SWIM-TI Technical Specifications Catalogue

Document information	
Project Title	Interface specifications and Services Technical requirements
Project Number	14.01.04
Project Manager	Leonardo-Finmeccanica
Deliverable Name	SWIM-TI Technical Specifications Catalogue
Deliverable ID	D44-001
Edition	00.01.00
Template Version	03.00.00
Task contributors	

LEONARDO-FINMECCANICA, THALES, INDRA, FREQUENTIS, AIRBUS, HONEYWELL, EUROCONTROL

Please complete the advanced properties of the document

Abstract

SWIM-TI Technical Specifications Catalogue provides an overview of the available SWIM-TI Technical Specifications and it includes references to all the available Technical Specifications. It also includes references to applicable guidelines concerning requirements and the way the Technical Specifications are organized.

Authoring & Approval

Prepared By - *Authors of the document.*		
Name & Company	Position & Title	Date
■■■■ LEONARDO-FINMECCANICA	■■■■	04/07/2016

Reviewed By - *Reviewers internal to the project.*		
Name & Company	Position & Title	Date
■■■ THALES	■■■■	22/06/2016

Reviewed By - *Other SESAR projects, Airspace Users, staff association, military, Industrial Support, other organisations.*		
Name & Company	Position & Title	Date
■■■■ AIRBUS	■■■■	22/06/2016
■■■■ THALES		22/06/2016

Approved for submission to the SJU By - *Representatives of the company involved in the project.*		
Name & Company	Position & Title	Date
■■■■ LEONARDO-FINMECCANICA	■■■■	04/07/2016
■■■■ INDRA		04/07/2016
■■■■ EUROCONTROL		04/07/2016
■■■■ FREQUENTIS		04/07/2016
■■■■ THALES		04/07/2016
■■■■ HONEYWELL		04/07/2016
■■■■ AIRBUS		04/07/2016

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

Rational for rejection
None.

Document History

Edition	Date	Status	Author	Justification
00.00.01	01/06/2016	Revised Draft	■■■■	Revised draft based on SJU approved previous version (D43-001). Updated §1, §2 and §3. Imported requirements guidelines.
00.00.02	24/06/2016	Revised Draft		Implemented open points and received comments.
00.00.03	30/06/2016	Candidate Final Version		Implemented remaining open comments. Final Version ready for approval.

00.00.04	01/07/2016	Candidate Final Version		Implemented minor updates in Appendix B.
00.01.00	04/07/2016	Final Version		Final version.

Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

Table of Contents

List of tables

List of figures

No Figure Found

Executive summary

SWIM-TI Technical Specifications Catalogue provides an overview of the available SWIM-TI Technical Specifications and it includes references to all the available Technical Specifications. It also includes guidelines concerning requirements and the way the Technical Specifications are organized.

1 Introduction

1.1 Purpose of the document

SWIM-TI Technical Specifications Catalogue consists of a series of Technical Specifications for the SWIM-TI.

The document provides brief overview of SWIM-TI together with references to available Technical Specifications.

For SWIM-TI architecture refer to SWIM-TI TAD [4].

1.2 Intended readership

The intended audience of this document is:

- SJU/IS in order to manage the SWIM Technical Infrastructure TSs,

- SWP14.2 projects in order to review the available TSs and to implement and verify the requirements;

- P9.19 project in order to review the applicable TSs and to implement interoperable solutions;

- B.4.3 in order to review the available TSs according to their relationship with architectural aspects;

- 08.03.10 in order to review the available TSs according to their relationship with service instances provisioning and consumption;

- Any other SESAR projects that are interested in the TSs of SWIM Technical Infrastructure, especially Federating System Projects.

1.3 Inputs from other projects

For each Technical Specification relevant input from other projects are provided in the TS §1.

1.4 Structure of the document

This document is organized as follows:

Chapter 1: Purpose, scope and document structure overview.

Chapter 2: SWIM-TI Technical Specifications Catalogue.   **Formatted:** French (Belgium)

Chapter 3: Referenced documents.

1.5 Glossary of terms

Refer to Technical Specifications (§1.5) and to §1.6 here below.

1.6 Acronyms and Terminology

Term	Definition
ATM	Air Traffic Management
BCA	Bridge Certification Authority
BP	Blue Profile
E-ATMS	European Air Traffic Management System
FB	Functional Block
HMI	Human-Machine Interface
ICD	Interface Control Document
META (information)	Information describing another information. META information about a service include all relevant information describing the service (service version, service design URLs, etc.).
NFR	Non-Functional Requirement
PKI	Public Key Infrastructure
PP	Purple Profile
REG	Run-Time Registry
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking (Agency of the European Commission)
SJU Work Programme	The programme which addresses all activities of the SESAR Joint Undertaking Agency.
SESAR Programme	The programme which defines the Research and Development activities and Projects for the SJU.
SLA	Service Level Agreement
SPA	SWIM Profile Assertion
STI	Security Token Infrastructure
SWIM	System Wide Information Management
SWIM-TI	SWIM Technical Infrastructure
TAD	Technical Architecture Description
TS	Technical Specification

Term	Definition
YP	Yellow Profile

2 SWIM-TI Technical Specifications Catalogue

2.1 SWIM-TI Overview

SWIM-TI is the enabler for the SWIM concept realization: *to increase the common situational awareness improving the ability to deliver the right information to the right people at the right time*. SWIM-TI contributes to the services' solution aspects providing means supporting an effective and secure ATM-specific services provisioning and consumption among SWIM Enabled ATM systems. The SWIM-TI concept and architecture are described in the SWIM-TI TAD [4].

SWIM-TI is built by specific technical elements identified and implemented in accordance with the needs of each ATM system and service. These technical elements consist of functionalities specified by providing requirements, architectural items, interfacing layers and standard technologies.

The SWIM-TI Technical Specifications deal with the "how" aspect of the SWIM-TI. More precisely, the Technical Specifications provide normative requirements concerning the SWIM-TI technical view [4]. As described in the SWIM-TI TAD [4], the key component that can provide/realize/deploy the functions of the Functional decomposition view of the SWIM-TI is the SWIM-TI Node. A SWIM-TI Node is an autonomous point of presence in the Distributed System (of Systems) that interacts with other SWIM-TI Nodes in the Distributed System (of Systems). The point of presence makes a set of functionality via one SWIM-TI Node available to any SWIM-TI Node or allows use of the functionality that is made available by a SWIM-TI Node via one or more SWIM-TI Nodes.

The SWIM-TI Node is a generic element that could be specialised in categories. At the time of writing, there are two categories of specifications [4]:

- The first category of specifications are captured and grouped under the notions of SWIM Profile [5], Profile Part, Role and Self-standing set.

- The second category of specifications consists of those captured and grouped under the notions of shareable functions [4].

Starting the TAD [4] and applying the SWIM Profiles principles and design [5], P14.01.04 provides a series of technical specifications, including functional, non-functional, applicable standards and interface requirements, belonging to the two categories.

Currently, three TSs of the first category are available:

- Yellow Profile Technical Specification [8].

- Blue Profile Technical Specification [9].

- Purple Profile Technical Specification [10].

In particular, the SWIM-TI functional view [4] have been analysed and detailed according to the SWIM-TI profiling [5], technical views [4] specifying per SWIM Profile Technical Specifications that include all applicable requirements to be implemented by software solutions. The scope of a given SWIM Profile Technical Specification is constrained by and defined according with the applicable SWIM Profile Assertion (SPA) available in §2.4 of the concerning TS.

In the table below, the applicability of SWIM-TI Functional Blocks, representing the SWIM-TI functional decomposition, to the available profiles is provided.

Functional Block Name	Functional Block Code	Applicable SWIM Profiles
Messaging	**MSG**	Blue Profile Yellow Profile Purple Profile
Security	**SEC**	Blue Profile Yellow Profile Purple Profile
Supervision	**SPV**	Blue Profile Yellow Profile
Recording	**REC**	Blue Profile Yellow Profile
Shared Object	**SO**	Blue Profile

Table 2-1: SWIM-TI Functional Blocks Applicability To SWIM Profiles

For what concerns the second category of specifications, currently two are available:

- Identity Management Technical Specification [6].

- Run-time Registry Technical Specification [7].

The Identity Management Technical Specification provides specifications for the information security technical views based on PKI (based on X.509 certificates) and/or STI (based on security tokens).

The Run-time Registry Technical Specification provides specifications for the Run-Time Registry technical view.

When applicable, in the SWIM Profile TSs the second category is also covered by specifications, with "consumer" role of Self-standing set, concerning shareable functions. In the table below the applicability of sharable functions to SWIM profiles is provided.

Sharable Function	Code	Applicable SWIM Profiles
Registry	**REG**	Yellow Profile Purple Profile
Identity Management	**PKI, STI**	Blue Profile (PKI only) Yellow Profile Purple Profile (PKI only)

Table 2-2: SWIM-TI Sharable Functions Applicability To SWIM Profiles

Refer to the SWIM-TI TAD [4] and SWIM Profiles [5] for further details about SWIM-TI architecture and SWIM Profiles.

All the available SWIM-TI Technical Specifications are briefly introduced in §2.3 together with the references to current versions.

2.2 SWIM-TI TSs Guidelines

P14.01.04 applied requirements guidelines including programme level guidelines [1] that have been extended introducing project level guidelines concerning requirement identifiers coding schema, requirements writing rules, project specific requirements attributes and links.

In particular, a number of P14.01.04 specific requirements attributes have been defined and specified. Each of the attributes can be considered as a dimension on which filtering can be applied. Combined filtering on multiple distinct attributes is meant to be meaningful. Conformance statements requirements included in the SWIM Profiles technical specifications are examples of filtering criteria.

SWIM-TI TSs table of content guidelines are provided in Appendix A.

SWIM-TI specific requirement guidelines are described in Appendix B.

2.3 SWIM-TI Technical Specifications

In this chapter an overview and references of each SWIM-TI Technical Specifications are provided.

The current set of <Service Binding> interface bindings for each of the available profiles have been extracted from the specification and reported in the SWIM Profiles Interface Bindings Catalogue [11].

2.3.1 SWIM-TI Yellow Profile Technical Specification

2.3.1.1 Overview

SWIM Yellow Profile scope and structure are detailed in the concerning SWIM Profile Assertion (§2.4 [8]).

The table below provides a summary of this SWIM profile scope and key elements.

Profile Name	Scope	Key Elements
Yellow Profile	• Based on the Web Services stack of standards running over Internet and sufficiently secured. • Deployment options kept open as possible. • Wide variety of interactions, flexibility and affordable for the service consumer. • Usable out-of-the-box with mainstream tools. • No real-time or near real-time uses. • Non demanding high availability. • Ground/Ground ATM information exchanges.	• Yellow Profile consists of different parts: "Core", "Messaging+", "Advance" and "Security+". • The Web Services family of protocols based on SOAP (SOAP 1.1 and 1.2, WSDL 1.1 and 2.0, WS-Security 1.1). • Transport level security controls (TLS 1.0, TLS 1.1 and TLS 1.2). • The AMQP v1.0 protocol. • Cryptography (PKI X.509 v3, XML Encryption, XML Signature and ECRYPT II).

Table 2-3:SWIM-TI Yellow Profile scope and key elements

For further details refer to 14.01.04.D44-004 §2.4 [8].

2.3.1.2 Reference

References to latest version of the SWIM-TI Yellow Profile Technical Specification are reported in the table below:

Deliverable Code	**14.01.04.D44-004**
Deliverable Name	**SWIM-TI Yellow Profile Technical Specification**
Edition Number and Date	**00.01.00, July 2016**
Spreadsheet containing exported Requirements set	**14.01.04-D44-004-SWIM-TI Yellow Profile Requirements.xls**

Table 2-4: SWIM-TI Yellow Profile Technical Specification Reference

2.3.2 SWIM-TI Blue Profile Technical Specification

2.3.2.1 Overview

SWIM Blue Profile scope and structure are detailed in the concerning SWIM Profile Assertion (§2.4 [9]).

The table below provides a summary of this SWIM profile scope and key elements.

Profile Name	Scope	Key Elements
Blue Profile	• Primarily Real-time or near real-time uses (best effort also supported). • Demanding high availability with severe constraints with respect to the available resources. • Technical solution as much as possible supported out-of-the-box. • Secured interactions (different security levels). • Running over trusted and untrusted networks. • Ground/Ground ATM information exchanges. • (FDD Profile part) Flight Object services.	• Blue Profile consists of different parts: "Core" and "Flight Data Domain". • The Web Services family of protocols based on SOAP (SOAP 1.1, WSDL 1.1). • OMG Real-time Publish-Subscr be specifications (DDS v1.2 and DDS-I v2.1). • Transport level security controls (TLS 1.0). • Message level security controls (OMG DDS Security). • Cryptography (PKI X.509 v3, and ECRYPT II).

Table 2-5:SWIM-TI Blue Profile scope and key elements

For further details refer to 14.01.04.D44-005 §2.4 [9].

2.3.2.2 Reference

References to latest version of the SWIM-TI Blue Profile Technical Specification are reported in the table below:

Deliverable Code	**14.01.04.D44-005**
Deliverable Name	**SWIM-TI Blue Profile Technical Specification**
Edition Number and Date	**00.01.00, July 2016**
Spreadsheet containing exported Requirements set	**14.01.04-D44-005-SWIM-TI Blue Profile Requirements.xls**

Table 2-6: SWIM-TI Blue Profile Technical Specification Reference

2.3.3 SWIM-TI Purple Profile Technical Specification

2.3.3.1 Overview

SWIM Purple Profile scope and structure are detailed in the concerning SWIM Profile Assertion (§2.4 [10]).

The table below provides a summary of this SWIM profile scope and key elements.

Profile Name	Scope	Key Elements
Purple Profile	- High latency and/or low bandwidth conditions. - No Real-time or near real-time uses. - Need to minimize the communication overhead and transport connections number. - Technical solution as much as possible supported out-of-the-box. - To enable proper information sharing in scenarios where availability of end-to-end connectivity over the communication infrastructure is intermittent and unpredictable. - Air/Ground ATM information exchanges.	- Purple Profile consists of different parts: "Core" and "Messaging Bridging". - Advanced Message Queuing Protocol (AMQP) (version 0-9-1). - Transport level security controls (TLS 1.0, TLS 1.1 and TLS 1.2). - Cryptography (PKI X.509 v3, XML Encryption, XML Signature and ECRYPT II).

Table 2-7: SWIM-TI Purple Profile scope and key elements

For further details refer to 14.01.04.D44-006 §2.4 [10].

2.3.3.2 Reference

References to latest version of the SWIM-TI Purple Profile Technical Specification are reported in the table below:

Deliverable Code	**14.01.04.D44-006**
Deliverable Name	**SWIM-TI Purple Profile Technical Specification**
Edition Number and Date	**00.01.00, July 2016**
Spreadsheet containing exported Requirements set	**14.01.04-D44-006-SWIM-TI Purple Profile Requirements.xls**

Table 2-8: SWIM-TI Purple Profile Technical Specification Reference

2.3.4 SWIM-TI Identity Management Technical Specification

2.3.4.1 Overview

According with SWIM-TI TAD [4], the SWIM-TI Identity Management provides primary activities concerning digital identities used in authenticated ATM information exchanges among SWIM participants. After evaluating different options offered by the current technological landscape, two main technical solutions has been identified in the TAD to support access control, transport and message level security at SWIM-TI layer. The first one relies on the Public Key Infrastructure (PKI) responsible for signing, emitting and maintaining X.509 certificates and revocation lists. The second one consists in the adoption of an Security Token Infrastructure (STI) providing capabilities to manage security tokens and Identity Store. It shall be clear that these solutions are not used in a mutually exclusive fashion, but rather they can cooperate to realise a comprehensive security strategy.

For further details refer to TAD [4] and 14.01.04.D44-002 §2 [6].

2.3.4.2 Reference

References to latest version of the SWIM-TI Identity Management Technical Specification are reported in the table below:

Deliverable Code	**14.01.04.D44-002**
Deliverable Name	**SWIM-TI Identity Management Technical Specification**
Edition Number and Date	**00.01.00, July 2016**
Spreadsheet containing exported Requirements set	**14.01.04-D44-002-SWIM-TI Identity Management Requirements.xls**

Table 2-9: SWIM-TI Identity Management Technical Specification Reference

2.3.5 SWIM-TI Run-Time Registry Technical Specification

2.3.5.1 Overview

Registry allows retrieving META Information about the Services and the ATM Information provided by them. It is also needed to support the sharing of policies where it is possible and desirable to manage a common set of policies. The policies are provided to the Policy Enforcement for SWIM-TI Messaging, SWIM-TI Security and SWIM-TI Supervision.

In particular the Registry covers the following capabilities:

- Service discovery/subscription, service publication, service dependencies/consumption (standards, policies, other services) management and service management;

- Policy discovery/subscription, policy publication, policy management and policy deployment;

- Standard discovery/subscription, standard publication and standard management;

- Certification discovery/subscription, certification publication, certification provision and certification management;

- Category discovery/subscription, category publication, category classification and category management.

However not all the aspects described above are covered by this deliverable. In particular the following aspects are not detailed:

- Standard discovery/subscription, standard publication and standard management;

- Certification discovery/subscription, certification publication, certification provision and certification management;

- Category discovery/subscription, category publication, category classification and category management.

For further details refer to TAD [4] and 14.01.04.D44-003 §2 [7].

2.3.5.2 Reference

References to latest version of the SWIM-TI Run-Time Registry Technical Specification are reported in the table below:

Deliverable Code	14.01.04.D44-003
Deliverable Name	SWIM-TI Run-Time Registry Technical Specification
Edition Number and Date	00.01.00, July 2016
Spreadsheet containing exported Requirements set	14.01.04-D44-003-SWIM-TI Run-Time Registry Requirements.xls

Table 2-10: SWIM-TI Run-Time Registry Technical Specification Reference

3 References

[1] Requirements and V&V Guidelines, 03.01.00.

[2] Templates and Toolbox User Manual, 03.01.00.

[3] SESAR Technical Specification (TS) Template, 03.00.00.

[4] 14.01.03 D30, SWIM Architectural Definition Final, Edition 00.01.00, June 2016.

[5] 14.01.03 D39 SWIM Profiles Final, Edition 00.01.00, June 2016.

[6] 14.01.04 D44-002, SWIM-TI Identity Management Technical Specification, Edition 00.01.00, July 2016.

[7] 14.01.04 D44-003, SWIM-TI Run-Time Registry Technical Specification, Edition 00.01.00, July 2016.

[8] 14.01.04 D44-004, SWIM-TI Yellow Profile Technical Specification, Edition 00.01.00, July 2016.

[9] 14.01.04 D44-005, SWIM-TI Blue Profile Technical Specification, Edition 00.01.00, July 2016.

[10]14.01.04 D44-006, SWIM-TI Purple Profile Technical Specification, Edition 00.01.00, July 2016.

[11] 14.01.04 D44, SWIM Profiles Interface Bindings Catalogue, Edition 00.01.00, July 2016.

Appendix A Technical Specifications Table Of Content Guidelines

The SWIM-TI Technical Specifications are based on the template and guidelines defined in the SESAR programme for the Technical Specifications [3]. The recommended table of content has been adapted according with the SWIM-TI. In particular, the scope, the purpose and the decomposition of some sections (mainly those concerning non-functional requirements (NFRs) have been refined to improve the accessibility of provided specifications.

In this appendix, guidance concerning the adopted Table Of Content (ToC) is provided.

A.1 Sharable Functions Technical Specifications

SWIM-TI Sharable Function TS §3 is organized in several sub-chapters. The main level of decomposition is between functional, non-functional and interface requirements[1]:

- Functional requirements (§3.1).

- Non-functional requirements, which include the following NFRs:

    - Adaptability (§3.2), which contains requirements related to growth and expandability.

    - Performance Characteristics (§3.3), which contains requirements concerning capacity, accuracy, timing performances, software resource usage, etc..

    - Safety and Security (§3.4), which contains security and privacy requirements, including access limitations, data protection and recovery methods; it also includes safety requirements(according to the safety analysis based on respective standards – when available).

    - Maintainability (§3.5), which contains quantitative maintainability requirements.

    - Reliability (§3.6) which contains requirements concerning the robustness to abnormal operating conditions.

    - Internal Data Requirements (§3.7).

    - Design and Construction Constraints (§3.8).

- Interface requirements (§3.9), which contains the specification of the interfaces (including external, internal and network bindings).

An additional level of decomposition concerns the NFRs: all the sections have been organized according to NFR characteristics and sub-characteristics defined in the ISO/IEC 25010:2011. For instance, §3.3 (Performance Characteristics) has been traced to ISO/IEC 25010:2011 "Performance efficiency" NFR characteristic. According with that, §3.3 has been decomposed by providing a section for each ISO/IEC 25010:2011 "Performance efficiency" sub-characteristics (i.e. time behaviour, resource utilization and capacity requirements). The adoption of ISO/IEC 25010:2011 as reference is coherent and consistent with the SWIM Profiles definition [5].

---

[1] In the Identity Management TS, this structured is duplicated for requirements applicable only to the PKI or to STI.

The interface requirements sections section (§3.9) has been decomposed according to interface binding kinds described in the TAD [4]. In particular, when applicable, following decomposition is adopted:

- Internal Service Interface bindings, which contains the specifications concerning the "Internal Service Binding". This kind of binding is internal to the SWIM-TI only and related to any such internal service (e.g. PKI services).

- Network Interface bindings, which contains the specifications concerning the "Network Binding". This kind of binding is external to the SWIM-TI and related to the Network only.

- External Service Interface bindings, which contains the specifications concerning the "External Service Binding". This kind of binding is external to the SWIM-TI and not a <Service binding> or a <Network binding> (e.g. Time Service).

A given binding of type "Internal Service Binding" or "External Service Binding" relies on one specific "Network Binding" (traced in the concerning REQ Trace table).

A.2 SWIM Profiles Technical Specifications

SWIM Profiles TS §3 is organized in several sub-chapters. The first level of decomposition is between requirements that apply to all the technical functions (§3.1) – or in general to the SWIM Node at a whole - and those that are specific to a given technical function (§3.2, §3.3, etc.). The technical functions are from functional and technical views detailed in the SWIM-TI TAD [4].

The second level of decomposition is between functional, non-functional and interface requirements. In particular, each sub-chapter §3.X is structured as follows:

- Functional requirements (§3.X.1).

- Non-functional requirements, which include the following NFRs:

    - Adaptability (§3.X.2), which contains requirements related to growth and expandability.

    - Performance Characteristics (§3.X.3), which contains requirements concerning capacity, accuracy, timing performances, software resource usage, etc..

    - Safety and Security (§3.X.4), which contains security and privacy requirements, including access limitations, data protection and recovery methods; it also includes safety requirements(according to the safety analysis based on respective standards – when available).

    - Maintainability (§3.X.5), which contains quantitative maintainability requirements.

- Reliability (§3.X.6) which contains requirements concerning the robustness to abnormal operating conditions.

- Internal Data Requirements (§3.X.7).

- Design and Construction Constraints (§3.X.8).

- Interface requirements (§3.X.9), which contains the specification of the interfaces (including external, internal and network bindings).

If in one or more sub-sections of §3.2, §3.3, etc., no requirements concerning a given category (e.g. Design and Construction Constraints) are provided, all those (if any) included in the concerning §3.1 section (e.g. §3.1.8) are applicable. This approach has been adopted to avoid the duplication of (similar) requirements.

The third level of decomposition concerns the NFRs: all the sections have been organized according to NFR characteristics and sub-characteristics defined in the ISO/IEC 25010:2011. For instance, §3.X.3 (Performance Characteristics) has been traced to ISO/IEC 25010:2011 "Performance efficiency" NFR characteristic. According to that, §3.X.3 has been decomposed by providing a section for each ISO/IEC 25010:2011 "Performance efficiency" sub-characteristics (i.e. time behaviour, resource utilization and capacity requirements). The adoption of ISO/IEC 25010:2011 as reference is coherent and consistent with the SWIM Profiles definition [5].

In the TAD [4], the SWIM-TI Security functional and technical views are described. This specification includes all the identified requirements representing the "what" and the "how" concerning those views. In this area, the SWIM Profiles TSs are complemented by the SWIM-TI Identity Management Technical Specification [6]. In accordance with ISO/IEC 25010:2011, for each §3.X sub-chapters, a specific section concerning the security has been provided. Requirements included in those sections are security requirements applicable to the SWIM Node or/and to the specific technical function (e.g. Messaging). The same applies to the SWIM-TI Security for which security requirements have been identified. For instance, the access to SWIM-TI Security function configurations shall be restricted to authorized users only: this is an example of "security requirement" applicable to the SWIM-TI Security technical functions.

The interface requirements sections section (§3.X.9) has been decomposed according to interface binding kinds described in the TAD [4]. In particular, when applicable, following decomposition is adopted:

- Service Interface bindings, which contains the specifications concerning the "Service Binding". This kind of binding is external to the SWIM-TI and related to an ATM specific service only.

- Internal Service Interface bindings, which contains the specifications concerning the "Internal Service Binding". This kind of binding is internal to the SWIM-TI only and related to any such internal service (e.g. PKI services).

- Network Interface bindings, which contains the specifications concerning the "Network Binding". This kind of binding is external to the SWIM-TI and related to the Network only.

- External Service Interface bindings, which contains the specifications concerning the "External Service Binding". This kind of binding is external to the SWIM-TI and not a <Service binding> or a <Network binding> (e.g. Time Service).

A given binding of type "Service Binding" or "Internal Service Binding" or "External Service Binding" relies on one specific "Network Binding" (traced in the concerning REQ Trace table).

Appendix B   SWIM-TI Requirements Guidelines

Requirements included in the SWIM-TI Technical Specifications have been specified and managed according to the guidelines provided in the TS template [3] and programme level guidelines [1] [2].

Additional project level guidelines concerning requirement identifiers coding schema, requirements writing rules, requirements attributes and links have been introduced. In particular, a number of P14.01.04 specific requirements attributes have been defined and specified. Each of the attributes can be considered as a dimension on which filtering can be applied. Combined filtering on multiple distinct attributes is meant to be meaningful. Conformance statements requirements included in the SWIM Profiles technical specifications are examples of filtering criteria.

In this appendix guidance concerning the main aspects is provided.

A.3 SWIM Profiles requirements writing guidelines

SWIM Profiles are assembled from Technical Specifications produced in the 14.01.04. Such assembly has additional requirements on the way Technical Specifications are produced.

A.3.1 Links

A.3.1.1 Unambiguity and precision

The SWIM Profile must be usable by 3 types of users: Service Provider, SWIM-TI Provider and Network Provider. For 2 types of users - SWIM-TI Provider and Network Provider -, precision and unambiguous interpretation are key requirements on the specifications.

A.3.1.1.1   Scope of specifications

Not all specifications are equal or peers. Without a formal link that documents how 2 specifications relate or possibly do not relate to each other, any interpretation is poss ble. In some cases the interpretation may be present in accompanying text but hidden deeply in that text and maybe in a way that is not clear.

Some specifications are specializations of other specifications, i.e. they inherit everything from a higher specification but add/restrict some elements. Not having such link formally established makes it impossible for a user of the Profile to know with certainty how 2 specifications related to each other.

Examples:

- Some specifications are specializations of other specifications, i.e. they inherit everything from a higher level specification but add/restrict some elements.

- Some specifications apply to other specifications, i.e. they constrain a specification.

- Combinations of above specifications can occur and the interpretation must be predictable and unambiguous. Without explicit documentation of the link between the specifications and the nature of the link, following specifications are subject to ambiguous interpretation:

  Req 1. *The SWIM Messaging Functional Block shall provide the Push style Publish/Subscribe Message Exchange Pattern (PSPUSH-MEP).*

  Req 2. *The SWIM Messaging Functional Block shall provide the Topic based Push style Publish/Subscribe Message Exchange Pattern (TPSPUSH-MEP).*

Req 3. *SWIM-TI Messaging Functional Block PSPUSH-MEP shall provide Subscribers with the ability to specify subscription expiration time*.

Req 1 and Req 2 can be seen as peers, i.e. 2 distinct MEPs. However Req 2 can also be seen as a specialization of Req1. From a textual analysis of the requirement Req 3 is interpreted as a constraint applicable to Req 1 only. Depending on the interpretation of the relationship between Req 1 and Req 2, the scope of applicability of Req 3 will be different.

Specifications come and go. If the structure and relationship between the specifications is not formally caught, an impact assessment is very difficult and probability of inconsistencies and ambiguity very high. Explicit provision of the links will support understanding.

Hence each such specialization specification needs a link of type

Specialized specification *<specializes>* generic specification

through a formal capturing in the REQ table.

Hence each such constraining specification needs a link of type

Constraining specification *<applies to>* specification

through a formal capturing in the REQ table.

SWIM-TI requirements "REQ Trace" table have been enriched with "links types" according with the needs documented above. Project specific links are described in appendix A.6.

A.3.1.1.2   Precision

A SWIM-TI provider and a Network provider require precise specifications. If the specifications are not sufficiently precise, the expected interoperability cannot be realized.

A hierarchy of specifications can exist whereby high-level specifications describe the requirements in a way that is not precise and/or not measurable. This is acceptable as long as low-level specifications exist that are precise and/or measureable and that are linked to these high-level specifications. Such links are of the type a low-level specification "satisfies" a high-level specification.

Hence each such low-level specification needs a link of type

Low-level specification <satisfies> High-level specification

through a formal capturing in the REQ attributes.

A single low-level specification can satisfy multiple high-level specifications.

However specifications are found with a precision that lies somewhere between high-level and low-level and which cannot be categorized: too detailed for the "Service Provider", not precise enough for the "SWIM-TI Provider" and/or "Network Provider".

SWIM-TI requirements "REQ Trace" table have been enriched with "links types" according with the needs documented above. Project specific links are described in appendix A.6.

A.3.1.2 Links in requirements text

Explicit links in the requirements text constrain the use of the specification to a particular context. Such mechanism could intentionally be used to explicitly inhibit reuse of a specification in any other context.

Each such link needs to be reflected in the requirement trace or through an equivalent formal capturing in the requirement attributes.

A.3.1.3 Targeted audience

The issuer of the specification may have a clear view on the targeted audience.

Hence each specification will have the option to establish a link with the targeted audience

Specification <relevant for> {Service Provider | SWIM-TI Provider | Network Provider}

through a formal capturing in the REQ attributes.

A.3.2 Interface

A.3.2.1 Consistency

Specifications that link 2 sides of an Interface require specifications re. the mapping of that Interface that allow the interaction.

Anti-pattern:

> "*Service provider shall provide information on the type of expected identity security token expected for user authentication and authorization during the service invocation.*"

The Service provider is located in the "ATM Application Layer". The authentication and authorization happen in the "SWIM-TI Layer". The term "provide" is interpreted as a request crossing the interface. However no abstract API nor mapping onto a concrete protocol can be found that allows the Service provider to cross the Interface for this type of request.

A.3.2.2 Roles

Specifications that link 2 sides of an Interface explicitly define the roles of the entities at each side. One side provides a service to the other side. Specifications on Internal Interface can be found whereby the roles are confused which make the specification difficult to impossible to understand.

Anti-pattern:

> "*SWIM-TI Security Functional Block Confidentiality Function shall provide XML Encryption based message level confidentiality*".

The message level confidentiality is provided by the Messaging. The Messaging uses the Security to perform some calculations related to XML Encryption.

A.3.3 Mix

A.3.3.1 Standards/protocols and configuration

In order to be able to separate the presentation in the SWIM Profile of protocols/ standards on one side and the configuration thereof on the other hand, this information should not be mixed in the same specification.

A.3.3.2 Granularity

A specification allocated to a SWIM Profile should not include superfluous or irrelevant requirements.

A.3.4 Overlaps

Specifications derived from distinct Use Case may be similar but not identical. Without context such specifications seem to overlap without justification but with a context described through links the necessary clarity and justification should be available.

A.3.5 Particular cases

Some technology does not dispose of an Interface description language such as WSDL or IDL.

A placeholder specification may be required to describe in a non-standardized manner the equivalent of a WSDL or IDL.

A.3.6 Terminology

A.3.6.1 Should

The term "should" is used to indicate a specification that is recommended not but not mandatory. If there is a need for such optional specification, a context is required in the requirement text itself.

A.3.6.2 Support/Allow

The terms Support and Allow can be found in specifications. The precise meaning and interpretation is often not clear. This is acceptable for a High-Level specification only and provided the presence of Low-level specifications that bring clarity.

A.3.6.3 Harmonization and traceability to definition

The terminology is not necessarily used in a consistent manner across specifications:

- The same term can be have different semantics depending on the context.

- Slightly different terms can have identical semantics depending on the context.

- Slightly different terms can have varying relationships depending on the context.

The use of different terms to cover the same semantics should be avoided. The term should be traced to its definition. The definition should also provide sufficient context to understand the relationships with other terms.

A.3.7 Conformance assessment

A.3.7.1 High-level specification only

A SWIM Profile provides a set of specifications for an implementation on a SWIM Node. A SWIM Node provides interoperability and capabilities.

Where interoperability is not impacted, a high-level specification without linked detailed specifications is acceptable.

However in case a high-level specification impacts interoperability, and it is not measurable, precise and unambiguous, and it has no linked detailed specification(s) that satisfies(/satisfy) the high-level specification, then high-level specification is open-ended and void.

Many or any implementation will then be able to claim conformance while interoperability will not be realized or capabilities will not meet Stakeholder expectations.

Hence, when interoperability is impacted a high-level specification must be accompanied by one or more detailed specifications.

A.3.7.2 Conformance claim point of view

Each specification needs to be assessed from a conformance claim point of view for each of the Stakeholders.

- is this specification relevant for conformance testing? Whether it is or not should be flagged. The existing flags of "Verification Method" as described in "Templates and Toolbox User Manual" should be used to indicate this relevance.

- if the specification is relevant for conformance testing

  - then assess:

    - the possible variations of interpretation and implementations that could occur: add precision and clarity to maximize interoperability and expected capabilities

    - the consistency of the specification with other specifications

The conformance criteria are part of the specification itself.

A.4 Specific template for requirement text

For a number of specifications the requirement text follows a specific template in order to be able to express a coherent atomic view of a set of elements.

A.4.1 Interface Bindings

A number of specifications are related to the technical configuration of the Internal Interfaces and External Interfaces of the SWIM-TI. The key element of such technical configuration is the binding specification.

The requirement text of a binding specification is presented in a specific format as it has to bring and bind together a set of different specifications and present all these specifications as a single atomic requirement that applies in its whole. The structure of the requirement text documented below is applicable to all types of bindings.

In order to keep the requirement text of the binding readable and limited in size, a set of specifications which are part of the atomic concept, have not been included directly in the requirement text but they are referenced through the <INCLUDES> links of the binding. The effect of each <INCLUDES> link is equivalent to effective inclusion of the entire requirement text of the referenced specification in requirement text of the binding.

The requirement text of a binding identifies in distinct elements:

- The protocol stack. This element describes the stacking of the protocols from high to low in the stack in this binding.

- MEP. This element enumerates all the Message Exchange Patterns as seen from the more abstract side of the interface, that are supported by the more concrete side of the Interface, i.e. protocol stack, in this binding. The allowed values are limited to the MEPs as defined in the SWIM-TI Technical Architecture Document and SWIM-TI TS documents.

- Fault handling if applicable. This element describes the extent to which one side of the interface controls the behaviour of the other side of the interface related to faults/exceptions in this binding.

- Encoding. This element enumerates the defined and supported encodings that apply to, that are understood by and that are supported by both sides of the interface in this binding.

- Security. This element enumerates for each security need of a defined set, the location of the security control or the security controls, that will support the security need in this binding. The defined set of security controls consists of Confidentiality, Integrity, Authenticity, Authorization, Non-repudiation. The allowed values for each of the security controls are constructed from: network, transport, message, none. Except for the value none, it is valid to specify multiple values to reflect the presence of multiple security controls at distinct locations that support a security need. For the security control or security controls linked with Authenticity the value above can be combined with one word from this list: client, server, mutual. This value indicates which participant, identified through the role the participant has in the communication, will be authenticated by other participant(s).

- Contract. If the presence of a contract is not applicable the value will be none. This element (formalism of contract description) defines for this binding the mandated formalism to describe the contract, i.e. the mapping between operations, data and MEP on one side of the Interface and the equivalent on other side of the Interface, the address or addresses where the Interface or elements of the Interface can be reached). This element (minimum) enumerates

the mandated concrete contracts that have been defined for this binding. This element (reference) enumerates the authoritative sources of contracts for this binding.

- Interoperability. This element enumerates the mandated specifications that constrain and override the configuration options of the included specifications in order to promote interoperability for this binding.

A.4.2 Measurements

In conformity with ISO/IEC 25010 and ISO/IEC 25023:

- A requirement related to Performance Efficiency (ISO/IEC 25010) shall, where applicable, be expressed in one or more measurements and the conditions whereunder these measurements are performed.

  A single requirement can contain multiple measurements and can contain only a single set of conditions. The set of conditions applies to all measurements. The measurements will specified first and followed by the conditions in a clearly separated manner.

  The measurements will be listed under a heading "Measurements".

  The conditions will be listed under a heading "Measurement conditions".

- A requirement related to Reliability (ISO/IEC 25010) shall, where applicable, be expressed in one or more measurements and the conditions whereunder these measurements are performed as well as for which period of time.

  A single requirement can contain multiple measurements and can contain only a single set of conditions and can contain only a single period of time. The measurements will specified first and followed by the conditions in a clearly separated manner and followed by the period of time in a clearly separated manner.

  The measurements will be listed under a heading "Measurements".

  The conditions will be listed under a heading "Measurement conditions".

  The period of time will be specified under a heading "Period of time".

Project Number 14.01.04
D44-001 - SWIM-TI Technical Specifications Catalogue

Edition 00.01.00

A.5 SWIM-TI specific requirement attributes

This chapter includes the description and the semantic requirement attributes used in 14.01.04 Technical Specification documents. These attributes complement the SESAR programme guidelines [1][2].

The various forms of categorisation of the requirements through the attributes that are described below constitute an aid to enable to quickly find relevant requirements in a particular context. In some cases the categorisation is formal and complete, in some cases it is not.

The attributes types are meant to be strictly generic and applicable across all SWIM Profiles. The attribute values could contain values that are specific for a SWIM Profile, SWIM Profile Part, Role or Selfstanding Set.

Each of the attr butes can be considered as a dimension on which filtering can be applied. Combined filtering on multiple distinct attributes is meant to be meaningful.

Following attributes are based on SWIM-TI ontology elements included in the SWIM-TI TAD [4] and SWIM Profiles definition [5].

A.5.1 "Profile Part" Attribute

A.5.1.1 Rationale

The notion of Profile Part is explained in the SWIM-TI Ontology [4]. It was first concretely applied to the Yellow Profile and this use has been motivated in the SPA of the Yellow Profile (§2.4 in [8]). The same has been applied also to Blue and Purple profiles.

A.5.1.2 Possible values

Each requirement is part of at least one Profile Part. Currently, one of more of the following values are allowed:

Blue Profile:

- <BP Core>
- <BP FDD>

Purple Profile

- <PP Core>
- <PP Messaging Bridging>

Yellow Profile:

- <YP Core>
- <YP Security+>
- <YP Advanced>

founding members

Avenue de Cortenbergh 100 | B -1000 Bruxelles
www.sesarju.eu

33 of 50

©SESAR JOINT UNDERTAKING, 2015. Created by LEONARDO-FINMECCANICA, THALES, INDRA, FREQUENTIS, AIRBUS, HONEYWELL, EUROCONTROL for he SESAR Joint Undertaking within the frame of the SESAR Programme co-financed by the EU and EUROCONTROL. Reprint with approval of publisher and the source properly acknowledged.

- ■ <YP Messaging+>

The list of values is not fixed. For instance: new Profiles may be defined, existing Profiles may disappear, new Profile Parts may be defined, existing Profile Parts may disappear. However above list of value is fixed in the context of SESAR 1 programme.

When a requirement applies only to one or more of <Identity Management Provider>, <Identity Management client>, <Shareable function provider>, <Shareable function consumer> roles and does not apply to any SWIM Profile, the following value is used:

- ■ <Not applicable>

A.5.1.3 Considerations

A Profile Part is used to group functionality into subsets ranging from minimal or core functionality to full or complete functionality. The difference with the notion of Level is that Profile Parts are not necessarily nested (called stacked pattern) but can also exist side-by-side.

The "Profile Part" is the encompassing and coordinating entity that ensures the coherent information sharing by all participants in a Plug & Play manner.

It suffices for a participant to stick to the specifications of a Profile Part in a conforming manner to be ensured of coherent information sharing with other participants in the context of the same Profile Part.

Profile Parts themselves can be composed in the different manners with other Profile Parts. This information is captured in both the SPA in dedicated requirements with category <Design>.

A possible example is provided in the figure below: the Yellow Profile consists of Core Part that represents minimal functionality. Three additional side-by-side Profile Parts have been defined: Messaging+, Security+ and Advanced that can exist in any combination with each other on top of the Core Part. The full or complete functionality is represented by the presence of all Profile Parts: Core, Messaging+, Security+ and Advanced.

The currently defined methods of composition are one of

- ■ <N/A>

- ■ <Stacked>: the profile part inherits and specializes the profile part (requirements) on which it is stacked on. In the figure below, all the requirements applying to the "<YP Core>" are also applicable to the "<YP Advanced>" profile part.

- ■ <SidebySide>: the profile part is independent of and can exist in any combination with one or more other parts. In the figure below, the "<YP Security+>" is in <Stacked> relationship with the "<YP Core>" and is independent of /can be combined in any forms with the "<YP Messaging+>" and "<YP Advanced>" (<SidebySide> relationship) parts.
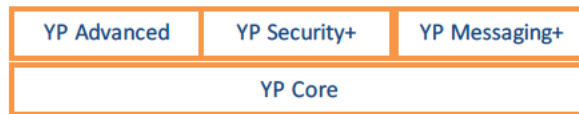
Figure 3-1: Example of SWIM Profile "Profile Part"

A.5.2 "Domain of interest" Attribute

A.5.2.1 Rationale

The requirements in the Profiles range from Interoperability and Interface related requirements over SLA and Governance related requirements to system Behaviour and Functional related requirements. The relevance of the requirements is not always considered to be equal (hence the use of the term Domain of interest). The competencies to address such requirements are often not concentrated in a single person or single entity. There is a high level of decoupling between 4 domains of interest present in the Profiles including lifecycle.

Example:

> Interoperability and interface related requirements are considered crucial and immutable while SLA and governance related requirements and system behaviour and functional related requirements are subjected to negotiations and changing methods of operation and organisation.
>
> SLA and Governance related requirements can change over time at a different pace than Interoperability and Interface related requirements.

A.5.2.2 Possible values

One requirement can be of interest for more than one Domain of interest. One requirement can be applicable to more than one Profile Part.

Currently, one of more of the following values are allowed:

- <ICD>

- <SLA>

- <Governance>

- <Function/Behaviour>

- <Unspecified>

<Unspecified> is an indication of a problem that needs to be solved. If a requirement is not found to be needed for any of the 3 providers (defined in subsequent Point of View), then the relevance of the requirement may be questionable.

The interest of a Domain of interest for a requirement can be different depending on the Profile Part.

The list of values is not fixed. For instance: currently it is proposed to keep Function and Behaviour related requirements together in the same Domain of interest but they could be split into 2 distinct Domain of interest.

A.5.2.3 Considerations

There is no single common standardised definition of ICD. Requirements related to protocols and the configuration thereof inside the SWIM-TI that allow 2 or more parties to participate in an interaction are part of ICD.

Requirements related to the interaction between the SWIM-TI and external entities such as ATM specific services and the Network are part of an ICD.

The notion of SLA is covered by various standards (e.g. ITIL and ISO/IEC 20000, CMMI, COBIT) but there is no single common standardised definition of SLA. The notion of SLA as Domain of Interest represents a subset of the topics typically covered by the various standards:

Requirements related to qualitative and quantitative measurements are part of SLA.

The notion Governance is covered by various standards (e.g. ITIL, CMMI, various ISO IT Governance Frameworks) but there is no single common standardised definition of Governance.

Requirements related to configurability are part of Governance.

Requirement related to Roles and responsibilities are part of Governance.

Requirements related to the manner an implementation is operated and organised are part of Governance.

There is no single common standardised definition of Behaviour/Functional.

Most of the Domain of Interest can be constructed to some extent in a mechanical manner from an existing attribute Category and in such case would not need an additional attribute. Without change of the current definition of Category following represents the best possible mapping:

<ICD> = <Interoperability> + <Interface> + <HMI>

<SLA > = <Performance> + <Maintainability> +<Reliability> + <Safety> + <Security>

<Governance> = <Maintainability> +<Reliability> + <Safety> + <Security>

<Function/Behaviour> = <Functional>

Above use of category presents following restrictions:

- there is no way to select one or more specific requirements that have classified in one or more of the limited list of Categories, to some of the Domains of interest remaining semantically correct.

- (example) the requirements on configurability of policies are in the Domain of Interest <Governance> but they are tagged in the Category <Functional>. Getting such specifications in <Governance> with existing construct would require to tag in one of the Categories that are mapped to <SLA/Governance>. However none of them covers configurability of policies.

Because of these limitations, the existing attribute Category as is cannot be re-used. This is why a dedicated requirement attribute has been introduced. This attribute could be defined and used as follows:

- ICD.

  By convention the requirements that belong to the Domain of interest ICD, can be identified through the classification in the TS. The requirements in following chapters belong to the Domain of interest ICD:

  3.x.8.2 Interoperability

  3.x.9 Functional Block Interface Requirements

  Additional requirements can be added to the Domain of interest ICD where needed.

- SLA/Governance.

  By convention the requirements that belong to the SLA/Governance, can be identified to some extent through the classification in the TS. The requirements in following chapters belong to the SLA/Governance:

  3.x.2 Adaptability

  3.x.3 Performance Characteristics

  3.x.4 Safety & Security

  3.x.5 Maintainability

  3.x.6 Reliability

  3.x.8.1 Co-existence

  3.x.8.3 Installability

  3.x.8.1Replaceability

  Additional requirements can be added to the Domain of interest SLA/Governance where needed. This applies in particular any requirement classified in the TS under 3.x.1 Capabilities that expresses the need for configurability.

- Behaviour/Functional.

  By convention the requirements that belong to the Behaviour/Functional, can be identified to some extent through the classification in the TS. The requirements in following chapters belong to the Behaviour/Functional:

  3.x.1 Capabilities

  3.x.1 Functional Block Internal Data Requirements

  Additional requirements can be added to the Domain of interest Behaviour/Functional where needed.

Theoretically the applicability of a requirement to a Domain of interest can be different depending on the Profile Part. This is theoretical and is not expected to occur often, nevertheless in case it would be needed then the possible values should also include the Profile Part which is not currently foreseen. In case such need would occur, it is to be considered as an anomaly and possibly requiring a requirement to be split.

A.5.3 "Point of view" Attribute

A.5.3.1 Rationale

From a system context diagram like perspective, the SWIM-TI interacts mainly with the ATM specific services and with the network. The providers for each of these 3 interacting entities have different needs regarding to which specifications of the SWIM-TI are relevant.

Example:

> The service provider may not need to be aware of the requirement that states that HMAC shall be provided a Message Authentication Codes algorithm but must know about the Message Exchange Patterns (MEP) the SWIM-TI offers to an ATM specific service. The network provider may not need to be aware of the MEPs the SWIM-TI offers to an ATM specific service but needs to know which version of IGMP or MLD is required. The SWIM-TI provider will need to know all requirements.

A.5.3.2 Possible values

One requirement can be needed for more than one provider. One requirement can be applicable to more than one Profile Part.

Currently, one of more of the following values are allowed:

- <SWIM-TI provider>
- <ATM service>
- <Network provider>
- <Unspecified>

<Unspecified> is an indication of a problem that needs to be solved. If a requirement is not found to be needed for any of the 3 providers, then the relevance of the requirement may be questionable.

This list could be changed but is considered to be mature and stable: the likelihood of being changed is very low.

A.5.3.3 Considerations

At least some of the requirements can be allocated to a Point of view in a mechanical manner.

Examples:

- bindings of the Network bindings group can be allocated systematically to the <Network provider>.

- bindings of the Service bindings group can be allocated systematically to the <ATM service>.

The need of a provider for a requirement can be different depending on the Profile Part. This is theoretical and is not expected to occur often, nevertheless in case it would be needed then the possible values should also include the Profile Part which is not currently foreseen. In case such need would occur, it is to be considered as an anomaly and possibly requiring a requirement to be split.

A.5.4 "Role" Attribute

A.5.4.1 Rationale

The notion of role is explained in the SWIM-TI Ontology [4] and applied in the SWIM Profiles definition [5].

A.5.4.2 Possible values

One of more of the following:

- <Service provider>

- <Service consumer>

- <Subscriber>

- <Subscription handler>

- <Publisher>

- <Publication consumer>

- <Publication mediator>

- <Identity Management provider>

- <Identity Management consumer>

- <Shareable function provider>

- <Shareable function consumer>

- <Unspecified>

The interpretation is as follows:

- <Service provider>, <Service consumer>: The term "Service" reflects an ATM specific service.

- <Subscr ber>, <Subscription handler>, <Publisher>, <Publication consumer>, <Publication mediator>: roles in the Publish/Subscribe type of MEPs and Observer type of MEPs.

- ▪ <Identity Management Provider>,<Identity Management client>: roles in an Identity management context.

- ▪ <Shareable function provider>, <Shareable function consumer>: generic roles for shareable functions, if no specific role denomination is required (e.g. run-time registry sharable function).

- ▪ <Unspecified> is an indication of a problem that needs to be solved.

A.5.4.3 Considerations

Similar to above (Domain of Interest and Point of View), theoretically the role for a requirement can be different depending on the Profile Part. This is theoretical and is not expected to occur often, nevertheless in case it would be needed then the possible values should also include the Profile Part which is not currently foreseen. In case such need would occur, it is to be considered as an anomaly and possibly requiring a requirement to be split.

A.5.5 "Selfstanding set" Attribute

A.5.5.1 Rationale

The notion of Selfstanding Set is explained in the SWIM-TI Ontology Terminology Relationships and Semantics (SWIM-TI TAD [4]).

A.5.5.2 Possible values

Some requirements represent a Selfstanding Set of requirements. One of the following:

- ▪ <Service binding>

- ▪ <Network binding>

- ▪ <External service binding>

- ▪ <Internal service binding>

- ▪ <Not applicable>

- ▪ <Unspecified>

The interpretation is as follows:

<Service binding> : external to the SWIM-TI and related to an ATM specific service only.

<Network binding> : external to the SWIM-TI and related to the Network only.

<External service binding> : external to the SWIM-TI and not a <Service binding> or a <Network binding>.

<Internal service binding> : internal to the SWIM-TI only and related to any such internal service.

<Not applicable>: any specification that does not represent a Selfstanding Set.

<Unspecified> is an indication of a problem that needs to be solved.

A.5.5.3 Considerations

It should be possible starting from one requirement that represents an entire Selfstanding Set of requirements to mechanically identity and assemble all applicable requirements. The existing defined relationships such as <APPILIES TO> and <INCLUDES> should be used.

Such relationships can exist in multiple stages and will be identified as being part of the Selfstanding set. Example:

REQ X is the requirement that represents a Selfstanding set of requirements.

REQ X <INCLUDES> REQ Y

REQ Z <APPLIES_TO> REQ Y

The Selfstanding Set represented by REQ X will consist of REQ X, REQ Y and REQ Z.

The set of requirements that are explicitly included in a binding requirement are limited to "ICD" type of requirements. There could be confusion on how to interpret a binding as a Selfstanding Set from inclusion or not of other requirements (e.g. functional, non-functional). By convention:

- all other requirements that are not tagged as "ICD" and that do not have an <APPLIES_TO> relationship will be included in the Selfstanding Set.

- all other requirements that are not tagged as "ICD" and that do have an <APPLIES_TO> relationship will be included in the Selfstanding Set if there exist a path via relationship to a requirement that is part of the "ICD" or that is part of the ones identified in the line above.

A.5.6 "Conformance" Attribute

A.5.6.1 Rationale

Grouping of specifications in Profiles, Profile Parts, Roles and Selfstanding Sets reduces the amount of variability but there typically still remains a certain amount of variability within such groups. This variability can be interpreted differently by different involved parties. Different interpretations can lead to situations whereby interoperability is impeded.

In order to avoid possibly distinct interpretations and resulting implementations of the technical specification of a SWIM Profile that do not interoperate, clarification is provided through a special kind of requirements that contain criteria to claim conformance for any of the groupings (Profiles, Profile Parts, Roles and Selfstanding Sets).

A.5.6.2 Possible values

Each requirement has an indication whether it is a conformance requirement or not:

- <Yes>

- <No>

- <Unspecified>

This list is fixed and not expected to change.

<Unspecified> is an indication of a problem that needs to be solved.

A.5.6.3 Considerations

In SESAR 1 different levels of SWIM-TI compliance have been defined and new levels may be defined or the criteria for existing level may be changed.

Each conformance requirement could have an additional attribute that indicates to which SWIM-TI compliance level it belongs. To avoid unnecessary coupling with the SWIM-TI compliance level, it is preferred to not keep a link with SWIM-TI compliance level in a conformance requirement.

The mapping on the existing Category attribute is an issue:

- Conformance requirements are not necessarily linkable to the pre-defined list of categories of the Category attribute.

- The Category attribute does not provide a "Not Applicable" option.

- The Category attribute does not provide a "Conformance" option.

It is therefore proposed to tag requirements that contain Conformance requirements as part of the Category <Metadata>.

A.5.7 "High Level" Attribute

A.5.7.1 Rationale

There are 2 types of requirements that can be considered High Level and for which an explicit classification is useful:

1. The specifications to be made visible to the <ATM Service> Point of View cannot all be derived in a mechanical manner from the existing attributes and the new attributes up to here. Such specifications provide an overview of the functionality that is covered more in detail by finer-grained specifications that are not relevant for the <ATM Service> Point of View.

2. A moniker that acts as a shorthand for a set of related specifications. The ability to use a single moniker instead have to include long series of requirements can improve readability and can as well reduce errors.

A.5.7.2 Possible values

One of these 3 values:

- <Yes>

- <No>

- <Unspecified>

This list is fixed and not expected to change.

<Unspecified> is an indication of a problem that needs to be solved.

A.5.7.3 Considerations

The first type of requirements tagged as High Level without concrete and/or precise specifications, that link to them through a <SATISFIES> link, indicate a problem (concrete requirements may have been forgotten, a requirement represents a wishful thinking, concrete requirements exist but have been allocated wrongly, a high level requirement is redundant with another one).

The second type of requirements tagged as High Level (mon kers), are linked with the requirements that it represent through two or more <INCLUDES> links.

Through the attributes and the links, it should be possible to trace any requirement to at least one Selfstanding Set. If that is not poss ble for a requirement it is an indication of problem that needs to be solved.

A.5.8 "Testability" Attribute

A.5.8.1 Rationale

In the context of conformance/compliance it is necessary an attribute that indicates whether a specification is testable or not, and if so to what extent.

A.5.8.2 Possible values

Different standardisation bodies have their classification related to the testability of conformance (e.g. ISO, OASIS, W3C). In this case use of the ontology and nomenclature documented https://w ki.oasis-open.org/tab/TestingPolicy is proposed:

- <Conformance testable>

- <Interoperability testable>

- <Applicable but not testable>

- <Not applicable>

- <Unspecified>

<Unspecified> is an indication of a problem that needs to be solved.

A.5.8.3 Considerations

Each requirement is expected to have the same classification irrespective of Profile Part, Domain of Interest, Point of View or Role.

A.6 SWIM-TI specific requirement links

In this appendix SWIM-TI specific requirements links (in addition of REQ Table in [1][2]) adopted in the SWIM-TI specifications are described. The needs for these additional links have been already introduced above in A.3 and A.5.

According with [2], the links (or traceability), between requirements are to be filled in for each requirement and this is done immediately after the definition of the requirement and its attributes within the "REQ Trace" table.

The "REQ Trace" table is composed of four columns, namely:

- **Relationship** – specifies the type of link (e.g. <SATISFIES>). This column can have only one value.

- **Linked Element Type** – As the different type of links can connect different types of elements (SE and reference data), the element type needs to be specified. This column can have only one value for example <ATMS Requirement> for a requirement defined in the SESAR documents having templates (e.g. DOD, OSED, SPR, INTEROP, TS).

- **Identifier** – contains the identifier of the element (SE or reference data) to which the requirement is linked. This column should only contain one identifier.

- **Compliance** – the compliance cell, is included in any row that corresponds to a link, however it is only relevant for <SATISFIES> links.

    For the <SATISFIES> link type, the compliance gives a rough estimate on how well this requirement meets the referenced requirement. It can have one of the following values:

    - <Full> when the requirement is 100% compliant with the linked requirement

    - <Partial> when the requirement is not 100% compliant with the linked requirement

    - <None> when the requirement is linked to but does not meet the linked requirement due to specific reasons (e.g. technology etc.).

    For all other types of links, the compliance is N/A which indicates that it is not applicable.

A.6.1 <Operational Focus Area> Linked Element Type

For this linked element type, all the SWIM-TI REQ Trace tables are filled in as follows:

- Relationship: <APPLIES_TO>

- Linked Element Type: <Operational Focus Area>

- Identifier: **ENB02.01.01**.

- Compliance: N/A.

A.6.2 <Functional Block> Linked Element Type

For this linked element type, all the SWIM-TI REQ Trace tables are filled in as follows:

- Relationship: <ALLOCATED_TO>
- Linked Element Type: <Functional block>
- Identifier: SWIM-TI Functional Block identifiers in Table 2-1.
- Compliance: N/A.

SJU recommended to also trace applicable SWIM Profile using this linked element type. In all the SWIM-TI REQ Trace tables are filled in as follows:

- Rules:
    - o The authoritative reference to identify the applicable profiles is the "Profile Part" attribute.
    - o A relationship has to be added for all the applicable profiles.
- Relationship: <ALLOCATED_TO>
- Linked Element Type: <Functional block>
- Identifier: "Yellow Profile" or "Blue Profile" or "Purple Profile".
- Compliance: N/A.

A.6.3 <Enabler> Linked Element Type

For this linked element type, all the SWIM-TI REQ Trace tables are filled in as follows:

- Relationship: <SATISFIES>
- Linked Element Type: <Enabler>
- Identifier: Enablers applicable to SWIM-TI and, in particular, to specific Functional Block and SWIM Profiles are provided in §2 of each TS. For each requirement, and according with the traced Functional block and profiles (see A.6.2), one or more enablers are traced using their unique code.
- Compliance: according to [2].

A.6.4 <Project> Linked Element Type

For this linked element type, all the SWIM-TI REQ Trace tables are filled in as follows:

- Relationship: <ALLOCATED_TO>
- Linked Element Type: <Project>

- Identifier: according to [2]. Most of the SWIM-TI requirements are allocated to P14.02.09.

- Compliance: N/A.

A.6.5 <ATMS Requirement> Linked Element Type

For this linked element type, programme guidelines [2] only allow <SATISFIES> relationship. As documented in A.3 and A.5, additional relationship types are needed in the SWIM-TI context.

Table 3-1 provides the relationships applicable to the <ATMS Requirement> linked element type relationships for SWIM-TI specifications.

REQ relationships Identified in 14.01.04	Description	Example	Link Type
Specialized specification <specializes> generic specification.	Requirement A specializes requirement B means that A inherits from B.	A: Synchronous R/R MEP. B: Synchronous R/R MEP implemented on top of SOAP/HTTP.	<SPECIALIZES><ATMS Requirement>
Low-level specification <satisfies> High-level specification.	Requirement A satisfies requirement B means that A covers high-level needs specified by B.	B: Message Encryption. A: XML Encryption.	<SATISFIES><ATMS Requirement>
Constraining specification <applies to> specification	Requirement A provides constraints about requirement B.	B: XML Encryption. A: Encryption Key length.	<APPLIES_TO><ATMS Requirement>
Including specification <includes> specification.	Requirement A includes requirement B means that to cover A it is also needed to cover B.	A: SOAP 1.1 over HTTP 1.1 Interface "X". B: SOAP 1.1 shall be provided.	<INCLUDES><ATMS Requirement>

Table 3-1: SWIM-TI <ATMS Requirement> Linked Element Type relationships

For this linked element type, all the SWIM-TI REQ Trace tables are filled in as follows:

- Relationship: <SATISFIES> or <SPECIALIZES> or <APPLIES_TO> or <INCLUDES>

- Linked Element Type: <ATMS Requirement>

- Identifier: target requirement identifier.

- Compliance: according to [2].

A.6.6 Improve Readability of requirement text

A requirement text that needs to contain a significant amount of text, e.g. binding, can become cluttered and opaque. In such case text that would be part of the requirement can be externalized by specifying another requirement and by adding the relationship in the REQ Trace table :

Specification <INCLUDES> <ATMS Requirement>

A.7 Requirements applicable to different TSs

The TSs catalogue consists of a set of distinct TS documents, each with its particular scope listing all the specifications that are applicable to its particular scope.

In some cases specifications are applicable to two or more distinct TS (e.g. SWIM Profiles). In order to avoid duplication and still keep track of the notion of a single root specification shared by multiple distinct TS documents, an authoritative source TS document is designated per category of specifications. When a non-authoritative TS document needs to include such a shared specification, then it references the single root specification in a cross-reference table.

Requirements tables with tags "[IREQ]" (instead of "[REQ]" [1]) and "[IREQ Trace]" (instead of "[REQ Trace]" [1]) are requirements shared by different TSs.

The authoritative source TS documents have been defined as follows:

- Specifications with an overall scope: Yellow Profile TS.

- Specifications related to Messaging: Yellow Profile TS.

- Specifications related to Security: Yellow Profile TS.

- Specifications related to Supervision: Blue Profile TS.

- Specifications related to Recording: Blue Profile TS.

- Specifications related to Registry: Registry TS.

- Specifications related to PKI and STI: Identity Management TS.

-END OF DOCUMENT-