

SWIM Profiles

The Context: Information Systems Interoperability

System Wide Information Management (SWIM) is defined as consisting of "*standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services*": interoperability is the key for SWIM.

Interoperability Frameworks are created to structure and to classify the different interoperability aspects from different perspectives (IT systems, data/information, governance). Such Interoperability Frameworks are based on a layered model including network, technical, syntactical, semantic and even legal interoperability layers. The technical, the syntactical and the semantic interoperability layers all fall within the remit of SESAR SWIM. The technical interoperability layer is covered by SESAR SWIM Infrastructure Profiles.

The Technical challenges: Heterogeneous constraints and competitive requirements

The number of technologies providing technical interoperability is large and continuously increasing. Therefore, each specific interoperability need usually offers multiple options to satisfy that need. Simply applying SOA principles to constrain the solution space is not sufficient to ensure technical interoperability.

Without some form of governance, and considering the many opportunities for differentiation, the risk for proliferation of point solutions is very high and leads to high fragmentation. Furthermore, proliferation of point solutions leads to exaggerated and unnecessary costs and complexity and also hinders agile and scalable service evolution.

Finding an agreed minimal set of technologies to provide the required interoperability is not considered possible: this is mainly due to **Constraints** and **Competing requirements**.

Constraints may originate from Stakeholders, Business Activities and Systems:

- **Stakeholders.** Not all Stakeholders are able or willing to mobilise the same financial and/or organisational capabilities. Stakeholders assume different roles and/or combinations of roles and target Business Models that are most appropriate to support their own interests. Varying Business Models mean varying Constraints that are not shared by all Stakeholders.
- **Business Activities.** The Business Activities are subjected to varying constraints that are not shared by all Business Activities. Typically the Business Activities are subjected to varying forms of Regulation and Certification that are not shared by all Business Activities.

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- **Systems.** The Systems create constraints through various mechanisms. They are subjected to specific constraints linked with the operational context (e.g. limited available bandwidth). Such constraints are not shared by all Systems. The existence of a need for interoperability with Legacy Systems is applicable in specific contexts but not in other contexts (e.g. write off of existing systems).

For almost every requirement one can find another requirement that creates a conflict that makes it difficult, or even impossible, to provide a solution that satisfies both **competing requirements** simultaneously.

Competing requirements typically emerge between following characteristics but they are not limited to the characteristics of security, performance, cost and reliability:

- **Security versus performance,**
- **Reliability versus cost,**
- **Reliability versus pace of change,**
- **Consistency versus Availability versus Partition Tolerance.**

The Approach: SWIM Technical Infrastructure profiling

A governance process takes all technical interoperability needs of the System of Systems (SoS) into consideration and segments these needs into smaller groups for each of which a satisfactory uniform solution can be defined. The criteria used for the grouping are mainly drawn from identified sources of constraints (involved stakeholders, systems and business activities) and based on the analysis of any competitive requirements areas. In other words, such grouping is required to be **coherent and appropriately sized**.

The result is that for each group an exhaustive list of SWIM Infrastructure requirements are specified, profiling the mandate solution from three different perspectives:

- **What?** SWIM Infrastructure features (e.g. message level security, messaging, etc.),
- **How?** Adopted STANDARDS (e.g. WS-Security, OMG DDS, etc.),
- **Which quality?** Specific CONFIGURATION adopted for selected features and standards (e.g. cryptographic algorithms, encryption key length, messaging QoS, etc.).

A SWIM Profile directly reflects such a grouping through the description of the solution structured as follows:

- **The SWIM Profile Assertion (SPA)** which provides the declaration of existence with scope and rationale.
- **The SWIM Profile Technical Specification (TS)** which provide the exhaustive list of requirements for the mandated solution.

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The requirements for SWIM Profiles are structured in a form allowing multi-dimensions filtering. This allows to select any sub-set of requirements concerning a specific point of view (ATM Service, SWIM-TI and Network Provider), a specific role (Provider, Consumer, Subscriber, etc.), different Profile parts, etc. Combined filtering on multiple distinct requirements attributes is meant to be meaningful.

Currently, three distinct SWIM Profiles have been defined: Yellow Profile, Blue Profile and Purple Profile. A brief overview of them is provided in the table below. For further details please refer to specific Profile factsheet, which can be accessed through the SWIM registry.

Profile Name	Scope	Key Elements
Yellow Profile	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Yellow Profile consists of different parts: “Core”, “Messaging+”, “Advanced” 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). Message level security controls. 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).
Blue Profile	<ul style="list-style-type: none"> 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). 	<ul style="list-style-type: none"> 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-Subscribe specifications (DDS v1.2 and DDS-I v2.1). Transport level security

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	<ul style="list-style-type: none">▪ Running over trusted and untrusted networks.	<ul style="list-style-type: none">▪ controls (TLS 1.0).▪ Message level security controls (OMG DDS Security).▪ Cryptography (PKI X.509 v3, and ECRYPT II).
Purple Profile	<ul style="list-style-type: none">▪ 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.	<ul style="list-style-type: none">▪ 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).

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