European ATM Service Description for the RunwayManagementInformation Service

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Abstract

This document describes the RunwayManagementInformation Service and the relevant architectural elements. The service aims at providing information about the runway configuration and capacity (current and planned) at an aerodrome.

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This deliverable consists of SJU foreground.

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Executive summary

This document describes the RunwayManagementInformation Service and the relevant architectural elements. The service aims at providing information about the runways status, configurations and capacities at an aerodrome. Service design has been performed in the context of Service Activity SVA006 (RunwayManagement).
The scope of this development was to provide a SWIM enabled service for the participation in validation exercises EXE-06.09.02-VP-678 (V3 in Release 4) and EXE-06.09.02-VP-679 (V3 in Release 5), for inclusion in the SWIM Demo in May 2014 and finally for the Validation Exercise EXE-06.03.01-VP-669 (V3 in Release 5).

The service was first designed (version 1.00) to provide a simple request/response operation (*queryRunwayUsageNow)* and a publish/subscribe mechanism (*subscribeRunwayUsage, unsubscribeRunwayUsage, notifyRunwayUsageInformation*), allowing to disseminate information about the current runway configuration at an airport.

In the second version 00.02.00, the RunwayManagementInformation service was restructured and enhanced to provide more sophisticated temporal operations, allowing the publication and the requesting of planned runway configuration changes.

In the new version 00.03.00, the service was renamed to RunwayManagementInformation service and has been further enhanced to provide additional related information, such as runway capacity figures.

In the new version 00.04.00, the payload of the service was enhanced with additional information to improve usability of the service in situational awareness contexts.

The design complies with the ISRM Foundation and the service is published as part of ISRM 2.0.

1 Introduction

1.1 Purpose of the document

The service designed in this document will be a part of the Service Portfolio. The Service portfolio presents all services that are available or is planned to become available at a high level.

The purpose of this Service description document is to provide a holistic overview of a particular service and its building blocks. It services 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 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

The OSED of project 06.05.04 (Airport Operations Centre Definition) identifies the exchange of the runway status as an information exchange requirement (IER-06.05.04-OSED-CAPC.0105) and the exchange of information about arrival and departure capacity for runways.

The OSED of project 05.06.04 (Tactical TMA and En-route Queue Management) identifies the exchange of short-term expectations of runway status as an information exchange requirement (IER-5.6.4-IERS-0032-0040, partial).

1.4 Glossary of terms

No terms beyond the ones accepted by SESAR have been identified yet.

1.5 Acronyms and Terminology

1.5.1 Acronyms

Term	Definition
ADD	Architecture Description Document
ATM	Air Traffic Management
CC	Capability Configuration
EATMA	European Air Traffic Management Architecture
E-ATMS	European Air Traffic Management System
FAA	Federal Aviation Administration
IER	Information Exchange Requirement
ISRM	Information Service Reference Model
MG	ISRM Modelling Guidelines
NAF	NATO Architecture Framework

Term	Definition
NSOV	NATO Service Oriented View
NOV	NATO Operational View
NSV	NATO 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
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	Capability is the ability of one or more of the enterprise's resources to deliver a specified type of effect or a specified course of action to the enterprise stakeholders.	EATMA Guidance Material [8]
Capability Configuration	A Capability Configuration is a combination of Roles and Systems configured to provide a Capability derived from operational and/or business need(s) of a stakeholder type.	EATMA Guidance Material [8]
Node	A logical entity that performs Activities. Note: nodes are specified independently of any physical realisation.	EATMA Guidance Material [8]
Service	The contractual provision of something (a non-physical object), by one, for the use of one or more others. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or	EATMA Guidance Material [8]

Term	Definition	Source
	written processes and procedures.	
Service function	A type of activity describing the functionality of a Service.	EATMA Guidance Material [8]
Service interface	The mechanism by which a service communicates	EATMA Guidance Material [8]

2 Service identification

Name	RunwayManagementInformation
ID	{87D76EF7-FFAB-459b-97DF-616FC96588D3}
Version	4.0
Keywords	Runway Configuration, Runway Usage
Architect(s)	[redacted] FINMECCANICA [redacted] DFS [redacted] Frequentis

Lifecycle status	Date	References
Identified	08/04/2014	[15]
Allocated	N/A	Not provided by WPB4.3.
Designed	30/05/2016	This document and ISRM model. Previous versions of the service design were provided in the following SDDs: [16], [17], [18].
Validated	31/03/2015	[19]: Validation Report for Exercise EXE-06.09.02-VP-678 (for validation of version 1.0 of this service) [20]: Validation report for Exercise EXE-06.09.02-VP-679 (for validation of version 2.0 of this service). [21]: Validation report for Exercise EXE-06.03.01-VP-669 (for validation of version 3.0 of this service).
IOC	*Date for Initial Operational Capability*	*Reference to technical enabler hosting the service in the ATM master plan*
FOC	*Date for Full Operational Capability*	*Reference to technical enabler hosting the service in the ATM master plan*

3 Operational and Business context

The operational context for the RunwayManagementInformation service derives from the P05.06.04 OSED ([11] and [12]) and INTEROP ([13]).

The RunwayManagementInformation service enables the Aerodrome ATS to:

- actively inform interested parties about runway information (e.g.: current and/or planned runway configuration). Among the interested parties are the Network Manager (who collects the information for further distribution – see below), the Airport Operations and/or En-route/Approach ATS units (both of them may either consume the runway information directly from the Aerodrome ATS or from the Network Manager – see below).

The RunwayManagementInformation service enables the Network Manager to:

- receive runway information (e.g., current and/or planned runway configuration) from Aerodrome ATS units;
- provide runway information (e.g., current and/or planned runway configuration) to interested parties, such as Airport Operations or En-Route/Approach ATS units.

In the context of Airport Performance Management, the current and planned ARR/DEP capacities from the Runway Management Tool are shared with the AOP as an input to the Airport DCB process. The Airport DCB can then aggregate runway plan information together with other constraints and compute aerodrome-related KPIs, in order to assess the current resources availabilities against the demand.

In response to these operational needs, the temporal scope of the present services is time scales on which DCB and other resource planning efforts by interested parties is effective, i.e. the primary focus of this service is common situational awareness.

The on-the-spot management of the “runway” in response to short-term tactical constraints, e.g.

- actual progress of individual flight operations,
- need for ground vehicle operations on the movement area, and
- MET nowcasts and observations

is supported by the early information sharing through the RunwayManagementInformationService service.

Note that the OFA 04.01.02 OSEDs [14] do not discriminate the “situational awareness” and “tactical management” aspects of Runway Management Information exchange. Therefore, the present service design provides for partial coverage of the pertinent IER.

3.1 Information Exchange Requirements

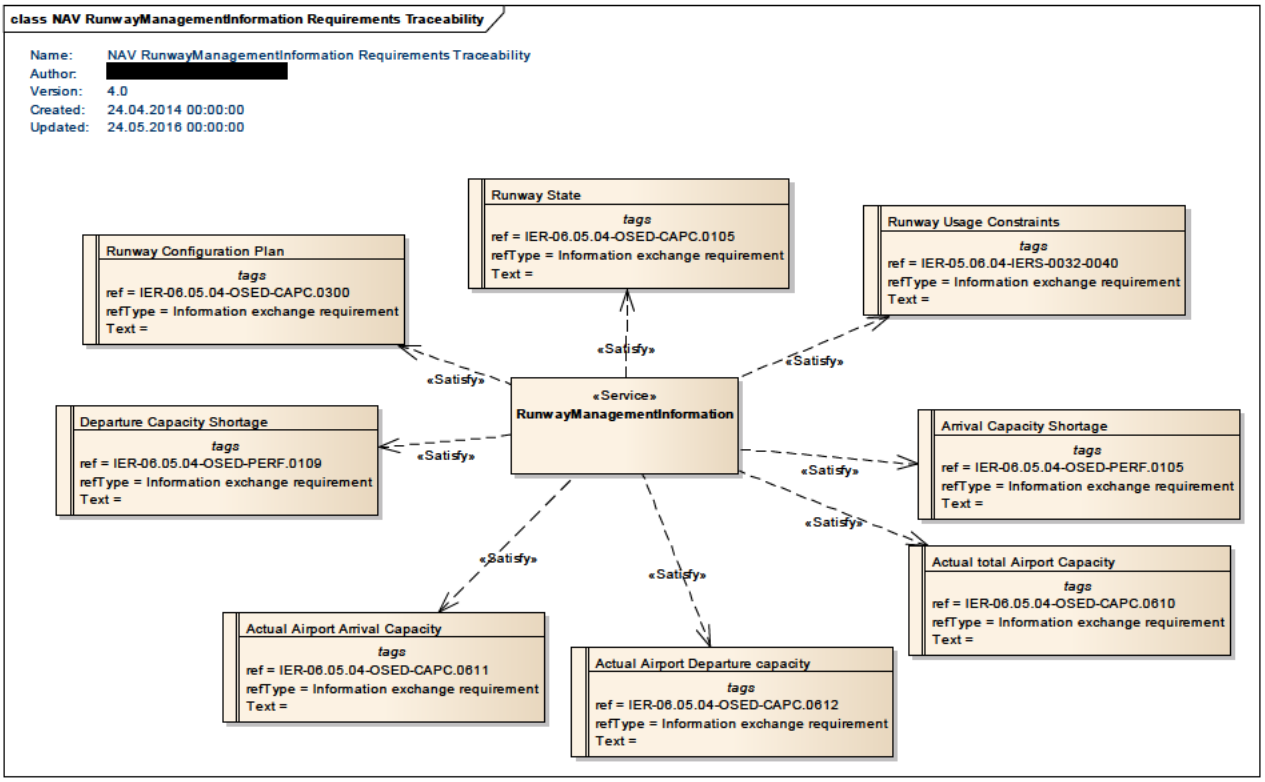


Figure 1: NAV RunwayManagementInformation Requirements Traceability IER diagram

Element Name	Author	Notes
Actual Airport Arrival Capacity	[redacted]	Actual Airport Arrival Capacity
Element Tagged Value Name		Value
ref		IER-06.05.04-OSED-CAPC.0611
refType		Information exchange requirement
Text		
Element Name	**Author**	**Notes**
Actual Airport Departure capacity	[redacted]	Actual Airport Departure capacity
Element Tagged Value Name		**Value**
ref		IER-06.05.04-OSED-CAPC.0612
refType		Information exchange requirement
Text		
Element Name	**Author**	**Notes**
Actual total Airport Capacity	[redacted]	Actual total Airport Capacity
Element Tagged Value Name		**Value**
ref		IER-06.05.04-OSED-CAPC.0610
refType		Information exchange requirement
Text		
Element Name	**Author**	**Notes**
Arrival Capacity Shortage	[redacted]	Arrival Capacity shortage Available Arrival Capacity – Arrival Demand (for pre-defined time frames)
Element Tagged Value Name		**Value**
ref		IER-06.05.04-OSED-PERF.0105
refType		Information exchange requirement
Text		
Element Name	**Author**	**Notes**

Departure Capacity Shortage	[redacted]	Departure Capacity Shortage Available Departure Capacity – Departure Demand (for pre-defined time frames)

	Element Tagged Value Name	Value
	ref	IER-06.05.04-OSED-PERF.0109
	refType	Information exchange requirement
	Text	

Element Name	Author	Notes
Runway Configuration Plan	[redacted]	Runway Configuration plan including for each defined time period: - The designators of each runway (planned to be) in use, - The operating mode of each runway, - The STAR / SID assignment for each runway. To be exchanged in combination with: Airport ID

	Element Tagged Value Name	Value
	ref	IER-06.05.04-OSED-CAPC.0300
	refType	Information exchange requirement
	Text	

Element Name	Author	Notes
Runway State	[redacted]	Runway State - For each runway: Open - in use / Open - not in use / Closed To be exchanged in combination with: Runway designator

	Element Tagged Value Name	Value
	ref	IER-06.05.04-OSED-CAPC.0105
	refType	Information exchange requirement
	Text	

Element Name	Author	Notes
Runway Usage Constraints	OFA 04.01.02 / [redacted]	**IER from OFA 04.01.02** The set of parameters describing the available capacity if runway(s) available to Arrival Management in Operational terms. Depending on … this may comprise … • Runway in use/closure/change of mode • ILS category • Landing Rate • … **SVA 006 aspect of IER** For situational awareness of all stakeholders, the set of parameters describing the available capacity of runway(s) should include Runway in use / closure / change / change of mode, expected ILS category and expected Landing Rate

	Element Tagged Value Name	Value
	ref	IER-05.06.04-IERS-0032-0040
	refType	Information exchange requirement

	Text	Note: partial coverage of requirement

Table 1: Requirements tracing

3.2 Other Requirements

3.2.1 Non-Functional Requirements

No NFR have yet been identified by the Operational Project.

3.2.2 Relevant Industrial Standards

N/A

3.2.3 Nodes

The Node to Service mapping for the RunwayManagementInformation service is presented in this figure:

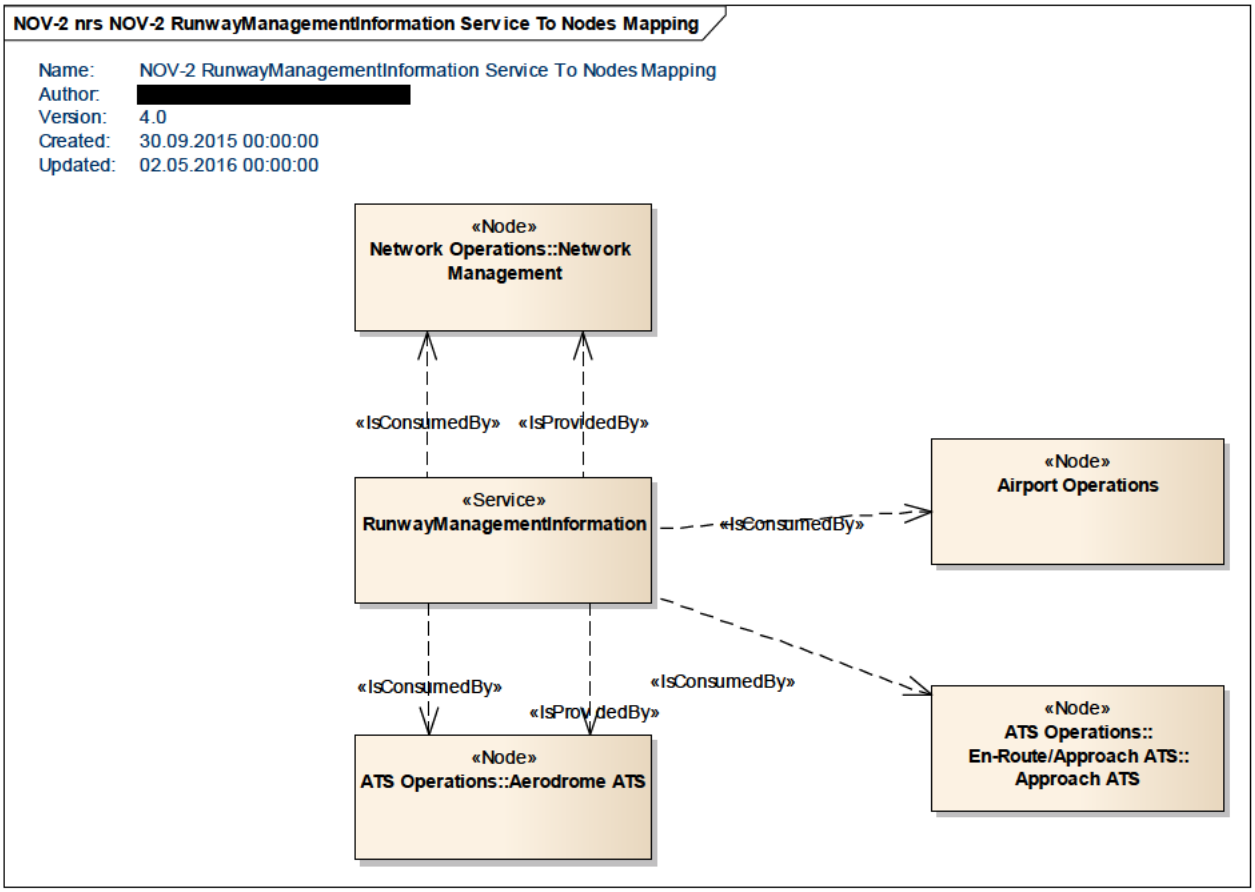


Figure 2: NOV-2 RunwayManagementInformation Service to Nodes Mapping diagram

This allows several potential deployment options as visualised in Appendix A.

4 Service overview

4.1 Service Taxonomy

The service taxonomy is described in the ISRM Service Portfolio document [9].

4.2 Service Levels (NfRs)

No service levels have yet been identified because of the missing NFR.

4.3 Service Functions and Capabilities

The mapping from Service to Operational Activities is shown in the NSOV-4 Service to Operational Activity diagram.

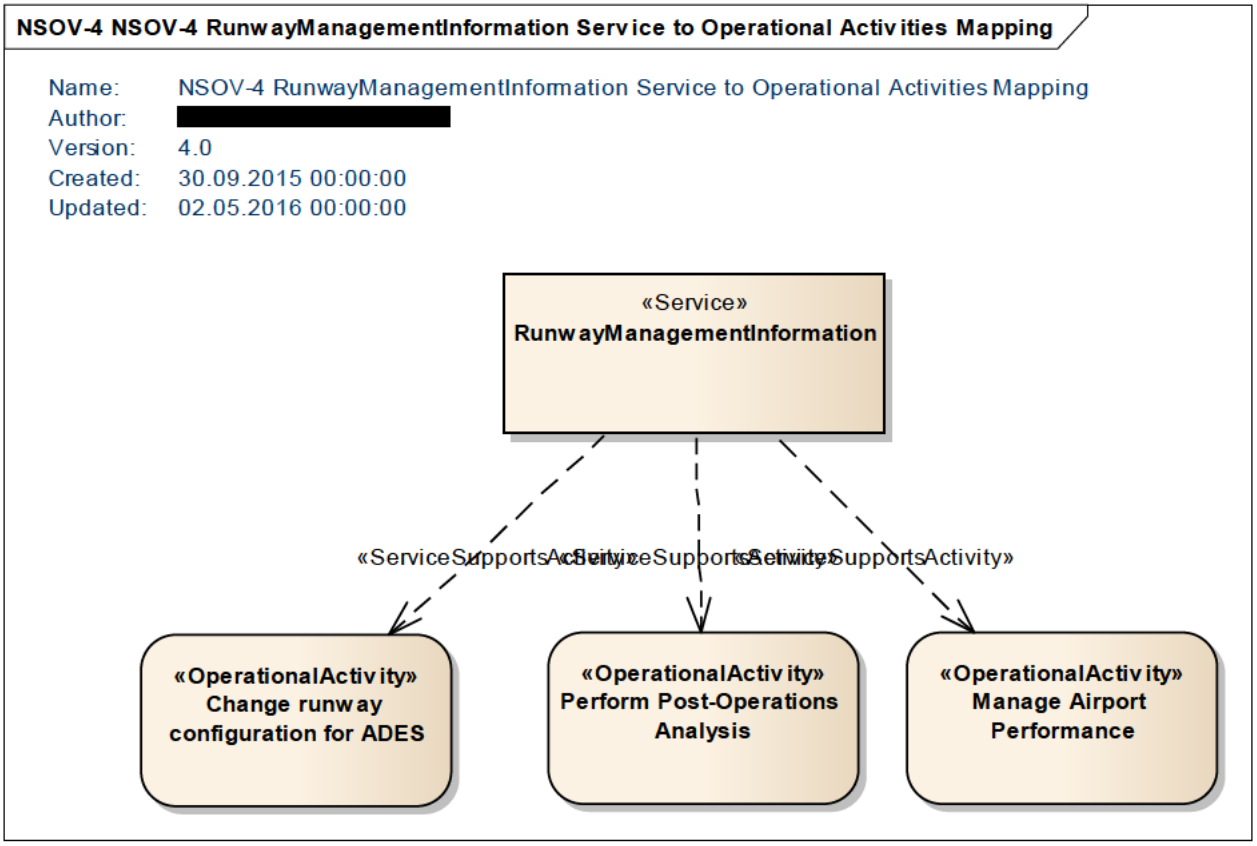


Figure 3: NSOV-4 RunwayManagementInformation Service to Operational Activities Mapping diagram

The mapping of service to capabilities is shown in Figure 4.

4.4 Service Interfaces

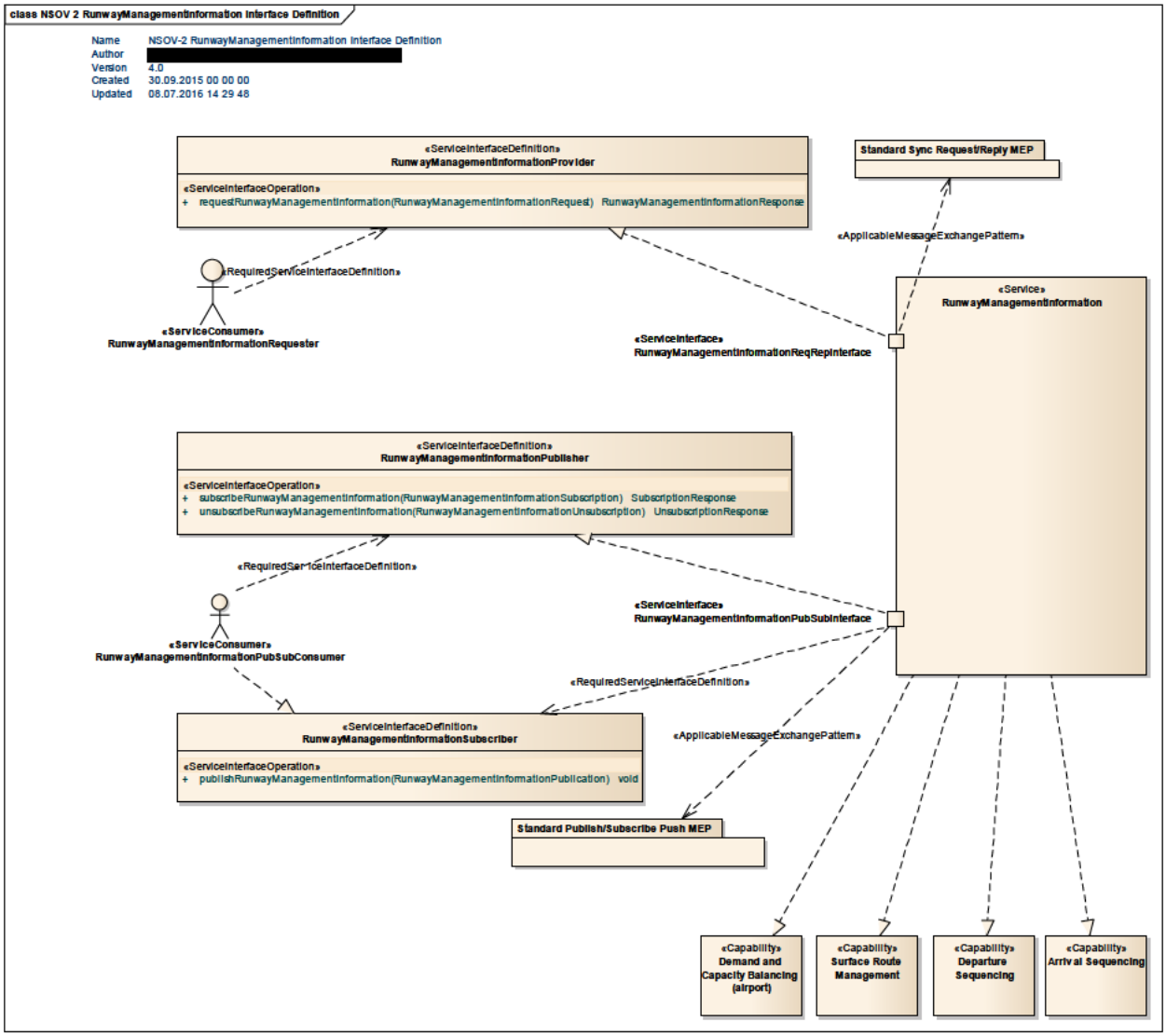


Figure 4: NSOV-2 RunwayManagementInformation Interface Definition diagram

ServiceInterface	ServiceInterfaceDefinition	ServiceInterfaceOperation	Role
RunwayManagementInformation-ReqRepInterface	RunwayManagementInformation-Provider	requestRunwayManagement-Information	provided
RunwayManagementInformation-PubSubInterface	RunwayManagementInformation-Publisher	subscr beRunwayManagement-Information	provided
RunwayManagementInformation-PubSubInterface	RunwayManagementInformation-Publisher	unsubscribeRunway-ManagementInformation	provided
RunwayManagementInformation-PubSubInterface	RunwayManagementInformation-Subscriber	publishRunwayManagement-Information	required

Table 2: Service Interfaces

5 Service interface specifications

The RunwayManagementInformation service is based on two interfaces, providing (a) a synchronous request/reply style interaction for retrieving data, and (b) a push style publish/subscribe mechanism. These service interfaces are supported by several service interface definitions.

5.1 Service Interface RunwayManagementInformationReqRepInterface

The RunwayManagementInformationProvider interface definition (see Figure 4) allows the consumer to request runway information data (a).

5.1.1 Service Interface Definition RunwayManagementInformationProvider

The RunwayManagementInformationProvider interface provides means to requesting information about the (planned or active) runway management information for a certain aerodrome.

A graphical representation of this interface is given in Figure 4.

5.1.1.1 Operation requestRunwayManagementInformation

5.1.1.1.1 Operation Functionality

Request the (actual or planned) runway management information from a selected aerodrome. Returns the runway information.

5.1.1.1.2 Operation Parameters

The only input parameter of the requestRunwayManagementInformation operation is the RunwayManagementInformationRequest, allowing to select the time interval for which the information is being requested (by providing a TimeInterval structure, specifying the start and end time via the “from” and “to” attributes).

The operation returns a RunwayManagementInformationResponse, containing a list of runwayInformationSlices. Each RunwayManagementInformationSlice holds the (current or planned) runway management information for a dedicated period of time by specifying

- the validityPeriod (a TimeInterval structure with two time stamps),
- the runway configuration and capacity per runway direction (a list of runwayInformations; for each runway direction, the RunwayCapacityAndConfiguration structure identifies the runway direction, specifies the arrival and departure capacity and expected landing rate and ILS category and specifies whether and for which purpose this direction is planned to be in use),
- the aggregatedRunwaysCapacity (the AerodromeAggregatedRunwaysCapacity structure contains aggregated arrival, departure and total capacity figures in dedicated attributes), and
- the aggregatedRunwaysShortage (same structure as aggregatedRunwaysCapacity).

A graphical representation of the operation payload is given in Figure 6.

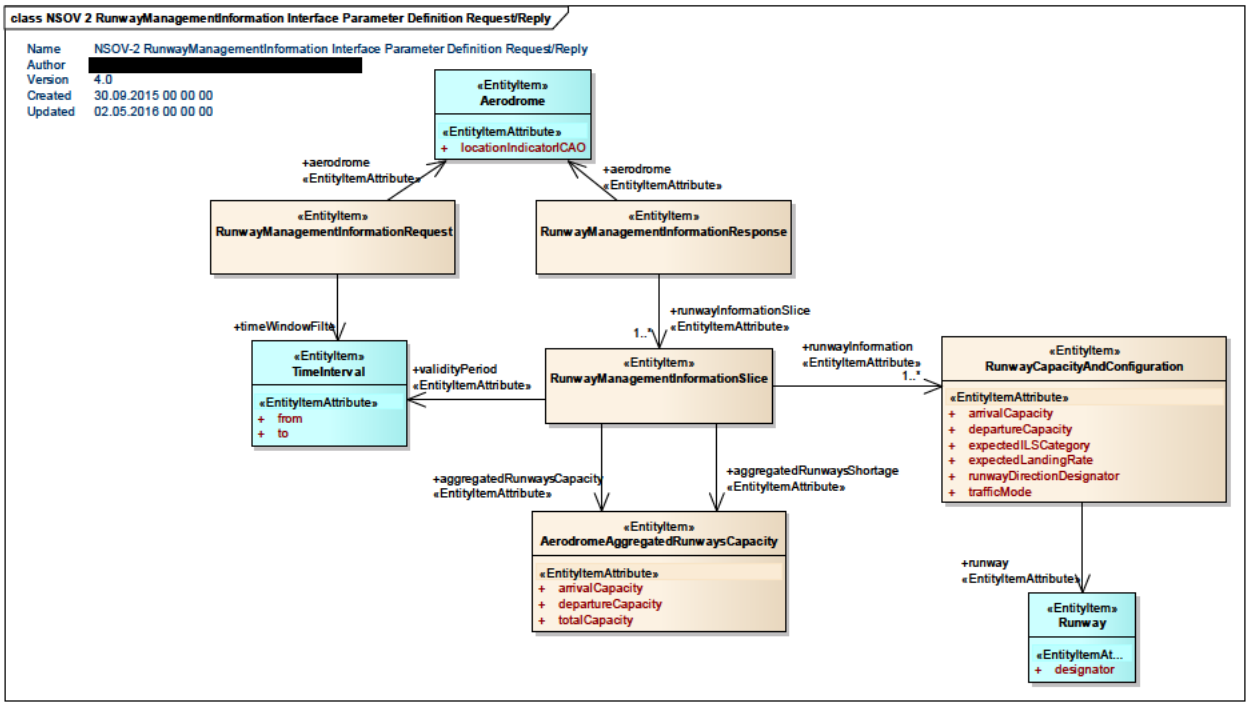


Figure 5: NSOV-2 RunwayManagementInformation Interface Parameter Definition Request/Response

Element Name	Author	Notes
AerodromeAggregatedRunwaysCapacity	[redacted]	The number of arrivals, departures and total aircraft movements taking into account the composite effect of all the runways at the airport.

	Attribute Name	Type	Notes
	arrivalCapacity		Number of arrivals per hour which can be accommodated by the entire runway infrastructure at the airport.

	Tagged Value Name	Value
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_ARRIVAL_CAPACITY
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

	Attribute Name	Type	Notes
	departureCapacity		Number of departures per hour which can be accommodated by the entire runway infrastructure at the airport.

	Tagged Value Name	Value
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_DEPARTURE_CAPACITY
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:Subje

		ctFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Attribute Name	Type	Notes
totalCapacity		Total movements per hour which can be accommodated by the entire runway infrastructure at the airport.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_TOTAL_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Element Name	Author	Notes
RunwayCapacityAndConfiguration	[redacted]	Information on a single runway operating mode and capacity.

Attribute Name	Type	Notes
arrivalCapacity		Number of arrivals per hour which can be accommodated by the runway.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@RUNWAY_DIRECTION_ARRIVAL_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Attribute Name	Type	Notes
departureCapacity		Number of departures per hour which can be accommodated by the runway.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@RUNWAY_DIRECTION_DEPARTURE_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Attribute Name	Type	Notes
expectedILSCategory		The ILS category expected to prevail in the time interval in question.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentILSCategory
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Codelists:CodeInstrumentApproachCategoryType

Attribute Name	Type	Notes
expectedLandingRate		The landing rate expected to be applicable in the time slice in question.

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentLandingRate

	Attribute Name	Type	Notes
	runwayDirectionDesignator		The full textual designator of the landing and take-off direction. Examples: 27, 35L, 01R.

	Tagged Value Name	Value
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:RunwayDirection@designator

	Attribute Name	Type	Notes
	trafficMode		The operating mode of the runway applicable for the time slice in question.

	Tagged Value Name	Value
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentRunwayMode
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeRunwayDirectionOperationModeType

Element Name	Author	Notes
RunwayManagementInformationRequest	[redacted]	A request for retrieving runway information, e.g., runway configuration plan, runway capacity, etc.
Element Name	**Author**	**Notes**
RunwayManagementInformationResponse	[redacted]	A response to the request for runway information.
Element Name	**Author**	**Notes**
RunwayManagementInformationSlice	[redacted]	The runway and aggregated runways capacities and configuration information for a given time interval.

Table 3: RunwayManagementInformationRequest and Response Payload tracing to AIRM

5.2 Service Interface RunwayManagementInformationPubSubInterface

The publish/subscribe interface RunwayManagementInformationPubSubInterface is specified by two interface definitions. The RunwayManagementInformationPublisher interface definition allows to subscribe or unsubscribe for being notified about runway information. This means, the RunwayManagementInformationPublisher interface supports the publish/subscribe message exchange pattern (b), together with the RunwayManagementInformationSubscriber interface, which allows the publisher to submit publication messages (see Figure 4).

The figure below provides an overview of the payload for the operations of the RunwayManagementInformationPublisher and the RunwayManagementInformationSubscriber service interface definitions.

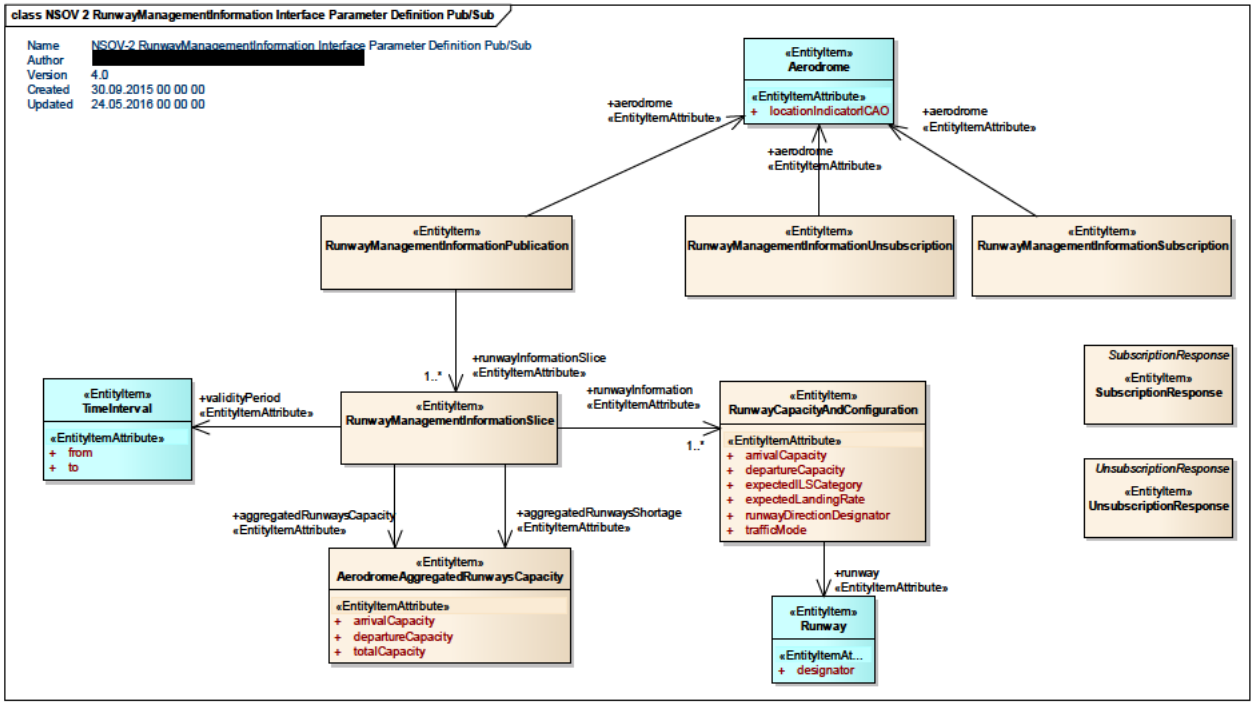


Figure 6: NSOV-2 RunwayManagementInformation Interface Parameter Definition Publish/Subscribe

5.2.1 Service Interface Definition RunwayManagementInformationPublisher

The RunwayManagementInformationPublisher interface provides means to

- subscribing for being informed of runway management information for a certain aerodrome;
- unsubscribing from being informed of runway management information for a certain aerodrome.

A graphical representation of this interface is given in Figure 4.

5.2.1.1 Operation subscribeRunwayManagementInformation

5.2.1.1.1 Operation Functionality

This operation allows subscribing for being informed about runway management information of a selected aerodrome. After a consumer has subscribed, the service will publish the runway management information either periodically, or whenever anything changes in the runway information.

5.2.1.1.2 Operation Parameters

The only input parameter of the subscribeRunwayManagmentInformation operation is the RunwayManagementInformationSubscription.

The operation returns a SubscriptionResponse.

A graphical representation of the operation payload is given in Figure 7.

Element Name	Author	Notes
RunwayManagementInformationSubscription	[redacted]	A request to subscribe to runway management information.
Element Name	**Author**	**Notes**
SubscriptionResponse	[redacted]	Reply to the subscription operation.

Table 4: RunwayManagementInformationSubscription Payload tracing to AIRM

5.2.1.2 Operation unsubscribeRunwayManagementInformation

5.2.1.2.1 Operation Functionality

This operation allows unsubscribing from being informed about runway management information of a selected aerodrome.

5.2.1.2.2 Operation Parameters

The only input parameter of the unsubscribeRunwayManagementInformation operation is the RunwayManagementInformationUnsubscription.

The operation returns a UnsubscriptionResponse.

A graphical representation of the operation payload is given in Figure 7.

Element Name	Author	Notes
RunwayManagementInformationUnsubscription	[redacted]	A request to unsubscribe from runway management information.
Element Name	**Author**	**Notes**
UnsubscriptionResponse	[redacted]	Reply to the unsubscription operation.

Table 5: RunwayManagementInformationUnsubscription Payload tracing to AIRM

5.2.2 Service Interface Definition RunwayManagementInformationSubscriber

The RunwayManagementInformationSubscriber interface definition provides means of being informed about runway management information data in the scope of a push style publish/subscribe MEP.

A graphical representation of this interface is given in Figure 4.

5.2.2.1 Operation publishRunwayManagementInformation

5.2.2.1.1 Operation Functionality

This operation allows the information provider to notify the information consumer about runway management information data at a certain aerodrome. This operation is used in the context of a publish/subscribe communication: as long as the service consumer is subscribed for runway management information for a certain aerodrome, the service provider uses this operation to notify the consumer about the runway management information at that aerodrome.

5.2.2.1.2 Operation Parameters

The only input parameter of the publishRunwayManagementInformation operation is the RunwayManagementInformationPublication, containing the published runway management

information as a list of RunwayManagementInformationSlices in an identical structure as described for the RunwayManagementInformationResponse in section 5.1.1.1.2.

The operation does not have a return type.

A graphical representation of the operation payload is given in Figure 7.

Element Name	Author	Notes
AerodromeAggregatedRunwaysCapacity	[redacted]	The number of arrivals, departures and total aircraft movements taking into account the composite effect of all the runways at the airport.

Attribute Name	Type	Notes
arrivalCapacity		Number of arrivals per hour which can be accommodated by the entire runway infrastructure at the airport.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_ARRIVAL_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Attribute Name	Type	Notes
departureCapacity		Number of departures per hour which can be accommodated by the entire runway infrastructure at the airport.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_DEPARTURE_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Attribute Name	Type	Notes
totalCapacity		Total movements per hour which can be accommodated by the entire runway infrastructure at the airport.

Tagged Value Name	Value
CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@AERODROME_RUNWAY_INFRASTRUCTURE_TOTAL_CAPACITY
CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value

Element Name	Author	Notes
RunwayCapacityAndConfiguration	[redacted]	Information on a single runway operating mode and capacity.

Attribute Name	Type	Notes

	arrivalCapacity		Number of arrivals per hour which can be accommodated by the runway.
	Tagged Value Name	**Value**	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@RUNWAY_DIRECTION_ARRIVAL_CAPACITY	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value	
	Attribute Name	**Type**	**Notes**
	departureCapacity		Number of departures per hour which can be accommodated by the runway.
	Tagged Value Name	**Value**	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeCapacityType@RUNWAY_DIRECTION_DEPARTURE_CAPACITY	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:DemandAndCapacityBalancing:Capacity@value	
	Attribute Name	**Type**	**Notes**
	expectedILSCategory		The ILS category expected to prevail in the time interval in question.
	Tagged Value Name	**Value**	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentILSCategory	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirspaceInfrastructure:Codelists:CodeInstrumentApproachCategoryType	
	Attribute Name	**Type**	**Notes**
	expectedLandingRate		The landing rate expected to be applicable in the time slice in question.
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentLandingRate	
	Attribute Name	**Type**	**Notes**
	runwayDirectionDesignator		The full textual designator of the landing and take-off direction. Examples: 27, 35L, 01R.
	Tagged Value Name	**Value**	
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:BaseInfrastructure:AerodromeInfrastructure:RunwayDirection@designator	
	Attribute Name	**Type**	**Notes**
	trafficMode		The operating mode of the runway applicable for the time slice in question.
	Tagged Value Name	**Value**	
	CLDMContextTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:Subje	

		ctFields:AirTrafficOperations:AerodromeOperations:RunwayOperationalConstraints@currentRunwayMode
	CLDMSemanticTrace	urn:x-ses:sesarju:airm:v410:ConsolidatedLogicalDataModel:SubjectFields:AirTrafficOperations:Codelists:CodeRunwayDirectionOperationModeType

Element Name	Author	Notes
RunwayManagementInformationSlice	[redacted]	The runway and aggregated runways capacities and configuration information for a given time interval.

Element Name	Author	Notes
RunwayManagementInformationPublication	[redacted]	A notification containing runway management information.

Table 6: RunwayManagementInformtionPublication Payload tracing to AIRM

6 Service dynamic behaviour

The RunwayManagementInformationInformation service supports different message exchange patterns (MEP), as sketched in the figures below.

6.1 Service Interface RunwayManagementInformationReqRepInterface

A synchronous Request/Reply MEP is realised by the requestRunwayManagementInformation operation of the RunwayManagementInformationProvider interface definition.

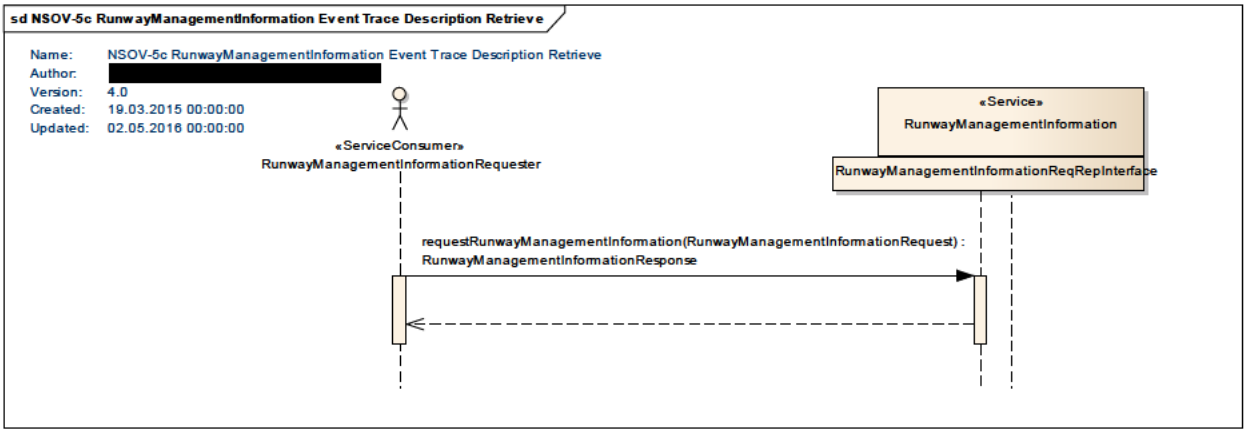


Figure 7: NSOV-5c RunwayManagementInformation Event Trace Description: Request/Response

6.2 Service Interface RunwayManagementInformationPubSubInterface

A push-style Publish/Subscribe MEP is realised by the subscribeRunwayManagementInformation and unsubscribeRunwayManagementInformation operations of the RunwayManagementInformationPublisher interface definition in combination with the publishRunwayManagementInformation operation of the RunwayManagementInformationSubscriber interface definition.

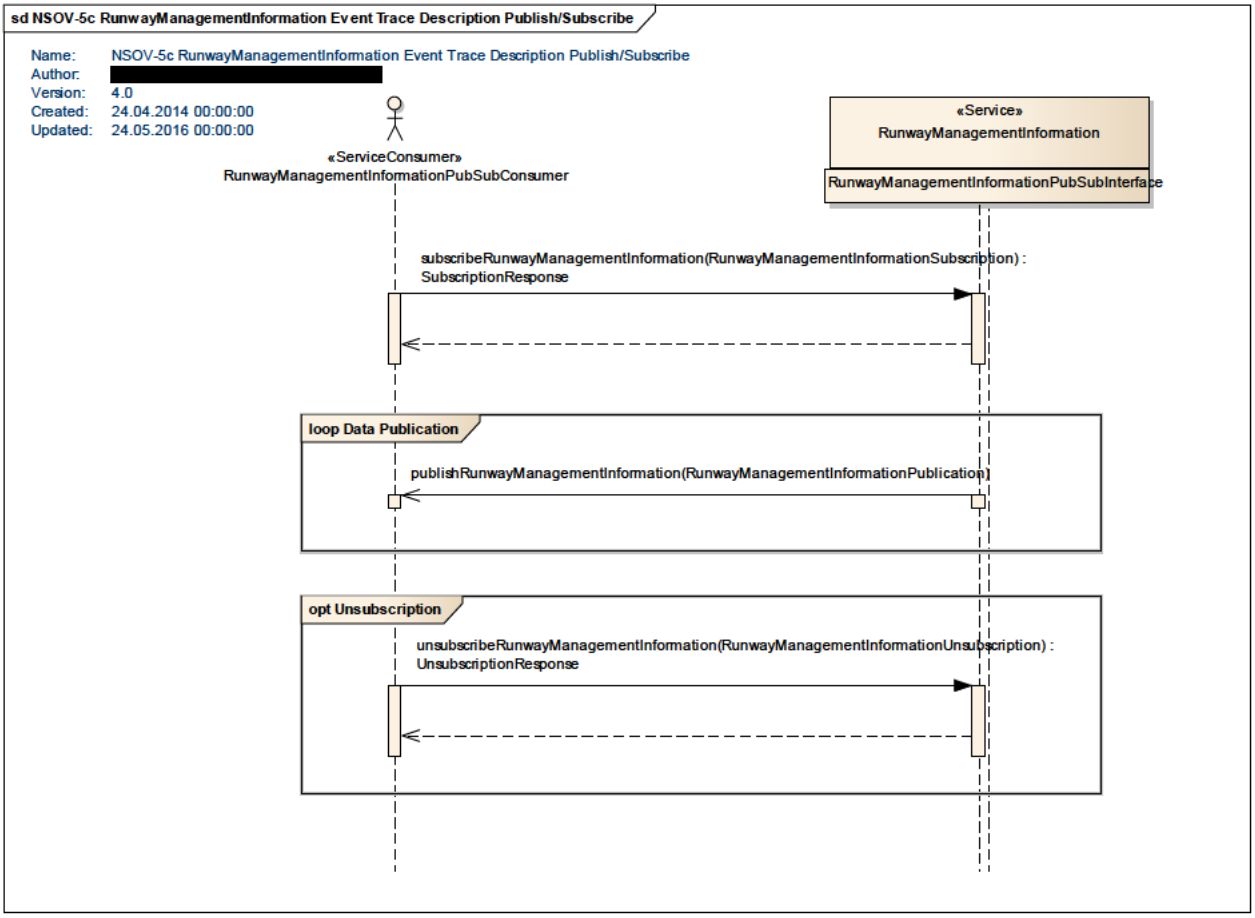


Figure 8: NSOV-5c RunwayManagementInformation Event Trace Description: Publish/Subscribe

7 Service provisioning (optional)

N/A

8 Validation and Verification

8.1 Verification

Verification performed according to the ISRM Rulebook [6] following the ISRM Verification Guidelines [7]. This includes use of verification scripts. Verification is partly automatic, partly semi-automatic and partly manual.

8.1.1 Verification Results

The verification reports for the service can be found in the Verification Reports directory located in the D65 delivery package:

Designed_Services_-_RunwayManagementInformation.xls

Designed_Services_-_RunwayManagementInformation_Common.xls

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

8.2 Validation

The first release of this service was verified and validated in Release 4 A-CWP prototype developed by DFS and Frequentis in project 12.05.04 as part of EXE-06.09.02-VP-678. The performed exercise verified at function level the compliance against the system requirements developed in phase 2, part 2 of the project. The exercise method used is a test. For details regarding the objectives covered by this exercises please refer to the “Frequentis/DFS Verification Report - Phase 2” [10].

Validation exercise EXE-06.09.02-VP-679 validated and verified the version 2.0 of the Service.

The objectives covered are:

- OBJ-12.05.04-VP-DST3.0030/ Verify that the SWIM Service is provided by the A-CWP prototype.

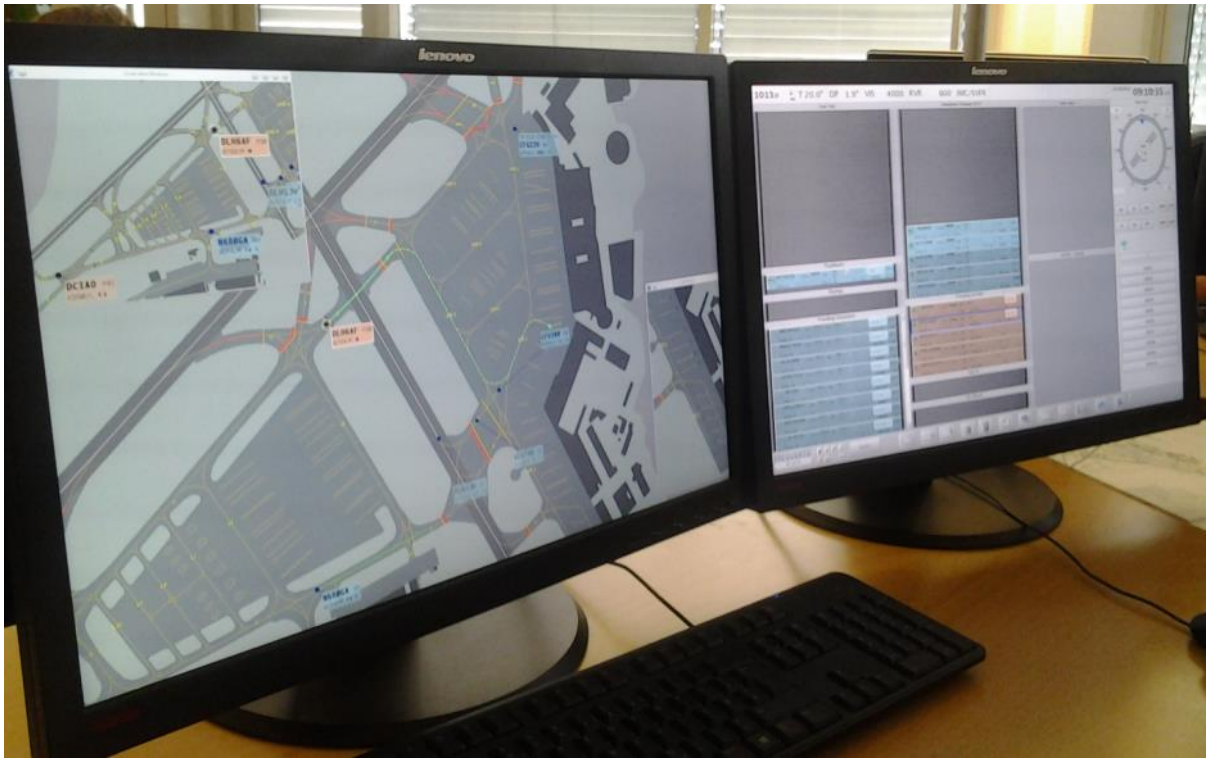


Figure 9: A-CWP in Testbed at DFS premises in Langen/Germany

Validation Exercise EXE-06.03.01-VP-669 validated version 3.0 of the service in the context of Airport Operations. The service allows the Runway Management Tool at the TWR to share information about capacity plan to the AOP and therefore allow accurate DCB and performance management/monitoring.

9 References

Name	Version	Document ID / Location
[1] Project deliverables template	03.00.00	SJU templates & guidelines package, Project deliverables template
[2] OSED template	03.00.00	SJU templates & guidelines package, SESAR Operational Service and Environment Definition
[3] SPR template	03.00.00	SJU templates & guidelines package, SESAR Safety and Performance Requirements
[4] ISRM Tooling Guidelines	00.07.00	08.03.10 Deliverable D44
[5] ISRM Modelling Guidelines	00.07.00	08.03.10 Deliverable D44
[6] ISRM Rule Book	00.07.00	08.03.10 Deliverable D44
[7] ISRM Verification Guidelines	00.07.00	08.03.10 Deliverable D44
[8] EATMA Guidance Material	00.04.02	B.04.01 Deliverable D66
[9] ISRM service portfolio	00.08.01	08.03.10 Deliverable D65
[10] Frequentis/DFS Verification Report - Phase 2	00.01.00	12.05.04 D35
[11] OFA 05.01.01 Consolidated OSED (Part1)	00.03.01	06.05.04 D16 (Part1)
[12] OFA 05.01.01 Consolidated OSED (Part2)	00.03.01	06.05.04 D16 (Part2)
[13] Consolidated SPR_INTEROP	00.00.02	05 06 04 D34
[14] Consolidated OSED	02.00.00	05.06.04 D35
[15] Service Coordination Group 13 Minutes		20140408 SCG13 Minutes
[16] European ATM Service Description for the RunwayManagement Service	00.01.01	08.03.10 D61
[17] European ATM Service Description for the RunwayManagement Service	00.02.02	08.03.10 D63
[18] European ATM Service Description for the RunwayManagementInformation Service	00.03.00	08.03.10 D64

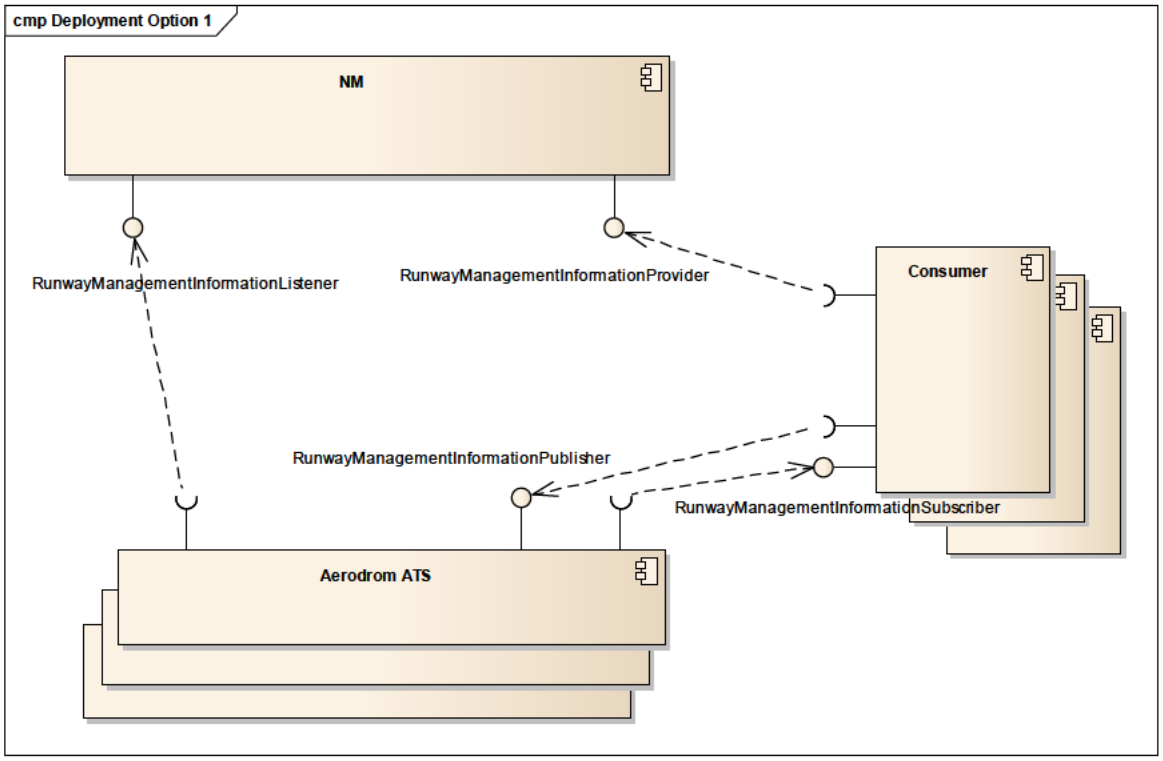
Name	Version	Document ID / Location
[19] Validation Report of the Validation Exercise EXE-06.09.02-VP-678 (Release 4)	00.01.02	06.09.02 D118
[20] Validation report of the Validation Exercise EXE-06.09.02-VP-679.		<Not yet available>
[21] Validation report of the Validation Exercise EXE-06.03.01-VP-669	00.01.00	06.03.01-D140

Appendix A Deployment Options

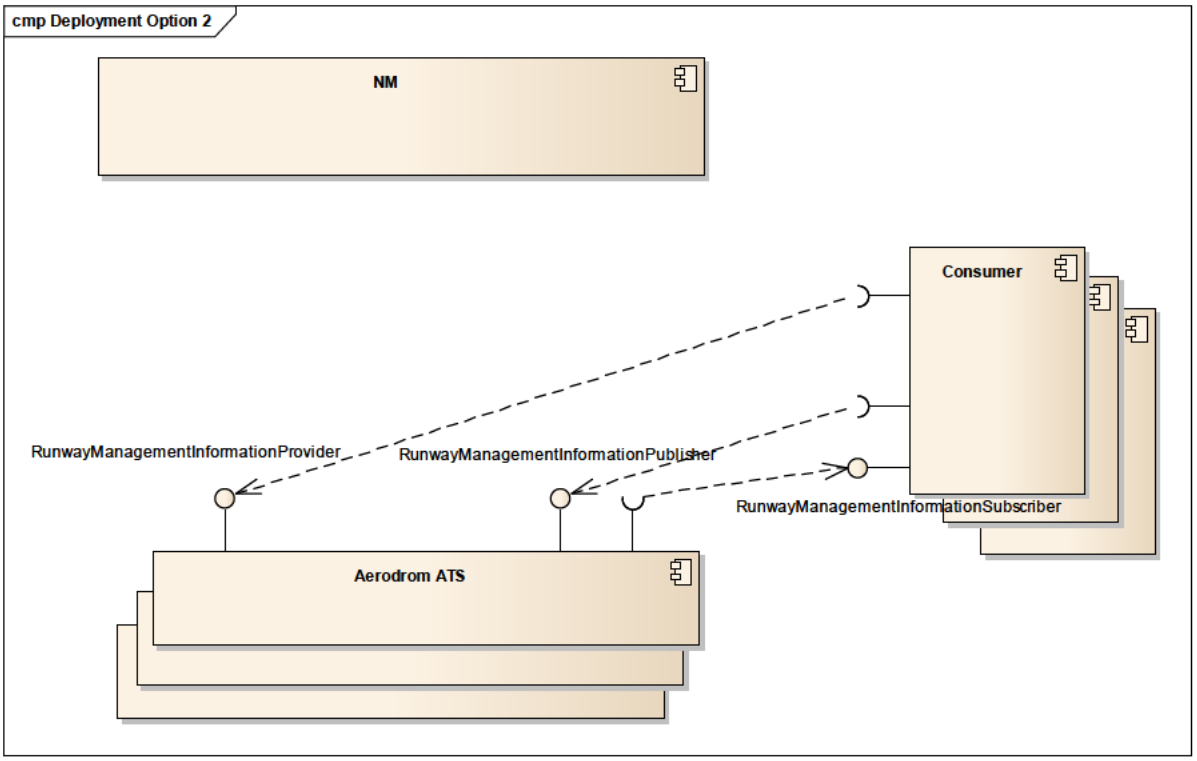
The logical design of the RunwayManagementInformation Service, with its different supported MEPs, supports various deployment options. A few of them are sketched in this annex.

Note that for future evolution, if all these deployment options should be supported, a refactoring of the service should be considered. The service should be split into two; one to be provided by the information provider (publish/subscribe and/or request/reply), the other one (a new standard one-way service) to be provided by the information receiver.

Deployment Option 1:
As described in B2B service description, NM collects Runway Configuration Plans from its clients (Aerodrom ATS) via the RunwayInformationListener interface and allows consumers to retrieve them on request via the RunwayInformationProvider interface.
In addition to the NM service, the originators (Aerodrome ATS) allow consumers to directly subscribe for being notified about the runway configuration plan.

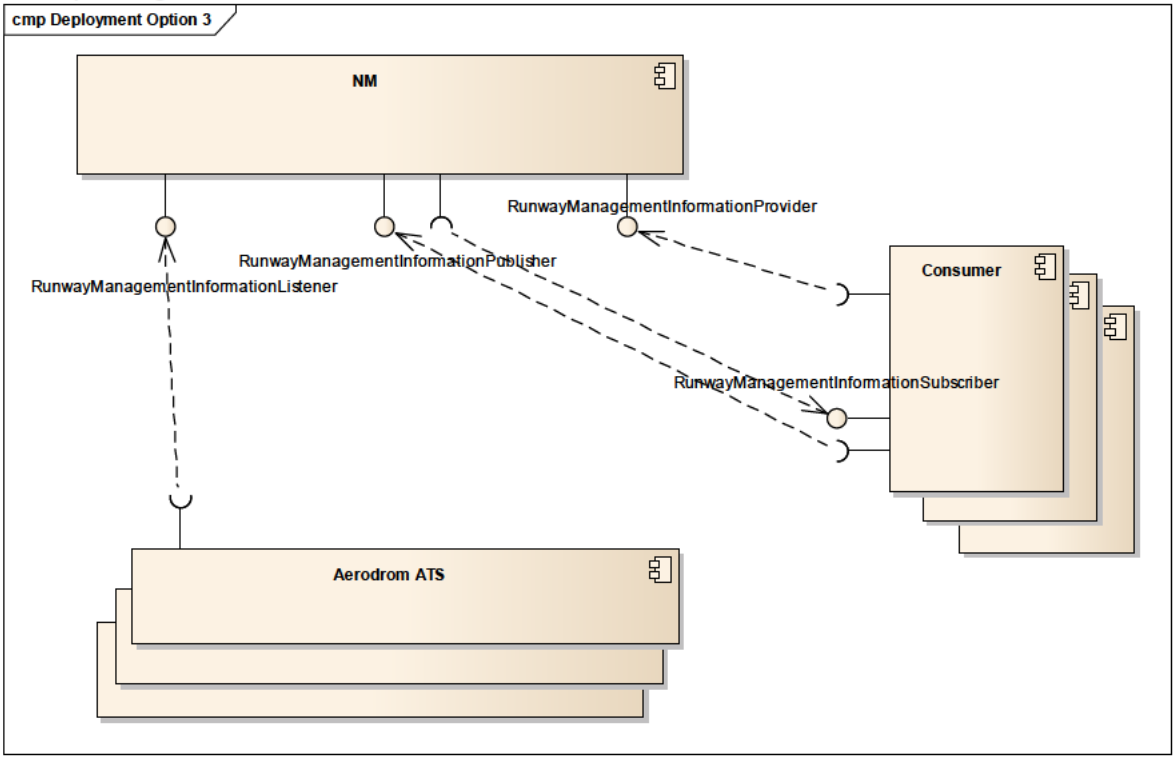


Deployment Option 2:
The information originators (Aerodrome ATS) could directly provide the RunwayInformationProvider interface (in addition to the pub/sub).



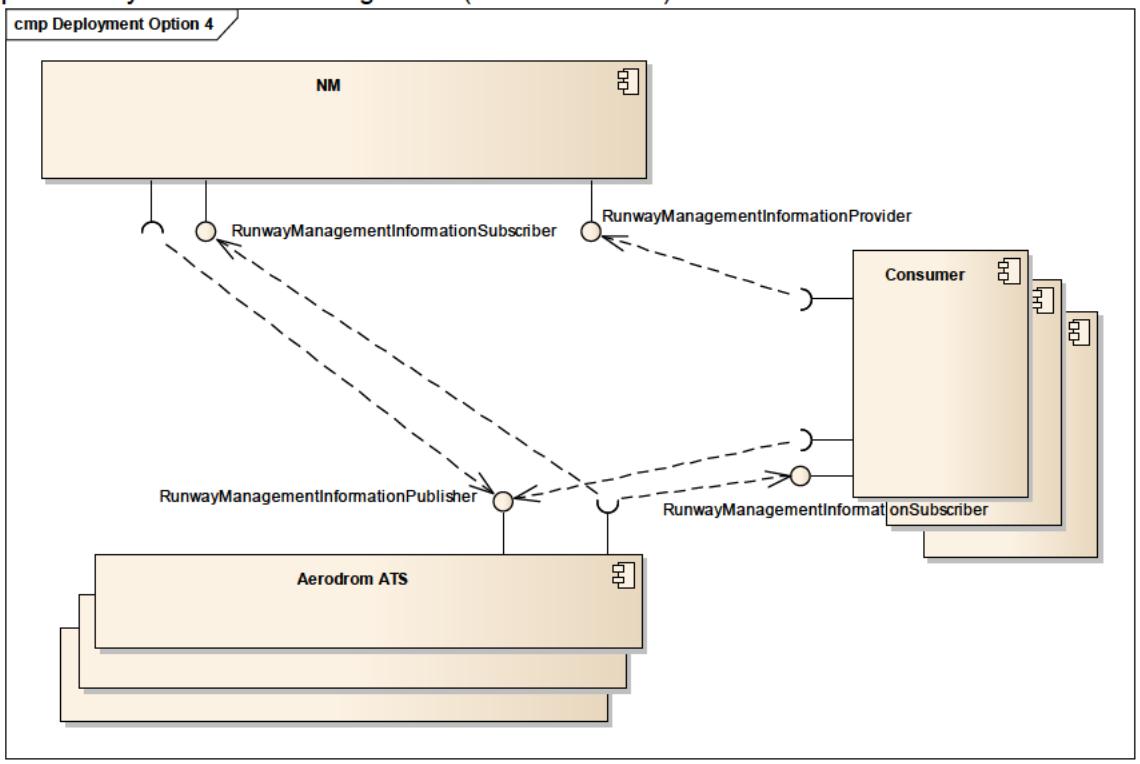
Deployment Option 3:

The NM could additionally provide the publish/subscribe interface. In this case, the Aerodrome ATS would only need to use the update interface (RunwayManagementInformationListener) at the NM, which – in turn – would have to trigger notifications to consumers subscribed at the NM for the corresponding aerodromes.



Deployment Option 4:

The NM could, instead of providing the Update interface, subscribe to the subscription interface provided by the information originators (Aerodrome ATS).



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