Federal Aviation Administration

SWIM Discovery Service (SDS) Update

SWIM Implementation Pioneer Group (SIPG/3)– Task 7 Update

June 1-5, 2026

Presented By:
APAC SWIM Task Force and FAA SWIM Program Office

Task 7: Registry Interconnection (SDS)

- SWIM Discovery Service (SDS) is a standards-based web service that enables federated discovery of SWIM services across independently managed service registries.

- As SWIM implementation expands globally, **without a standardized metadata format and discovery mechanism, cross-registry service discovery becomes constrained**, limiting interoperability and reducing the effectiveness of global information sharing. **SDS addresses this challenge by:**
  - Enabling **federated discovery** without centralizing metadata storage
  - **Standardizing service models, metadata structures, and schemas**
  - Supporting the conceptual data interactions and objectives of the ICAO IMP SWIM Registry Interoperability Job Card

Envisioned end state of Interconnected registries

SIPG Task 7 Work Plan Updates

- [x] **Task 7-1 Publish SDCM and SDS revisions for alignment with PANS-IM**
  - [x] Service Description Conceptual Model (SDCM) and SWIM Discovery Service (SDS) changes have been reviewed, documented and published in alignment with ICAO 10199 information service overview.

- [ ] **Task 7-2 Implementation of SDS v2.0**
  - [x] Implementation of SDS in compliance with SDS specification v2.0 including JSON schema updates; Develop SDS openAPI spec;
  - [x] Setup GitHub for SDS version control and collaboration
  - [ ] Migration from v1.0 to v2.0 for individual SDS instances

- [x] **Task 7-3 Develop Operational Scenarios**
  - [x] Develop operational scenarios for new features, including federation between registries, caching, rate limits, mutual TLS, OAuth 2.0 authentication mechanism and other related policies.

- [ ] **Task 7-4 Testing and Demonstration of the Operational Scenarios**
  - [ ] Execute SDS test cases based on operational scenarios from task 7-3 and capabilities provided by SDS specification v2.0.

- **Key scope of Task 7 was to develop a harmonized schema that aligns with ICAO technical procedures and data model. This has been achieved through collaborations between July 2025-April 2026.**
- **However, SDS testing is dependent on individual state implementation of SWIM Registry. V2 migration and task 7-4 are more appropriately suited under Tasks 5 and 9 instead for integration testing.**

Current Focus

- **Regional Adoption of SDS v2.0 as the standard for APAC SDS implementation (confirmed during TF/11 all implementations be based on v2)**

- **Develop and formalize test cases for SWIM service discovery. Requesting early implementors of SDS to initiate Test cases development**

- **SDS Implementation and Testing Coordination**
  - Follow up with each task 7 members on SWIM Registry and SDS implementation status and timelines
  - Develop test plan, schedule, and milestones
  - Collect input on access and security requirements to establish registry interconnection (i.e. any policies one should be aware of to establish connection with another ICAO state)

Current Focus

- **SDS v2.0 minor update**
  - Addition of new fields “Use Limitation” and “ Information Service Definition Reference” to align with the PANS-IM Information Service Overview (ISO)
  - Action in progress. Targeting updated schema release end of June.

- **Stakeholder updates**
  - Provide monthly updates on Implementations, demonstrations, and lessons learned in SIPG
  - Drive global adoption of SDS via technical collaborations and working papers in ICAO Information Management Panel Working Group I/S
  - Iterative updates to the data model per user feedback and ICAO PANS-IM Updates

SDS APAC Updates

- Singapore has implemented the SDS in their SWIM Test environment using test SWIM Registry data. The service is exposed through an API Gateway.

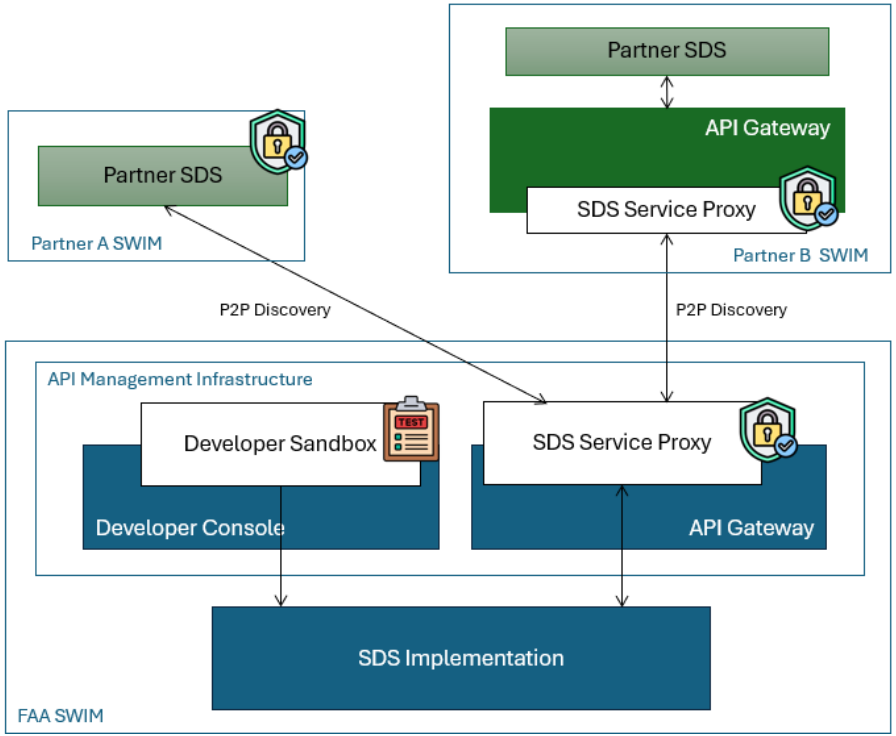
- ROK had implemented SDS instance v1.0 in 2021 and, ROK is planning to deploy SDS instance v.2.0 (supporting baseline capability) to their SWIM test environment using mock metadata before ICAO APAC SWIM TF/11(May, 2026).
  - Further capabilities (e.g., cross-registry discovery) to support operational will be integrated incrementally into the SDS instance v2.0 in alignment with the test timeline when test cases are confirmed.

- Japan had developed a test SWIM Registry based on SDS specification 1.0.1, and conducted a joint demonstration with FAA and KAC. An update to SDS specification 2.0.0, along with an international demonstration over the APAC SWIM test platform, is planned for 2026.

FAA SDS Implementation

- The FAA will be implementing SDS via an API Gateway that enforces OAuth 2.0 and mutual TLS for secure and harmonized connection with international registries.
- SDS will be integrated with an API Management (APIM) capability to enhance the design-time and runtime capabilities and governance for FAA's SWIM implementation.
- APIM will enable SDS by meeting key non-functional requirements, including security, rate limiting, throttling, caching, and message transformation.

- Coordination in progress to develop test version of SDS v2.0 based on mock export of current NSRR data for APAC testing.



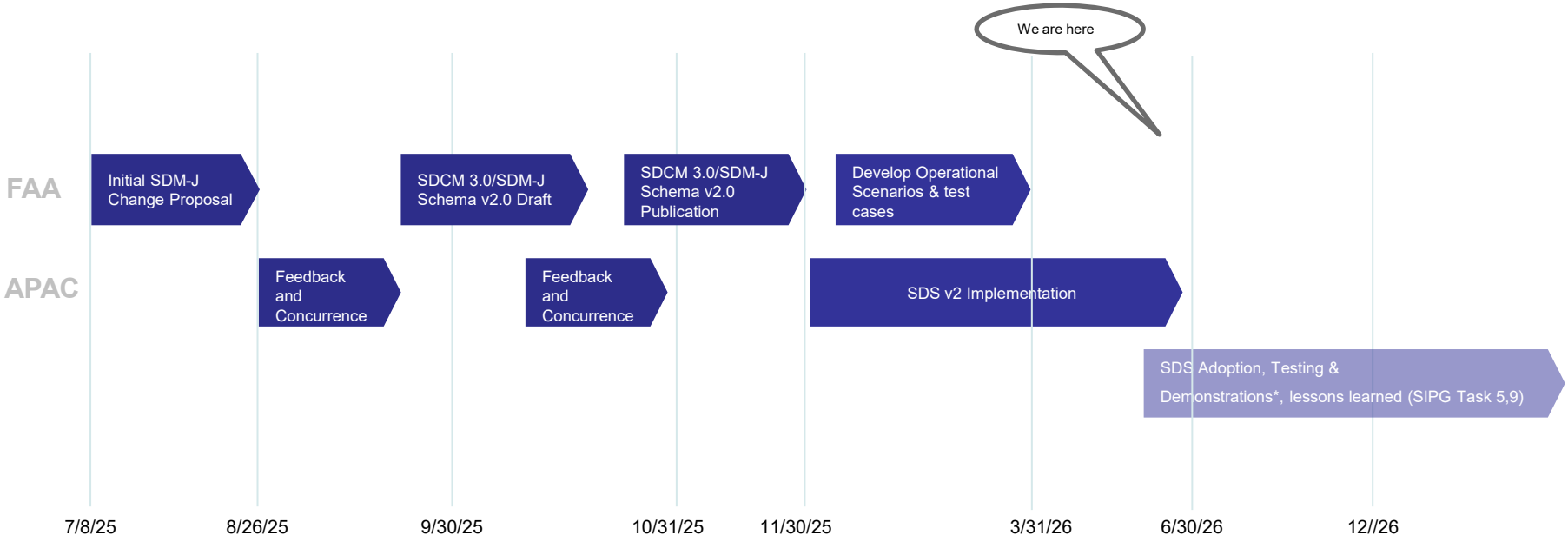
GitHub for SDS Chage Management

- ❑ **Latest SDCM, SDS Specifications and schema files will be published to discovery.swim.aero site**

- ❑ **Proposing that we use GitHub for version control and collaboration**
  - Version Control allows multiple developers to work on the same code base through multiple releases, keeps a records of changes, can revert any changes and go back to previous state.
  - Collaboration feature can track and coordinate resolution on issues (change requests, bugs, enhancements) through their lifecycles
  - Maintain a single branch (main)
  - Use tags for different official versions

  https://github.com/faa-swim/swim-discovery-service

Regional Timelines (APAC and FAA)



***Testing, demonstrations, and go-live dates are subject to change per individual SWIM registry and interconnection implementation. To be incorporated with Tasks 5 &9.**

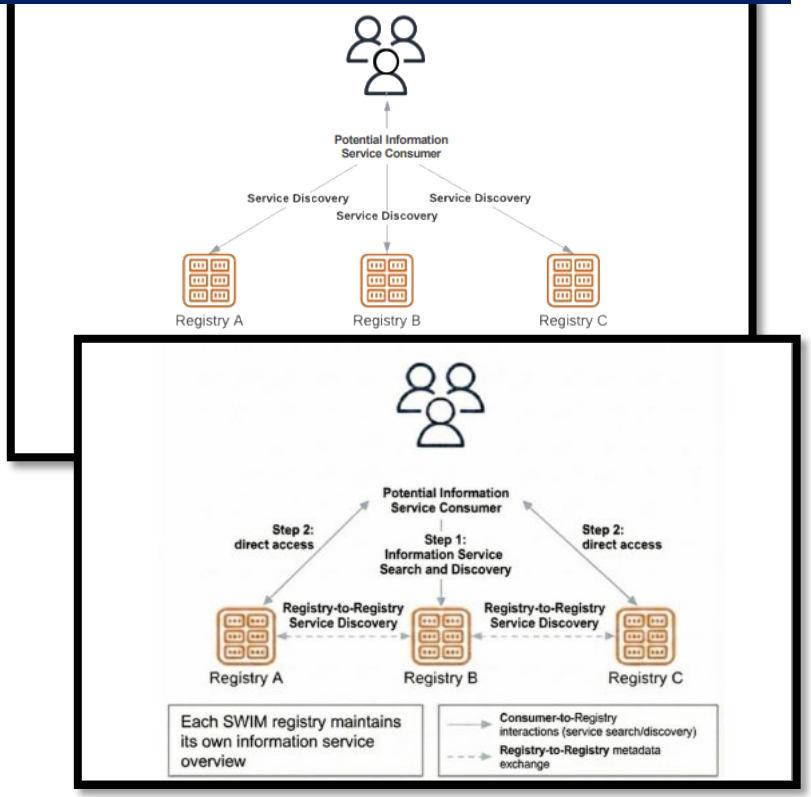
Any Questions?

Backup

Federated discovery

- The federated discovery model will flexibly evolve as the architecture, security, and access procedures mature with ICAO standards for SWIM Registry Interoperability Concept.
- This enables Registry A to establish API access both directly with all partner SWIM registries (i.e. Registry A directly queries Registry B and C) or via single peer-to-peer discovery (Registry A only queries Registry B to discover both Registry B and C SWIM information services).
- The SDS technical implementation is agnostic of discovery method, as the RESTful API mechanics and security policies (OAuth, mTLS) can be applied equivalently with either user case
- This supports the service discovery and metadata synchronization and access policies depicted in the "*IMP/4, WP 008 SWIM Registry Interoperability Concept*"

SDS as an enabler of interconnected registries



Figures 1-2 "*IMP/4, WP 008 SWIM Registry Interoperability Concept*"

SDS Ops Scenario #1 - Cross Registry Service Discovery

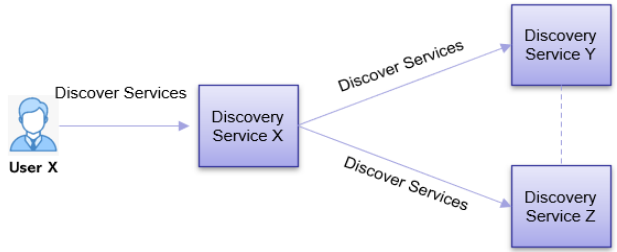
Description: Registry X automatically queries Registry Y (and other peers) to retrieve available service metadata. This is a backend registry-to-registry Application Programming Interface (API) call; no direct user interaction required.

Operational Outcome

- ❑ Users accessing Registry A can discover services published in peer registries without manually accessing each registry.

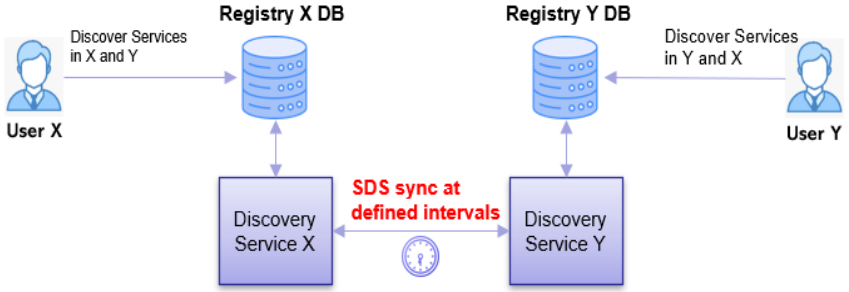
P2P Discovery

Every Discovery Service ("peer") is an equally privileged, equipotent participant with the same capabilities and responsibilities



SDS Ops Scenario #2 - Service Metadata Synchronization

Description: Registry X periodically retrieves and updates metadata from Registry Y (and other peers)

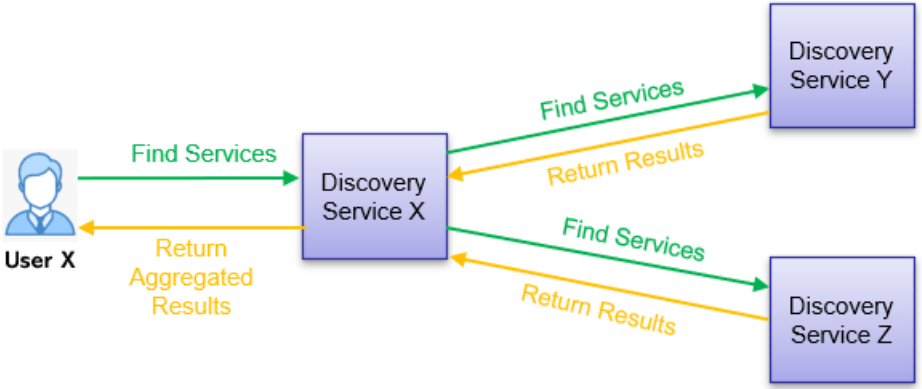


Operational Outcome:

- Ensures that all participating peer registries continuously share the most current API definitions, versions, and metadata without manual intervention.
- This reduces human error, prevents version drift, and maintains consistent information across distributed systems in real time. It improves reliability and trust between peers, accelerates integration updates, and strengthens security and governance by ensuring changes propagate quickly and uniformly.

SDS Ops Scenario #3 - Federated Registry Search

Description: User initiates a search from Registry X. Registry X distributes a search request to peer registries and aggregates responses.



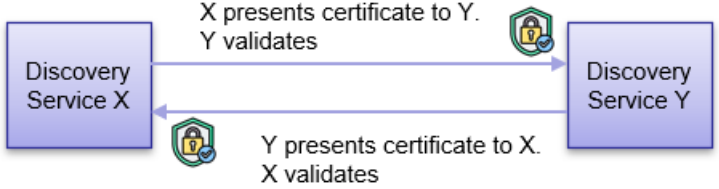
Operational Outcome

- A single search returns services meeting defined criteria across multiple registries.

SDS Ops Scenario #4 - P2P Service Authentication and Establishing Trust

Description: Registries authenticate each other using mutual TLS (mTLS), OAuth 2.0, or certificate-based trust frameworks.

P2P Service Authentication using mTLS as example

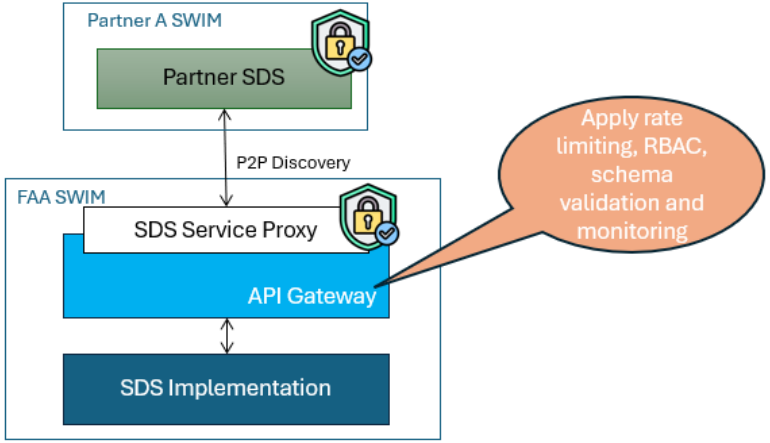


Operational Outcome

- ❑ Secure, trusted registry interconnection across States or regions. Machine-to-machine authentication without user involvement.

SDS Ops Scenario #5 - Enhanced P2P Service Security

Description: SDS will apply and enforce API security using common industry controls such as API rate limiting, Role-Based Access Control (RBAC), schema validation and real-time monitoring.



Operational Outcome:

- Rate limiting and throttling can be applied per peer identity to **prevent abuse or cascading failures,** while RBAC ensures authenticated peers can only access permitted resources and operations.
- Strict schema validation should be enforced against defined API contracts (e.g., OpenAPI/JSON Schema) to **reject malformed or malicious payloads before business logic executes.**
- Continuous **monitoring and logging of requests, errors, and anomalous patterns** further **strengthen security by enabling rapid detection and response** to misuse or compromised peers.

SDS Test Cases

Following the review of the SDS Operational Scenarios, we propose a collaborative, scenario-based testing approach using the following methods.

- Validate a shared understanding of each operational scenario
- Develop test cases for each operational scenario outcome
- Define standardized test case format
- Incorporate non-functional tests such as performance and security and responsiveness for timely metadata retrieval