International Civil Aviation Organization

The Sixth Meeting of System Wide Information Management Task Force (SWIM TF/6)

Video Teleconference (VTC), 17 – 20 May 2022

Agenda Item 4: Updates on the assigned tasks by task leads/contributors including progress report and issues

d) Governance

- Task 5: Registry and Other Related Governance Policies

SWIM DISCOVERY SERVICE (SDS) UPDATE AND NEXT STEPS

(Presented by USA/Federal Aviation Administration (FAA), ROK/Korea Airports Corporation (KAC), PRC/Civil Aviation Administration of China Air Traffic Management Bureau (ATMB), Japan/Electronic Navigation Research Institute (ENRI))

SUMMARY

This paper describes the status and plans of a growing collaborative effort to deploy a network of SWIM Discovery Services (SDS) in the Asia Pacific Region (APAC). The effort aims to support federated service discovery among independently developed and autonomously managed SWIM domains.

1. INTRODUCTION

1.1 As states and administrations in the APAC region implement SWIM services to support their mission, there is an increasing need for SWIM users to discover and leverage services developed by other SWIM programs.

1.2 The SWIM Discovery Service (SDS) specification [1] was developed by FAA in 2020 to address this need by defining a standard mechanism for exchanging service description information, or metadata, between independently managed SWIM programs. It specifies a web services interface, key interaction patterns, schemas, and message exchange formats required to exchange service metadata.

1.3 FAA and KAC have collaborated closely over the past two years to evolve the SDS specification and adapt it in the APAC region. Both agencies have independently developed SDS implementations to expose information about services published in their respective registries so that the services can be discovered and potentially reused by partners. The team shared their experiences and lessons learned at SWIM TF/5. [2]

1.4 In April 2022, ATMB and ENRI joined the SDS development effort. Together, these organizations are developing SDS-compliant services, collaborating on potential use cases, and evolving the SDS specification to include new features to address service discovery needs of the region.

1.5 This joint effort leverages a collaboration platform that includes the discovery.swim.aero website and a GitHub repository (https://github.com/faa-swim/swim-discovery-service). The platform is also accessible to interested parties in the APAC region.

2. DISCUSSIONS

2.1 At SWIM TF/5, FAA and KAC conducted a demonstration of a cross registry search module to illustrate how SDS can facilitate discovery of services published in different SWIM registries. As shown in Figure 1, the demonstration scenario involves an FAA SWIM user searching for discovery services offered by different Air Navigation Service Providers (ANSP) using FAA's National Airspace System (NAS) Service Registry and Repository (NSRR).

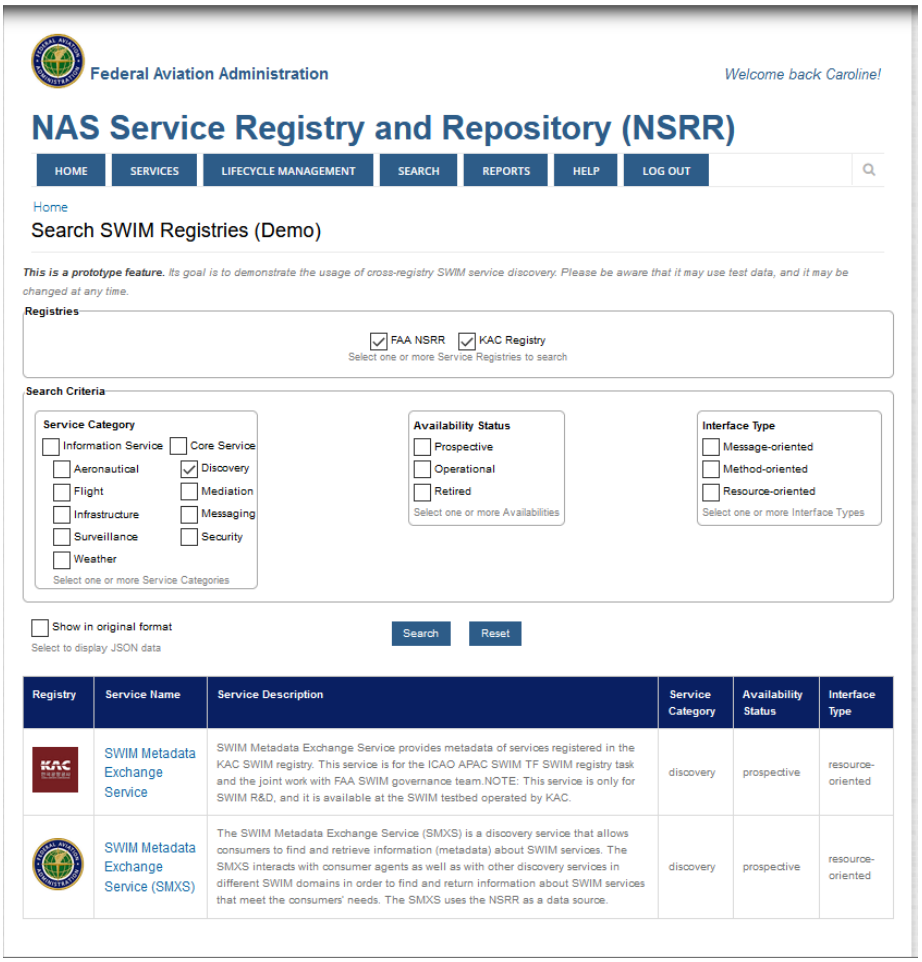

Figure 1 Cross Registry Search

2.1.1 From a technical point of view, NSRR uses FAA's SDS implementation to communicate with KAC's SDS implementation. Once a user clicks a search button on the NSRR cross registry search page, FAA's SDS re-routes the request to the KAC's SDS and returns a consolidated query result to the user (Figure 2).

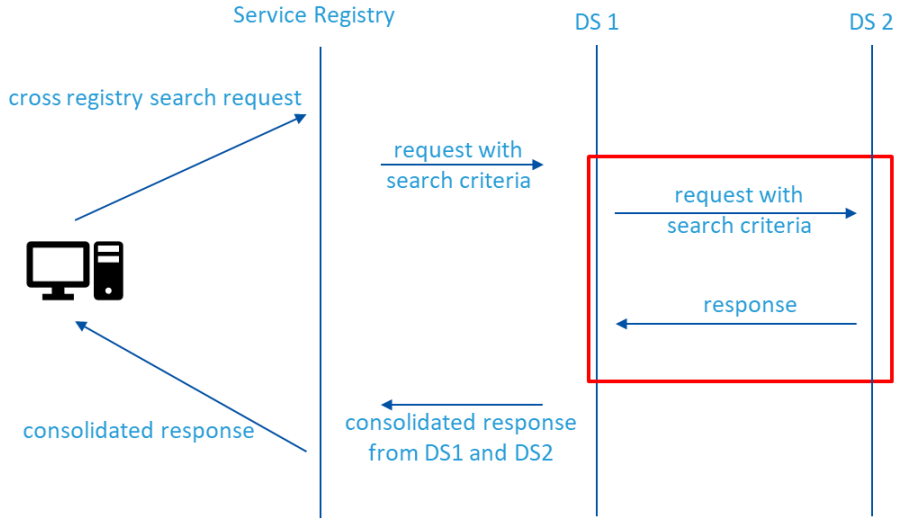

Figure 2 Communications between registry and Discovery Service (DS) instances

2.2 ATMB is planning to develop an SDS-compliant service to exchange information maintained in its SWIM registry (Figure 3) with partners.

Figure 3 ATMB SWIM Registry Testbed

2.2.1 The ATMB SWIM service registry testbed is deployed in a laboratory environment for technical validation. It includes two functional modules: service registration and service catalog. Service providers can register service descriptions in the registry

center. The registered services are published in the service catalog after approval by the system administrator.

2.2.2 The ATMB registry is not currently deployed in an internationally interconnected network environment. ATMB plans to address the network connectivity issues and make changes to its service description data model to align with the SDS specification.

2.3 ENRI has developed a SWIM Test System that includes a SWIM Registry, as shown in Figure 4. The components in yellow are SWIM information services that support information utilization based on the standard information exchange models. The components in red are SWIM enabled applications that support ATM operation by using information services. The SWIM Registry includes internal and external functionalities. The main objective of the internal functionality is to support life-cycle information service management. The external functionality is intended to provide an access point for information service utilization to outside users.

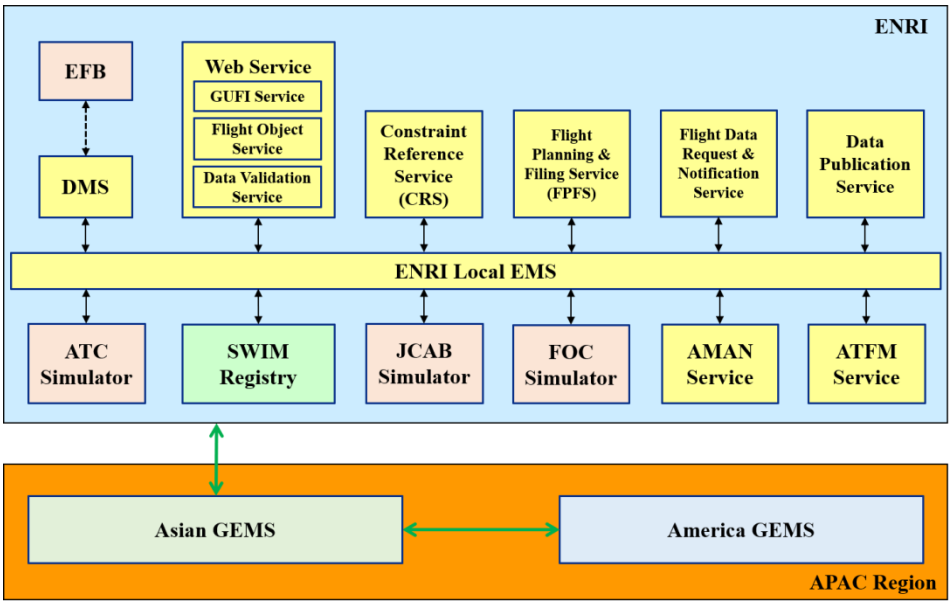

Figure 4 ENRI SWIM Test System

2.3.1 A number of services are currently published in the ENRI registry. Their interfaces conform to standards such as AIXM 5.1, IWXXM 3.0, FIXM 4.2. They support both request/reply and publish/subscribe message exchange patterns (MEP).

2.3.2 ENRI plans to start development of SDS in a local environment and conduct a joint test with partners for system improvement. The service description model of the ENRI SWIM Registry is based on the Service Overview defined in the SWIM Manual (Doc 10039) that is a little different from the definition in SDS. To achieve interoperability, the common model should be considered at the regional or global level.

2.3.3 ENRI is working with FAA to validate SDS schemas and has provided feedback via the SDS GitHub site .

2.4 Following the SDS specification, KAC has developed a SWIM Metadata Exchange Service (SMXS) that exposes service metadata from KAC's SWIM registry. (See Figure 5)

2.4.1 KAC has worked closely with FAA to validate SDS schemas and specifications.

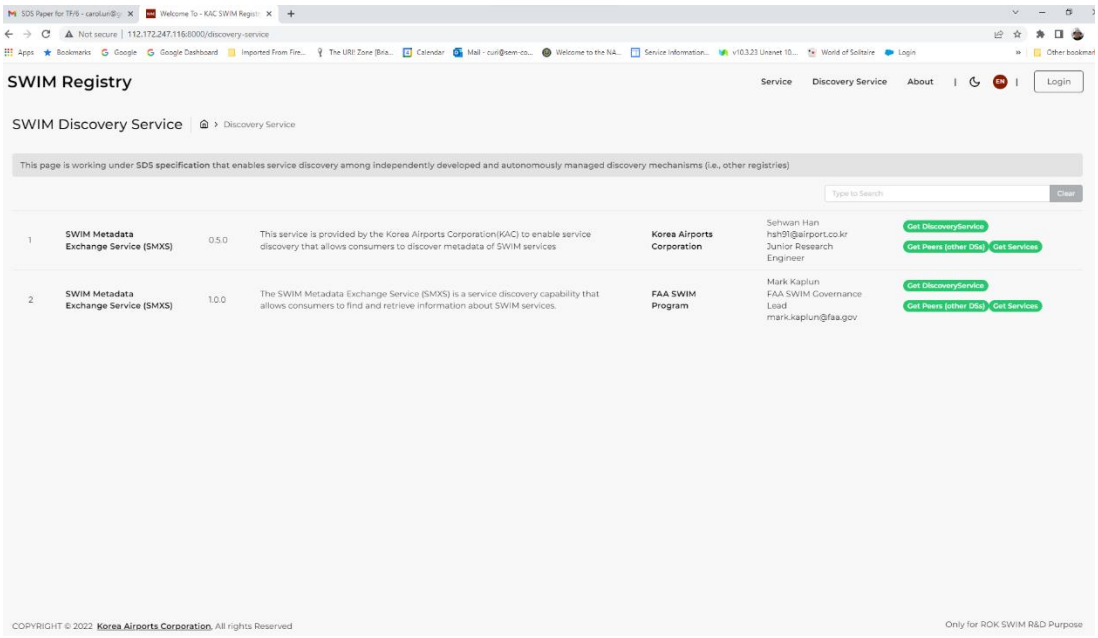

Figure 5 KAC SWIM Registry

2.5 Following the SDS specification, FAA has also developed a SWIM Metadata Exchange Service (SMXS) that exposes service metadata from NSRR to authorized partners. More information about FAA SMXS can be found at https://nsrr.faa.gov/services/smxs/profile.

2.5.1 FAA has established a GitHub repository for collaborating on SDS-related issues and maintaining SDS artifacts under development or revision. Active issues related to SDS schemas and specifications are also tracked using GitHub.

2.5.2 FAA has also worked with the Open Geospatial Consortium (OGC) to organize a workshop to solicit industry feedback on SDS. [3]

2.5.3 Based on feedback received from partners, results of bilateral testing with KAC and issues reported on GitHub, FAA has released a new version of the SDS schemas and published it on discovery.swim.aero.

2.5.4 In addition to the specification and schemas, relevant publications and information about current implementations is available on the website discovery.swim.aero.

3. CONCLUSIONS AND THE NEXT STEP

3.1 The development of SDS will encourage the adoption of SWIM in the APAC region by allow SWIM services to be discovered and reused by aviation partners.

3.1.1 By following a peer-to-peer discovery approach, SDS supports federated discovery. Consistent with the governance structure of APAC, this approach allows ANSP in the region to develop registries based on their mission needs while facilitating information exchange among them.

3.1.2 SDS can serve as a case study for the service composition design pattern, as the network of interconnected SDS instances appears as a single integrated capability to a SWIM user. Based on a Service-Oriented Architecture (SOA), an objective of SWIM is to provide new services to aviation users through composition of existing capabilities.

3.1.3 The SDS implementation experience provides valuable lessons learned to regional SWIM implementers, like making service specifications developer-friendly through the use of standards such as OpenAPI and JSON schema.

3.2 The partners will work together to enhance service discoverability in the region.

3.2.1 The partners will consider SDS use cases for multi-party environments. For example, the use case of discovering previously unknown peers (multiple peers) was included in the specification and could be further explored.

3.2.2 Support for advanced data filtering in SDS is also being considered. Other areas of interest include service authentication mechanisms, common format for service definition and more efficient control for queries.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper;

b) provide feedback on the SDS specification and implementation approaches;

c) encourage collaboration on SWIM service discovery; and

d) discuss any relevant matter as appropriate.

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REFERENCES

[1] FAA, SWIM Discovery Service (SDS) Implementation Specification, Version 1.0.0, https://discovery.swim.aero/sds/1.0.0/SDS%20Specification%20v.1.0.0.pdf

[2] FAA, KAC, “SWIM Discovery Service (SDS) Demonstration and Lessons Learned”, APAC SWIM TF/5, August 2021,

https://www.icao.int/APAC/Meetings/2021%20SWIM%20TF%205/WP09_ROK%20and%20USA%20AI.6%20SDS%20Demonstration.pdf

[3] FAA, Presentation at OGC Technical Review Workshop, September 2020, https://discovery.swim.aero/SWIM%20Discovery%20Service%20Specification%2009092020.pdf