

International Civil Aviation Organization



**THE FIRST MEETING OF AERONAUTICAL  
COMMUNICATION SERVICE (ACS)  
IMPLEMENTATION CO-ORDINATION GROUP  
OF APANPIRG (ACSICG/1)**



Seoul, Republic of Korea, 13 - 16 May 2014



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**Agenda Item 6:           Review Concept of Operation of the System Wide Information  
Management (SWIM)**

**SYSTEM WIDE INFORMATION MANAGEMENT (SWIM)  
OPERATIONAL CONCEPT DISCUSSION**

(Presented by USA/FAA)

**SUMMARY**

This Paper presents the Federal Aviation Administration operational and implementation point of view to SWIM Concept – DRAFT Version 0.9 developed by ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP), dated 30 November 2013. This paper is also limited in its scope to Aeronautical Fixed Service (AFS). This paper was presented at Eighteenth European Regional Aeronautical Fixed Service Group (AFSG/18) held in Paris, France 7-11, 2014. The result of the discussion at the First Asia/Pacific Aeronautical Communication Service Implementation and Coordination Group (ACSICG/1) will be consolidated into the recommended SWIM Concept of Operation to the upcoming Aeronautical Communication Panel Working Group I to be held in Montreal, Canada July 2014.

**1. Introduction**

1.1 ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP) released a System Wide Information Management (SWIM) Concept document, Draft Version 0.9 for review.

1.2 The FAA was requested to provide comment and its comment was submitted on January 2014 to Aeronautical Communication Panel.

1.3 It was observed by the FAA telecommunication network and SWIM offices that even though SWIM has been developed and operational in a number of Air Navigation Service Providers (ANSPs), the SWIM objective has not been defined sufficiently to be used by ICAO member States. This document is the first attempt to define the SWIM concept and its objective.

1.4 Per ICAO SWIM Concept document, SWIM shall address (a) the need to increasingly complement human-to-human communication with machine-to machine communication, and (b) the need to emphasize better data distribution and accessibility in terms of quality and timeliness.

1.5 The document states SWIM is an integral part of the Global Air Navigation Plan (GANP) and it is covered in a number of Aviation System Block Upgrades (ASBU) modules.

1.6 The SWIM Concept document introduces a major change in distributing and managing messages as specified below in the document:

1.6.1 The SWIM concept introduces a significant change in the business practices regarding how information is managed during the entire life cycle of an ATM system. The implementation of the SWIM concept seeks to provide quality information to the right people at the right time. The SWIM environment shifts the ATM information architecture paradigm from point-to-point data exchanges to system-wide interoperability;

1.6.2 The ICAO SWIM Concept document defines Service Oriented Architecture (SOA) as a general concept or paradigm for ‘organizing and utilizing distributed capabilities that may be under the control of different owners’. While there is no formally agreed definition of SOA, it is generally considered that partitioning of functionality into un-associated, self-contained and therefore reusable services, that can be discovered by potential users, is a key feature that discriminates SOA from more traditional architectural paradigms. The SOA paradigm has been used successfully in many industries including manufacturing, banking, health care, and merchandise retailing;

1.6.3 ICAO SWIM Concept document section 4.3 shows the transition from the current environment of point-to-point Aeronautical Fixed Telecommunication Network (AFTN) and Air Traffic Service Message Handling System (AMHS) to SWIM. It is also concluded or assumed that all point-to-point inter-connection will be changed to IP networking.

## **2. Discussion**

- 2.1 SWIM is defined in the ICAO Concept document as an environment that will:
- a) Promote interoperable, effective, and secure information exchanges among information and messaging systems (e.g. AFTN, AMHS, AIDC, and Weather System) through consistent application of SOA principles;
  - b) Deploy a robust and sustainable SOA governance framework to ensure that a common set of policies, rules, and standards for identifying, discovering, and operating ATM services is consistently applied; and

- c) Replace individual system-to-system interfaces versus a set of loosely-coupled services.
- d) Assume all point-to-point circuits will be changed to a global IP network.

2.2 The following are recommended issues with the ICAO SWIM Concept document to clearly provide the material and information for the ANSPs to consider for implementation and development of their operational procedures. Detailed comments by the FAA to the ICAO SWIM Concept document are provided in the Attachment. The AFSG/18 is in support of the following recommendation.

- a) The use of SOA to integrate existing systems is specified but needs more specifics of type of message or data to be applied (e.g. flight plan/clearance, AIDC, Weather data: OPMET, WAFS, international search and rescue, NOTAM, etc.);
- b) The performance characteristics of message distribution based on SWIM need to be specified (e.g. time distribution, time acceptance, message confirmation, message tracking, legal recording, message priority, etc.);
- c) SWIM Governance needs to specify who manages the message in the SWIM environment. As specified in the SWIM Concept document, SWIM can only be operated efficiently with a single entity that is responsible for organizing and utilizing distributed capabilities.
- d) To achieve message-oriented message distribution that ensures delivery requires a single entity or a coordination of many entities to manages the SWIM “cloud” and its IP based network in addition to requiring ANSPs to adhere to its SWIM governance and contract to its IP network. The ICAO SWIM
- e) Concept should emphasize the need for a single entity to manage all SWIM message distribution. This will also imply all ANSPs that use SWIM for message distribution will enter a contract agreement to use its service including its IP network.
- f) ICAO SWIM Concept document, section 4.3 shows a series of scenarios in phasing out AFTN/AMHS will be complicated and time consuming since the document has to define all interfaces of the applications/systems. The AFTN and AMHS is designed to standardize the distribution format between States and governed by ICAO Doc. 7910 and 8585 and maintained by Address Management Center (AMC).

- g) Furthermore, no definition of a SWIM Access Point is provided. It should specify how the message is distributed between ANSPs through its SWIM cloud and IP network regardless of the system used by ANSPs.
- h) Currently, there are many regional Virtual Private Networks (VPNs) which are connected together through AMHS which is defined as an application. This means SWIM is limited to regional VPN domain unless a global VPN is implemented.

2.3 The following issues should be completed before SWIM can be realized by ANSPs:

- a) Each ICAO region should establish a common regional Private Internet Protocol Network with a common service provider to ensure meeting stringent distribution of time sensitive message requirement by ICAO Annex 10;
- b) Develop an agreement and Interface Control Document to inter-connect regional IP network. The AFSG/18 has indicated that the interface between regional VPNs should be through AMHS to ensure security and performance of the network is not compromised due to different network core used by different vendors;
- c) Select a SWIM Governance entity or a coordination of many entities to manage day to day operation;
- d) Develop a SWIM Governance Policy and require ANSPs to adopt;
- e) Develop a cost reimbursable procedure/contract for ANSPs to pay for the operation of SWIM Governance entity;
- f) ANSPs need to allocate budget to train their personnel to manage their messages based on SWIM environment; and
- g) A clearly defined enhancement benefits over the existing service/systems should be specified in the ICAO Concept document to support ANSPs in justifying the increased budget request.

**3. Action by the Meeting**

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.
- c) the feedback of this paper will be presented to ACP Working Group I to be held in July 2014

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## Comments for SWIM Concept – DRAFT, Version 0.9, November 30, 2013

**Reviewer:** SWIM Governance/EES SOA Support

#	Page/Line	Para	Type	Comment	Proposed change	Proposed Editors disposition
1	All	1	General	<p>This document underrepresents one of the integral and fundamental parts of SWIM operations –SOA Governance. Although Governance is mentioned throughout the document, and there is even a whole section dedicated to it, the document’s description of the role of Governance as an integral part of SWIM implementation is still insufficient or inadequate.</p> <p>In the FAA SWIM environment, SOA Governance is understood to be the application of policies, rules, and standards needed to ensure that all of the independent SOA-based efforts (whether in the design, development, deployment, or operations of a service) come together to meet enterprise requirements and to ensure their interoperability.</p> <p>FAA SWIM SOA Governance is realized through a body of policies that drive the overall behavioral model of the participants and ensure their interoperability. The Governance policies include service lifecycle management policies, technical policies and standards-compliance policies. (The major aspects of the FAA SOA Governance effort are outlined in a <a href="#">presentation given to ATNICG WG/12 on August 5, 2013</a>).</p>	<p>Introduce Governance as one of the major aspects of enabling a SOA-based global framework, explain the impacts of ungoverned services in a SOA environment and introduce the evolution of a SWIM Governance Framework as a part of the SWIM Concept of Operations.</p>	

#	Page/Line	Para	Type	Comment	Proposed change	Proposed Editors disposition
2	All	1	General	Another important aspect of SWIM that didn't receive sufficient exposure in this document is the notion of semantic interoperability. For example, the term "semantic interoperability" is used only once in the whole document, and the notion itself is never fully explained.	Review <a href="#">the presentation</a> that I referred to in comment 1 for a very brief overview of how the term interoperability is understood in the FAA SWIM Governance context, and how different kinds of interoperability are leveraged.	
3	Page 2-4/ Lines 18-20	2.3.1	General	This oft-cited definition of SWIM is rather inexplicit and not very well written; the term is central to the whole document and needs to be defined in a more unambiguous way. This definition doesn't state what the concept <i>is</i> , e.g., SWIM is a framework, or SWIM is an architectural solution.	Suggest using a definition similar to the following: " <a href="#">A globally interconnected network environment that supports the sharing of ATM-related information among ICAO stakeholders by providing governance as well as architectural and technical solutions based on the consistent application of SOA principles, common standards, methodologies, and best practices.</a> "	
4	Page 2-4/ Lines 21-29	2.3.1	General	The term "scope" probably is not adequate for the context of this section.	Suggest using " <a href="#">architecture</a> " or " <a href="#">conceptual representation</a> " instead of " <a href="#">scope</a> " (especially if the notion of SWIM being a "network environment" as suggested in the previous comment is accepted).	

#	Page/Line	Para	Type	Comment	Proposed change	Proposed Editors disposition
5	Page 2-6/ Lines 13-15	2.3.2	General	“c) use of open standards”. Usage of open standards by participants doesn’t always ensure interoperability; there are many open standards that are not compatible with each other.	Suggest changing “use of <b>open</b> standards” to “use of <b>common</b> standards”.	
6	Page 3-1/ Line 18-20	3	Technical	Information Exchange Models bullet, second sentence says, “...information exchange <b>standards</b> define...” Probably it should say “information exchange <b>models</b> define...”. Also, if these are models such as AIXM and WXXM, then instead of saying “ <b>structure, content and format</b> of the data exchanged”, I suggest saying “ <b>syntax and semantics</b> of the data exchanged”.	Change “information exchange <b>standards</b> ” to “information exchange <b>models</b> ” and change “ <b>structure, content and format</b> ” to “ <b>syntax and semantics</b> ”.	
7	Page 3-8/ Table 1	3.2	Technical	Row “Data Representation”. WFS and WMS are interface specifications and shouldn’t be part of Data Representation set of standards. <b>GML</b> (Geography Markup Language) could/should be included instead.	Delete <b>WFS</b> and <b>WMS</b> and add <b>GML</b> .	
8	Page 3-8/ Table 1	3.2	Technical	Some important standards are missing or miscategorized.	Suggest adding “ <b>Interface Definition</b> ” row with a corresponding set of standards: <b>WSDL, WADL, WFS, WMS, WCS</b> ; and adding “ <b>Semantic Interoperability</b> ” row with standards like <b>RDF/RDFS, OWL, SKOS</b> . Also recommend including “ <b>Service Registration</b> ” in this table as a separate entry	



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					<p>with corresponding standards like <a href="#">UDDI</a>, <a href="#">eBXML</a>, <a href="#">CSW</a>, <a href="#">S-RAMP</a>.</p> <p>Note: if suggested additions are accepted, then Appendix A should be updated with these new acronyms.</p>	
9	Page 3-10/ Line 2	3.3.1	Editorial	<p>It would be more consistent if this section started with a clear definition of a Service Registry (or a SWIM Registry), similar to the way section 3.2.1 is started. For example, the FAA <a href="#">SWIM Controlled Vocabulary</a> defines the <a href="#">NAS Service Registry/Repository</a> as “A SWIM-supported capability for making services visible, accessible, and understandable across the NAS. NSRR supports a flexible mechanism for service discovery, an automated policies-based way to manage services throughout the services lifecycle, and a catalog for relevant artifacts.” This definition could be edited into something that would fit the context of this document, e.g., NAS could be replaced by global SWIM context, NSRR with SWIM Registry, and so on.</p>	<p>Suggest starting this section with a definition of a Service Registry.</p>	

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10	Page 3-10/ Lines 32-36	3.3.1	Technical	These (bulleted) artifacts are usually considered components of a service repository, or at least they don't fit into the UDDI-based model of a service registry.	Suggest introducing the concept of Service Repository (e.g., the FAA <a href="#">SWIM Controlled Vocabulary</a> defines <a href="#">service repository</a> as a "mechanism for storing artifacts related to a service in an organized way so that the artifacts may be selectively retrieved.")	
11	Page 3-11/ Line 3	3.3.1	Editorial	The sentence is unclear and should be reconsidered.	Recommend saying either "The Registry may have the following functionality:" or "The Registry functionality should include:".	
12	Page 3-11/ Lines 6-7	3.3.1	Editorial	"Evolution Management" is a rather ambiguous expression.	Suggest saying "Change Management" instead of "Evolution Management" and adjusting the following text accordingly.	
13	Page 3-11/ Line 8	3.3.1	Editorial	Inadequate explanation of Notification process.	Suggest replacing "Keeping those interested updated" with "Notifying stakeholders about changes in service metadata and lifecycle status".	
14	Page 3-11	3.3.1	Technical	List of functionality is missing functionality associated with Service Repository. (See comment 10).	Suggest adding to the list of registry functionality "Related Resources. Management of service-associated artifacts".	

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15	Page 3-16 thru Page 3-20	3.5.1	Editorial/ General	<p>The section is titled “SWIM Functional Architecture Example”, but the notion of “SWIM Functional Architecture” has not been introduced or explained. If this section presents only an example – as the title suggests -- and not characteristic of the architecture for the proposed system, then this section should be moved to an Appendix, otherwise this section should be named “SWIM Functional Architecture”, similar to the following section 3.5.2. It is also worth noticing that the architecture described in this section uses an earlier FAA SWIM Architecture circa 2006-2007. Since then, this architecture has been reviewed and modified based on improved understanding and lessons learned. For example, the notion of “Interface Management Service” is not used anymore, and all functionality mentioned in Table 2 under Interface Management is currently considered the purview of SWIM Governance. Also not clearly explained is the addition of Boundary Protection as a separate element (core service?). Boundary Protection is a subset of Security measures; why it is moved outside of Security?</p>	Suggest reconsidering the purpose of this section and subsequently rewriting this section.	

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16	Page 3-23/ Line 2...	3.6	Editorial	When a concept is not defined up front, it makes it harder for a reader to understand the content of the section.	<p>Consistent with section 2.3.1 and 3.3.1 (as proposed in comment 9), I recommend starting this section with a definition of SWIM Governance. For example, the FAA SWIM Governance draft (as of December 2013) defines SWIM Governance as “the realization of SOA Governance by the SWIM program, with the major goal of enabling a set of enforceable policies, procedures, processes, tools, and organizational activities that together ensure a consistent alignment between FAA/NAS business objectives and SOA best practices, methodologies, and technological solutions.”</p> <p>Again, the scope of this definition is NAS, but it could be easily expanded to fit a global context.</p>	

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17	Page 3-23/ Lines 11-21	3.6	Technical	The list on page 3-23 is missing important elements of SWIM Governance.	Suggest adding the following elements of SWIM Governance: 1) “establish a common set of regulatory policies and standards”, and 2) “promote semantic and structural interoperability among stakeholders by developing a common set of semantic and structural artifacts (e.g., taxonomies, ontologies, controlled vocabularies).”	

#	Page/Line	Para	Type	Comment	Proposed change	Proposed Editors disposition
18	Page A-5 Glossary	App. A	Technical	<p>Term “Consumer” (“Information Consumer”). This glossary correctly includes and defines the term “Service Provider”; however, it defines it in a way disconnected from the concept of a Service Consumer, where Service Provider is an organization and Service Consumer is an application. Suggest using an approach similar to the one established in the <a href="#">SWIM Controlled Vocabulary</a>, where <a href="#">Service Provider</a> is an “<b>organization</b> that offers the use of capabilities by means of a service” and <a href="#">Service Consumer</a> is an “<b>organization</b> that seeks to satisfy a particular need through the use of capabilities offered by means of a service”. Applications that either a provider or consumer develops and operates are referred to as <a href="#">provider agents</a> or <a href="#">consumer agents</a> respectively. This conceptual vision is consistent with the vision outlined in <a href="#">W3C Web Service Architecture</a> and <a href="#">OASIS SOA RM</a>.</p>	<p>This document should adapt the conceptual vision and terminology of SOA as delineated in the artifacts mentioned, and make changes in the Glossary accordingly.</p>	