

FAA SWIM Governance and Interoperability Initiatives

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Agenda

- Basic concepts
- Introducing SWIM Governance
- What is interoperability?
- Syntactic and semantic interoperability
- How SWIM Governance facilitates interoperability
- Summary



Basic concepts

SOA

- SOA, or service-oriented architecture, is a paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. [1]

SOA Governance

- SOA governance is the ability 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. [2]

Introducing the SWIM Governance effort

- **SWIM Governance** is 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.



SWIM Governance activities include (but are not limited to):

- Developing governance standards, policies, and procedural guidelines to support the functional requirements for implementing all aspects of service-oriented development.
- Making all services discoverable, searchable, and retrievable, through a formal cataloging process of service metadata, by establishing and operating the NAS Service Registry and Repository (NSRR).
- Promoting interoperability among FAA systems by developing a common set of semantic and structural artifacts and promulgating them through communities of stakeholders.



What is interoperability?

Interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged.[3]

- **Syntactic Interoperability** is the aspect of interoperability that assures that there is a technical connection, i.e., that the data can be transferred between systems.[4]
- **Semantic Interoperability** is the aspect of interoperability that assures that the content is understood in the same way in both systems, including by those humans interacting with the systems in a given context.[4]

Example of *syntactic* conflicts between systems

```
<?xml version="1.0" encoding="UTF-8" ?>
<Airport>
  <date>2008-02-11</date>
  <icao>KSFO</icao>
  <name>
    San Francisco International Airport
  </name>
  <iata>SFO</iata>
  <latitude>37-37-11N</latitude>
  <longitude>122-21-53W</longitude>
  <elevation>26M</elevation>
</Airport>
```

```
<?xml version="1.0" encoding="UTF-8" ?>
<current_observation>
  <location>
    San Francisco, CA, San Francisco International
    Airport
  </location>
  <station_id>KSFO</station_id>
  <latitude>37.61966</latitude>
  <longitude>-122.36472</longitude>
  <observation_time_rfc822>
    Mon, 11 Feb 2008 06:51:00 -0500 EST
  </observation_time_rfc822>
</current_observation>
```

Example of *semantic* conflicts

One reason Government Agencies and Military Services have trouble operating jointly is that they speak different languages.

“Secure the Building!” What does it mean?

Navy: “Turn off the lights and lock the doors.”

Army: “Surround the building, occupy, and control entry.”

Marines: “Call in close air support, assault with small team, neutralize occupants, fortify and hold at all costs until properly relieved!”

Air Force: “Take out a three-year lease with option to buy.”

From presentation "Transforming the Way DoD Shares Information", STRATCOM Component Commander's Conference, Michael Krieger, October 2006

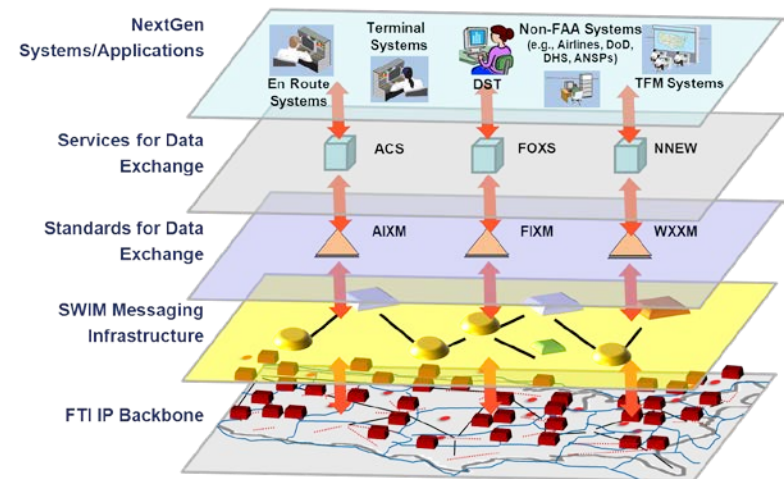
How SWIM Governance facilitates syntactic interoperability

- By identifying and establishing a common set of standards and exchange models.
 - XML – data exchange meta-language
 - AIXM, FIXM and WXXM – domain-specific data exchange models
- By promoting and enforcing these standards through the Governance policies and regulations.



What Information Exchange Models used in SWIM-enabled programs, and How

- **The Aeronautical Information Exchange Model (AIXM)** is designed to enable the management and distribution of Aeronautical Information Services (AIS) data in digital format. [5]
- **The Flight Information Exchange Model (FIXM)** is a data interchange format for sharing information about flights throughout their lifecycle. FIXM is part of a family of technology independent, harmonized and interoperable information exchange models designed to cover the information needs of Air Traffic Management. [6]
- **The Weather Data Model (WXXM)** is a family of data models designed for the exchange of aeronautical weather information in the context of a net-centric and global interoperable Air Transport System (ATS).

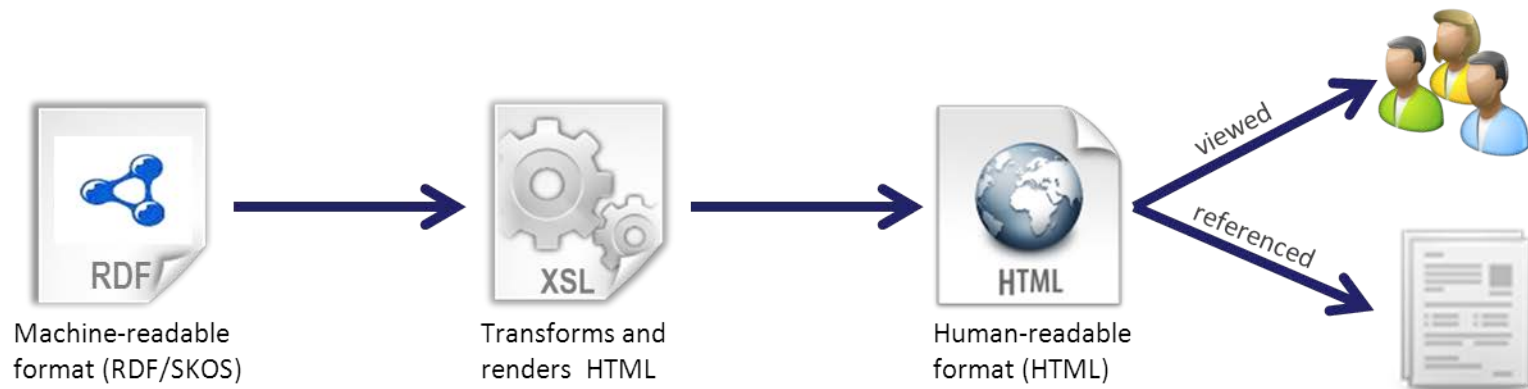


How SWIM Governance facilitates semantic interoperability

- By using machine-readable and open industry standards:
 - RDF/RDFS, OWL, SKOS, Dublin Core
- By creating controlled, shared vocabularies and semantic models:
 - SWIM Controlled Vocabulary (SWIM CV), Web Service Description Ontological Model (WSDOM)
- By leveraging model-driven development of various artifacts based on a common set of semantic models:
 - WSDD, WSRD, JMSDD

Introducing SWIM Controlled Vocabulary

- The SWIM CV is located at <http://www.faa.gov/go/swimvocabulary>.
- To link to a specific term within the CV, the URL <http://www.faa.gov/go/swimvocabulary#term> is used (e.g., <http://www.faa.gov/go/swimvocabulary#service-provider>).

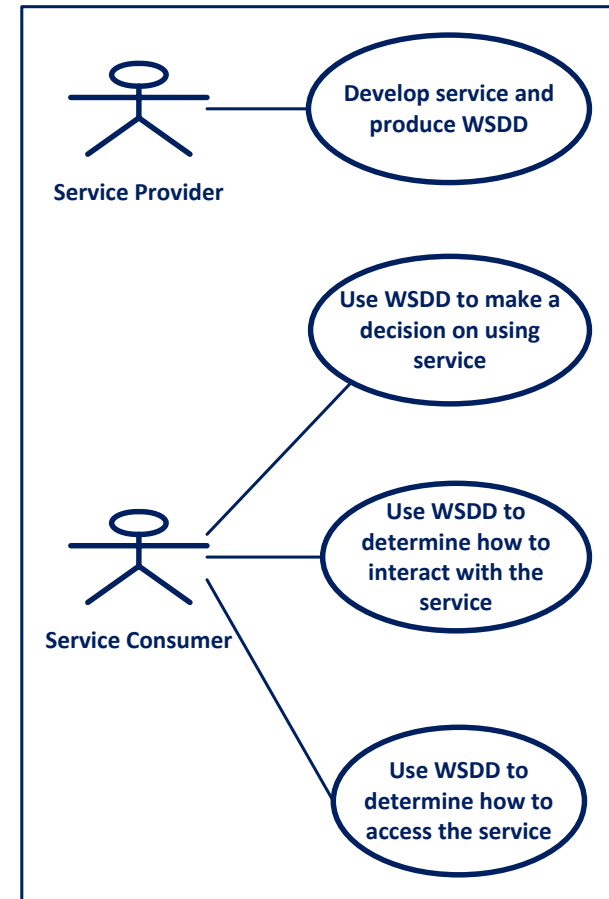


FAA Web Service Description Document

- A **Service Description** is the information needed in order to use, or consider using, a service. [1]
- A **Web Service Description Document (WSDD)** is:
 - a) a service description, as it is defined and understood in SOA;
 - b) a document, that is developed and used in accordance with FAA engineering practices.
- Conceptually, a WSDD is based on semantic models/ontologies developed in both FAA (WSDOM) and industry (OWL-S, SOA-RM), and on various FAA and industry standards (FAA-STD-025, WSDL).

Who uses a WSDD, and How

- Every FAA program responsible for developing a Web service is responsible for producing a WSDD.
- In the SWIM environment, WSDDs are stored and made available in NSRR.
- SESAR and FAA are currently working together on developing a common model and/or document for a service description.



Summary

- One of the major aspects of SWIM Governance is creating the means for supporting interoperability between interacting SOA components and SOA stakeholders.
- SOA Governance supports two kinds of interoperability:
 - *Syntactic*, by facilitating the use of information exchange models such as AIXM, FIXM and WXXM;
 - *Semantic*, by developing documentation standards and establishing common vocabularies and semantic models (ontologies), with the goal being to establish shared and consistent understanding across FAA's COIs as well as FAA's business partners, both international and domestic.

References

[1] SWIM Controlled Vocabulary, March 2013

<http://www.faa.gov/go/swimvocabulary>

[2] WebLayers Whitepaper: SOA Governance, 2005, p. 9

<http://www.slideshare.net/guestf73e68/introduction-to-soa-governance-web-layers>

[3] IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries, IEEE, 1990

[4] OWS-9 CCI Semantic Mediation Engineering Report: Open Geospatial Consortium:2013

https://portal.opengeospatial.org/files/?artifact_id=51840?

[5] EUROCONTROL - Aeronautical Information Exchange Model

http://www.aixm.aero/public/subsite_homepage/homepage.html

[6] EUROCONTROL - Flight Information Exchange Model

<http://www.fixm.aero/>

Where to get more information about SWIM Governance

- Governance page at FAA.SWIM.GOV at [\[https://www.faa.gov/about/office org/headquarters offices/ato/service units/techops/atc comms services/swim/governance/\]](https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/atc_comms_services/swim/governance/)
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