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COSER

PJ.15 COMMON SERVICES

Abstract

This document provides the description of the ArrivalSequenceProvision Service that supports the provision of the Extended Arrival Management (E-AMAN) Common 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 logical design description of the "ArrivalSequenceProvision" service identified by the Solution PJ.15-02 E-AMAN Common Service, to describe the service to such a level that it is possible to make decisions on the implementation of the services 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 PJ.15-02 Solution folder within EATMA Repository (MEGA).

A.1.2 Scope

The scope of this document is to provide the logical service definition that aims to support the delivery of the E-AMAN Common Service, as defined by PJ.15-02. It includes artefacts such as service interfaces, service operations and service payload (data elements and data entities in EATMA), while maintaining a technology-agnostic nature, meaning that the logical 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.

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.15-02 Solution partners that are involved in any Technical Validation exercises planned for TRL6 use 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 PJ15 and after coordination with SJU, it was agreed that PJ15 Solutions would provide the SDD(s) as independent deliverables, 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.15-02 to adapt it to its needs, and most of the sections were completed with textual descriptions.

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.6.3 depict the payload exchanged through the service.

- Section A.9 describes the dynamic behavior of the service.

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
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

A.1.6 Acronyms and Terminology

Term	Definition

ACC	Area Control Centre
AMAN	Arrival Manager (Controller support tool)
ANSP	Air Navigation Service Provider
APTT	AMAN Planned Target Time
ATC	Air Traffic Control
ATLDT	AMAN Planned Target Landing Time
ATM	Air Traffic Management
ATSU	Air Traffic Service Unit
CR	Change Request
CTA	Calculated Time of Arrival
DMAN	Departure Manager (Controller support tool)
DS	Data Set (ATM Master Plan Level 2)
E-AMAN	Extended AMAN
EATMA	European ATM Architecture
EPP	Extended Projected Profile
ETA	Estimated Time of Arrival
FIR	Flight Information Region
IER	Information Exchange Requirement
IRS	Interface Requirements Specification
MEP	Message Exchange Pattern
MSSC	Minimum Set of Security Controls
NAF	NATO Architecture Framework
NFR	Non-Functional Requirements
NM	Network Manager
NSOV	NAF Service Oriented View
PJ	Project (in SESAR2020)
QoS	Quality of Service

SDD	Service Description Document
SecRAM	Security Risk Assessment Methodology
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)
TRL	Technology Readiness Level
TS	Technical Specification
TTO	Target Time Over
TWR	Tower
UAC	Upper Area Control Centre

A.2 Service Identification

Name of the Service	ArrivalSequenceProvision
Identifier	niRahu94OnCw
Version	EATMA Draft
Architect(s)	XU Junchen
Last Modification Date	5/13/2018

Table 1: Service identification (I)

IOC	
FOC	12/31/2030

Table 2: Service identification (II)

The "ArrivalSequenceProvision" Service that supports the provision of the E-AMAN Common Service is described as follows:

<<This Service will have to provide the E-AMAN information for different consumers and purposes and will output local Arrival Planning results (e.g. total delay) aggregated to serve different purposes of the involved actors (e.g. queue management). These will be used in the planning/tactical phase (e.g. departure delay) and in real-time/operations (e.g. delay and/or speed advisories).>>

A.3 Operational and Business Context

Two potential scenarios have been identified and developed as hypothetical deployment scenarios for the E-AMAN Common Service in [1].

- Colocation of E-AMAN on a local level

- Federation of E-AMAN

The Federation scenario has been selected by the PJ.15-02 Solution partners as scenario for a Technical Validation activity in TRL6 phase. As a consequence, the service defined in TRL6 is mainly driven by this scenario with the aim to support the development and prototyping activities of the partners involved in the exercises.

From the architecture perspective, each scenario could be seen as an alternative option, where new stakeholders and new needs to exchange information are identified. The complete architecture description can be found in [2].

A.3.1 Operational Context

The functional scope of the service is aligned with the description provided of the E-AMAN Common Service provided in the Business Model [1]:

The E-AMAN Common Service provides functions necessary to operate Arrival Management with an extended horizon in an environment where multiple actors are involved e.g. multiple Airports, AMANs, ACCs, UACs and other interested parties, e.g. NM (i.e. Cross Boarder Arrival Management).

It is important to note that the level of capability considered here is matching basic E-AMAN requirements (excl. concepts of CTA, TTO, ETA min/max, EPP, coupled AMAN/DMAN). These basic E-AMAN functions are:

- Arrival Sequencing / Planning
- Arrival Management Information Distribution to all involved actors

A.3.2 Information Exchange Requirements

The related Information Exchange Requirements were defined in SESAR, by Projects P05.06.04 and P05.06.07. Part of these requirements are covered by the "ArrivalSequenceProvision" service; these are captured in Table 3. The complete list of requirements can be found in [3] and [4].

Identifier	Name	Issuer	Intended Addressees	Information Element	Involved Operational Activities	Service Identifier
IER-5.6.4-IERS-0032-0010	Arrival Management Information_US	Arrival Management	Stakeholder ATSU	Arrival Management Information Items of Interest may depend on airspace structure (FIR, sector, route, fix, …) receiving role, …	Monitor Traffic Situation Separate Traffic	ArrivalSequenceProvision

Identifier	Name	Issuer	Intended Addressees	Information Element	Involved Operational Activities	Service Identifier
IER-5.6.4-IERS-0032-0030	Arrival Management Information_DS	Arrival Management	Destination Airport	Arrival Management Information Items of Interest may be: • Landing Time • Runway (when AMAN manages multiple runway) TWR should be treated as an ATC stakeholder, i.e. with all options.	Implement Updated Arrival Sequence	ArrivalSequenceProvision
IER-5.6.4-IERS-0032-0050	Arrival Management Information_UG	Arrival Management	Satellite Airport	Arrival Sequence Information. Depending on implementation, items of interest may be • Time To Lose on the ground / Delay Share assigned • APTT at destination • Time over Metering Fix	Provide Takeoff Clearance	ArrivalSequenceProvision

Table 3: Information Exchanges Requirements for baseline and extended horizon operations (from SESAR P05.06.07 OSED)

A.3.3 Other Requirements

N/A

A.4 Service Overview

A.4.1 Service Taxonomy

Supported Capability	Parent Capability	Level 1 Capability
E-AMAN Common Service Provision		
	ATM Service Management	
		Service Delivery Management

A.4.2 Service Levels (NFRs)

Some Non-Functional Requirements have been identified for the "ArrivalSequenceService" in order to ensure that the service is provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.

These requirements are described in this section.

[REQ]

Identifier	REQ-15.02-SDD-ASPS.0101
Title	Service availability
Requirement	Percentage of time that the service is up and running shall be greater than or equal to 95%.
Status	<validated>
Rationale	Service should be provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.
Category	<Performance>

[REQ]

Identifier	REQ-15.02-SDD-ASPS.0102
Title	Message integrity
Requirement	Percentage of messages transmitted by the service provider that correctly reaches the consumer system (messages are syntactically correct) shall be greater than or equal to 95%.

Status	<validated>
Rationale	Service should be provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.
Category	<Reliability> <Performance>

[REQ]

Identifier	REQ-15.02-SDD-ASPS.0103
Title	Data integrity
Requirement	For each message that correctly reaches the consumer system, the percentage of attributes that have been received with no error or corruption (data is semantically correct) shall be greater than or equal to 95%.
Status	<validated>
Rationale	Service should be provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.
Category	<Reliability> <Performance>

[REQ]

Identifier	REQ-15.02-SDD-ASPS.0104
Title	Time of response
Requirement	The time that it takes for the service provider to convert the input data into the harmonised format, and generate the required output ready to be distributed to the consumer, shall be smaller than or equal to 2 seconds.
Status	<validated>
Rationale	Service should be provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.
Category	<Performance>

[REQ]

Identifier	REQ-15.02-SDD-ASPS.0105
Title	Time of transmission
Requirement	The time that it takes for a message to go from the provider system to the consumer system, shall be smaller than or equal to 5 seconds.
Status	<validated>
Rationale	Service should be provided with the minimum Quality of Service required to effectively support the Arrival Management operating concept in an extended horizon.
Category	<Performance>

Concerning security, no requirements have been identified since PJ.15-02 is considered being a non-prioritised solution. Therefore, the security activities have been stopped, in accordance with the SecRAM, after identifying the threats.

A.4.3 Service Functions and Capabilities

The "ArrivalSequenceProvision" service is supporting the "E-AMAN Common Service Provision" Capability in the EATMA V10 Capability Model. It is a Level 3 which falls under the "Service Delivery Management" capability area. The complete Capability model can be found at https://www.eatmportal.eu/working/rnd/atm-capability-model

A.4.4 Service Interfaces

Table 4 provides the description of the ArrivalSequenceProvision Service.

Service Name	Description
ArrivalSequenceProvision	This Service will have to provide the E-AMAN information for different consumers and purposes and will output local Arrival Planning results (e.g. total delay) aggregated to serve different purposes of the involved actors (e.g. queue management). These will be used in the planning/tactical phase (e.g. departure delay) and in real-time/operations (e.g. delay and/or speed advisories).

Table 4: Description of the Service

The ArrivalSequenceProvision service has two Service Interfaces, as shown in Figure 1.
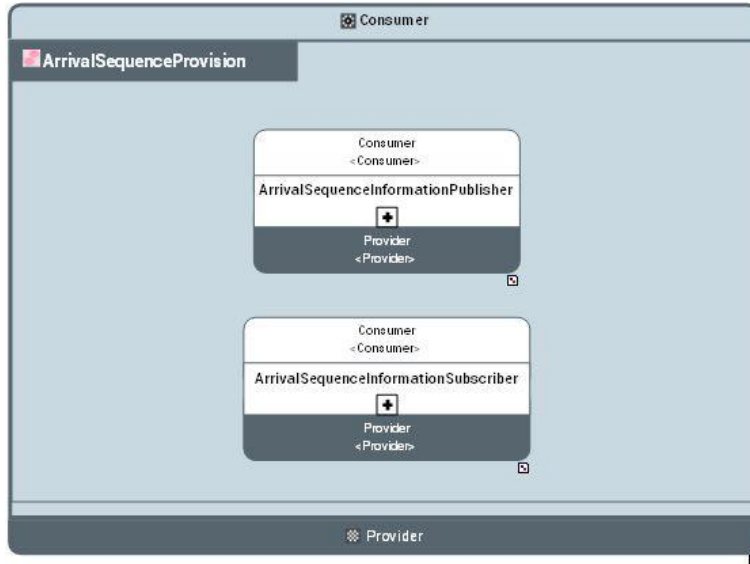
Figure 1: Service to Service Interface mapping

The Table 5 below summarizes the two interfaces of the Service, along with their description. These are further specified in the next section.

Service Interface Definition	Description
ArrivalSequenceInformationPublisher	This interface is the providing interface to receive a subscription or an unsubscription for arrival sequence information from the consumer.
ArrivalSequenceInformationSubscriber	This interface is the consuming interface to receive the arrival sequence information distributed by the provider.

Table 5: Service Interface description

A.5 Service interface specifications

A.5.1 ArrivalSequenceInformationPublisher

This interface is the providing interface to receive a subscription or an unsubscription request for arrival sequence information from the consumer, as illustrated in Figure 2.

The interface design is using a standard Request/Reply MEP.

Figure 2: "ArrivalSequenceInformationPublisher" Interface Exchange diagram

This interface owns two Service Operations, as shown in Table 6 below. The next sub-sections further specify the operations.

Service Operation	Invoker participant	Input parameter	Invoked participant	Return
subscribeToArrivalSequence Information	<Consumer>	SubscriptionRequest	<Provider>	SubscriptionResponse
unsubscribeToArrivalSequen ceInformation	<Consumer>	UnsubscriptionRequest	<Provider>	UnsubscriptionResponse

Table 6: Operations of the "ArrivalSequenceInformationPublisher" Interface

A.5.1.1 Operation subscribeToArrivalSequenceInformation

Operation to realise the subscription.

The sequence of the exchanges needed to complete this operation is illustrated in Figure 3, while Table 7 captures the input and return payloads. For this operation, the service consumer (<Consumer> in Figure 2) is the invoker participant and the service provider (<Provider> in Figure 2) is the invoked participant.

Figure 3: "subscribeToArrivalSequenceInformation" Operation Exchange diagram

Input	Service Payload	Data Entity
	SubscriptionRequest	DestinationAerodrome FlightIdent SubscriptionFilters SubscriptionRequest SupplementaryDataSelection
Return	**Service Payload**	**Data Entity**
	SubscriptionResponse	SubscriptionResponse

Table 7: "subscribeToArrivalSequenceInformation" operation parameters

A.5.1.2 Operation unsubscribeToArrivalSequenceInformation

Operation to realise the unsubscription.

The sequence of the exchanges needed to complete this operation is illustrated in Figure 4, while Table 8 captures the input and return payloads. For this operation, the service consumer (<Consumer> in Figure 2) is the invoker participant and the service provider (<Provider> in Figure 2) is the invoked participant.

Figure 4: "unsubscribeToArrivalSequenceInformation" Operation Exchange diagram

Input	Service Payload	Data Entity
	UnsubscriptionRequest	UnsubscriptionRequest
Return	**Service Payload**	**Data Entity**
	UnsubscriptionResponse	UnsubscriptionResponse

Table 8: "unsubscribeToArrivalSequenceInformation" operation parameters

A.5.2 ArrivalSequenceInformationSubscriber

This interface is the consuming interface to receive the arrival sequence information distributed by the provider, as illustrated in Figure 5.

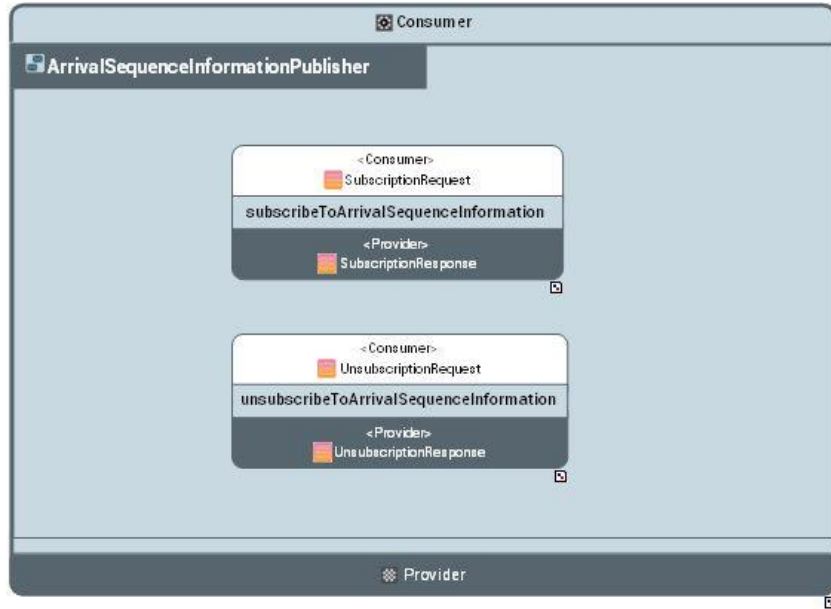The interface design is using a standard Publish/Subscribe MEP.
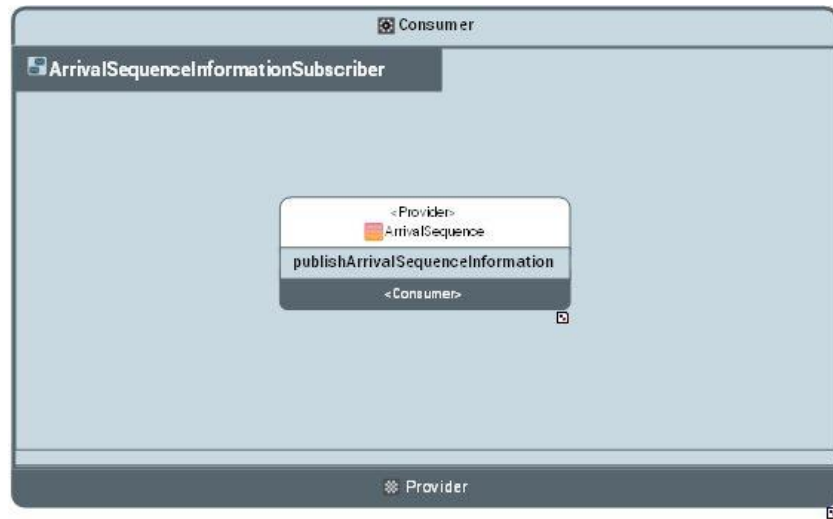
Figure 5: "ArrivalSequenceInformationSubscriber" Interface Exchange diagram

This interface owns one Service Operation, as shown in Table 9 below. The next sub-section further specifies the operation.

Service Operation	Invoker participant	Input parameter	Invoked participant	Return
publishArrivalSequenceInformation	<Provider>	ArrivalSequence	<Consumer>	-

Table 9: Operations of the "ArrivalSequenceInformationSubscriber" Interface

A.5.2.1 Operation publishArrivalSequenceInformation

Operation on the consumer side to receive the arrival management information.

The sequence of the exchanges needed to complete this operation is illustrated in Figure 6, while Table 10 captures the input and return payloads. For this operation, the service provider (<Provider> in Figure 5) is the invoker participant and the service consumer (<Consumer> in Figure 5) is the invoked participant.
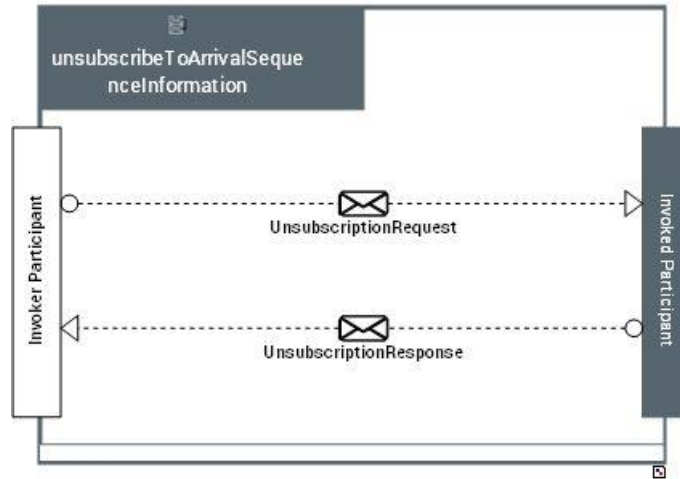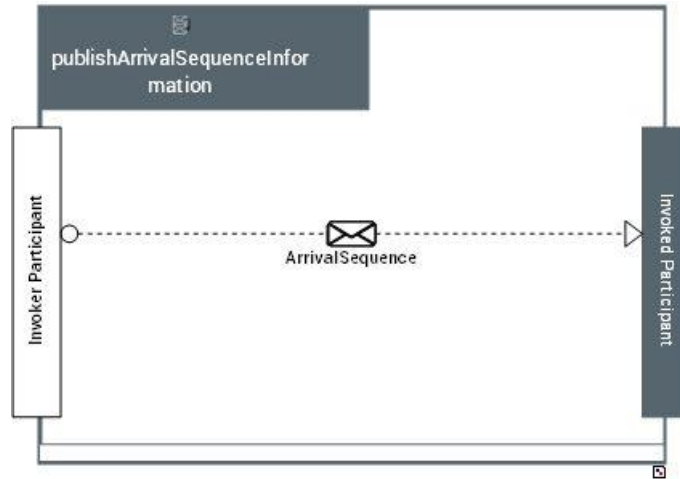

Figure 6: "publishArrivalSequenceInformation" Operation Exchange diagram

Input	Service Payload	Data Entity
	ArrivalSequence	Advisory ArrivalManagementInformation ArrivalSequence CustomWakeTurbulenceCategory FlightIdentification MeteringInformation PriorityHandlingIndicator

Table 10: "publishArrivalSequenceInformation" operation parameters

A.6 Payload Data Diagrams

This section shows the data diagrams of the entities that are used as payload of the service. They constitute the actual content that are exchanged between the provider and the consumer of the service when invoking the operations.

In order to better structure the payload, the entities have been grouped in three clusters by taking into account their usage. This is described in Table 11.

Cluster	Usage in Service Operations	Notes

Core	publishArrivalSequenceInformation	It contains the Set of Arrival Management Information Items returned by a request specifying the domain of interest.
		It contains both mandatory and optional entities.
		
		• Mandatory data entities represent the core payload of the service and shall be provided by the service provider. If a mandatory entity is not provided, it shall be considered a run time error condition.
		• Optional payload elements are part of the core payload with cardinality [0..1] or [0..*]. They
		    ○ Shall be provided by the service provider, if he has access to the appropriate data.
		    ○ Shall not be provided if he has no access to the appropriate data.

Extensions	publishArrivalSequenceInformation	Entities described as part of the extension may be provided on a voluntary basis.
Subscription	subscribeToArrivalSequenceInformation unsubscribeToArrivalSequenceInformation	Entities used to request either the subscription or unsubscription to the service, including potential filters; and the responses from the service provider to the requests.

Table 11: Description of the Service Payload clusters

A.6.1 NSOV-2 ArrivalSequenceProvision Interface Parameter Definition Core
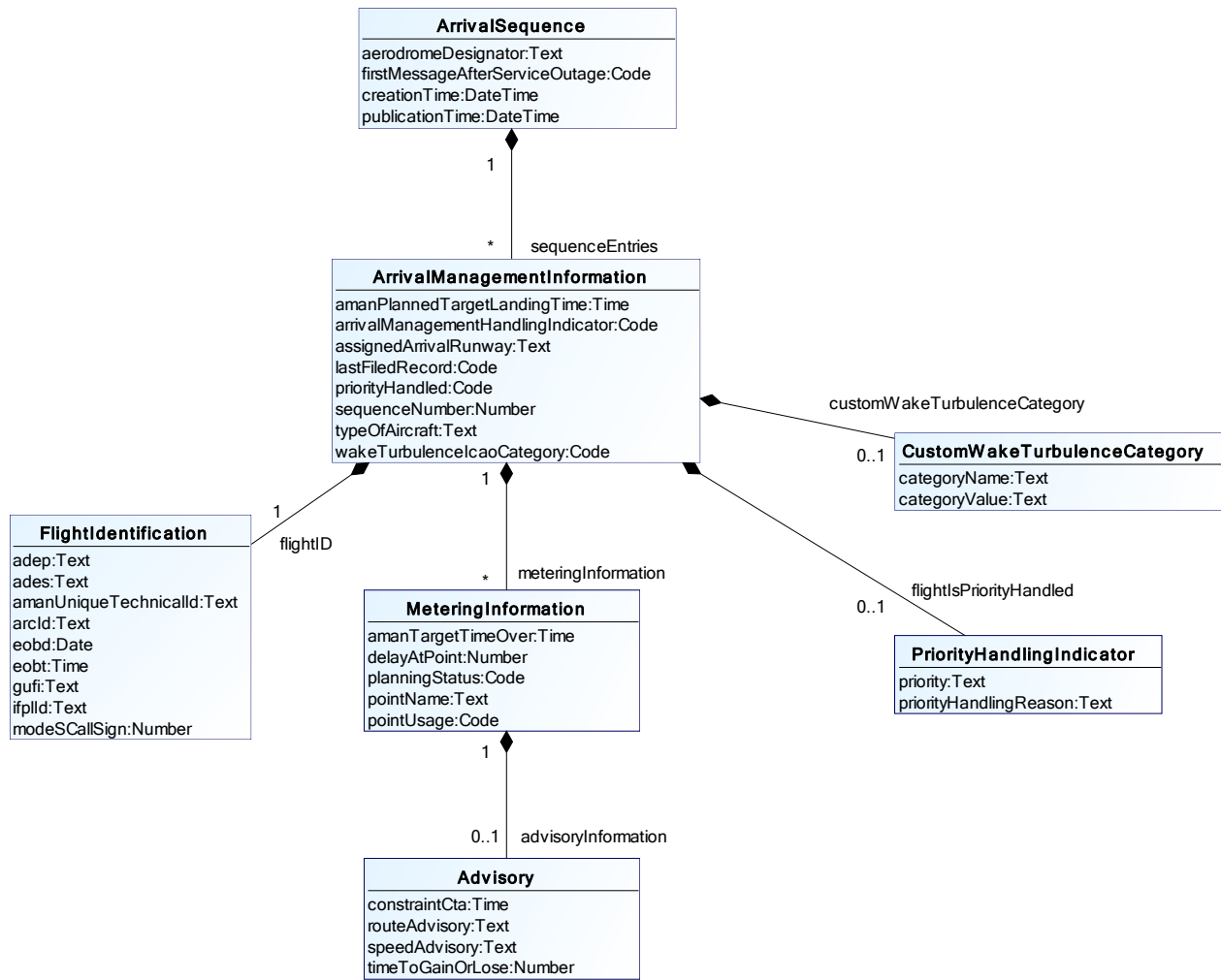
Figure 7: Interface Parameter Definition - Core

A.6.2 NSOV-2 ArrivalSequenceProvision Interface Parameter Definition Extensions
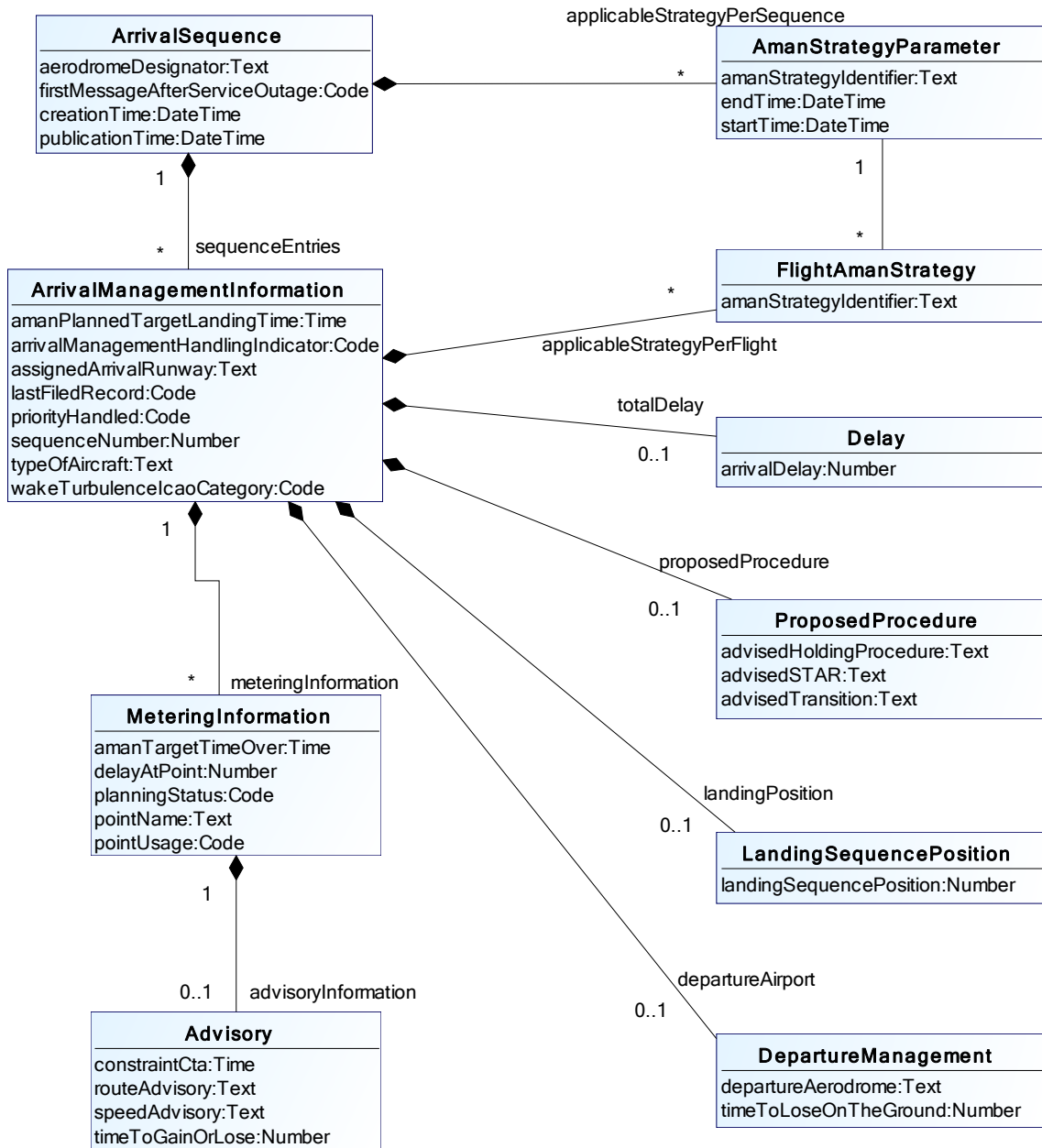
Figure 8: Interface Parameter Definition - Extensions

A.6.3 NSOV-2 ArrivalSequenceProvision Interface Parameter Definition Subscription
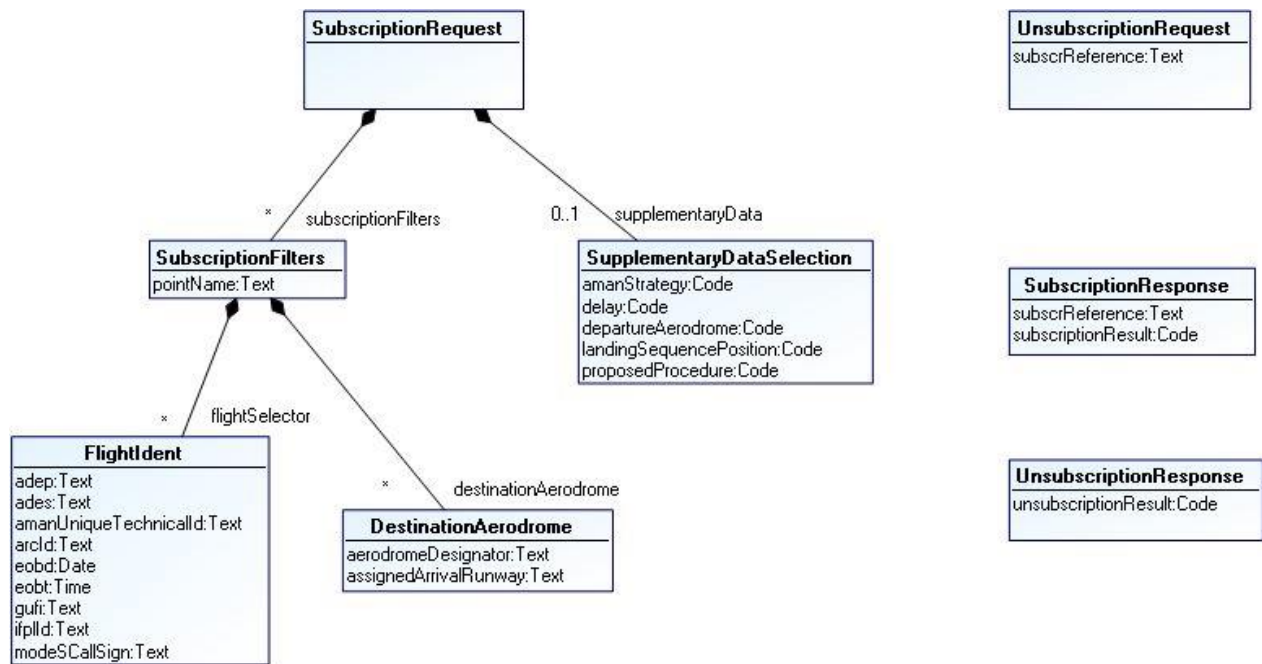
A.7 Figure 9: Interface Parameter Definition - Subscription

A.8 Payload Elements

This section provides the description of each data entity and their attributes, in line with the diagrams shown in section A.6.

The payload description provided in Table 12 has the following structure:

Class					
Class 1	Definition of Class 1				
Attributes					
	Attribute 1	Type	Definition of Attribute 1	Mandatory? (Yes/No)	Cardinality
	......	......	......	......	......
	Attribute n	Type	Definition of Attribute 2	Mandatory? (Yes/No)	Cardinality
Relationships					

Linked class	*Role Name*	*Type of relationship end*	*N/A*	*Cardinality*
……	……	……	……	……
Linked class	*Role Name*	*Type of relationship end*	*N/A*	*Cardinality*

Class				
Advisory	Consists of attributes concerning the AMAN advisories which might be given for a particular flight.			
Attributes				
	constraintCta	Time	Controlled time constraint proposed by the AMAN.	No	0..1
	routeAdvisory	Text	The route advised to synchronize traffic. The route information is represented in conformance with ICAO Doc 4444 Appendix 3 ""Field 15"".	No	0..1
	speedAdvisory	Text	The speed advisory published by the AMAN.	No	0..1
	timeToGainOrLose	Number	An arrival management advisory in form of the amount of time that a flight is supposed to lose or gain to arrive at the Metering Fix/COP to land at the AMAN planned threshold time (unit of measure is minutes). The TTL/TTG is a conversion of the delay at point into actionable information for controllers.	No	0..1
Relationships				
	MeteringInfornmation	advisoryInformation	Association		0..1
Class				
AmanStrategyParameter	AMAN strategies which are applicable to the sequence.			
Attributes				
	amanStrategyIdentifier	Text	The ID/name of the set of operational rules and procedures underlying the AMAN tool optimisation algorithm. The strategy implements the trade-off between the goals of equity, high throughput, and trajectory efficiency which has agreed between the stakeholders. It is assumed that both sides (consumer/provider) refer to the same operational strategy when receiving/sending the identifier.	Yes	1
	endTime	DateTime	End time of the AMAN strategy.	Yes	1

	startTime	DateTime	Start time of the AMAN strategy.	Yes	1
Relationships					
	ArrivalSequence	applicableStrategyPerSequence	Association		*
	FlightAmanStrategy	-	Association		1
Class					
ArrivalManagementInformation		Contains information on single flights and their position in the landing sequence. Information relevant to all AMAN information users -AMAN Planned Target Landing Time (ATLDT) as determined by the AMAN optimization algorithm -Status of the sequencing (i.e. to what extent is the flight constrained by ATC) -Status of the progress of sequencing (i.e. what is the current status of the process towards fitting the flight into the sequence).			
Attributes					
	amanPlannedTargetLandingTime	Time	The time, calculated by the Arrival Manager tool, at which the aircraft is planned to cross the runway threshold. This is also the landing time shown to the Controller on the AMAN timeline.	Yes	1
	arrivalManagementHandlingIndicator	CodeAmanStatusType	Descriptors of the status of a flight in the sequencing process, as required to give the controller appropriate situational awareness.	No	0..1
	assignedArrivalRunway	Text	Indicator of runway and runway direction assigned to the flight (e.g. 25L) as described within ICAO Annex 14, chapter 5.2.2.	No	0..1
	lastFiledRecord	Code[1]	Indication whether this flight will appear in the sequence again (value ""false"") or this is the last record (value=""true"").	No	0..1
	priorityHandled	Code[1]	Flight has been flagged with a higher priority than other flights within the sequence.	No	0..1
	sequenceNumber	Number	A description of the position of a flight in the temporal sequence of threshold crossings. As aircraft land and are removed from the sequence, the sequence numbers for the remaining airborne flights may be updated dynamically or may remain fixed (a re-	No	0..1

[1] Please note that the correct data type for this attribute should be "Boolean". However, it is not included among the data types managed by MEGA, where the Service is modelled. Therefore it was decided to use "Code" instead.

			numbering of airborne flights is not triggered), depending on local implementation. This is required to improve situational awareness by directly showing the ordering of flights, see SESAR REQ-5.6.4-REQS-0028-0690.		
	typeOfAircraft	Text	Aircraft Type as codified by ICAO Doc 8643.	No	0..1
	wakeTurbulenceIcaoCategory	CodeWakeTurbulenceCategory	A grouping of aircraft according to the effect of the rotating air mass created behind the wing tips (ICAO Doc 4444).	No	0..1
Relationships					
	ArrivalSequence	sequenceEntries	Association		*
	CustomWakeTurbulenceCategory	-	Composition		-
	Delay	-	Composition		-
	DepartureManagement	-	Composition		-
	FlightAmanStrategy	-	Composition		-
	FlightIdentification	-	Composition		-
	LandingSequencePosition	-	Composition		-
	MeteringInformation	-	Composition		1
	PriorityHandlingIndicator	-	Composition		-
	ProposedProcedure	-	Composition		-
Class					
ArrivalSequence			The Set of Arrival management Information Items (Flight specific) returned by a request specifying the domain of interest.		
Attributes					
	aerodromeDesignator	Text	ICAO location indicator designator of the AMAN operated aerodrome the sequence is calculated for (ICAO Doc 4444 Annex 2, FPL Item 16a).	Yes	1
	firstMessageAfterServiceOutage	Code[1]	This flag is used in order to allow a provider to inform the consumer that the current message he is receiving is including a sequence after some service outage. The information might contain gaps compared to the latest previously received messages.	No	0..1
	creationTime	DateTime	Date and time of creation of the record (UTC).	Yes	1

	publicationTime	DateTime	Date and time of the publication of the record (UTC).	No	0..1

Relationships					
	AmanStrategyParameter	-	Composition		-
	ArrivalManagementInformation	-	Composition		1

Class					
CustomWakeTurbulenceCategory		Information on custom (i.e. non-ICAO) separation wake turbulence category in use for separation of this flight (e.g. RECAT_EU, national exceptions).			

Attributes					
	categoryName	Text	The name of the wake turbulence categorization scheme in use at the concerned airport.	Yes	1
	categoryValue	Text	Definition The category value (i.e. the categorization of the flight in question in terms of the custom categorization).	Yes	1

Relationships					
	ArrivalManagementInformation	customWakeTurbulenceCategory	Association		0..1

Class					
Delay		Data Entity to expose the delay of a flight.			

Attributes					
	arrivalDelay	Number	The difference (in seconds) between times APTT (i.e. time over landing threshold point calculated by the AMAN) and ETA (as per the latest available flight plan of the AMAN ATSU's FDPS).	No	0..1

Relationships					
	ArrivalManagementInformation	totalDelay	Association		0..1

Class					
DepartureManagement		Contains departure information for a given flight. This reflects the arrival management process by which the AMAN provides a time to loose for flights departing from regional airports with the understanding that the delay will be absorbed by later-than-filed departure.			

Attributes					
	departureAerodrome	Text	The ICAO location indicator of the aerodrome (within the AMAN horizon) from which the flight is scheduled to depart.	Yes	1

	timeToLoseOnTheGround	Number	Time To Lose on the ground (unit of measure is minutes).	No	0..1
Relationships					
	ArrivalManagementInformation	departureAirport	Association		0..1
Class					
DestinationAerodrome		Filter concerning the destination aerodrome.			
Attributes					
	aerodromeDesignator	Text	Filter for the AMAN Aerodrome ICAO Location Indicator, i.e. data is provided for assigned to arrive at this (and hence possibly sequenced towards) this airport. Note that this does not filter on the ADES field of the flight identification data structure, but returns all flights actually going to the airport in question (i.e. including diversions to this aerodrome and excluding diversions away from it).	Yes	1
	assignedArrivalRunway	Text	Runway direction filter, i.e. data is provided for flights assigned to arrive using this runway direction.	No	0..*
Relationships					
	SubscriptionFilters	destinationAerodrome	Association		*
Class					
FlightAmanStrategy		Aman strategy applicable to the flight.			
Attributes					
	amanStrategyIdentifier	Text	The ID/name of the set of operational rules and procedures underlying the AMAN tool optimisation algorithm. The strategy implements the trade-off between the goals of equity, high throughput, and trajectory efficiency which has agreed between the stakeholders.	No	0..1
Relationships					
	AmanStrategyParameter	-	Association		*
	ArrivalManagementInformation	applicableStrategyPerFlight	Association		*
Class					
FlightIdent		This data entity contains all filters concerning elements of the flight identification. It corresponds to the "FlightIdentification" data entity of the core payload. For the			

			attributes contained, please refer to the description of the "FlightIdentification" data entity. All attributes of the "FlightIdent" data entity are optional.		
Attributes					
	adep	Text	ICAO Location Indicator of Departure Aerodrome see ICAO Doc 444 Annex 2, FPL Item 13a.	No	0..1
	ades	Text	ICAO Location Indicator of Destination Aerodrome see ICAO Doc 444 Annex 2, FPL Item 16a.	No	0..1
	amanUniqueTechnicalId	Text	A unique internal technical flight identifier created by the AMAN System.	No	0..1
	arcId	Text	Aircraft Identification as specified in ICAO Doc 4444 Annex 2, FPL Item 7.	No	0..1
	eobd	Date	Estimated Off-Block Date used for identification purposes only. Please note that this is not the EOBT updated continuously by CDM but the EOBT as it is in the ICAO flight plan which may be changed if a change is issued to the flight plan.	No	0..1
	eobt	Time	Estimated Off Block Time: The estimated time at which the aircraft will commence movement associated with departure. This field is used for identification purposes only.Please note that this is not the EOBT updated continuously by CDM but the EOBT as it is in the filed ICAO flight plan (Item 13b), which may be changed if a change is issued to the flight plan.	No	0..1
	gufi	Text	The Globally Unique Flight Identifier provides a globally unique reference to the flight, allowing all eligible members of the ATM Community to unambiguously refer to information pertaining to a flight (ICAO Doc 9965).	No	0..1
	ifplId	Text	The unique identifier assigned to a flight plan by the EUROCONTROL Integrated Initial Flight Plan Processing System (IFPS).	No	0..1
	modeSCallSign	Text	Call Sign as included in the ASTERIX CAT 62 field (data item I062/380 - Aircraft derived data).	No	0..1
Relationships					
	SubscriptionFilters	flightSelector	Association		*

Class					
FlightIdentification		Data uniquely identifying the flight (and in some cases an aircraft). Refer to standards ICAO4444 Appendix 2 and EUROCONTROL ADEXP specification. Note: Service consumers need to be able to correlate the sequence information with flight information from other services or systems, such as the FDPS. Therefore, a common identifier for flights is needed. The requirements of this service do not prescribe which data items shall be used as a common identifier to correlate flights between systems, as this is depending on local conditions.			
Attributes					
	adep	Text	ICAO Location Indicator of Departure Aerodrome. See ICAO Doc 444 Annex 2, FPL Item 13a.	Yes	1
	ades	Text	ICAO Location Indicator of Destination Aerodrome. See ICAO Doc 444 Annex 2, FPL Item 16a.	Yes	1
	amanUniqueTechnicalId	Text	A unique internal technical flight identifier created by the AMAN System.	No	0..1
	arcId	Text	Aircraft Identification as specified in ICAO Doc 4444 Annex 2, FPL Item 7.	Yes	1
	eobd	Date	Estimated Off-Block Date used for identification purposes only. Please note that this is not the EOBT updated continuously by CDM but the EOBT as it is in the ICAO flight plan which may be changed if a change is issued to the flight plan.	No	0..1
	eobt	Time	Estimated Off Block Time: The estimated time at which the aircraft will commence movement associated with departure. This field is used for identification purposes only.Please note that this is not the EOBT updated continuously by CDM but the EOBT as it is in the filed ICAO flight plan (Item 13b), which may be changed if a change is issued to the flight plan.	No	0..1
	gufi	Text	The Globally Unique Flight Identifier provides a globally unique reference to the flight, allowing all eligible members of the ATM Community to unambiguously refer to information pertaining to a flight (ICAO Doc 9965).	No	0..1
	ifplId	Text	The unique identifier assigned to a flight plan by the EUROCONTROL Integrated Initial Flight Plan Processing System (IFPS).	No	0..1

	modeSCallSign	Number	Call Sign as included in the ASTERIX CAT 62 field (data item I062/380 - Aircraft derived data).	No	0..1
Relationships					
	ArrivalManagementInformation	flightID	Association		1

Class					
LandingSequencePosition		This information provides the ""Airport view"" on what is the position of the a/c in the sequence.			
Attributes					
	landingSequencePosition	Number	The position of the flight in the runway sequence (i.e. number of a/c to land before this a/c plus 1).	No	0..1
Relationships					
	ArrivalManagementInformation	landingPosition	Association		0..1

Class					
MeteringInformation		Consists of attribute concerning the metering point in view for which AMAN advisory might be given. This provides the additional information relevant for ATSUs but not Airports, namely times, planning stati and advisories for fixes used in arrival management.			
Attributes					
	amanTargetTimeOver	Time	The time, computed by the Arrival Manager tool, at which the aircraft is predicted to be over a significant point (in particular, the metering point). Synonym of optimalTimeOver.	Yes	1
	delayAtPoint	Number	AMAN calculated total Delay at Point (Unit of Measure is seconds) to be achieved for a given flight to generate an optimal arrival sequence.	No	0..1
	planningStatus	CodePlanning Status	Qualification of the planning status of the flight the AMAN calculation is based on.	No	0..1
	pointName	Text	The published name of the significant point for which the calculated time information is provided.	Yes	1
	pointUsage	CodeArrivalPointUsage	Intended use of the significant point in arrival management operations.	Yes	1
Relationships					

	ArrivalManagementInformation	meteringInformation	Association		*
	Advisory	-	Composition		1
Class					
PriorityHandlingIndicator		Information provided in case of a priority handling of the flight.			
Attributes					
	priority	Text	A priority indicator as used by ATC managing flights into the airport in view.	Yes	1
	priorityHandlingReason	Text	Textual description of the reason why the flight is priority handled.	No	0..1
Relationships					
	ArrivalManagementInformation	flightIsPriorityHandled	Association		0..1
Class					
ProposedProcedure		Optionally, the AMAN may provide the controller with recommendations for using a specific procedure on a flight to implement the sequence (i.e. the sequence has been optimized using a specific course of action that requires controller intervention).			
Attributes					
	advisedHoldingProcedure	Text	The holding advised to synchronize traffic.	No	0..1
	advisedSTAR	Text	The STAR advised to synchronize traffic.	No	0..1
	advisedTransition	Text	The procedure transition advised to synchronize traffic.	No	0..1
Relationships					
	ArrivalManagementInformation	proposedProcedure	Association		0..1
Class					
SubscriptionFilters		This entity constitutes the filters to be implemented by the service provider.			
Attributes					
	pointName	Text	The published name(s) of the significant point(s) for which the metering information shall be provided.	No	0..*
Relationships					
	SubscriptionRequest	subscriptionFilters	Association		*
	DestinationAerodrome	-	Composition		-
	FlightIdent	-	Composition		-

Class					
SubscriptionRequest	The set of criteria to specify information concerning a specific operational situation or use case in the context of AMAN extended horizon to be supported by Arrival Management Information e.g. AMAN advisories.				
Relationships					
	SubscriptionFilters	-	Composition		-
	SupplementaryDataSelection	-	Composition		-
SubscriptionResponse	Subscription response message.				
Attributes					
	subscrReference	Text	It represents the reference that the provider uses to uniquely refer to a subscriber.	Yes	1
	subscriptionResult	CodeSubscriptionResult	Description of subscription request result.	Yes	1
Class					
SupplementaryDataSelection	This class provides switches to ensure that information can be selected by the consumer if needed.				
Attributes					
	amanStrategy	Code[1]	Switch to indicate whether the AMAN Strategy Information extension (i.e. info included in AmanStrategyParameter and ExtFlightAmanStrategy classes) will be needed.	Yes	1
	delay	Code[1]	Switch to indicate whether the delay information extension (i.e. info included in ExtDelay class) will be needed.	Yes	1
	departureAerodrome	Code[1]	Switch to indicate whether the departure aerodrome information extension (i.e. info included in ExtDepartureManagement class) will be needed.	Yes	1
	landingSequencePosition	Code[1]	Switch to indicate whether the landing sequence information extension (i.e. info included in LandingSequencePosition class) will be needed.	Yes	1
	proposedProcedure	Code[1]	Switch to indicate whether the proposed procedure information extension (i.e. info included in ProposedProcedure class) will be needed.	Yes	1
Relationships					
	SubscriptionRequest	supplementaryData	Association		0..1
Class					

UnsubscriptionRequest	Unsubscribe Message.			
Attributes				
subscrReference	Text	The unique reference that the provider uses to refer to the subscription. This reference is provided in the response to the subscription request.	Yes	1
UnsubscriptionResponse	Unsubscription response message.			
Attributes				
unsubscriptionResult	CodeUnsubscriptionResult	It allows to inform the subscriber if the unsubscription request was successful or not.	Yes	1

Table 12: Service Payload description

A.8.1 Payload Data Types

This section lists the data types of the payload described in the previous section. For the ArrivalSequenceProvision service there are six enumeration codes, which are also included in the Table 13.

Name	Description	Len	Dec	Type	Value
Code		6		P-Character	
CodeAmanStatusType	This is the enumeration to expose the values the AMAN Status could take. Implementations are expected to restrict the set of values to those that are relevant to local procedures and raise an error condition if any other value is transmitted.				DESEQUENCED HAS_LANDED IS_ON_FINAL MANUAL_INTERVENTION SEQUENCED_FROZEN SEQUENCE_STABLE SEQUENCE_UNSTABLE TIME_FROZEN
CodeArrivalPointUsage	Arrival Point Usage.				COORDINATION FINAL_APPROACH_FIX INITIAL_APPROACH_FIX INITIAL_METERING_FIX METERING_FIX

	This codelist restricts the AIXM point usage codes to those relevant to Arrival Management (From ED-254)				OTHER STACK_EXIT
CodePlanningStatus	Qualifier of the planning status.				CONTROLLED_TIME ESTIMATED_TIME TARGET_TIME
CodeSubscriptionResult	Enumeration indicating the results of a subscription request.				SUBSCRIPTION_FAILURE SUBSCRIPTION_SUCCESSFUL
CodeUnsubscriptionResult	Enumeration indicating the results of an unsubscription request.				UNSUBSCRIPTION_FAILURE UNSUBSCRIPTION_SUCCESSFUL
CodeWakeTurbulenceCategory	Enumeration indicating the wake turbulence category of an aircraft				L M H J
Date				P-Date	
DateTime				P-Datetime	
Number				P-Numeric	
Text				P-Text	
Time				P-Time	

Table 13: Service Data Types description

A.9 Service dynamic behaviour

This section describes the dynamic aspects of the interactions involving the ArrivalSequenceProvision service, by depicting the nominal sequence of the operations that take place between the provider and the consumer. An overview of this is shown in Figure 10 below, in the form of a sequence diagram.

Figure 10: Service Dynamic Behaviour diagram

A brief description of the sequence is provided below:

1.1 The service consumer sends a "SubscriptionRequest" to the provider in order to subscribe to the service and be able to receive the related Arrival Sequence information.

1.2 Upon reception of a "SubscriptionRequest" message, the service provider returns a "SubscriptionResponse".

2.1 The service provider distributes the "ArrivalSequence" message to all subscribed consumers on a periodic basis. The distribution of the "ArrivalSequence" messages is interrupted whenever the service consumer unsubscribes to the service.

3.1 At any time, the service consumer can send an "UnsubscriptionRequest" in order to unsubscribe from the service and stops receiving the related Arrival Sequence information.

3.2 Upon reception of an "UnsubscriptionRequest" message, the service provider returns an "UnsubscriptionResponse".

A.10 References Documents

[1] SESAR2020 PJ.15-02 Business Model of the E-AMAN Common Service V3, Edition 00.01.01

[2] SESAR2020 PJ.15-02 E-AMAN Service TRL6 High Level Architecture Description, Edition 00.01.01

[3] SESAR1 P05.06.07 D15 - Update of 5.6.4 OSED – Step 1, Edition 00.01.01

[4] SESAR1 P05.06.07 D53 - Update of 5.6.4 SPR-INTEROP Step 1 – Edition 2

[5] SESAR2020 PJ19.03 Service Portfolio 2017, Edition 00.01.00

[6] SESAR2020 SecRAM, Edition 02.00.00

[7] SESAR2020 PJ15-02 Security Assessment Report - Part A (Low Risk Material), Edition 00.00.03

[8] SESAR2020 PJ15-02 Security Assessment Report - Part B (Medium Risk Material), Edition v00.00.02

[9] SESAR2020 PJ.15-02 Technical Validation Report (TVALR) V3, Edition 00.01.01

A.11 Security Risk Assessment

In PJ15-02, a Security Risk Assessment has been performed following the guidance provided in SecRAM [6].

Specifically, two primary assets and one supporting asset have been identified in the context of PJ.415-02 for TRL6 phase. The outcome can be found in [7] for Low Risk material and in [8] for Medium Risk material (password-protected).

All of the MSSC (Minimum Set of Security Controls) have to be implemented in all SESAR Projects aligned with the methodology. The following requirements are coming from a set of MSSC more relevant for this solution:

- ATM business continuity shall develop and maintain a managed process to addresses the ATM service and information security requirements.
- ATM networks shall be managed and controlled to protect from eavesdropping, maintain security for the systems and applications, and information in transit.

- Agreements shall be established for the exchange of ATM services and information. It will be necessary to implement policies, procedures and controls to protect the exchange of these services and information using all types of communication facilities.
- The information technology resources shall be right-sized to meet business requirements.
- Staff shall receive appropriate awareness training and regular updates in organisational policies and procedures, as relevant for their job function.
- The tasks and areas of responsibility shall be segregated in order to reduce the opportunities for unauthorized or unintended modification, or for misuse of the ATM assets.
- An adequate password management shall be established to protect the system about attackers that pretend access to the system and conduct risk situations. Maintaining the default passwords will increase the risk of the system.
- An access control policy shall be documented, and reviewed based on business and security requirements for access.

-END OF DOCUMENT-