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CAPACITY & EFFICIENCY

Enabling SWIM Service Composition with REST- based API

WP10

Presented to:

The Seventh Meeting of System Wide Information
Management Task Force (SWIM TF/7)

Presented by:

Federal Aviation Administration (FAA), USA
Bangkok, Thailand, 09 – 12 May 2023





Agenda

1. Introduction

2. Discussions

- SWIM Discovery Service (SDS)
- Open Geospatial Consortium (OGC) Testbeds

3. Actions by the Meeting



1. Introduction

- Service Oriented Architecture (SOA) as foundation for SWIM
 - Reusability independent of technologies, programming languages, or platforms
- Representational State Transfer (REST) as design principles of World Wide Web
 - Standardized protocols and operations further reduces the barriers of communications via Web Services
- Motivation for exploring REST as SWIM evolves
 - Delivering context-driven information to consumers
 - Improving developer productivity and service deployment
 - Achieving global interoperability

2. Discussions

SWIM Discovery Service (SDS)

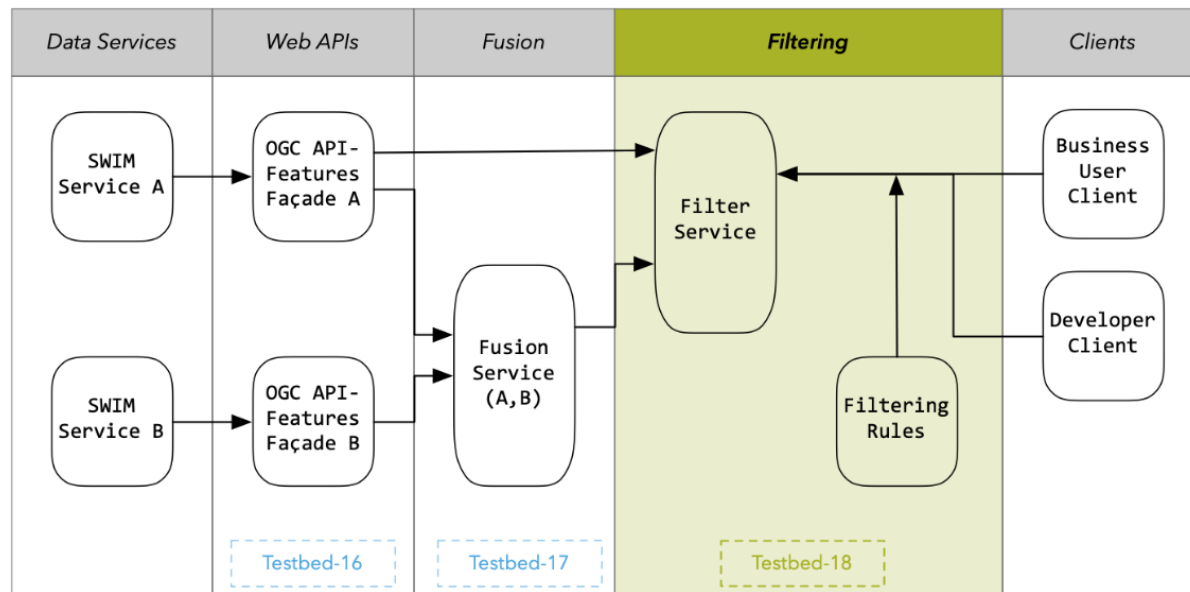
- Joint effort to facilitate the exchange of service metadata
 - Architectural perspective – Individual discovery services are composed together via REST APIs
 - User's perspective – Querying a network of interconnected discovery services to discover information
- Web services consistent with the REST principle
 - Resources are defined and uniquely identified using URI
 - Open API allows a new SDS implementer to jump start the development effort



2. Discussion

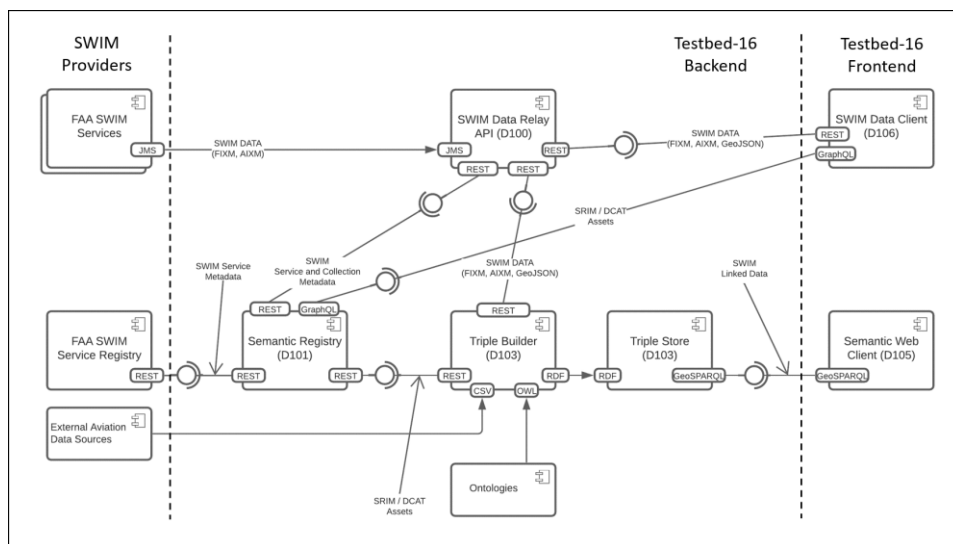
OGC Testbeds

- FAA and OGC explored how standard-based API can enhance SWIM data distribution
 - Engineering Reports (ER)
 - Live demonstrations



2. Discussion

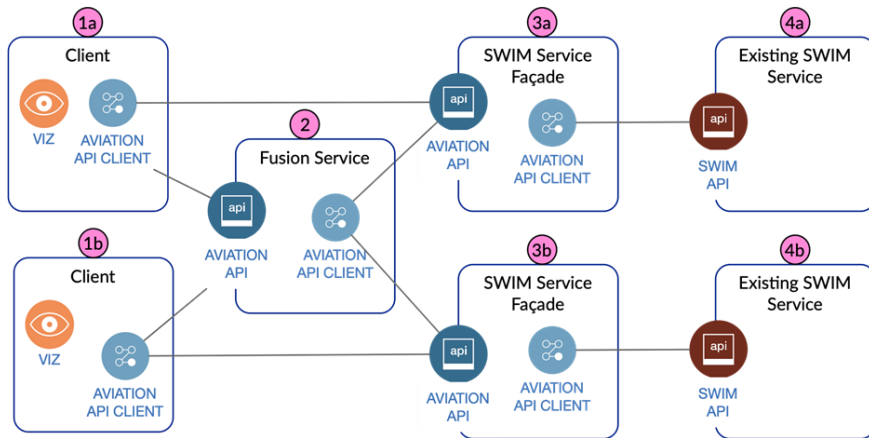
Foundation for REST API in Testbed 16



- Use of OpenAPI improved developer productivity
 - 5 different organizations
 - 6 different software components
 - Completed in a few months
- Lessons Learned
 - Need for defining “features”
 - Need to handling large data volume.

2. Discussion

Service composability in Testbed 17



- Two fusion scenarios
 - Flight Restrictions Data Fusion Service with multiple FAA SWIM services
 - International Flight Data Fusion Service fused flight plans across US and European airspaces
- Two demo perspectives
 - Fusion developers
 - Business Users
- Lessons Learned
 - Combine data elements from multiple sources and resolve discrepancies



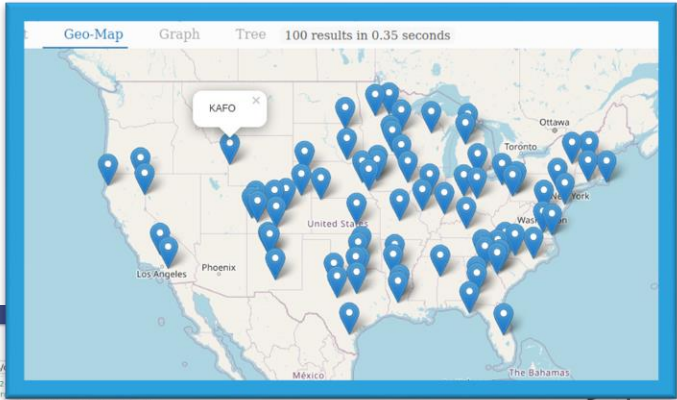
2. Discussion

Business and Developer Clients

The screenshot shows the LuciadRIA AIXM interface. The top navigation bar includes 'Connect', 'Datasets', 'Tools', and 'About'. A 'Bing Search' field and a 'Logout' button are also present. The main map area displays a satellite view of the United States with numerous blue airplane icons representing flight paths. A 'Feature Properties' popup is visible, showing details for a specific flight path:

```

Feature Properties
gulf: 769a03da-ebc3-4796-a5ca-0910a44a65f9
flightPlanIdentifier: KL1957400
departurePoint: KJAX
arrivalPoint: KJFK
beginTime: 2020-08-05T20:20:00.000+0000
endTime: 2020-08-06T01:19:00.000+0000
isInterim: FALSE
altitude: 0
speed: 0
json: Object(1)
  _calculated_heading: 65.8194139704308
  
```



Knowledge Manager

Airport Query

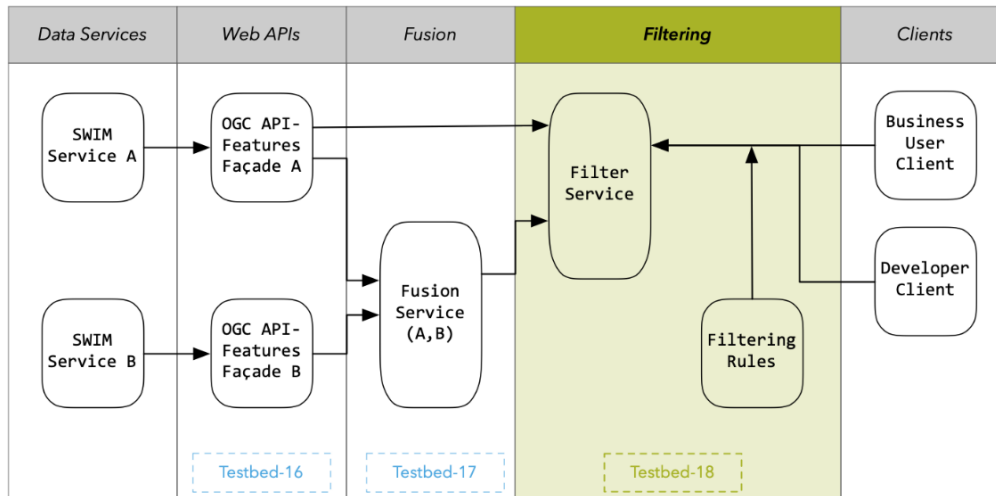
```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3 PREFIX asinfra: <http://www.opengis.net/ont/testbed16/aviation/infrastructure-#>
4 PREFIX geosparql: <http://www.opengis.net/ont/geosparql#>
5
6 SELECT ?airportName ?faaCode ?icaoCode ?wt WHERE {
7   ?airport a asinfra:Airport .
8   ?airport asinfra:airportName ?airportName .
9   ?airport asinfra:faaAirportCode ?faaCode .
10  ?airport asinfra:icaoAirportCode ?icaoCode .
11  ?airport geosparql:hasGeometry ?geo .
12  ?geo geosparql:isWkt ?wt
13 } LIMIT 100
  
```

| Table | Response | Bar-Chart | Geo-Map | Graph | Tree | 100 results in 0.35 seconds | Filter query results | Page size: 50 |
|-------|------------------------------|-----------|----------|--|----------------------|-----------------------------|----------------------|---------------|
| | airportName | faaCode | icaoCode | wt | | | | |
| 1 | JAFFREY AIRPORT-SILVER RANCH | AFN | KAFN | "Point(-72.003021944444 42.805134166667)" | geosparql:wktLiteral | | | |
| 2 | TAYLOR MOUNTAIN | ATM | PATM | "Point(-157.391944444444 60.867777777778)" | geosparql:wktLiteral | | | |
| 3 | WASHINGTON MUNI | AWG | KAWG | "Point(-91.676083333333 41.275694444444)" | geosparql:wktLiteral | | | |
| 4 | CURTIS FIELD | BBD | KBBB | "Point(-99.323916666667 31.179277777778)" | geosparql:wktLiteral | | | |
| 5 | WEXFORD COUNTY | CAD | KCAD | "Point(-85.418916666667 44.275333333333)" | geosparql:wktLiteral | | | |
| 6 | JAMES M COX DAYTON INTL | DAY | KDAY | "Point(-84.219416666667 39.90225)" | geosparql:wktLiteral | | | |
| 7 | EDWARD G PITKA SR | GAL | PAGA | "Point(-156.93495872222 64.736196527778)" | geosparql:wktLiteral | | | |
| 8 | CROFTON NEWINGTON | CON | KCON | "Point(-73.0451000000 41.3300000000)" | geosparql:wktLiteral | | | |

2. Discussion

Filtering mechanisms for feature data in Testbed 18



- A subset of the data provided by a SWIM service
- Decoupling filtering rules from data services



3. Actions by the Meeting

- Note the information contained in this paper
- Discuss any relevant matter as appropriate



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THANK YOU