EUROCONTROL

EUROCONTROL Specification for SWIM Service Description

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EUROPEAN ORGANISATION
FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL Specification for SWIM Service Description

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Abstract

This specification contains requirements for describing information services in the context of Initial System Wide Information Management (iSWIM). The requirements prescribe the minimum set of elements a service description has to contain.

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The following table identifies all management authorities who have successively approved the present issue of this document.

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EXECUTIVE SUMMARY

This specification contains requirements for describing implemented information services within the context of Initial System Wide Information Management (iSWIM). In order for service consumers to make good use of the available information services, it is essential that service descriptions cover the service consumers' needs. Therefore, the requirements focus on the service description that a service provider makes available to service consumers.

More specifically, the requirements prescribe the minimum set of elements to be contained by a service description in order for a service consumer to discover a service, consider using a service, or implement a service consuming client.

The requirements ensure that a service description covers the information needs of business experts, operational experts and technical experts, more particularly in terms of: what a service does, how a service works, how to access a service, and other information for consuming a service.

1. Introduction

1.1 Purpose

This specification contains requirements for describing implemented information services within the context of Initial System Wide Information Management (iSWIM).

In order for service consumers to make good use of the available information services, it is essential that service descriptions cover the service consumers' needs. Therefore, the requirements focus on the service description that a service provider makes available to service consumers.

More specifically, the requirements prescribe the minimum set of elements to be contained by a service description in order for a service consumer to discover a service, consider using a service, or implement a service consuming client.

The requirements ensure that a service description covers the information needs of business experts, operational experts and technical experts, more particularly in terms of: what a service does, how a service works, how to access a service, and other information for consuming a service.

1.2 Scope

This specification considers which information needs to be provided to service consumers about implemented services.

This specification does not cover the information needs of service providers, e.g. to implement a service. In addition, this specification does not identify a list of services to be implemented and does not cover governance aspects.

Further complementary requirements to the present specification exist: the EUROCONTROL Specification for SWIM Information Definition [RD 2] contains requirements for creating information definitions that conform to the ATM Information Reference Model; the EUROCONTROL Specification for SWIM Technical Infrastructure Yellow Profile [RD 3] contains requirements on the suite of technological choices concerning service interface binding aspects.

1.3 Applicability

iSWIM supports "*information exchanges that are built on standards and delivered through an internet protocol (IP)-based network by SWIM enabled systems*" [RD 1]. It lists four areas for information exchanges:

1. aeronautical information exchange;
2. meteorological information exchange;
3. cooperative network information exchange; and
4. flight information exchange.

The Pilot Common Project Regulation (PCP) [RD 1] requires that service implementations in support of the information exchanges "*be compliant with the applicable version of [the ATM] Information Reference Model (AIRM), the AIRM Foundation Material and the Information Service Reference Model (ISRM) Foundation Material*" (see sections 5.1.3, 5.1.4, 5.1.5 and 5.1.6 of the Annex to the Pilot Common Project).

Satisfying the requirements of this specification can be considered a means of compliance for the enabling ATM functionality iSWIM as defined by the PCP [RD 1] in relation to the "*ISRM Foundation Material*".

This specification can also be adopted outside of the specific PCP context by those seeking to achieve the benefits of SWIM.

This specification is expected to be applied by service providers when describing the services they offer.

1.4 Target Audience

The target audience for the specification includes, but is not limited to:

- operational stakeholders implementing services supporting the exchange of information over SWIM. This audience includes:
  - business experts procuring systems and services;
  - technical experts designing and implementing systems and services; and
  - operational experts using systems and services to fulfil operational needs;.
- oversight authorities.

1.5 Conventions

The following conventions are used in this EUROCONTROL specification:

- '**shall**'- indicates a requirement that must be implemented to provide conformity with this specification;
- '**should**' - indicates a requirement that is recommended to achieve the best possible implementation of this specification; and
- '**may**' - indicates an option.

Annex B to this specification provides the conformity checklist indicating, per requirement, the level of implementation to be achieved – see tables 4 and 5.

Each requirement is detailed in a table with the following structure.

Title	Title of the requirement, used as a short name for the requirement for mnemonic and readability purposes.
Identifier	Unique identifier of the requirement.
Requirement	Statement expressing the requirement.
Rationale	Justification of the existence of the requirement.
Verification	Quality characteristics to be assessed when inspecting a service description with regards to the requirement. Each requirement will indicate the verification method to cover the following characteristics: • Completeness • Consistency • Correctness
Examples/Notes	Examples in support of the requirement or additional notes to clarify the requirement. The examples and the notes are informative.

Table 1 – Requirement structure

1.6 Abbreviations

Abbreviation	Term
AIRM	ATM Information Reference Model
AIXM	Aeronautical Information Exchange Model
AMQP	Advanced Message Queuing Protocol
ASBU	Aviation System Block Upgrade
ATM	Air Traffic Management
BPM	Business Process Management
DPI	Departure Planning Information
ERAF	EUROCONTROL Advisory Framework
EU	European Union
EUROCAE	European Organisation for Civil Aviation Equipment
ICAO	International Civil Aviation Organization
ICAO IMP	International Civil Aviation Organization Information Management Panel
IER	Information Exchange Requirement
IR	Implementing Regulation
ISO	International Organization for Standardization
ISO/IEC	International Organization for Standardization / International Electrotechnical Committee
ISRM	Information Service Reference Model
iSWIM	Initial System Wide Information Management
IWXXM	ICAO Meteorological Information Exchange Model
MTOM	Message Transmission Optimization Mechanism
NAF	NATO Architecture Framework
NM	Network Manager
OASIS	Organization for the Advancement of Structured Information Standards
OSED	Operational Service and Environment Definition

Abbreviation	Term
PCP	Pilot Common Project
REST	Representational state transfer
SESAR	Single European Sky ATM Research
SLA	Service Level Agreement
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SPR	Safety and Performance Requirements
SWAL	Software Assurance Level
SWIM	System Wide Information Management
TI	Technical Infrastructure
TLS	Transport Level Security
UML	Unified Modeling Language
URL	Uniform Resource Locator
W3C	World Wide Web Consortium
WADL	Web Application Description Language
WSDL	Web Services Description Language
XML	Extensible Markup Language
XSD	XML Schema Definition

Table 2 – List of abbreviations

1.7 Definitions

Term	Definition	Source
accountability	The degree to which the actions of an entity can be traced uniquely to the entity.	ISO/IEC 25010:2011[RD 12]
authenticity	The degree to which the identity of a subject or resource can be proved to be the one claimed	ISO/IEC 25010:2011[RD 12]
availability	The degree to which a system, product or component is operational and accessible when required for use.	ISO/IEC 25010:2011[RD 12]
completeness	The degree to which the content contains the expected information.	Adapted from ISO/IEC 25012:2008 [RD 7]
confidentiality	The degree to which a product or system ensures that data is accessible only to those authorized to have access.	ISO/IEC 25010:2011[RD 12]
consistency	The degree to which the content is free from contradiction and is coherent within itself and with referenced resources.	Adapted from ISO/IEC 25012:2008 [RD 7]
consumer side interface	A service interface, required by the service, which is implemented by the service consumer.	-
correctness	The degree to which the content correctly represents the true value.	Adapted from ISO/IEC 25012:2008 – Accuracy [RD 7]
information definition	A formal representation of information concepts or data concepts.	-
information exchange requirement	A specification of the information that is to be exchanged.	NAF v3 [RD 14]
information service (synonym: information exchange service)	A type of service that provides an information exchange capability.	-
integrity	The degree to which a system, product or component prevents unauthorized access to, or modification of, computer programs or data	ISO/IEC 25010:2011[RD 12]
interface binding	Specification of the protocol and data format to be used in transmitting messages defined by the associated interface.	W3C Web Services Description Requirements, [RD 10]
interoperability	The ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.	-

Term	Definition	Source
message exchange pattern	A Message Exchange Pattern (MEP) is a template, devoid of application semantics, that describes a generic pattern for the exchange of messages between agents. It describes relationships (e.g., temporal, causal, sequential, etc.) of multiple messages exchanged in conformance with the pattern, as well as the normal and abnormal termination of any message exchange conforming to the pattern.	W3C Web Services Glossary [RD 9]
non-repudiation	The degree to which actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later	ISO/IEC 25010:2011[RD 12]
operation (synonym: service operation)	Specification of a transformation or query that an object may be called to execute *Note: An operation has a name and a list of parameters.*	ISO 19119:2005, 4.3
operational stakeholders	Civil and military: airspace users, air navigation service providers and airport operators. *Note: The operational stakeholders are identified in the Appendix to the Implementing Regulation.*	EU Implementing Regulation No 409/2013 [RD 8]
protocol	A set of semantic and syntactic rules for exchanging information.	ISO/IEC 14519:2001[RD 13]
provider side interface	A service interface which is implemented by the service provider.	-
quality of service	The degree or level of confidence that the performance of a service meets the requirements of the user.	-
security	The degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization. It includes confidentiality, integrity, non-repudiation, accountability, authenticity.	ISO/IEC 25010:2011[RD 12]
semantic correspondence	The relation between a concept in an information definition and the AIRM. *Note: A semantic correspondence takes the form of a mapping to AIRM concepts based on their meanings, an out-of-scope declaration or a reference to a change request.*	-
service	A mechanism to enable access to one or more capabilities, where the access is provided using a prescribed interface.	OASIS (2006) [RD 11]
service category	A class of services which share a common feature.	-
service consumer	An organization that seeks to satisfy a particular need through the use of capabilities offered by means of a service.	OASIS (2006) [RD 11]

Term	Definition	Source
service description	The information needed in order to use, or consider using, a service.	OASIS (2006) [RD 11]
service function	A type of activity describing the functionality of a service.	NAF v3 [RD 14]
service interface	The means by which the underlying capabilities of a service are accessed. *Note: The service interface is the means for interacting with a service.*	OASIS (2006) [RD 11]
service policy	A constraint governing one or more services.	NAF v3 [RD 14]
service provider	An entity (person or organization) that offers the use of capabilities by means of a service.	OASIS (2006) [RD 11]
SWIM TI	A technical infrastructure conformant to one or more SWIM TI specifications (e.g. SWIM TI YP Specification).	-
SWIM TI Profile	Specification defining an implementation of the SWIM TI. Multiple SWIM TI Profiles can coexist, each of them focused on the implementation of technical infrastructure but with different scope and applicability.	-

Table 3 – List of terms with definition

1.8 Reference material

[RD 1] Commission Implementing Regulation (EU) No 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan

[RD 2] EUROCONTROL Specification for SWIM Information Definition, Ed. 1.0, 01 December 2017

[RD 3] EUROCONTROL Specification for SWIM Technical Infrastructure Yellow Profile, Ed. 1.0, 01 December 2017

[RD 4] AIRM Abbreviations http://airm.aero/abbreviations

[RD 5] ISRM Service Portfolio. Published within the 5th element of the Initial system-wide information management (SWIM) technology solution pack (http://www.sesarju.eu/node/2255, 05_ISRM_Solution_46_SWIM_Technological_Solution.zip, 0502DEL_08.03.10_D65_ISRM_Service_Portfolio.pdf)

[RD 6] SESAR ISRM Foundation 8[1]. Published within the SESAR Joint Undertaking Transversal Solutions (http://www.sesarju.eu/transversal-solutions), it is composed of 3 documents:

- ISRM Primer (http://www.sesarju.eu/sites/default/files/documents/transversal/08.03.10_D45_ISRM_Primer.docx);
- ISRM Foundation Rulebook (http://www.sesarju.eu/sites/default/files/documents/transversal/08.03.10_D45_ISRM_Foundation_Rulebook.docx);
- ISRM Modelling Guidelines (http://www.sesarju.eu/sites/default/files/documents/transversal/08.03.10_D45_ISRM_Modelling_Guidelines.docx

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[RD 7] International Organization for Standardization – ISO/IEC 25012:2008 Software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Data quality model

[RD 8] Commission Implementing Regulation (EU) No 409/2013 of 3 May 2013 on the definition of common projects, the establishment of governance and the identification of incentives supporting the implementation of the European Air Traffic Management Master Plan

[RD 9] World Wide Web Consortium (W3C) Web Services Glossary (2004), http://www.w3.org/TR/ws-gloss/

[RD 10] World Wide Web Consortium (W3C) Web Services Description Requirements (2002), http://www.w3.org/TR/ws-desc-reqs/

[RD 11] OASIS Reference Model for Service Oriented Architecture 1.0 (2006) , http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf

[RD 12] International Organization for Standardization - ISO/IEC 25010:2011 – Systems and software engineering – Systems and Software Quality Requirements and Evaluation (SQuaRE) – System and Software quality models

[RD 13] International Organization for Standardization - ISO/IEC 14519:2001 – Information Technology – POSIX Ada Language Interfaces – Binding for System Application Program Interface (API)

[RD 14] NATO Architecture Framework (NAF) version 3

[RD 15] Aeronautical Information Exchange Model (AIXM), www.aixm.aero

[RD 16] ICAO Meteorological Information Exchange Model (IWXXM) https://schemas.wmo.int/iwxxm/

1.9 Document structure

Chapter 1 introduces this document, including scope, applicability and audience. Chapter 2 gives the conformance statements. Chapter 3 lists the requirements addressing service descriptions. Annex A provides context for the service descriptions, introducing to their purpose and use. Annex B summarises the requirements to be met when assessing conformity to this specification. Annex C lists contributing subject matter experts.

1.10 Maintenance of the Specification

This EUROCONTROL Specification has been developed under the EUROCONTROL Advisory Framework (ERAF) and is maintained by EUROCONTROL in accordance with this framework.

2. Conformance

The conformity checklist table is available in Annex B. It is provided in support of assessing conformance with this specification.

3. Requirements

3.1 General Requirements

3.1.1 Coverage

Title	Service description coverage
Identifier	SWIM-SERV-001
Requirement	A service description **shall** describe a single service.
Rationale	The readability of any service description is improved by keeping it focussed on one service.
Verification	Completeness: Not Applicable. Consistency: Not Applicable. Correctness: Verify that one and only one service is described.
Examples/Notes	

3.1.2 Language

Title	Service description language
Identifier	SWIM-SERV-002
Requirement	The textual descriptions in a service description **shall** be written in English using the spelling listed as the primary British spelling when conflicting spellings exist.
Rationale	By using a single reference language, the risk of translation ambiguities when comparing service descriptions is removed.
Verification	Completeness: Not Applicable. Consistency: Not Applicable. Correctness: Verify that the textual descriptions are correct British English.
Examples/Notes	Note: This requirement does not apply to implementation details that are reflected in the content of the service description e.g. service operation names.

Title	Define abbreviations and acronyms
Identifier	SWIM-SERV-003
Requirement	A service description **shall** define all used abbreviations and acronyms and be in accordance with the AIRM abbreviation list [RD 4].
Rationale	It is best practice to document all abbreviations and acronyms used in a document.

Verification	Completeness: Verify that all used acronyms and abbreviations are defined in the service description. Consistency: For abbreviations/acronyms existing in AIRM, verify that the definitions are the same. Correctness: Not Applicable.
Examples/Notes	Note: It is allowed to use abbreviations/acronyms not defined in AIRM abbreviation list [RD 4]. However, when using one of those, their definitions must be the same.

Title	Use standard abbreviations and acronyms
Identifier	SWIM-SERV-004
Requirement	A service description **should** only use standard abbreviations and acronyms.
Rationale	It is best practice to use standard abbreviations and acronyms only. Using non-standard abbreviations and acronyms makes the reading more difficult and may confuse the reader.
Verification	Completeness: Not Applicable. Consistency: Verify that the acronyms and abbreviations have same definitions as in their source. Correctness: Not Applicable.
Examples/Notes	Note: This applies to ATM and non-ATM abbreviations and acronyms. Example sources for standard abbreviations and acronyms: • ATM: ICAO and AIRM; • Non-ATM: ISO.

3.1.3 Service Description Identification

Title	Service description identification
Identifier	SWIM-SERV-005
Requirement	A service description **shall** include: • a title by which the service description is known; • an edition; and • a reference date for use in citing the service description.
Rationale	This requirement supports the identification and citation of a service description.
Verification	Completeness: Verify that the 3 elements are included. Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Example service description identification: • “Flight Management service description, edition 20.0, 14 Mar

	2016”. Note: The edition of the service description is not to be confused with the version of the service. A service description can evolve to a new edition while still describing the same service version.

3.1.4 Service Identification

Title	Service identification
Identifier	SWIM-SERV-006
Requirement	A service description **shall** include: • the name of the service; and • the version of the service.
Rationale	This requirement makes clear what the subject of the service description is. It supports the identification and citation of the service being described.
Verification	Completeness: Verify that the 2 elements are included Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Example service identifications: • “TargetOffBlockTimeSetting service, version 1.3.0”; • “FlightManagement service, version 20.0”. Note: To improve readability across service descriptions, it is best practice to apply following conventions for a service name: • include the operational concept supported or the information being exchanged; • be a maximum of five words in length; • be represented using UpperCamelCase, and not use snake_case; and • not end with the ‘service’ suffix.

Title	Service abstract
Identifier	SWIM-SERV-007
Requirement	A service description **shall** include an abstract as a small textual description in plain language summarising the service.
Rationale	A good abstract is valuable, in particular during service discovery. This requirement supports the decisions on whether the described service is suitable for use in a particular situation.
Verification	Completeness: Verify that the element is included. Consistency: Not Applicable. Correctness: Not Applicable.

Examples/Notes	Note: It is best practice for an abstract to summarise the information provided elsewhere in the service description and not to bring any new information.

3.1.5 Service Provider

Title	Service provider
Identifier	SWIM-SERV-008
Requirement	A service description **shall** include the following information about the service provider: • the name and description of the organisation responsible for the service; and • one or more points of contact where additional information can be obtained, including name, contact information and role.
Rationale	Knowing the service provider is essential to business experts. Point of contact allows getting additional information regarding the service.
Verification	Completeness: Verify that the elements are included. Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Example contact information: • email address; • postal address; • phone number; • URL. Example points of contact: • “Customer Relations, to request access to the service, http://www.donlon-airport.com/swim/service-request”; • “Service Desk, to report incidents on services in operation, contact [24/7] +693 555 01 service-desk@donlon-airport.com”. Note: Consider including information on provider certification when relevant for the service being described (e.g. for a Meteorological service).

3.1.6 Service Category

Title	Service categories
Identifier	SWIM-SERV-009
Requirement	A service description **shall** include the categories to which the service belongs based on the PCP information exchange areas: • Aeronautical information exchange; • Meteorological information exchange;

	• Cooperative network information exchange; • Flight information exchange.
Rationale	Service category information allows discovering services by a series of classification criteria. This requirement supports decision making in terms of service suitability in relation to a particular usage context.
Verification	Completeness: Verify that the PCP category is present. Consistency: Not applicable. Correctness: Not Applicable.
Examples/Notes	Note: It is best practice to include additional category information, and state the service categorisation scheme used, by inclusion or reference. The SESAR 1 ISRM Portfolio [RD 5] is a good source for service categories.

3.1.7 Service References

Title	Service standard reference
Identifier	SWIM-SERV-010
Requirement	A service description **shall** include • a statement indicating whether the service adheres to a service standard; and if so, • a reference to the service standard; • a statement on any implemented options of the service standard; and • a statement on any deviation from the service standard.
Rationale	The reference to standards is essential information, fostering reuse.
Verification	Completeness: Verify that the statement about adherence to a reference standard is included. Consistency: If the service adheres to a service standard, verify that the reference to the service standard is included. Correctness: Not Applicable.
Examples/Notes	Example service standard references: • “EUROCAE Arrival Sequence standardised service design, version 1.0”; • “Not adherent to a service standard”.

3.1.8 Operational Need

Title	Operational needs
Identifier	SWIM-SERV-011
Requirement	A service description **shall** • include information about the operational needs fulfilled by the service;

	• indicate whether information exchange requirements (IER) were used in the identification of the needs for the service; and if so • include or refer to the information exchange requirements (IER).
Rationale	Operational needs relate to the operational context in which the service is used. IERs reference the requirements that are at the origin of the service. This requirement supports decision making in terms of service suitability within a particular operational context.
Verification	Completeness: Verify that operational needs are included; verify that the indication on whether IERs were used is included. Consistency: If IERs were used, verify that the IERs and the source(s) are included. Correctness: if a source is included, verify that the IERs are available in the referenced source.
Examples/Notes	Example operational need: • "The Flight Management service fulfils the need to retrieve information about flights and flight plans and the need to provide information about changes in flights". Note: When describing operational needs, it is best practice to add a reference to an operational concept document, or contextual description. Example IERs: • "It shall be possible for the end user to access up-to-date network weather forecasts (up to D-10) in the specified geographical areas (regional/sub-regional/local) or airports (e.g. snow situation), with variable granularity levels depending on the time horizon. (reference REQ-07.06.01-OSED-WX01.0010; source SESAR 1 OSED 07.06.01)"; • "To allow the Aircraft Operator or Ground Handler to set, update or delete the value of the Target Off-Block Time of a departing flight, in accordance with the operations involving Target Off-Block Time that take place between A-CDM Milestones 2 and 11 (derived from: Airport CDM Implementation Manual v4)".

3.1.9 Service Functionality

Title	Service functionality
Identifier	SWIM-SERV-012
Requirement	A service description **shall** describe the functionality of the service as a list of functions and their associated real world effects.
Rationale	The functions provide business and operational experts with a business view of the interactions with the service, without having to look at the interface details.

<table>
<tr><td>Verification</td><td>Completeness: Verify that the elements are included.

Consistency: Verify that the functions and real world effects are consistent with the operational needs.

Correctness: Not Applicable.</td></tr>
<tr><td>Examples/Notes</td><td>Note: A function is a type of activity describing the functionality of a service. Every function usually (but not always) can be mapped to service operations defined as a part of the service's interface; i.e., functions provide a "business view" and service operations provide a "technical view" of a particular service activity.

Note: A real world effect is an ultimate purpose associated with the interaction with the service. It may be the response to a request for information or the change in the state of some entities shared between the participants in the interaction.

Example functions and real world effects:

<table>
<tr><th>function</th><th>real world effect</th></tr>
<tr><td>Retrieve a list of flights</td><td>(Network Information sharing)</td></tr>
<tr><td>Retrieve information of a single flight</td><td>(Network Information sharing)</td></tr>
<tr><td>Provide Departure Planning Information (DPI)</td><td>NM systems updated with the information; NM systems publish the resulting flight update</td></tr>
</table>
</td></tr>
</table>

3.1.10 Access and Use Conditions

Title	Service access and use conditions
Identifier	SWIM-SERV-013
Requirement	A service description **shall** include the conditions which apply to accessing and using the service, such as • legal constraint; • service policies; • service consumption constraints; and • security constraints.
Rationale	This requirement ensures that a service consumer is aware of any limitations on the access and use of the service. It is good practice to share business constraint information associated with the conditions of usage of the service.
Verification	Completeness: Verify that the elements included cover the required constraints and policies. Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Example legal constraints: • Licenses to be bought; • Intellectual property rights to be respected.

	Example services policies: • Contingency policy; • Business policy(s) in terms of business rule or objective i.e. how the business is conducted; • Operational policy(s) (i.e. constraints and requirements for how services operate and interoperate at runtime) in terms of rules and guidelines. Operational policies are utility centric (handling operational characteristics) covering mainly; , logging, messaging protocol and versioning. Normally standardised for a defined collection of services; • Technical policy(s). Technical policies can (if available) be provided in machine-readable format; • Versioning scheme used (e.g. major.minor[.fix]) and the compatibility guaranteed between different versions (e.g. backwards compatibility is guaranteed between minor versions but not for major); • Lifecycle policy applied to the service (e.g. to allow consumers to know that he is not investing on a soon to be retired service). Example service consumption constraints: • The maximum number of requests per time window allowed for a service consumer. Example security constraints: • Confidentiality: o Statement of the confidentiality offered by the service (e.g. message, transport, none…); o Elements of the payload whose confidentiality is required or provided (whole payload, body, specific sub-elements…); o Cryptographic algorithms and key sizes; • Integrity: o Statement of the integrity offered by the service (e.g. message, transport…); o Elements of the payload whose integrity is required or provided (whole payload, body, specific sub-elements…); o Cryptographic algorithms and key sizes; • Authentication: o Statement of the authentication mechanisms used on consumer and provider side; o Statement of the failed authentication constraints; o Identity tokens; • Authorisation: o Statement on the authorisation mechanism used; o Credentials used for the authorisation; o Levels of authorisation. Note: Additional use conditions could be diplomatic, geographical reasons, safety criticality and fees to be paid, for instance.

3.1.11 Quality of Service

Title	Quality of service
Identifier	SWIM-SERV-014
Requirement	A service description **shall** include statements on the quality of service offered with regards to: • availability of the service; • response time of the service; and • throughput of the service.
Rationale	This is a key criterion in deciding to use the service. This is key information to be included in a service level agreement and will influence the content of the SLA. It informs contract negotiations between consumers and providers.
Verification	Completeness: Verify that quality statements are included in the service description. Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Note: The **availability** is typically expressed as a percentage representing the ratio between minimum target uptime versus maximum uptime. The service provider needs to describe the service outages he intends to mask/alleviate. The availability information needs to be expressed for various situations, e.g. planned and unplanned outages. The service provider needs to describe the schedule of planned outages. Example of availability: ≥ 99.95 % of Continuous Operations. Note: The **response time** expressing the delay to process a service request could include: delay in seconds, percentage of messages, message size. Example of response time: 2s delay for 95% of messages of average size 1MB, with no compression. Example of response time: max 3s response to complete a service request, measured from the time the service provider agent receives the request to the time the service provider transmits the response. Note: The **throughput** is typically expressed as a number of service requests that the service can accommodate within the given time period. Example of throughput: 200 service requests per minute. Note: It is a good practice to describe the measuring conditions of the quality of service figures given.

3.1.12 Technical Constraint

Title	Technical constraint
Identifier	SWIM-SERV-015

Requirement	**If** technical constraints are known, a service description **shall** include information about the technical constraints that would guide the consumer in their client development.
Rationale	Knowing and satisfying the pre-requisite constraints of a service facilitate good use of the service, such as benefiting from the indicated quality of service statements. This requirement supports decision making in terms of assessing the implication, costs and feasibility, of using the service.
Verification	Completeness: Not Applicable. Consistency: If provided, verify that the information corresponds to the described service. Correctness: Not Applicable.
Examples/Notes	Example technical constraints: firewall, minimum bandwidth or server resources, interface language, integration pattern, protocol and communication ports. Example: For a publication service where the subscription mechanism is not based on a capability of the service itself, stakeholders need to understand how they can subscribe (e.g. using electronic form, email, etc).

3.2 Service Interface Requirements

3.2.1 Service Interfaces

Title	Service interfaces
Identifier	SWIM-SERV-016
Requirement	A service description **shall** list the service interfaces (provider side and consumer side interfaces), including for each service interface, • the name of the service interface; • a textual description of the service interface including its purpose; • an indication that the interface is a provider side interface or a consumer side interface; and • for a provider side interface, the fully qualified network address at which the interface can be accessed.
Rationale	This information facilitates the unambiguous identification of the interface, the understanding of its purpose, and the location to access it.
Verification	Completeness: Verify that the list of interfaces is included; verify that the name, description and indication are included for each interface. Consistency: For each provider side interface, verify that the network address is provided. Correctness: Not Applicable.
Examples/Notes	Note: To improve readability across service descriptions, it is best practice to apply following conventions for a service interface name

	(the appendix B "ISRM naming conventions" of the SESAR 1 Modelling Guidelines [RD 6] is a good source for naming conventions): • be represented using UpperCamelCase; and • use the <noun> <role> pattern where <noun> is a topic related to the service and <role> describes the roles in a composition/interaction sequence, based on the Message Exchange Pattern that is used. Example service interface names: FlightPlanCoordinator, FlightPlanSubmitter, ForecastProvider, ForecastConsumer, ClearanceRequester, ClearanceManager, PreDepartureSequencer, FlightInformationPublisher, AlertListener. Note: It is best practice to provide, in addition, the network address(es) for accessing the service instance(s) that can be used for testing and development purposes.

Title	Message exchange pattern
Identifier	SWIM-SERV-017
Requirement	A service description **shall** include the message exchange pattern used by the service.
Rationale	The message exchange pattern helps understanding how the information interaction with the service works.
Verification	Completeness: Verify that the information is included. Consistency: Verify that the information is consistent with the selected service interface binding. Correctness: Not Applicable.
Examples/Notes	Note: Typical message exchange patterns (as from the SWIM Technical Infrastructure Yellow Profile [RD 3]): • Request/Reply (synchronous or asynchronous); • Publish/Subscribe (Push or Pull); • One Way (also known as Fire and Forget).

3.2.2 Service Interface binding

Title	SWIM TI Profile and interface bindings
Identifier	SWIM-SERV-018
Requirement	A service description **shall** include for each service interface, • the selected SWIM TI Profile and its version; • a reference to a service interface binding as specified in the selected SWIM TI Profile; • a reference to a network interface binding as specified in the selected SWIM TI Profile; and • reference to additionally supported requirements as specified in the selected SWIM TI Profile.

Rationale	To support the concept of interoperability between the service provider and service consumer, the SWIM TI Profiles only allow a certain set of technical solutions, which can be chosen by the service designer. This is used by technical experts to assess feasibility to implement.
Verification	Completeness: Verify that the reference information is provided for each provider side and consumer side interface. Consistency: Verify that the selected service interface binding, network interface binding and additionally supported requirements are consistent with the selected SWIM TI Profile and version. Correctness: Not Applicable.
Examples/Notes	Note: If configuration options are available in the service interface binding, it is best practice to document them (e.g. use of GZIP compression, Message Transmission Optimization Mechanism (MTOM) encoding). Example additionally supported requirements: • "SWIM-TIYP-0092, SWIM-TIYP-0098".

Title	Service interface protocols and data format
Identifier	SWIM-SERV-019
Requirement	A service description **shall** include the list of service interface protocols (including name and version) and data format to be used.
Rationale	Makes explicit within the service description what the protocols are.
Verification	Completeness: Verify that all relevant protocols and versions are listed; verify that the information is provided for each provider side and consumer side interface. Consistency: Verify that the protocols are consistent with the selected interface binding. Correctness: Not Applicable.
Examples/Notes	Note: The list of supported protocols are the ones corresponding to the selected interface binding. The supported versions of the protocols need to be declared. E.g. version of the Transport Level Security (TLS).

3.2.3 Machine-Readable Service Interface

Title	Machine-readable service interface definition
Identifier	SWIM-SERV-020
Requirement	**If** the service interface binding specifies the use of machine-readable formats, a service description **shall** include or refer to a service interface definition in a machine-readable format using a standard service definition formalism/language.
Rationale	Enables consumer software components to be created.

Verification	Completeness: If the service interface binding supports it, verify that the required elements are included. Consistency: Verify that provided elements are consistent with the selected binding. Correctness: Not Applicable.
Examples/Notes	Example machine-readable descriptions: • service descriptions: o WSDL (e.g. if a Web Service binding using SOAP is selected); • message descriptions: o XSD; o Schematron Rules. Note: AMQP does not mandate a specific machine-readable format. Note: REST may use WSDL 2.0 or WADL. However, WADL is not standardised.

3.2.4 Service Operations

Title	Service operations
Identifier	SWIM-SERV-021
Requirement	A service description **shall** include a technical description of the service operations of each of its interfaces, including: • the name of the service operation; • a description of the intent and the results of the service operation; and • a description of the exchanged information by the service operation, including the input, output and error messages.
Rationale	The consumer needs to know which service operations are available to be called for the expected result.
Verification	Completeness: Verify that all service operations are described. Consistency: Verify the service operations against the messaging technology needs. Correctness: Not Applicable.
Examples/Notes	Note: To improve readability across service descriptions, it is best practice to apply following conventions for a service operation name: • include a verb and a noun; and • be represented using lowerCamelCase. Example service operation names: getAlerts; requestTrajectoryAnalysis; publishAirportMETInducedCapacity; setCoordinationAndTransferData; proposeARESDeActivation. Note: For readability and understanding of services implemented using REST methods, it is best practice to define logical operations and to map these to the underlying REST methods being used. Note: In case of subscription in a Publish / Subscribe message

	exchange pattern, the management of subscriptions must be specified, including the use and management of subscription id, the mechanism to unsubscribe, etc. Note: When a service operation has several input parameters, it is best practice to indicate the role of each parameter. Note: It may be considered to include information such as the expected number of elements to be exchanged and their frequencies.

3.2.5 Exchanged Information

Title	Information definition
Identifier	SWIM-SERV-022

Requirement	A service description **shall** describe the elements of the exchanged information including:
	• the name of the element;
	• the definition of the element;
	• the cardinality applicable to the element, including whether the element is optional, conditional or mandatory in the exchange;
	• constraints applicable to the element, such as:
	  • datatype;
	  • value ranges;
	  • special values;
	  • character set restrictions;
	• the semantic correspondence of the element with the AIRM; and
	• the structure and relevant relationships between the elements.

Rationale	This requirement ensures that the precise meaning of the exchanged information is shared by all parties of the information exchange.
Verification	Completeness: Verify that the service description describes all elements of the exchanged information and that the required details are provided. Consistency: Verify that the elements are consistent with each other and with the AIRM concepts used in the semantic correspondence. Correctness: Not Applicable.
Examples/Notes	Note: The service description must describe all elements of the exchanged information at all levels, down from the service operation parameters to attributes and data types. Note: It is best practice to base the information definition on the requirements found in the EUROCONTROL Specification for SWIM Information Definition [RD 2], ensuring that it contains the extra details required by this requirement.

	Note: The information definition can be provided by reference, for example when using an AIRM conformant standardised information exchange models, such as Aeronautical Information Exchange Model (AIXM) [RD 15] and ICAO Meteorological Information Exchange Model (IWXXM) [RD 16].

Title	AIRM conformance
Identifier	SWIM-SERV-023
Requirement	A service description **shall** include a statement indicating • whether the information definition used by the service conforms to the ATM Information Reference Model (AIRM); and if so, • the version of the AIRM to which it conforms.
Rationale	To achieve semantic interoperability.
Verification	Completeness: Verify that the conformance statement is present. Consistency: If the statement claims conformance with the AIRM, verify that the AIRM version is included. Correctness: Verify that the statement is true.
Examples/Notes	Example AIRM conformance statements: • “Conformant with AIRM version 4.1.0”; • “Not conformant with AIRM”

Title	Filter capabilities
Identifier	SWIM-SERV-024
Requirement	A service description **shall** describe the filtering capabilities, including meaning and syntax of filter expressions, which can be applied to the information exchange.
Rationale	This requirement ensures that the precise meaning of the filter expressions is understood.
Verification	Completeness: If filter expressions are applied, verify that the capabilities, meaning and syntax are included. Consistency: Not Applicable. Correctness: Not Applicable.
Examples/Notes	Examples include indication of how to interpret and/or combine filters, including cases such as usage of wildcards, allowing and interpreting empty filters, combinations of filters in terms of logical expressions (e.g. implicit AND, implicit OR, explicit operator), etc. Note: Nothing needs to be provided when the exchanged information has no filter expression.

3.2.6 Service Behaviour

Title	Service behaviour
Identifier	SWIM-SERV-025
Requirement	A service description **shall** include information on the behaviour of the service including: • the sequence of service operations; and • the handling of unexpected behaviour.
Rationale	This requirement facilitates the understanding of the service behaviour, including the sequencing of service operations to support operational processes, and the error handling.
Verification	Completeness: Verify that the behaviour information is included and covers the errors handling as well. Consistency: Verify that the names of the interfaces, service operations and exchanged information are consistent with the interface definitions. Correctness: Not Applicable.
Examples/Notes	Examples of behaviour specification: • The behaviour under normal conditions; • The behaviour with incorrect input data (e.g., out of range or incorrect data type); • The use of error messages, and error handling in general; • The list of error codes and expected effects. Note: The service behaviour can be captured in formal modelling notations such as a Unified Modeling Language (UML) sequence diagram, and/or expressed as textual description in plain language.

3.2.7 Model View

Title	Model view
Identifier	SWIM-SERV-026
Requirement	A service description **should** • include a model view on the conceptual parts, expressed using a formal and standardised notation, that formalises the representation of the business logic of its service interfaces, service operations and exchanged information; and • declare the notation used to express the model view.
Rationale	Exposing the business logic of the service in a formalised notation and standardised notation allows operational and technical experts to understand how the service works and make comparisons.
Verification	Completeness: If the model view is provided, verify that the notation is declared; and verify that the model view fully covers service interfaces, service operations and exchanged information. Consistency: If the model view is provided, verify that the model view is consistent with the service description (e.g. same service operation

	name). Correctness: If the model view is provided, verify that the model view is aligned with the declared notation.
Examples/Notes	Note: It is recommended to use the UML as notation. Note: The model view covers structural and activity diagrams when using UML as notation. Note: The SESAR ISRM Foundation 8 is an example of a formal and standardised notation [RD 6].

3.3 Other Requirements

3.3.1 Validation Statement

Title	Service validation
Identifier	SWIM-SERV-027
Requirement	A service description **shall** include a statement indicating • whether a validation of the service has been performed; and if so, • the method used; and • the results achieved.
Rationale	This requirement ensures the service description contains sufficient statements on the testing done to enable the consumer to have confidence in the quality of the service.
Verification	Completeness: Verify that the validation statement is included. Consistency: If validation has been performed, verify that the statement includes the method and the results of the validation. Correctness: Not Applicable.
Examples/Notes	Example service validation statement: • “The service has not been validated yet”.

3.3.2 Service Monitoring

Title	Service monitoring
Identifier	SWIM-SERV-028
Requirement	**If** a service monitoring mechanism is available to service consumers, a service description **shall** describe how to use the service monitoring mechanism.
Rationale	Allow the service consumer to use the available mechanism and monitor the service.
Verification	Completeness: If a service monitoring mechanism is available, verify that the information is included. Consistency: Not Applicable.

	Correctness: Not Applicable.
Examples/Notes	Examples: Monitoring the availability of the service (e.g. by heartbeat); monitoring response time.

3.3.3 Code Examples

Title	Examples of code
Identifier	SWIM-SERV-029
Requirement	A service description **should** include or refer to examples of code exemplifying the implementation of the consuming interface.
Rationale	Best practice to speed up prototyping.
Verification	Completeness: Not Applicable. Consistency: If provided, verify that the provided examples correspond to the described service. Correctness: Not Applicable.
Examples/Notes	Examples include source code in a given programming language, input and output messages.

ANNEX A – Service descriptions

A.1 Purpose of a service description

A service description provides information about an implemented service. Providers and consumers of information services use a service description to exchange information about the capabilities of a specific implemented service.

A well-formulated service description, built according to the present specifications, enables the unambiguous interpretation of the underlying information exchanges and service design, both inside and outside the European ATM Network context.

From the viewpoint of a **service *consumer***, a service description is essential to obtain information about available services (e.g. in the context of iSWIM implementation). For each service, the consumer can find in the service description the information needed in order to use, or consider using, a service made available. This covers for example aspects such as the behaviour of the service, the information it provides, and any constraint attached to its use. Based on the information provided, a well-formulated service description enables a consumer to compare and assess services in terms of usefulness (e.g. fitness for purpose), usage (e.g. feasibility to implement) and quality.

From the viewpoint of a **service *provider***, a shared service description enables a service to be discoverable within the SWIM environment. Typically, an organisation publishes the service description information through a common registry. This provides an organisation with a means to expose the services it offers. Additionally, a well-defined and standardised way of describing a service might improve efficiency when exploring and comparing new services.

A.2 Use of a service description

Depending on the context of the service consumer (e.g. business, operational or technical) the actual use of the service description may be different.

Typically, the following usage contexts exist:

- Discover a SWIM Service;
- Consider using a SWIM Service;
  - from business points of view (=assess fitness for business purpose);
  - from operational points of view (=assess fitness for operational purpose);
  - from technical points of view (=assess technical feasibility);
- Implement a consuming client (technical by nature).

To meet the different expectations of service description information, the usage contexts listed above require different types of information about a service. They constitute the drivers for the requirements on the service description provided in this specification.

The uses further described below are informative and are provided in order to highlight the main differences that could occur in terms of the information need of each type of expert using service description information. In reality, the differences explained may be distributed to the expert roles in different ways, depending on each organisation's internal mode of operations.

A.2.1 Discover SWIM services

In support of business decision-making, experts need to:

- discover and compare services that would meet the business or operational objectives;
- discover and compare services in relation to technical considerations; and

- explore service description information to become aware of what the service delivers (e.g. through a SWIM registry);

To enable the above steps, service providers need to:

- provide business information about the service to document service usage conditions; and
- provide information about the service to document what the service delivers;

A.2.2 Consider using a SWIM service

Assess fitness for business purpose

In support of operational decision-making, business experts need to:

- evaluate the service in relation to the business objective.

To enable the above steps, service providers need to:

- provide business information about the service.

Assess fitness for operational purpose

In support of operational decision-making, operational experts need to:

- understand what the service delivers in relation to the operational context;
- understand how the service works without being overloaded by technology details; and
- evaluate the service in relation to the operational goals.

To enable the above steps, service providers need to:

- provide operational information about the service to document the intended operational usage;
- provide information about the service to document what the service delivers in relation to the operational context; and
- provide information about how the service works without technology details.

Assess technical feasibility

In support of technical considerations and decision-making, technical experts need to:

- evaluate the service in relation to technical feasibility; and
- understand how the service interfaces must be implemented in technical systems in order to use the service.

To enable the above steps, service providers need to:

- provide technical information about the service interfaces.

A.2.3 Implement a SWIM service consuming client

In support of technical considerations and decision-making, technical experts need to:

- understand how the service works at the technical level;
- understand how to access the service; and
- use machine-readable artefacts in support of prototyping and development.

To enable the above steps, service providers need to:

- provide information which explains how the service works at the technical level;
- provide information about how to access the service; and

- provide machine-readable artefacts allowing the service consumer to use the service.

ANNEX B – Conformity Checklist

This annex summarises the requirements to be met when assessing conformity to this specification.

Table 5 lists each requirement in the specification using its identifier and title. It then states the level of implementation to be achieved (see Table 4). In some cases, the implementation is conditional which means that the requirement is to be implemented when the condition applies.

Level of Implementation	Operative verb used in the requirement
M = Mandatory	**shall**
R = Recommended	**should**
O = Optional	**may**

Table 4 – Level of implementation

Identifier	Title	Level of Implementation
	General Requirements	
SWIM-SERV-001	Service description coverage	M
SWIM-SERV-002	Service description language	M
SWIM-SERV-003	Define abbreviations and acronyms	M
SWIM-SERV-004	Use standard abbreviations and acronyms	R
SWIM-SERV-005	Service description identification	M
SWIM-SERV-006	Service identification	M
SWIM-SERV-007	Service abstract	M
SWIM-SERV-008	Service provider	M
SWIM-SERV-009	Service categories	M
SWIM-SERV-010	Service standard reference	M
SWIM-SERV-011	Operational needs	M
SWIM-SERV-012	Service functionality	M
SWIM-SERV-013	Service access and use conditions	M
SWIM-SERV-014	Quality of service	M
SWIM-SERV-015	Technical constraint	M Conditional
	Service Interface Requirements	
SWIM-SERV-016	Service interfaces	M
SWIM-SERV-017	Message exchange pattern	M
SWIM-SERV-018	SWIM TI Profile and interface bindings	M

Identifier	Title	Level of Implementation
SWIM-SERV-019	Service interface protocols and data format	M
SWIM-SERV-020	Machine-readable service interface definition	M Conditional
SWIM-SERV-021	Service operations	M
SWIM-SERV-022	Information definition	M
SWIM-SERV-023	AIRM conformance	M
SWIM-SERV-024	Filter capabilities	M
SWIM-SERV-025	Service behaviour	M
SWIM-SERV-026	Model view	R
	Other Requirements	
SWIM-SERV-027	Service validation	M
SWIM-SERV-028	Service monitoring	M Conditional
SWIM-SERV-029	Examples of code	R

Table 5 – Conformity checklist

ANNEX C – List of Contributors

This specification was prepared by EUROCONTROL with the assistance of the following subject matter experts:

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Table 6 – List of subject matter experts

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