European ATM Service Description for the Arrival Management Information Service

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Abstract

The definition of standardised Arrival Management services supports the application of Arrival Management by multiple stakeholders through a common picture of the traffic situation at the congested airport.

There are operational requirements indicating that arrival sequence information determined by the AMAN is required by upstream ATSUs (in extended horizon scenarios)

Authoring & Approval

Prepared By - *Authors of the document.*		
Name & Company	Position & Title	Date
[redacted] DFS	[redacted]	25/04/2014

Reviewed By - *Reviewers internal to the project.*		
Name & Company	Position & Title	Date
[redacted]	[redacted]	30/05/2014
[redacted] /LFV		30/05/2014

Reviewed By - *Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.*		
Name & Company	Position & Title	Date
[redacted]	[redacted]	25/04/2014
[redacted] DFS[1]		30/05/2014
[redacted] Thales[2]		30/05/2014

Approved for submission to the SJU By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
[redacted] NORACON	[redacted]	31/05/2014
[redacted] NORACON		31/05/2014

Rejected By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date

Rational for rejection

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Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

[1] See attachment for approval of the SDD

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Executive summary

The application of Arrival Management is capable of minimizing environmental impact / fuel burn, optimizing runway throughput, optimizing ATC workload share and more generally leads to more efficient flight trajectories.

To this end, Arrival Management support tools (“AMANs”) compute an optimal (internal) set of trajectories to produce proposed advisories for individual Flights and flight sequence information specific to runway thresholds and relevant significant points. This information can either be actioned by ATCOs to initiate delay absorption measures or used by IT systems to base further processing on this information.

The Information Exchange requirements developed by OFA 04.01.02 in the context of OI step TS-305A indicate the need to share the information described above between Destination and Satellite Airport Towers, other Airport Stakeholders, Approach and En Route Control Centres. A corresponding validation exercise (VP-695) has been identified.
The service design for this information exchange was done in a service activity (SVA005). Service activities are a means to conduct a service design process according to specific rules and guidelines to assure a certain quality level of the outcome of the service architecting process. The process owner is the SCG (Service Coordination Group)

Therefore the present document describes the logical structure of a service to disseminate Arrival Management Information.

1 Introduction

1.1 Purpose of the document

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

The purpose of the SDD is to provide a complete design description of each service, to describe the services 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 and supports the configuration management process by providing well-defined baselines.

1.2 Intended readership

This service description document is intended to be read by Enterprise Architects, Service Architects, Information Architects, System Engineers and Developers in pursuing architecting, design and development activities.

1.3 Inputs from other projects

See references section.

1.4 Glossary of terms

1.5 Acronyms and Terminology

1.5.1 Acronyms

Term	Definition
ADD	Architecture Description Document
AMAN	Arrival Manager
AOR	Area of Responsibility
AOI	Area of Interest
APTT	AMAN Planned Threshold Time
ATM	Air Traffic Management
E-ATMS	European Air Traffic Management System
FAA	Federal Aviation Administration
IER	Information Exchange Requirement
ISRM	Information Services Reference Model
NAF	NATO Architecture Framework

Term	Definition
NSOV	NAF Service Oriented View
NOV	NAF Operational View
NSV	NAF System View
OSED	Operational Service and Environment Definition
QoS	Quality of Service
SDD	Service Description Document
SESAR	Single European Sky ATM Research Programme
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SoaML	Service Oriented Architecture Modelling Language
SWIM	System Wide Information Management
TMA	Terminal Manoeuvring Area
UML	Unified Modelling Language
V&V	Validation and Verification
WSDL	Web Services Definition Language
XSD	XML Schema Definition

1.5.2 Terminology

Term	Definition	Source
Capability	The collective ability to deliver a specified type of effect or a specified course of action. Within the context of the SESAR Programme a capability is therefore the ability to support the delivery of a specific operational concept to an agreed level of performance.	Common working meeting between B41 EA study and B43 T5
Capability Configuration	A combination of organisational aspects (with their competencies) and equipment that combine to provide a capability. A Capability Configuration represents a recognisable set of resources (technical systems, human roles, and physical assets) derived from a generic stakeholder organisation.	B43 ADD

Term	Definition	Source
	Note: Capability Configuration is a term used in NAF. The equivalent SoaML stereotype to be used is Participant. Also see note in Node term definition.	
Node	A logical entity that performs Operational Activities specified independently of any physical realisation e.g. a stakeholder type providing and/or consuming operational information within a network of others. Note: Node is a term used in NAF. The equivalent SoaML stereotype to be used is Participant. Be aware that the original intention of SoaML is that Participants are physical items and not logical constructs. Service architects must indicate whether the Participant is a logical (Node) or a physical (Capability Configuration) construct.	Common working meeting between B41 EA study and B43 T5
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.	B43 T5 study
Service attribute	A Service Attribute defines a property of a service. Examples: Response time, Frequency of invocation, Message Exchange Pattern.	B43 T5 study
Service contract	A service contract represents an agreement between the stakeholders involved for how a service is to be provided and consumed.	B43 T5 study
Service function	A Service function describes what functionality is needed to provide or consume a service; it is the trigger for or is triggered by the Service interactions. A Service function can be automated to different extents depending on the context e.g. a Service function supporting a complex activity may need more automation than a Service function for a simple activity. Note: The equivalent SoaML stereotype is Capability, in WP8 Foundation documentation referred to as Service Capability.	B43 T5 study
Service interaction	A Service interaction is a description of an information exchange between ATM stakeholders' systems which can potentially be automated; phone calls / voice exchanges are considered as non-automated service interactions. In considering automated interactions, a service interaction is described by several modelling artefacts depicting the static and dynamic behaviour of a service. This includes service operations, data messages model and interaction behaviour.	B43 T5 study
Service interface	The mechanism by which a service communicates. Service providers and consumers need to implement service interfaces to be able to collaborate. A service interface includes service operations that enable access to the	B43 T5 study

Term	Definition	Source
	functionality of the services identified, as well as the data used in the service interaction.	

2 Service identification

The Arrival Information Management Service as derived from the OSED 5.6.7 D32 "Tactical TMA and En-route Queue Management" and the document "DEL-05 06 07-D06-Technical Note to 564 OSED SPR INTEROP" [10] which represents an extract on Information Requirements of the OSED. Those documents address three main stakeholders for AMAN management information,

- a stakeholder ATSU controlling a flight to the TMA in view of the AMAN implementation,
- the destination airport for which AMAN sequences the flights,
- a satellite airport which is a "nearby" airport having a departing flight to the concerned destination airport.

The Technical Note doesn't specify a specific payload per stakeholder and it also doesn't provide constraints or rules for a more detailed modelling of the domain of interest according to stakeholder needs which would offer the ability to more explicitly define the information exchange per stakeholder.

Therefore it was decided to distinguish between those stakeholder needs by using one service interface per stakeholder and a mechanism to filter the certain information needs out of a superset of AMAN Sequence Information until subsequent versions of the OSED will provide a clearer picture on a more specific stakeholder payload.

The service design has two purposes, to fulfil the top-down requirements and to be aligned with the real world prototype used by Validation Exercise 695, namely the BARCO AMAN System on the provider side at Heathrow TMA. The service developed for this exercise only addresses the stakeholder ATSU. The payloads of SVA005 and the BARCO prototype have been aligned. In some cases, where actually no elements stipulated by the prototype are available in the AIRM, AIRM CRs were created and will be traced to the service model.

Table 1: Service

Name	ArrivalManagementInformationService
ID	17304CF8-F5E5-4ff4-95A8-94429D578A7F
Version	Version. 1.0
Keywords	AMAN Sequence, TTL/TTG
Architect(s)	Service Architect: [redacted] DFS Information Architect: [redacted] DFS

Table 2: Service Lifecycle

Lifecycle status	Date	Link
Identified	*30/04/2014*	*n.a., no gate in the SCG process anymore,*

Allocated	*Not yet allocated*	
Designed	*Date when design is approved.*	*Link to protocol documenting the decision*
Validated	*Date when validated. Filled by WP3*	*Link to protocol documenting the decision*
IOC	*Date for Initial Operational Capability*	*Link to technical enabler hosting the service in the ATM master plan*
FOC	*Date for Full Operational Capability*	*Link to technical enabler hosting the service in the ATM master plan*

3 Operational and Business context

For background information on the operational and business context of this service please refer to the Service Identification Document [9] of SVA-005 .The reference document for the IERs and IES is the Technical Note by project 05.06.07 handed over to the SJU on April 25th [10]:

3.1 Information Exchange Requirements

Table 3: Information Exchange Requirements

Identifier	Information Exchange name	Information Element	Provider	Consumer	Comments
IER-5.6.4-IERS-0032-0010	Arrival Management Information	Arrival Management Information Items of Interest may depend on airspace structure (FIR, sector, route, fix, …) receiving role, … (see New Information Elements)	Arrival Management	Stakeholder ATSU	
IER-5.6.4-IERS-0032-0030	Arrival Management Information	*Arrival Management Information* *Items of Interest may be* • *Landing Time* • *Runway (when AMAN manages multiple runway)* (see New Information Elements)	*Arrival Management*	*Destination Airport*	
IER-5.6.4-IERS-0032-0050	Arrival Management Information	Arrival Management 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 (see New Information Elements)	Arrival Management	Satellite Airport	

Table 4: Information Elements

Identifier	IE-5.6.4-0032-0004
Name	Metering Fix
Description	A reference point over which traffic is metered, i.e. measured and/or spaced in time.
Properties	See “Significant Point” as defined by ICAO and contained in AIRM.
Rules applied	
Comments	Abbreviation: MF Synonyms: Metering Point, CTA Point (in the context of CTA operations) See REQ.5.6.4-REQS-0028-0230

Identifier	IE-5.6.4-0032-0021
Name	AMAN Planned Threshold Time
Description	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.
Properties	Runway / runway direction the time refers to. Defined by ICAO (see AIRM).
Rules applied	
Comments	Abbreviation: APTT Synonyms in use: Optimal Time of Arrival (OTA) See REQ.5.6.4-REQS-0028-1030 Note: could in the future be extended to landing, runway exit … see OFA 04.01.01 and 04.02.01. • In previous work, this time has also been referred to as “Scheduled Time of Arrival” (STA). However, in the wider ATM community, “STA” is predominantly used with a different meaning, namely as the planned arrival time used in Airport Slot Allocation during the strategic planning phase. • There is a functional difference between the APTT (which is the automated proposal of the AMAN optimization algorithm) and the TLDT (which is the shared planning objective based on the APTT but subject to stakeholder discretion). • For the definition of TLDT see the SESAR Lexicon (also quoted above). Notice that other than stated in Chap 3.6.2.1, TLDT is not part of Airport CDM.

Identifier	IE-5.6.4-0032-0022

Name	AMAN Planned Time Over
Description	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).
Properties	Significant point the time refers to. Defined by ICAO (see AIRM).
Rules applied	
Comments	Abbreviation: APTO Synonyms in use: Optimal Time Over (OTO) See REQ-5-6-4-REQS-0028-0260 Notes: see IE-5.6.4-0032-0021

Identifier	IE-5.6.4-0032-0024
Name	Time To Gain / Time to Lose
Description	An arrival management advisories in form of the amount of time that a flight is supposed to lose or gain to arrive at the Metering Fix to land at the AMAN planned threshold time.-
Properties	Metering Point the advisory refers to. See “Metering Point” Information Element
Rules applied	
Comments	Abbreviation: TTL/TTG See REQ.5.6.4-REQS-0028-0260 Notice that this definition is aligned with ADEXP.

Identifier	IE-5.6.4-0032-0031
Name	Landing Sequence
Description	The order in which two or more aircraft are planned to land taking into account ATM constraints, i.e. the order by APTT.
Properties	Runway / Runway direction referenced Set of flights, ordered by time. For each flight, (selected) Arrival Management Information -- see below. Optional: AMAN strategy in effect – see below
Rules applied	
Comments	Synonyms in use: Arrival Sequence, Runway Sequence, Planned Sequence See REQ.5.6.4-REQS-0028-0160 Notice • The “Landing Sequence” Information Element is generally considered the “container” for communicating any operationally relevant data item output by the AMAN tool. • The properties listed above are either defined as Information Elements elsewhere in this section, or already available in the AIRM

Identifier	IE-5.6.4-0032-0032
Name	Arrival Management Information
Description	Information Record for a given flight subject to Arrival Management, as issued by the AMAN support tool
Properties	Contents of the record depend on the Information Exchange in question. I.e. “required” items must always be present, whereas “optional” items can be

	omitted if not mandated for the operational purpose of a given Information Exchange Required • Identifier (e.g. ARCID, ADEP, ADES, EOBT, <EOBD>) – ICAO defined Optional • APTT – see IE defined above • Runway assigned to flight • Sequence Number – see below • Arrival Delay (global) – see below • Delay Share assigned to recipient • Time and delay at metering fix and other designated points on the trajectory -- see other IEs in this section • Advisories (e.g. TTL/TTG, speed advisory, route advisory ...) proposed by AMAN -- see IE above for TTL; AIRM definition for speed advisory • Aircraft performance characteristics (e.g. type of aircraft, wake turbulence category, ...) -- see ICAO definitions / AIRM • AMAN handling indicators – see new Information Element • *Miles to fly to threshold* Notes: • Logically, “CTA” could be grouped here. However, whether or not this information is to be considered part of the present Information Element needs to be discussed with 5.6.1. As mentioned above, this is out of scope of the OSED. • *The “miles to fly to threshold” property has been identified in a post-OSED discussion and is listed here as a suggestion for inclusion in the consolidated OSED*.

Identifier	*IE-5.6.4-0032-0032-PR001*
Name	*Sequence Number*
Description	*The ordinal number describing the position of a flight in the temporal sequence of threshold crossings.* *This is fixed for a given flight when the sequence is frozen, it does NOT change when the first plane lands.* *This is required to improve situational awareness by directly showing the ordering of flights, see REQ-5.6.4-REQS-0028-0690*
Value Range	*Integer > 0*

Identifier	*IE-5.6.4-0032-0032-PR002*
Name	*Arrival Delay*
Description	*For the purposes of the EXE-695, defined as the difference between time APTT and ETA as per the flight plan instance maintained by the flight data*

	processing system used by the Sequence Manager.
Value Range	*Numeric*

Identifier	*IE-5.6.4-0032-0032-PR003*
Name	*AMAN Strategy*
Description	*The 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*
Value Range	*Implementation dependent character string*

Identifier	IE-5.6.4-0032-0104
Name	AMAN Handling Indicator
Description	Descriptors of the status of a flight in the sequencing process, as required to give the executive controller appropriate situational awareness, e.g. “Presequenced, “CTA accepted”, See REQ-5.6.4-REQS-0028-0690, -0710
Value Range	Enumeration of predefined codes. Implementation dependent -- depends on procedures implemented in the ATCC in question.

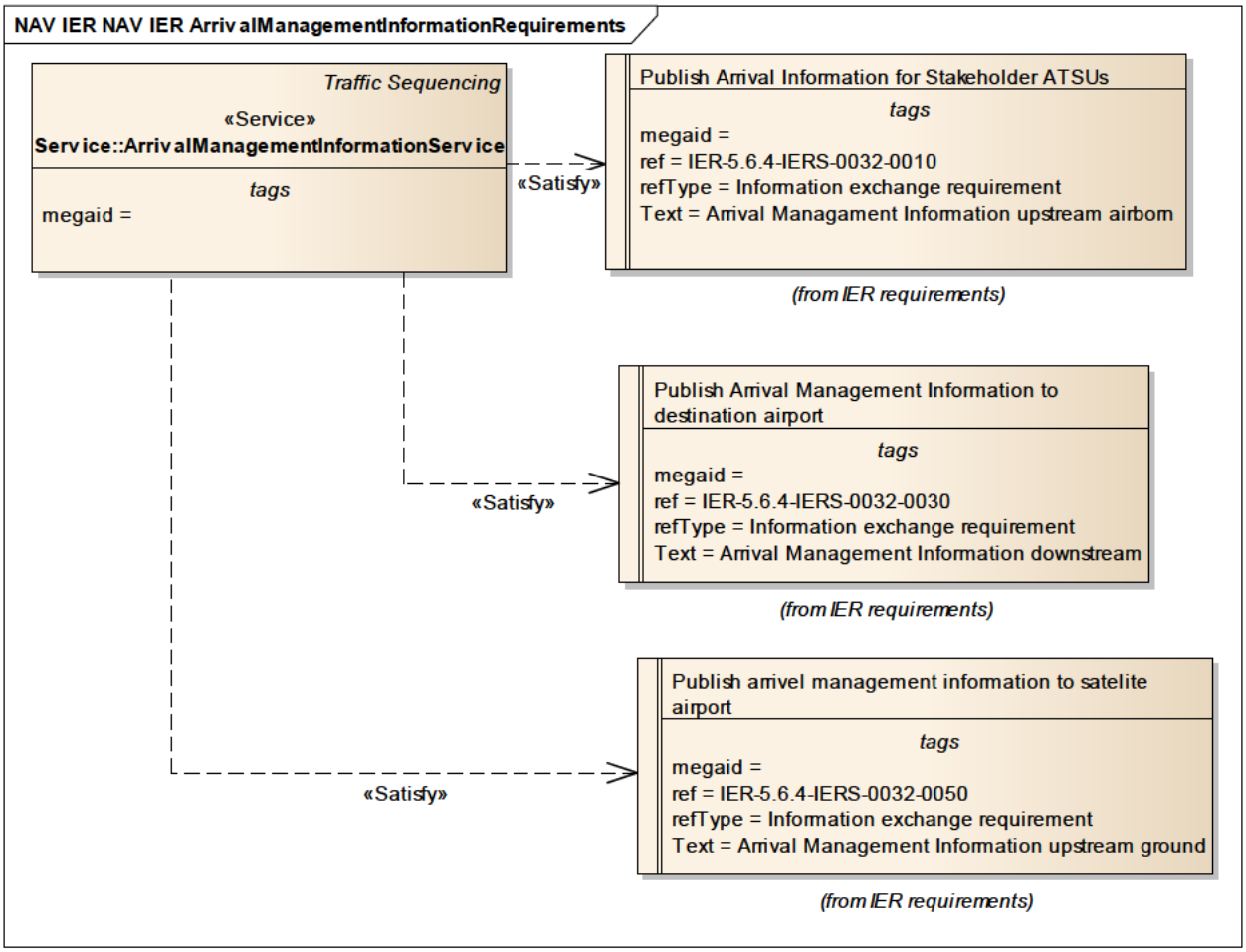

Figure 1 NAV IER Arrival Management Information Service to Requirements Traceability Diagram

3.2 Other Requirements

3.2.1 Non-Functional Requirements

Not available

Table 5: QoS

Identifier	IER/SPR Name	Property / Criteria	Comments
NFR13.02.02_xx.xx	Name of NFR	Property and Criteria	Your interpretataion of the NFR

3.2.2 Relevant Industrial Standards

Not available

3.2.3 Nodes

The mapping of EATMA Nodes to the service Interface Definition is shown below

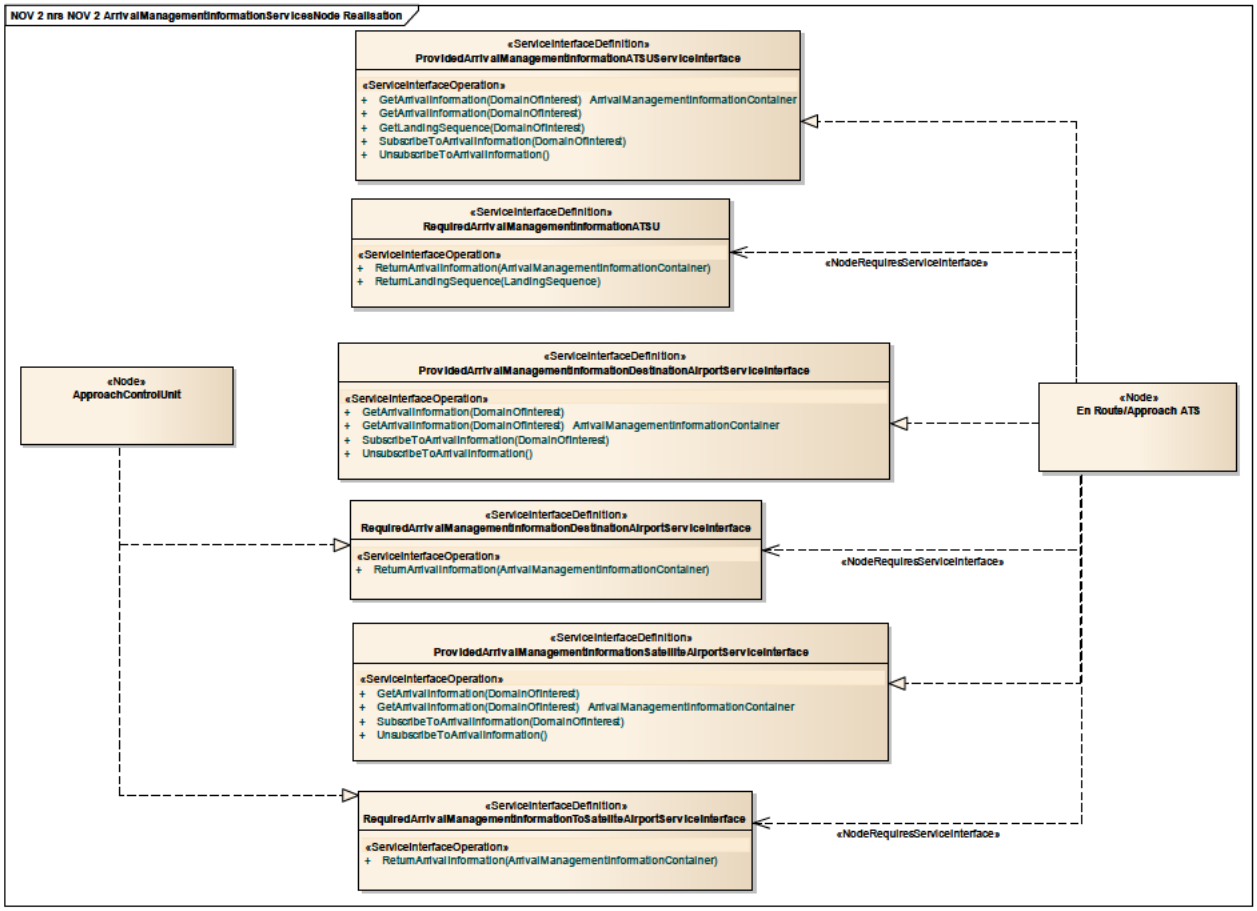

Figure 2 NOV-2 Node to Interface Definition Mapping

4 Service overview

4.1 Service Policies (Taxonomy)

The following diagram describes the relevant part of the ISRM Service Taxonomy, and the positioning of the identified service within it.

Figure 3: Part of the NSOV-1 service taxonomy diagram

4.2 Service Attributes (QoS)

Currently there are only preliminary quality of service definitions available, which according to P 4.6.7 shouldn't be used. It is foreseen that the service activity will be reopened when stable requirements concerning QoS are available.

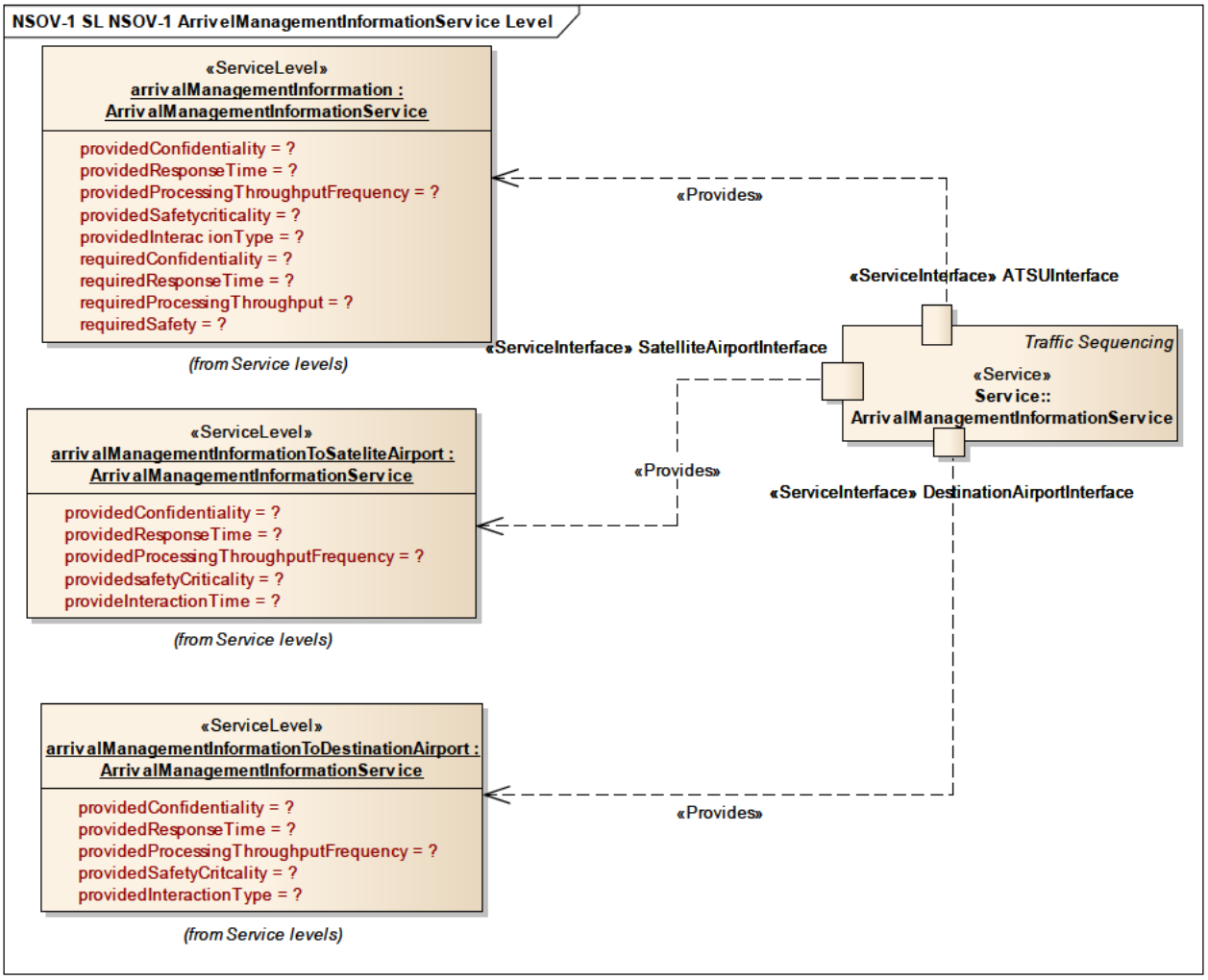

Figure 4: NSOV-1 Arrival Management Information Service Attributes

4.3 Service Functions and Capabilities

The functions and capabilities of the service can be shown through the following diagrams. The Operational Activities shown in the following diagram come from the EATMA import to the ISRM

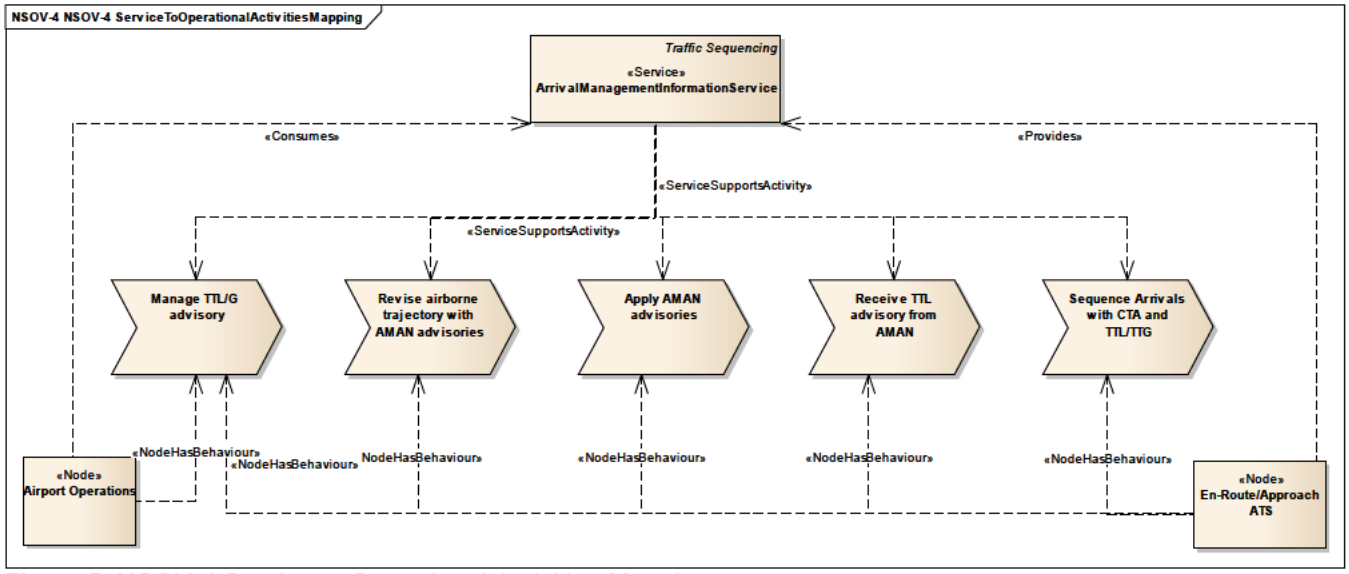

Figure 5: NSOV-4 Service to Operational Activities Mapping

The relationship between identified consumer and provider nodes can be shown in the NOV-2 Node Realization of Service diagram. Note the Nodes identified are taken from the common section of the ISRM as imported from EATMA repository.

4.4 Service Interfaces

It was decided to design one interface per stakeholder.

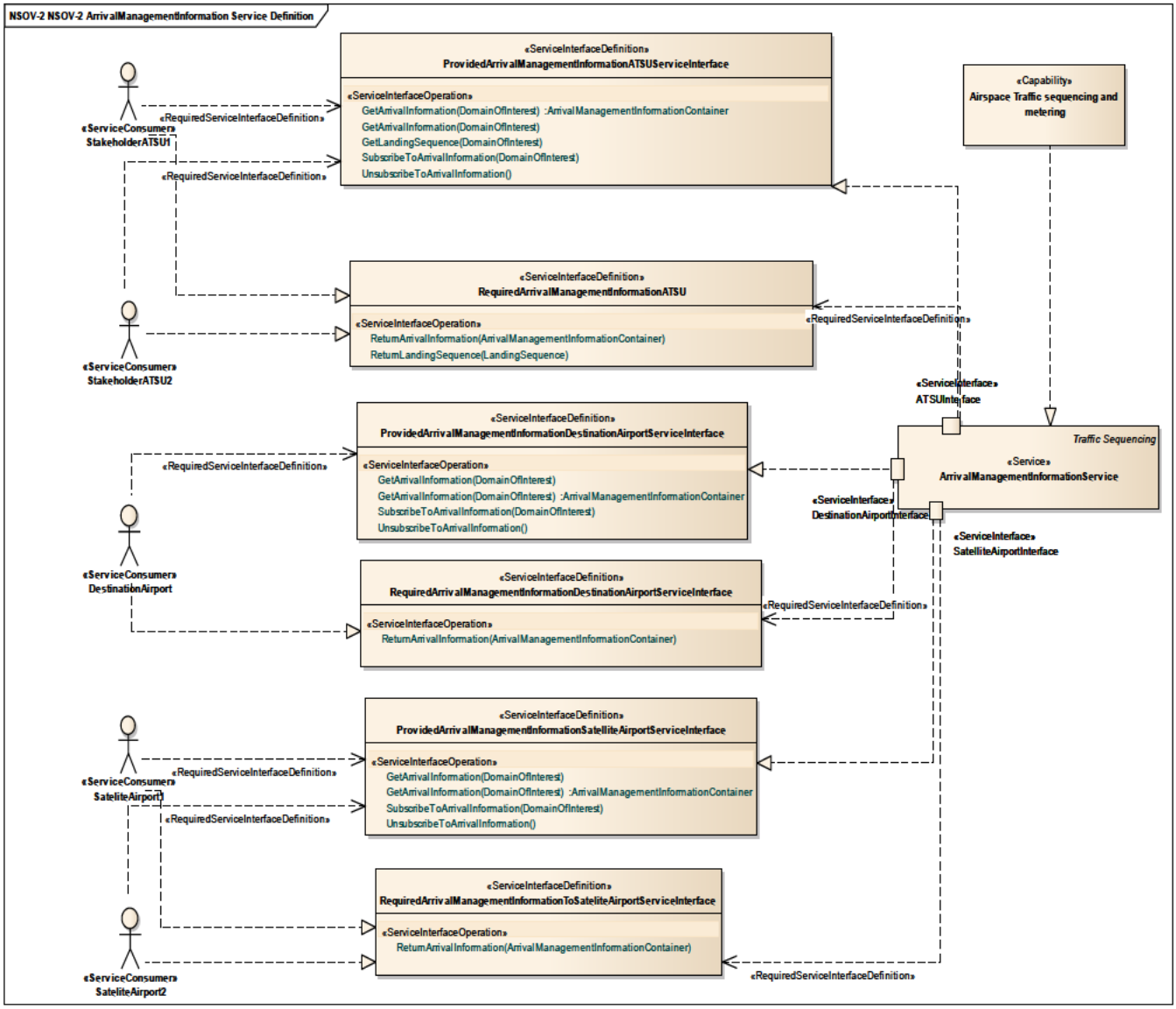

Figure 6: NSOV-2 Service Interface Definition

4.5 Service Operations

The Service Operations and service payloads are described in section 5.

5 Service interface specifications

For the service interface description UML-views refer to chapter 4.4.

5.1 'ProvidedArrivalManagementInformationATSUServiceInterface'

This service interface will be provided for a specific TMA/destination airport. It provides Arrival Management Information for a domain of interest (e.g. for a specific flight, for flights coming from a specified destination aerodrome,…). The main purpose of this interface is to transmit AMAN advisory information like a route advisory or a time to lose/gain (TTL/TTG) to a downstream ACC in the context of the AMAN extended horizon to avoid holdings and to support an optimal sequencing of arrival flights.

5.1.1 Operation 'GetArrivalInformation' (synchronous)

5.1.1.1 Operation Functionality

Operation for synchronous Information exchange of the Arrival Information.

5.1.1.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the information need of an upstream ACC for a particular situation in the context of AMAN extended horizon, to e.g. receive AMAN advisories for flights in their AOR or AOI.

Output Parameters

ArrivalManagementInformationContainer: The payload of the service containing the information need of a upstream ACC for a particular situation in the context of AMAN extended horizon, e.g. AMAN advisories for flights in their AOR/AOI.

5.1.2 Operation 'GetArrivalInformation' (asynchronous)

5.1.2.1 Operation Functionality

Operation for asynchronous Information exchange of the Arrival Information.

5.1.2.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the information need of an upstream ACC for a particular situation in the context of AMAN extended horizon, to e.g. receive AMAN advisories for flights in their AOR or AOI.

5.1.3 Operation 'GetLandingSequence'

5.1.3.1 Operation Functionality

This operation is used for a resynchronisation after a loss of information caused by e.g. a disruption of a network connection. It provides the whole current AMAN Sequence of a specified destination airport. A controller in an upstream center which is far away from the

destination airport needs AMAN Sequence Information for the whole airport as he is maintaining one route to this destination.

5.1.3.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the information need of an upstream ACC for a particular situation in the context of AMAN extended horizon, to e.g. receive AMAN advisories for flights in their AOR or AOI.

5.1.4 Operation 'SubscribeToArrivalInformation'

5.1.4.1 Operation Functionality

This operation allows a user to subscribe to the Arrival Management Information.

5.1.4.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the information need of an upstream ACC for a particular situation in the context of AMAN extended horizon, to e.g. receive AMAN advisories for flights in their AOR or AOI.

5.1.5 Operation 'UnsubscribeToArrivalInformation'

5.1.5.1 Operation Functionality

This operation allows to unsubscribe from the Arrival Management Information.

5.1.5.2 . Operation Parameters

none

5.2 'RequiredArrivalManagementInformationATSU'

Interface to be implemented on the consumer side (the stakeholder ATSU) to achieve e.g. AMAN advisories.

5.2.1 Operation 'ReturnArrivalInformation'

5.2.1.1 Operation Functionality

Operation to be used on the consumer side to receive the Arrival Management Information.

5.2.1.2 Operation Parameters

Input Parameters

ArrivalManagementInformationContainer: The payload of the service containing the information need of a downstream ACC for a particular situation in the context of AMAN extended horizon, e.g. AMAN advisories for flights in their AOR.

5.3 'ProvidedArrivalManagementInformationDestinationAirport ServiceInterface'

This Service Interface is provided by the AMAN Sequence Manager to fulfil the specific needs for Arrival Information of the Destination Airport, like a landing Time and runway direction.

5.3.1 Operation 'GetArrivalInformation(asynchronous)'

5.3.1.1 Operation Functionality

Operation for asynchronous Information exchange of the Arrival Information.

5.3.1.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a destination airport for a specific operational situation (runway, landing time,...)

5.3.2 GetArrivalInformation (synchronous)

5.3.2.1 Operation Functionality

Operation for synchronous Information exchange of the Arrival Information.

5.3.2.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a destination airport for a specific operational situation (runway, landing time,...)

Output Parameters

ArrivalManagementInformationContainer: The payload of the service containing the arrival management information need of a destination airport for a specific operational situation.

5.3.3 SubscribeToArrivalInformation

5.3.3.1 Operation Functionality

This operation allows to subscribe to the Arrival Management Information Service.

5.3.3.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a destination airport for a specific operational situation (runway, landing time,...)

5.3.4 UnsubscribeToArrivalInformation

5.3.4.1 Operation Functionality

This operation allows to unsubscribe from the Arrival Management Information Service.

5.3.4.2 Operation Parameters

none

5.4 'RequiredArrivalManagementInformationDestinationAirportServiceInterface'

This interface has to be implemented by the service consumer (the destination airport) to achieve Arrival Management Information.

5.4.1 Operation 'ReturnArrivalInformation'

5.4.1.1 Operation Functionality

Operation to be used on the consumer side to receive the Arrival Management Information for the destination airport.

5.4.1.2 Operation Parameters

Input Parameters

ArrivalManagementInformationContainer: The payload of the service containing the arrival management information need of a destination airport for a specific operational situation.

5.5 'ProvidedArrivalManagementInformationSatelliteAirportServiceInterface'

This Service Interface is provided to fulfil the specific needs for Arrival Information of a Satellite Airport (e.g. time to lose on the ground, APTT at the destination airport) which manages a departing flight with a destination airport in view of the concerned AMAN Sequence Manager.

5.5.1 Operation: 'GetArrivalInformation' (asynchronous)

5.5.1.1 Operation Functionality

Operation for asynchronous Information exchange of the Arrival Information.

5.5.1.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a satellite airport for a specific operational situation (time to lose on the ground, APTT...)

5.5.2 Operation: 'GetArrivalInformation' (synchronous)

5.5.2.1 Operation Functionality

Operation for synchronous Information exchange of the Arrival Information.

5.5.2.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a satellite airport for a specific operational situation (time to lose on the ground, APTT...)

Output Parameters

ArrivalManagementInformationContainer: The payload of the service containing the arrival management information need of a satellite airport for a specific operational situation.

5.5.3 Operation 'SubscribeToArrivalInformation'

5.5.3.1 Operation Functionality

This operation allows to subscribe to the Arrival Management Information Service

5.5.3.2 Operation Parameters

Input Parameters

DomainOfInterest: A set of criteria to specify the arrival management information need of a satellite airport for a specific operational situation (time to lose on the ground, APTT...)

5.5.4 Operation 'UnsubscribeToArrivalInformation'

5.5.4.1 Operation Functionality

This operation allows to unsubscribe from the Arrival Management Information Service.

5.5.4.2 Operation Parameters

none

5.6 'RequiredArrivalManagementInformationToSateliteAirport ServiceInterface'

This interface has to be implemented by the service consumer (a satellite airport) to achieve Arrival Management Information.

5.6.1 Operation 'ReturnArrivalInformation'

5.6.1.1 Operation Functionality

Operation to be used on the consumer side to receive the Arrival Management Information for the satellite airport.

5.6.1.2 Operation Parameters

Input Parameters

ArrivalManagementInformationContainer: The payload of the service containing the arrival management information need of a Satellite airport for a specific operational situation.

5.7 Service Payload

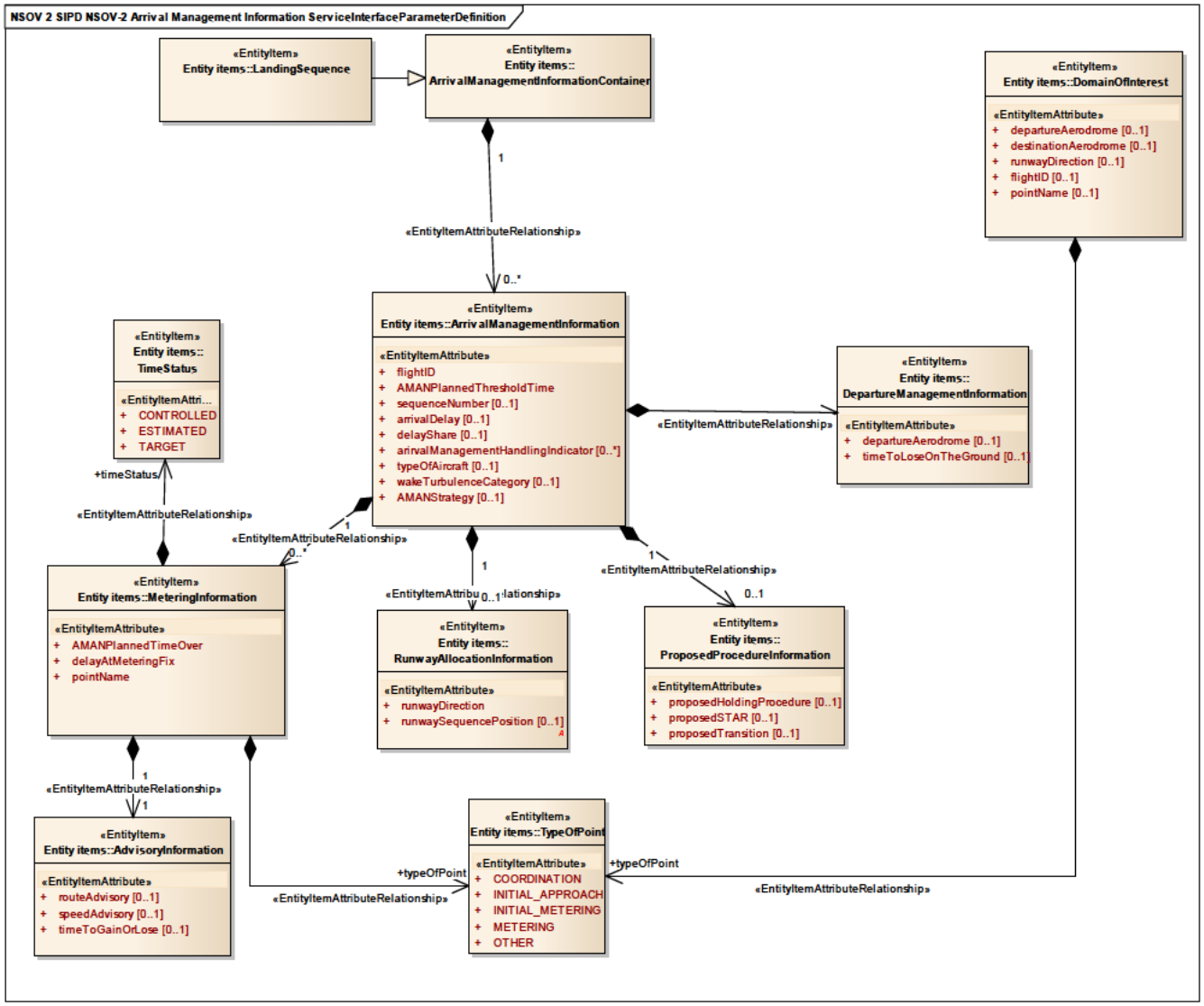

Figure 7: NSOV-2 Logical Payload Structure

The payload has been designed to allow access to the entire sequencing information produced by the AMAN tool, combined with the information about the sequencing status of the flight, even if the AMAN is not the reference source of the latter information.

It is worth mentioning that all aggregations and many of the attributes are defined as optional. This is because depending on the DomainOfInterest of a given service consumer, only restricted subsets of the full payload will be operationally meaningful. It is operationally desirable not to transmit information that is not relevant to the recipient.

Operational experts have only identified a minimum set of attributes as truly mandatory.

It is understood that in any specific service instance, a richer set of attributes will be specified as mandatory for the specific DomainOfInterest constellations supported by the service implementation. However, this is a configuration aspect that depends so much on local procedures that it cannot be standardized by the ISRM.

Arrival Management Information Container

The Set of Arrival management Information Items (Flight specific) returned by a request specifying the domain of interest.

Landing Sequence

The order in which two or more aircraft are planned to land taking into account ATM constraints, i.e. the order by APTT. The Landing Sequence is made up of Landing Sequence Entries, representing the single flights ordered by their arrival sequence number.

Domain Of Interest

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.

Arrival Management Information

Contains information on single flights concerning their integration into the arrival sequence.

Information relevant to all AMAN information users

AMAN Planned Threshold time (APTT) 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)?

Runway Allocation Information

Consists of attributes concerning the runway allocation for a given flight at the destination airport.

This information in conjunction with the Arrival Management Information implements the Arrival Management Information (Upstream) Information Element.

Departure Management Information

Contains departure information for a given flight.

This information in conjunction with the Arrival Management Information implements the “Arrival Management Information (Downstream Ground)“ Information Element.

Metering Information

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 statuses and advisories for fixes used in arrival management.

Advisory Information

Consists of attributes concerning the AMAN advisories which might be given for a particular flight at a particular fix indicated as “Metering Information”.

Proposed Procedure Information

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).

In conjunction with the “Arrival Management Information”, “Metering Information”, “Advisory information” and “Proposed Procedure Information” implement the “Arrival Management Information (Upstream Airborne)”Information Element.

5.8 Service Payload Mapping to the AIRM

The mapping of the service payload was done according to the ISRM Modelling Guideline via unique identifier for AIRM attributes or a linkage to AIRM CRs.

As a means of compliance to the AIRM the mapping of AIRM URNs and CRs to payload attributes of the Arrival Management Information Service is provided by the following sheet.

Table 6: Service Payload Mapping to AIRM

Element Name			Author	Notes
ArrivalManagementInformation				
	Attribute Name	**Type**		**Notes**
	flightID			
	Tagged Value Name		**Value**	
			urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightIdentifier:FlightIdentifier	
	Attribute Name	**Type**		**Notes**
	AMANPlannedThresholdTime			
	Tagged Value Name		**Value**	
	CLDMSemanticTrace		urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:Flight:FlightPhase:Arrival:AMANPlannedThresholdTime	
	Attribute Name	**Type**		**Notes**

	sequenceNumber		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:ArrivalManagement:ArrivalSequencing@sequencePosition	
	Attribute Name	**Type**	**Notes**
	arrivalDelay		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:Constraints:ATCConstraints:DelayApportionment@totalTimeToLoseOrGain	
	Attribute Name	**Type**	**Notes**
	delayShare		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:Constraints:ATCConstraints:PartialDelayApportionment	
	Attribute Name	**Type**	**Notes**
	arrivalManagementHandlingIndicator		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:DataTypes:Codelists:CodeAMANStatusType	
	Attribute Name	**Type**	**Notes**
	typeOfAircraft		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Aircraft:AircraftCharacteristics:AircraftType@icaoIdentifier	
	Attribute Name	**Type**	**Notes**
	wakeTurbulenceCategory		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Aircraft:AircraftCharacteristics:AircraftType@wakeTurbulanceCategory	
	Attribute Name	**Type**	**Notes**
	AMANStrategy		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	CR00397 (AMAN Strategy)	
Element Name	**Author**	**Notes**	
MeteringInformation			
	Attribute Name	**Type**	**Notes**
	AMANPlannedTimeOver		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:Flight:FlightPhase:Arrival:AMANPlannedTimeOverArrivalPoint	
	Attribute Name	**Type**	**Notes**
	delayAtMeteringFix		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:Constraints:ATCConstraints:TacticalConstraint@timeDelay	

	Attribute Name	Type	Notes
	pointName		

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:AirspaceInfrastructure:AirspacePoint:SignificantPointDesignator

Element Name	Author	Notes
AdvisoryInformation		

	Attribute Name	Type	Notes
	routeAdvisory		

	Tagged Value Name	Value
	CLDMSemanticTrace	CR00399 (AMAN Advisories revised)

	Attribute Name	Type	Notes
	speedAdvisory		

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightPhase:Arrival:OverArrivalPoint@speedAdvisory

	Attribute Name	Type	Notes
	timeToGainOrLose		

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightPhase:Arrival:OverArrivalPoint@timeToGainOrLose

Element Name	Author	Notes
RunwayAllocationInformation		

	Attribute Name	Type	Notes
	runwayDirection		

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:Runway:RunwayDirection@designator

	Attribute Name	Type	Notes
	runwaySequencePosition		

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:ArrivalManagement:ArrivalSequencing@sequencePosition

Element Name	Author	Notes
ProposedProcedureInformatiom		

	Attribute Name	Type	Notes
	proposedHoldingProcedure		

	Tagged Value Name	Value
	CLDMSemanticTrace	CR00399 (AMAN Advisories revised)

	Attribute Name	Type	Notes
	proposedSTAR		

	Tagged Value Name	Value
	CLDMSemanticTrace	CR00399 (AMAN Advisories revised)

	Attribute Name	Type	Notes
	proposedTransition		

	Tagged Value Name	Value
	CLDMSemanticTrace	CR00399 (AMAN Advisories revised)

Element Name	Author	Notes

DepartureManagementInformation			
	Attribute Name	**Type**	**Notes**
	timeToLoseOnTheGround		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	CR00399 (AMAN Advisories revised)	
	Attribute Name	**Type**	**Notes**
	departureAerodrome		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:Flight:departureAerodromeDesignator	

Element Name	Author	Notes
DomainOfInterest		
Attribute Name	**Type**	**Notes**
departureAerodrome		
Tagged Value Name	**Value**	
CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:Flight:departureAerodromeDesignator	
Attribute Name	**Type**	**Notes**
destinationAerodrome		
Tagged Value Name	**Value**	
CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:Flight:destinationAerodromeDesignator	
Attribute Name	**Type**	**Notes**
runwayDirection		
Tagged Value Name	**Value**	
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:Runway:RunwayDirection@designator	
Attribute Name	**Type**	**Notes**
flightID		
Tagged Value Name	**Value**	
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightIdentifier:FlightIdentifier	
Attribute Name	**Type**	**Notes**
pointName		
Tagged Value Name	**Value**	
CLDMSemanticTrace	urn:x-ses:sesarju:airmFACADE:v310:SubjectFields:AirspaceInfrastructure:AirspacePoint:SignificantPointDesignator	

Element Name	Author	Notes
TimeStatus		
Attribute Name	**Type**	**Notes**
CONTROLLED		
Tagged Value Name	**Value**	
CLDMSemanticTrace	CR00377 (AMAN terminology upgrade), see also urn:x-ses:sesarju:airm:v310:InformationModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:ATMConstraint:ControlledTimeOver	
Attribute Name	**Type**	**Notes**
ESTIMATED		
Tagged Value Name	**Value**	

	CLDMSemanticTrace		urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:DataTypes:Codelists:CodeEventPlanningStatusType@ESTIMATED
	Attribute Name	**Type**	**Notes**
	TARGET		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:DataTypes:Codelists:CodeEventPlanningStatusType@TARGET	
Element Name	**Author**	**Notes**	
TypeOfPoint			
	Attribute Name	**Type**	**Notes**
	COORDINATION		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AirTrafficControlOperations:Coordination:CoordinationAndTransfer:CoordinationData@coordinationPoint	
	Attribute Name	**Type**	**Notes**
	INITIAL_APPROACH		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightPhase:Arrival:OverArrivalPoint@initialApproachFix	
	Attribute Name	**Type**	**Notes**
	INITIAL_METERING		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightPhase:Arrival:OverArrivalPoint@initialApproachFix	
	Attribute Name	**Type**	**Notes**
	METERING		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:Flight:FlightPhase:Arrival:OverArrivalPoint@meteringFix	
	Attribute Name	**Type**	**Notes**
	OTHER		
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v310:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:AirspacePoint:SignificantPoint	

6 Service dynamic behaviour

6.1 Service Interface ‘ATSUInterface’

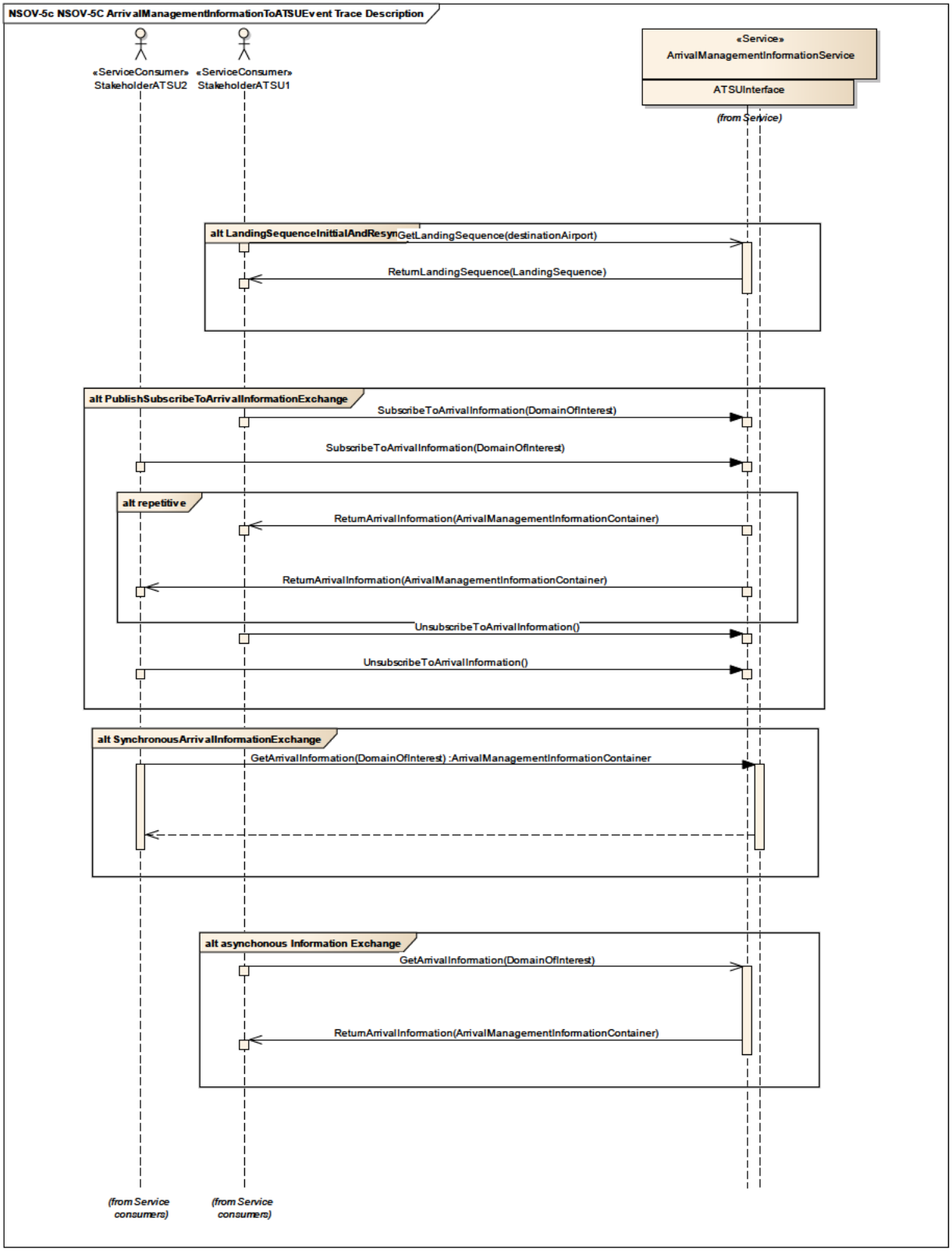

Figure 8: NSOV-5 Service Event Trace Description

6.2 Service Interface 'DestinationAirportInterface'

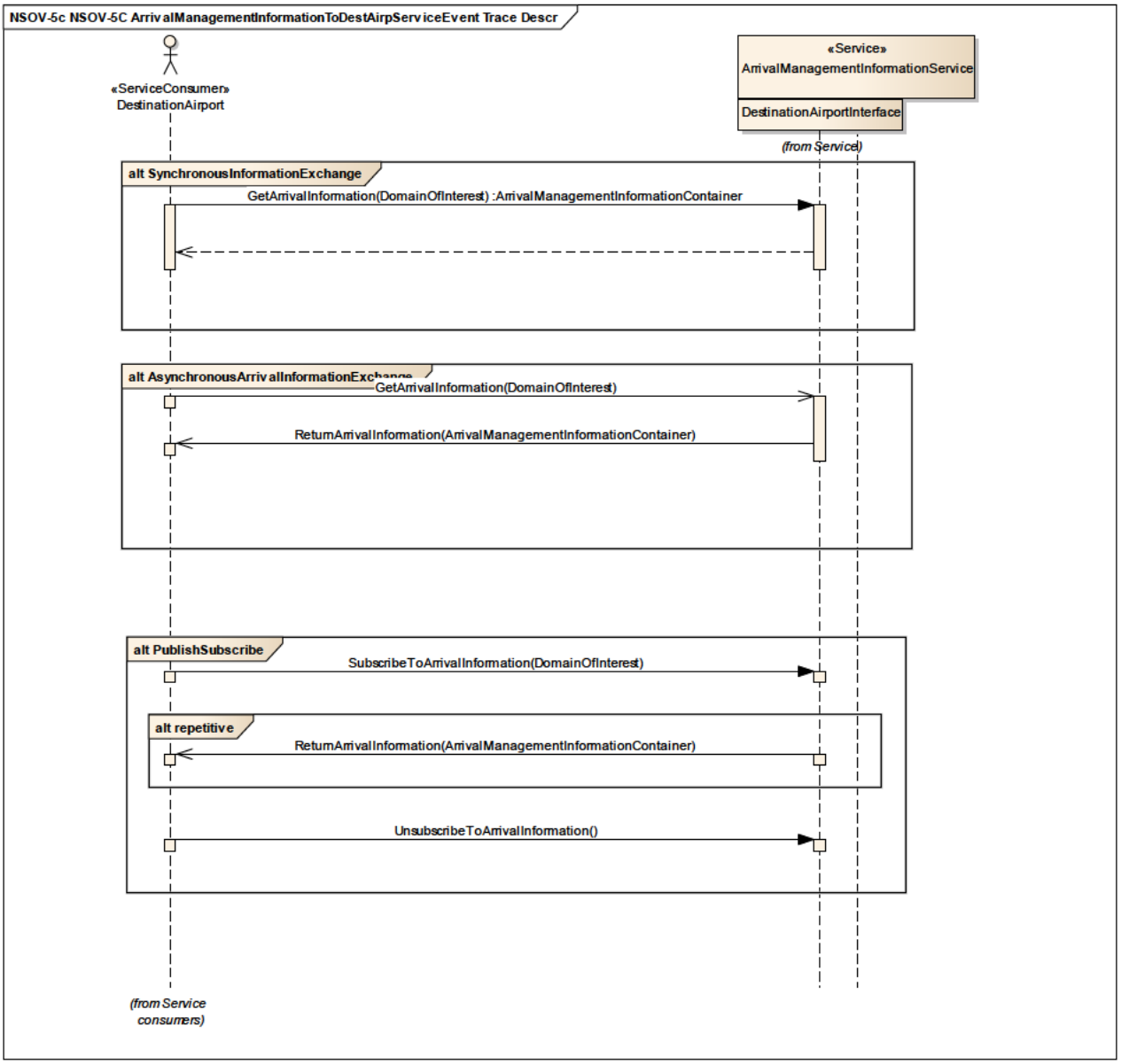

Figure 9: NSOV-5 Service Event Trace Description

6.3 Service Interface 'DestinationAirportInterface'

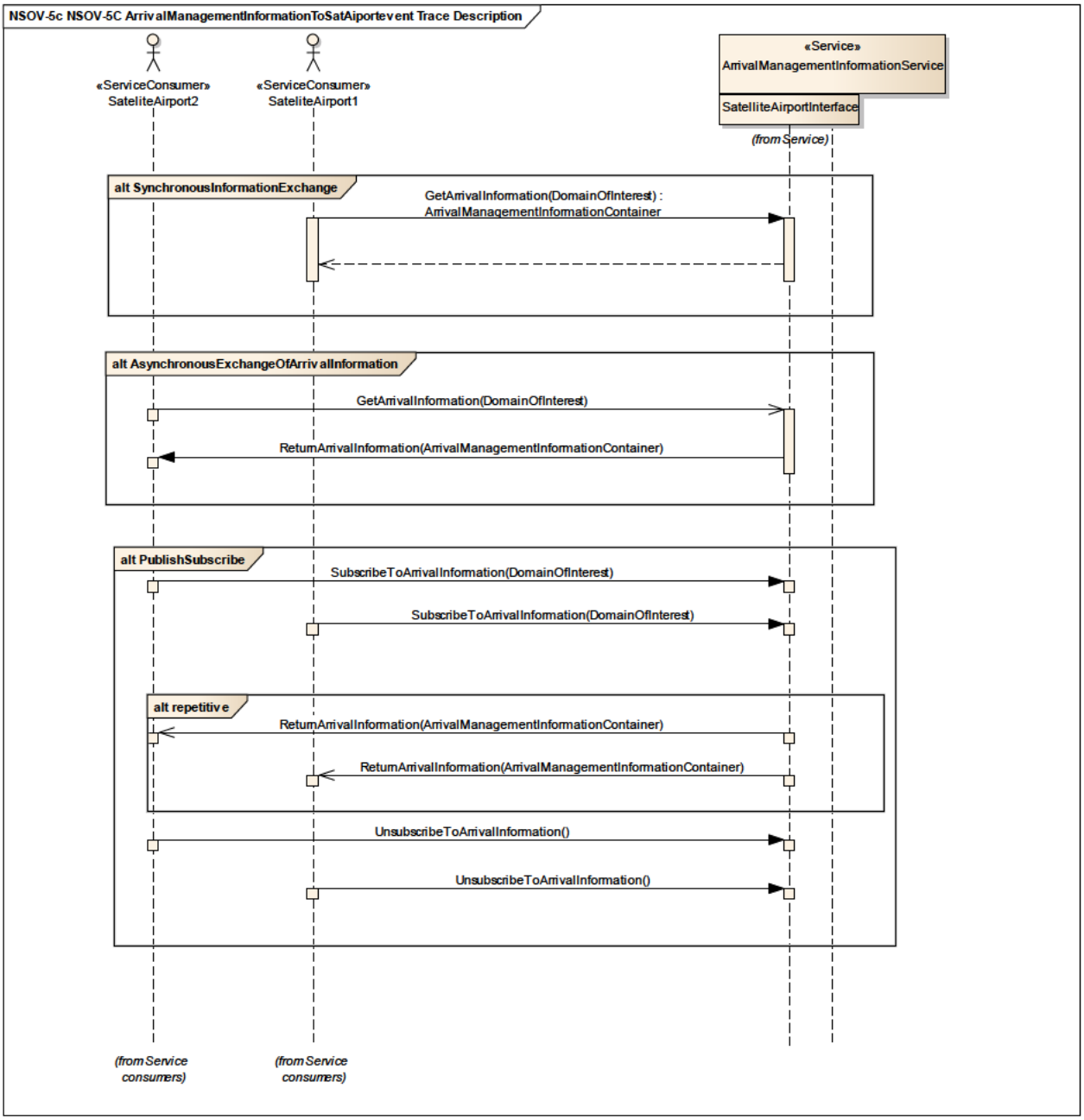

Figure 10: NSOV-5 Service Event Trace Description

7 Service provisioning (optional)

Not relevant.

8 Validation and Verification

8.1 Verification

Verification was performed using the WP 8.3.10 verification scripts.

Embedded verification report:

Verification report_ArrivalManag

Table 7: Verification Findings

Service Name:	Arrival Management Information Service	**Date of Verification:**	26/05/2014
Service Version:	00.01.00	**Version of Verification Rules used:**	00.03.10
Phase:	-		
Owner of Service:			
Name of Verifier:	[redacted]	**Manual**	
Overall Comments:		**Passes:**	
		Failures:	0
		Warnings:	0

ID	Path	Author	Modified	Type	Rule	Result	Comment	Response

The columns descriptions are:

ID	*The ID of the verification finding*	***Type***	*The type of element (e.g.Package, Class, Component, etc.)*
Path	*Unique EA identifier to the model element*	***Rule***	*The rule being executed*
Author	*The author of the model element*	***Result***	*Verification result i.e. true or false*
Modified	*Last time the model element was modified*	***Comment***	

8.2 Validation

The service instances of the Arrival Management Information Service will be implemented for the Validation Exercise 695 performed by the SESAR project 5.6.7. This exercise focuses on the exchange of AMAN advisory information between London Heathrow and ACC Reims. The will use the BARCO AMAN System as the providing system.

The operational platform at Reims UAC that will be used is called DSNA XMAN @ Reims UAC.

This platform will be based on the legacy DSNA operational system (CAUTRA) with the XMAN prototype (AMAN part of the D08 prototype from the 10.9.2) and will be connected with the operational platform of NATS. The D08 AMAN will be modified to support EXE-05-06-07 VP 695 in its validation task and the adaptation to the Reims UAC operational environment.

The different requirements are:

HMI requirements:

- Timeline with all aircraft, FL and target time over the COP
- Quic look on FL 360 et 380, considering RFL or current altitude
- Flight filters, for instance by flight levels, considering RFL or current level
- Implementation: One central position (for FMP) + 6 control positions
- The tool should connect to web service to collect NATS AMAN information.
- Architecture and technology choices (SWIM)
- Requirements in WP14, SWIM-TI Technical Specification 2.0, are considered.
- Cross Border WAN View

NATS provides arrival data thanks to a web server and via PENS (public internet possible use).

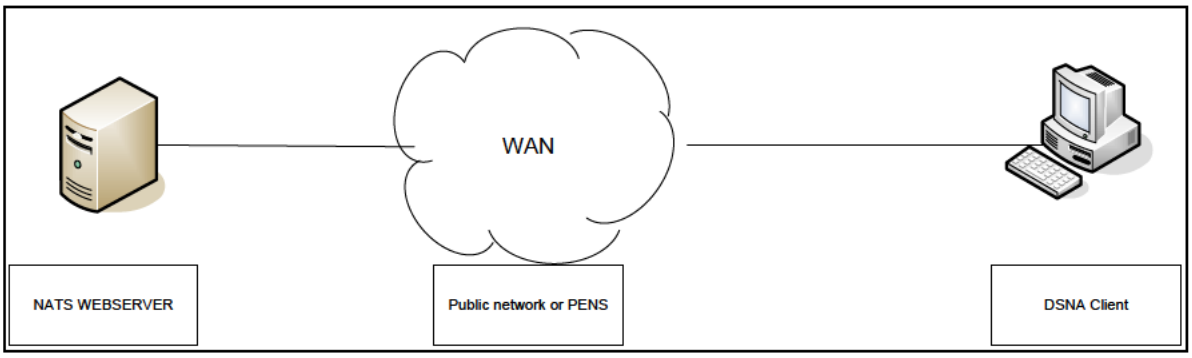

Figure 11: WAN architecture schema

DSNA VIEW

The flow entered the DSNA network through secured gateway. It is transported to the En-Route center via the internal DSNA WAN. There, a dedicated LAN or the test LAN if possible, will be used in order to:

- do not impact operational systems and network,
- allow an access to radar data.

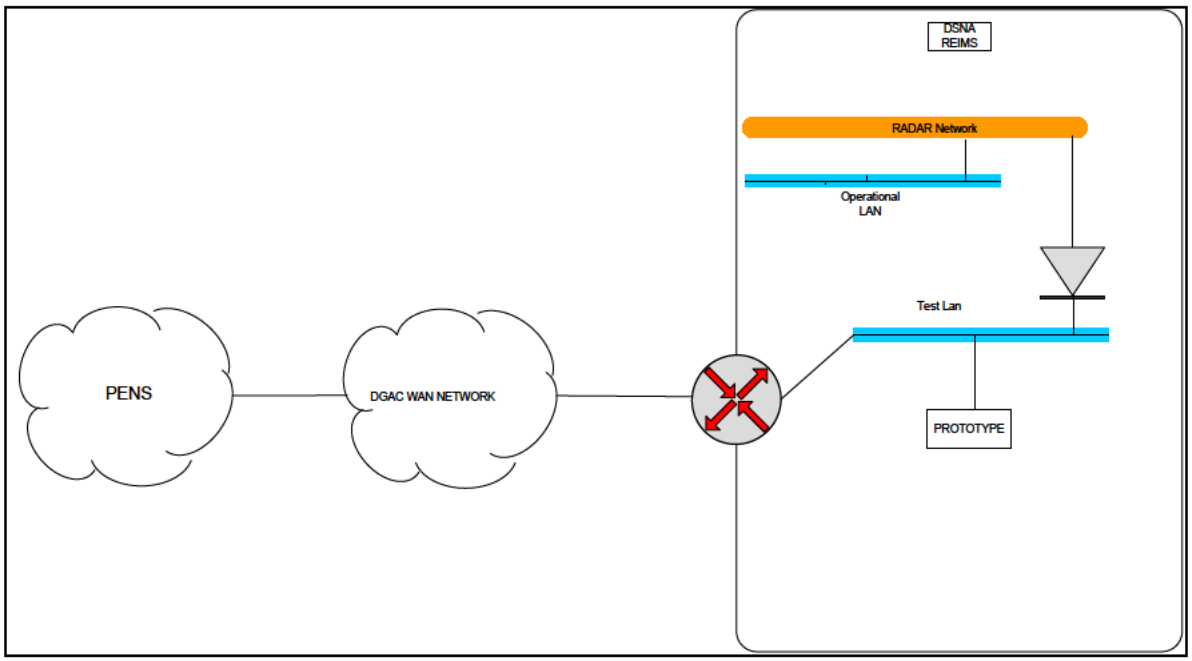

Figure 12: DSNA WAN/LAN view

Technology

Exercise will use an interoperability standard.

[REQ]

Table 8: Validation Protocoll Stack

Identifier	REQ-14.01.04-TS-0001.0001
Requirement	The SWIM Messaging capability shall be compliant with the following interoperability standards: ▪ SOAP 1.1 over HTTP 1.1. ▪ SOAP 1.2 over HTTP 1.1. ▪ XML over HTTP 1.1. ▪ DDS Real Time Publish Subscribe Protocol (DDS Interoperability Wire Protocol version 2.1). ▪ WS-Notification ▪ WS-Security ▪ UDDI 3.01
Title	Reims UAC D08 AMAN platform
Status	<In Progress>
Rationale	
Category	<V&V>
Validation Method	Live trial
Verification Method	

9 References

Nr.	Version	Location
[1] FAA Web Service Description Document	2008-16-10	http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/atc_comms_services/swim/documentation/media/briefings/WSDD%20FPS%20EXAMPLE%2008-16-10.pdf
[2] NATO Architecture Framework	v3.0 & 3.1	http://www.nhqc3s.nato.int/
[3] SoaML	1.0 Beta 09-04-01	http://www.omg.org/spec/SoaML/
[4] SESAR European ATM Service Description Document template	01.00.00	https://extranet.sesarju.eu/Programme%20Library/SESAR%20European%20ATM%20Service%20Description%20Document.dot
[5] WP8 Internal workflow including modelling artefacts	00.00.22	https://extranet.sesarju.eu/WP_08/SWP_08.00/Other%20Documentation/WP8%20Internal%20Workflow/WP8%20Internal%20workflow%20including%20modelling%20artefacts.doc
[6] SJU templates & guidelines package, Project deliverables template	03.00.00	https://extranet.sesarju.eu/Programme%20Library/Project%20deliverables%20template.dot
[7] SJU templates & guidelines package, OSED template	03.00.00	https://extranet.sesarju.eu/Programme%20Library/SESAR%20Operational%20Service%20and%20Environment%20Definition.dot
[8] SJU templates & guidelines package, SPR template	03.00.00	https://extranet.sesarju.eu/Programme%20Library/SESAR%20Safety%20and%20Performance%20Requirements.dot
[9] SID Document SVA005	00.01.00	https://extranet.sesarju.eu/WP_08/Project_08.03.10/Other%20Documentation/05%20Service%20Production/SVA005%20-%20Arrival%20Management%20Information%20Service/European%20ATM%20SID%20for%20Arrival%20Management%20Information%20Service%2000.01.00.docx
[10] DEL-05 06 07-D06-Technical Note to 564 OSED SPR INTEROP	00.01.01	https://extranet.sesarju.eu/WP_05/Project_05.06.07/Project%20Plan/Deliverables/DEL-05%2006%2007-D06-Technical%20Note%20to%20564%20OSED%20SPR%20INTEROP.docx

Appendix A Approval from P 5.6.7 and 10.2.9

Dear [redacted]

The ‘SDD (Service design description) for Arrival Management Information Service’ satisfies the operational needs of project 5.6.7 expressed in its deliverable D06-05.06.07 (Technical Note about IERs). Moreover, it seems to be in line with the validation needs of exercise EXE-05.06.07-VP-695 described in the existing DRAFT VALP.

There are no further comments or questions from our side.

Best Regards,

[redacted]

[redacted]

DFS Deutsche Flugsicherung GmbH
OP/SR
Am DFS-Campus 5
63225 Langen

Phone: +49 6103 707 5782
Fax: +49 6103 707 5741
E-Mail: [redacted]

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