➔ This is also applicable for EAD

1.2.2 Interfaces

SESAR 1 has defined AIRM and ISRM as the basis for SWIM. Moreover, SESAR 1 has defined the SWIM Technical Infrastructure and has defined a number of profiles with technical specifications regarding their quality of service capabilities and their intended use-cases and candidate technologies.

In order to leverage these designs, it is assumed that PJ15 will be based on these SWIM standards and will run within the SWIM Technical Infrastructure. ➔ full SWIM compliance is intended as a future development for EAD, but is currently not yet available

1.2.3 Data Model

In this context AIXM-compliant is to be interpreted as a fully AIRM compliant dataset, of which AIXM 5.1 is the portion related to AIM. ➔ This also applies to EAD

In addition to AIXM, which is a part of AIRM, PJ15 will also take into account that AIXM is embedded in AIRM and may have cross-dependencies on other AIRM components and needs to be harmonised with them. ➔ this aspect is currently not covered by EAD

1.2.4 Solution 11

The Aeronautical Digital Map Service provides digital maps ready to be used by different ATM systems (e.g. Safety Nets) when performing separation functions. The output is highly customizable in order to meet the different requirements from the consumers and easily convertible among different digital formats, as AIXM, GML, XML, etc.

➔ A digital MAP service as described for Solution 11 is currently not available in EAD.

The accuracy and consistency of the data provided should be predictably enhanced, leading in turn to safety improvements, while the use of high-efficiency automated processes would allow cost reductions by a high margin.

The Service collects aeronautical data from authorised sources, filters them and produces individual map graphics depending on the specific usages as geographical area or system functionality. In this sense, configuration management tools should be implemented to better satisfy the consumers requirements.

➔ A service as described for central visualisation is currently not part of EAD

Given it is an offline service, no resilience measures have to be considered, but the output data should achieve high degree of quality, integrity and authenticity for safety reasons.

2 Gap Analysis

2.1 Services / Functions

2.1.1 Additional Scope of PJ15

- Higher degree of automation for validation
- Configuration Management Tools
- Additional business rules for AIRM / ISRM

2.1.2 Additional Scope of EAD

- Worldwide scope versus Europe Focus
- Specific Briefing reports
- Flight Plan Management
- Publication Management and Tools
- Front-end (client) tools

2.2 Interfaces

2.2.1 Additional Scope of PJ15

- Full SWIM compliance
- Based on SWIM-TI

2.2.2 Additional Scope of EAD

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2.3 Data Model

2.3.1 Additional Scope of PJ15

- AIXM 5.1 and harmonisation / alignment with other AIRM components

2.3.2 Additional Scope of EAD

- Legacy File Formats

2.4 Visualisation

2.4.1 Additional Scope of PJ15

- Aeronautical Digital MAP Service (Solution 11)
    - can be a basis for aeronautical charting

2.4.2 Additional Scope of EAD

- Production of aeronautical paper charts

3 Tabular comparison EAD / PJ-15.10/11

	EAD	PJ-15.10/11
Core Services		
NOTAM Management ICAO (legacy)	Yes	Not in scope
Digital NOTAM	Planned in future	Yes (implicit)
AIXM Data Management (legacy AIXM 4.5)	Yes	Not in scope
AIXM Data Management (AIXM 5.x)	Partial	Yes
Flight Plan submission to NM	Yes	Not in scope
Service to ensure quality, integrity and reliability of the aeronautical data (business rules, operational service)	Yes	Yes
Provide static and dynamic aeronautical data in digital form to be used by different ATM systems (e.g. Safety Nets	Not in scope	Yes
Business rules that increase the automation of validation for European highly structured data in accordance with AIRM / AIXM and ISRM	Partial (no ISRM, no full AIRM)	Yes
Derived services for Information usage dependent on core services		

	EAD	PJ-15.10/11
Pre-Flight Information Bulletin / Briefing	Yes	Partial (more in SESAR 1)
AIXM Data Reporting	Yes	Yes
Publication Management for AIP, AIC, SUP, AMDT (PAMS)	Yes	Not in scope
Chart Authoring for print output	Yes	Not in scope
GIS output of AIM data	Basic client viewer	Aeronautical Digital Map Service usable also for systems
AIP Authoring	Yes	Not in scope
Interfaces		
Client / End-user applications	Yes	Not in scope (back-end service), but client applications provided for validation
System-to-system interface	AIMSL (pre-SWIM) (SWIM Payload and technology webservices, but no usage of full SWIM infrastructure)	Full SWIM
SWIM Support		
AIRM	Partial (AIXM 4.5, AIXM 5.1 mapped from 4.5)	Yes
ISRM	Partial	Yes
SWIM-TI	Not in scope	Yes
Data Model		

	EAD	PJ-15.10/11
Data Model – Compliancy with AIXM 5.1 Output	Partial, data converted from AIXM 4.5	Yes
DataModel – Compliancy with AIXM 5.1 Input	Planned	Yes
AIRM embedded AIXM	Not in scope	Yes
Minimum dataset mandatory	Yes	Yes
Full dataset mandatory	No	Yes
Services		
Automatic validation	Yes	Yes
Configuration management tools	Not in scope	Yes
Digital Map Service	Not in scope	Yes (PJ.15-11)
Centralised visualization	Not in scope	Yes
Operational Data Validation and Correction Service	Yes	Not in scope of pre-operational system but in final system
Scope of Data		
Coverage geographically	World-wide	Europe initially, worldwide planned
Data Coverage	Full AIXM 4.5 for Europe Minumum Dataset worldwide	Full AIXM 5.1
Information directly usable by NM and other ATM actors	Partial	Yes
Target Group		

	EAD	PJ-15.10/11
Airspace Users (physical)	Yes	Not in scope
Airspace User systems	Not in scope	Yes (SWIM)
AIM Organisations	Yes	Yes
NM	Partial	Yes (SWIM)
ATC Systems	Not in scope	Yes (SWIM)
FMS Providers	Not in scope	Yes (SWIM)
Other ATM Systems or ATM System components like SDD and Safety Nets, as well for simulation systems and other systems using digital aeronautical data	Not in scope	Yes (SWIM)
Other		
Degree of complexity in business rules	Medium	High
Degree of data automation	Medium	High