

AEROTHAI Overview

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Success Criteria

- Ability to develop and execute more complex use cases, i.e. the ability to exchange information in AIXM/FIXM/iWXXM format
- To learn (and prepare) about the minimum network requirements expected in the SWIM environment
- To extend and support international participation
- To expand the awareness on global development regarding information management
- To gain the hand-on experience as well as to develop the related software/system in advance, creating a head start in information management research and development



Architecture Overview

Demonstration System Capabilities

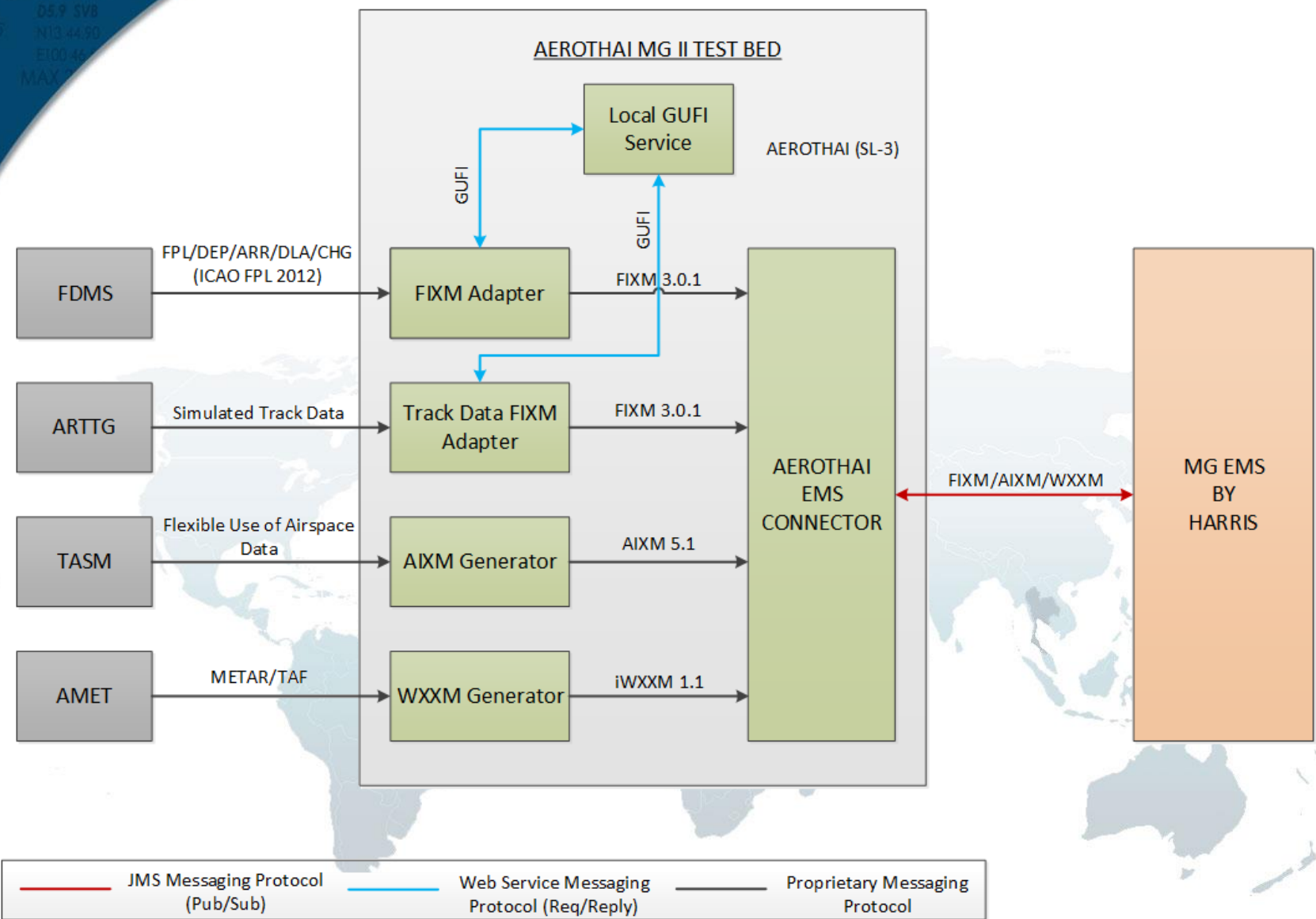
- Publish FIXM v3.0.1/AIXM v5.1/iWXXM v1.1 messages
- Receive FIXM v3.0.1/AIXM v5.1/iWXXM v1.1 messages
- Local GUFU Service

Real-time Simulated Data

- Flight plan data
- Departure data
- Airborne track data
- Arrival data
- NOTAM (CDR)
- TAF



Architecture Diagram





Message Availability

Data Source	Message	Standard
FDMS	FPL/DEP/ARR/DLA/CHG	FIXM v3.0.1
ARTTG	Track Data	FIXM v3.0.1
TASM	NOTAM	AIXM v5.1
AMET	TAF	iWXXM v1.1

*FDMS: Flight Data Management System

**ARTTG: AEROTHAI Track Generator

***TASM: Pre-Tactical Airspace Management Database

****AMET: Advanced MET Information Database



Lessons Learned

- Requirements for SWIM-based system development
- Important aspect needed to be considered in application development, e.g. validation and processing of coordinate-related elements in AIXM/IWXXM message
- Limitation of using ATS message-based system in the future operational environment



CAAS Technical Overview for Mini Global II Demonstration

David Leow, Senior Engineer,
Aeronautical Telecommunications Engineering
17 May 2016

Overview

- CAAS is looking to SWIM to provide an information rich environment
 - Support multi-nodal ATFM
 - Increase situational awareness
 - Increase predictability
 - Data analytics
 - Support FF-ICE and TBO
- MG II offers us an opportunity to explore some of the operational scenarios



Singapore's MG II Approach

- Team members
 - Mr David Leow, Senior Engineer
 - Mr Francis Chan, Executive Engineer
- Purpose
 - To experiment with different operational scenarios and to discover the operational benefits that SWIM might bring
 - To find out more about the GEMS and how it works.
 - To learn more about SWIM implementation

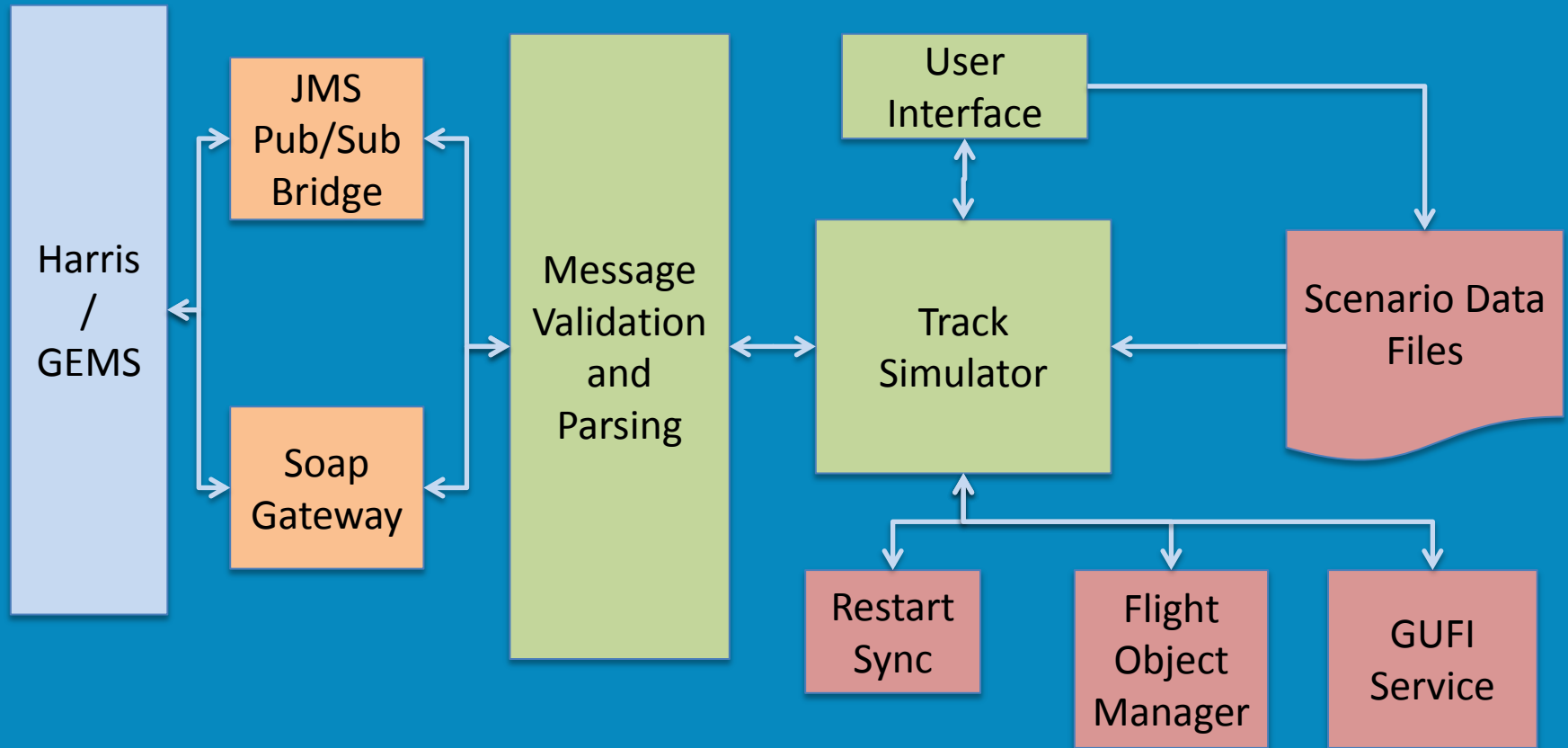


Singapore's MG II Approach

- Approach
 - Purpose built simulator to generate FIXMs, AIXMs and iWXXMs
 - Simulator is automated and relies on event triggers to progress through each scenario
 - Allows us to craft scenarios easily
 - Integrated scenario generator, map and message viewer and scenario dashboard into a single UI for easy access.



Architecture Diagram



Screen Shot – Map Viewer

The screenshot displays a web browser window with multiple tabs for 'Scenario Architect'. The address bar shows '192.168.8.8:8081'. The main content area is titled 'Air Picture' and features a map of East Asia with two red airplane icons labeled 'ANA77A'. One icon is positioned over Japan, and the other is over the Philippines. To the right of the map is a data table for flight 'ANA77A'.

Field	Data
<> GUFID	e1e868b3-3d22-44dc-b7fc-c9ab5809b2e9
<> Registration	JAG999
<> Altitude	30000.0
<> Speed	550.0
<> Origin	RJAA
<> Destination	KLAX
<> Estimated	2016-01-28T00:10:00.000Z
<> Departure	2016-01-28T00:16:00.000Z
<> Arrival	
<> Route	CUPID Y808 ONION OTR5 ADNAP OTR5 KALNA/M083F330 44N160E 46N170E 47N180E 48N160W 47N150W 44N140W 40N130W DCT DACEM/N0486F350 DCT PAINT DCT PIRAT DCT AVE SADDE

Below the table is a 'Messages' section with a tree view showing flight status changes:

- CHG: <Flight flightType="NON_SCHEDULED" source="JCAB" system="FDPS" centre="ENRI" timestamp="2016-01-28T00:30:00.000Z">
- DEP: <agreed>
- FPL: <route flightDuration="P0Y0M0DT9H11M0.000S" initialFlightRules="IFR" routeText="CUPID Y808 ONION OTR5 ADNAP OTR5 KALNA/M083F330 44N160E 46N170E 47N180E 48N160W 47N150W 44N140W 40N130W DCT DACEM/N0486F350 DCT PAINT DCT PIRAT DCT AVE SADDE">
 - <initialCruisingSpeed uom="KNOTS">504.0</initialCruisingSpeed>
 - <requestedAltitude ref="FLIGHT_LEVEL" uom="FEET">31000.0</requestedAltitude>
 - <segment>
 - <routePoint>
 - <point xsi:type="fb:FixPointType" fix="CUPID"/></routePoint>

Screen Shot - Editor

The screenshot displays the Scenario Architect editor interface. At the top, the browser address bar shows the URL `https://global.gotomeet.../192.168.8.8:8081/#/actionT3`. The page title is "View Scenario > Edit Scenario ID: 6ac70068-2186-4d60-9b8f-7bac42c0dea3".

The main content area features a "Description" field with the text "AEROTHAI Case 1: SIN to BKK with DA Activation (MNG 901)". To the right of the description are "Save & Go Back" and "Close" buttons.

Below the description is the "Component Workflow" section, which includes a "+ Add New Component" button and a table of workflow components.

	ID	Summary	Conditions	Actions
☰	5ba23adb-a3a5-49d4-9cf1-d0da7350d930	○○○○●○ ○●●○○	Receive AIXM about the activation of VT D71 from AEROTHAI	✔ Flight from Singapore to Thailand (with Danger Area) ✔
☰	cbad8c77-1bbf-4736-95f5-de154d47f39b	○●●●●○ ○○○○	Receive AIXM about the De-activation of VT D71 from AEROTHAI	✔ Flight change message from Singapore to Thailand (without Danger Area) ✔
☰	b8bdb2de-b3b1-43c5-b23e-49bd8ddd354b	○●●●○○ ○○○○	Wait for 5 minutes before sending departure message	✔ DEP message for Flight from Singapore to Thailand ✔
☰	c618adf0-e2fa-4e34-b1b2-6f37908e481a	○●○○○○ ○○○○	Create flight track	✔ Create flight track MNG901 ✔
☰	21f92d21-4288-4312-8855-bdcf09267f15	○●●●○○ ○○○○	Create flight track	✔ Create FIXM Message for flight track MNG901 ✔
☰	e864e793-4758-444a-af01-a9b6f91af8e7	●●●●○○ ○○●●	Fly flight track	✔ Flying to VTK ✔
☰	17e36123-e25b-4b33-ae2-e2c767c3e553	●●●●○○ ○○●●	Fly Flight Track 2	✔ Fly to VMR ✔
☰	679131f9-14cd-4d6c-9015-1b6c40ae5d0c	○●○○○○ ○○○○	Last step to destroy flight track	✔ Click edit to configure actions for this component ✔
☰	0ea66c98-5ce8-4f12-9b39-71d623259008	○○○○○● ○○○○	Reached VTK	✔ Click edit to configure actions for this component ✔
☰	6c981308-a062-4853-9172-6e6c42c06795	○○○○○● ○○○○	Reached VMR	✔ Click edit to configure actions for this component ✔

Screen Shot - Dashboard

The screenshot shows a web browser window with the address bar displaying `192.168.8.8:8081/#/actionT3`. The page title is "Platform Dashboard".

Console

Auto-scroll

```
2016-01-28T09:45:03+08:00 : objectFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: Dependencies resolved
2016-01-28T09:45:03+08:00 : objectFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: Spawning plane component
2016-01-28T09:45:03+08:00 : objectFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: Initializing other components
2016-01-28T09:45:03+08:00 : objectFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: Executing
2016-01-28T09:45:03+08:00 : componentFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: 056566f1-35e9-4008-a099-13450e9a50ca: Initializing...
2016-01-28T09:45:03+08:00 : componentFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: 056566f1-35e9-4008-a099-13450e9a50ca: Activating
2016-01-28T09:45:03+08:00 : componentFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: 056566f1-35e9-4008-a099-13450e9a50ca: Initialization completed
2016-01-28T09:45:03+08:00 : componentFactory: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561: 056566f1-35e9-4008-a099-13450e9a50ca: Activating
2016-01-28T09:45:03+08:00 : JMSBridge: Sending Message
2016-01-28T09:45:05+08:00 : ==== child: Terminating for scenario: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561
2016-01-28T09:45:05+08:00 : run: stopped: ac5e0245-a5fe-47ad-8c4a-1afd1dbdf561
```

Scenario Status

	Actions	Internal ID	Status	Notes
☰	▶ ◻	6ac70068-2186-4d60-9b8f-7bac42c0dea3	Stopped	AEROTHAI Case 1: SIN to BKK with DA Activation (MNG 901)
☰	▶ ◻	17ca887e-ae1a-4cd5-aa02-a8e594692eda	Stopped	Testing AEROTHAI Case 1 Step 1: SIN to BKK with DA Activation (MNG 901)
☰	▶ ◻	db994bef-4497-4a75-b00d-d38e636a6535	Stopped	Testing AEROTHAI Case 1 Step 2: SIN to BKK with DA Activation (MNG 901) debug
☰	▶ ◻	f7304ee4-ee4c-4bfe-a154-81080fee96de	Stopped	Testing AEROTHAI Case 1 Step 3: SIN to BKK with DA Activation (MNG 901)
☰	▶ ◻	69bc9978-755a-4f6c-8fd4-e9075bd69739	Stopped	Testing AEROTHAI Case 1 Step 4: SIN to BKK with DA Activation (MNG 901)
☰	▶ ◻	1866442e-0453-4f17-bf52-ff8cfd67d295	Stopped	AEROTHAI Case 2: SIN to BKK with TAF Message (MNG 903)
☰	▶ ◻	f10e357f-ddf5-44b2-8cc5-64345a9e4697	Stopped	Testing AEROTHAI Case 2 Step 1: SIN to BKK with TAF Message (MNG 903)
☰	▶ ◻	ab6aef01-cdc9-487e-a168-892537acc59	Stopped	Testing AEROTHAI Case 2 Step 2: SIN to BKK with TAF Message (MNG 903)
☰	▶ ◻	a65f7c8b-20bf-4ca2-a0c3-9073677a0b88	Stopped	Testing AEROTHAI Case 2 Step 3: SIN to BKK with TAF Message (MNG 903)
☰	▶ ◻	d3f5cdd5-3243-43d5-af6f-b4b28cfd3b22	Stopped	AEROTHAI Case 3: BKK to SIN with SIGMET (MNG905)
☰	▶ ◻	393f0850-1d9e-4de0-b08b-2daefecfb1ed	Stopped	Testing AEROTHAI Case 3 Step 1: BKK to SIN with SIGMET (MNG905) - Issue SIGMET
☰	▶ ◻	22898c77-ab26-421b-8d21-1dfc69354fba	Stopped	Testing AEROTHAI Case 3 Step 2: BKK to SIN with SIGMET (MNG905) Fly to WSSS
☰	▶ ◻	8358d916-036f-403e-803a-8cc66a81e92d	Stopped	Testing AEROTHAI Case 3 Step 3: BKK to SIN with SIGMET (MNG905) Arrival Message

Singapore's Success Criteria

- Demonstrate the capability to transmit and receive trajectory updates for a flight
- Demonstrate the capability to limit data transmission to only certain approved parties
- Demonstrate the ability to transmit and receive weather data
- Demonstrate the ability to transmit the FIXM messages to facilitate ATFM



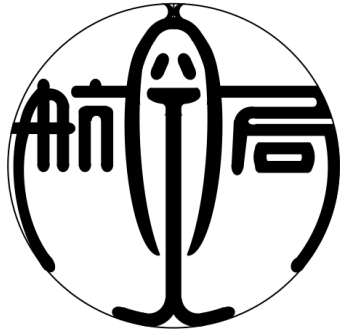
Demonstrated Benefits

- Benefits
 - Data harmonization through the use of the various data models allows different systems to become interoperable
 - Ease of information exchange facilitate operations
 - Timely information results in more efficient flight



Lessons Learnt

- Meta data in the form of headers is extremely important for message transport
- Data models need to be consistent for data harmonization to occur
 - Consistent meaning that the same term does not have 2 different interpretations in different models.
 - Use of data models for non-traditional transactions need to be agreed upon before-hand.



Japan - JCAB

Xiaodong Lu

Researcher, ENRI, Japan

Technical Overview

➤ Participation Level

- Service Level 4

- > Produce semi-live flight data and simulated data
- > Consume FIXM, AIXM and iWXXM messages
- > GUFi Service in local
- > Flight Object Management

➤ Data Exchange

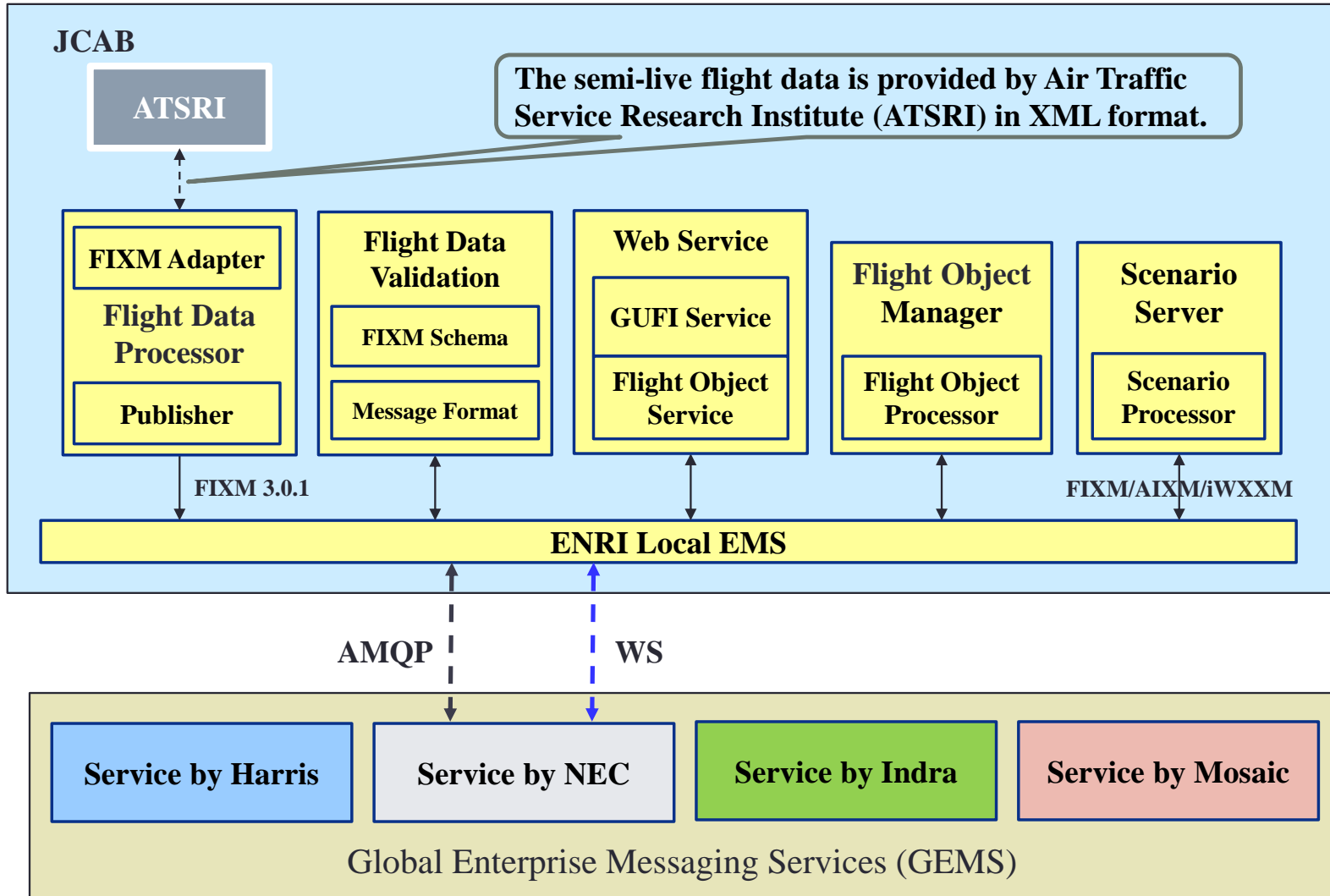
- Message types for semi-live data (FIXM 3.0.1)

- > ROUTE
- > DEPARTURE
- > ARRIVAL
- > TRACK

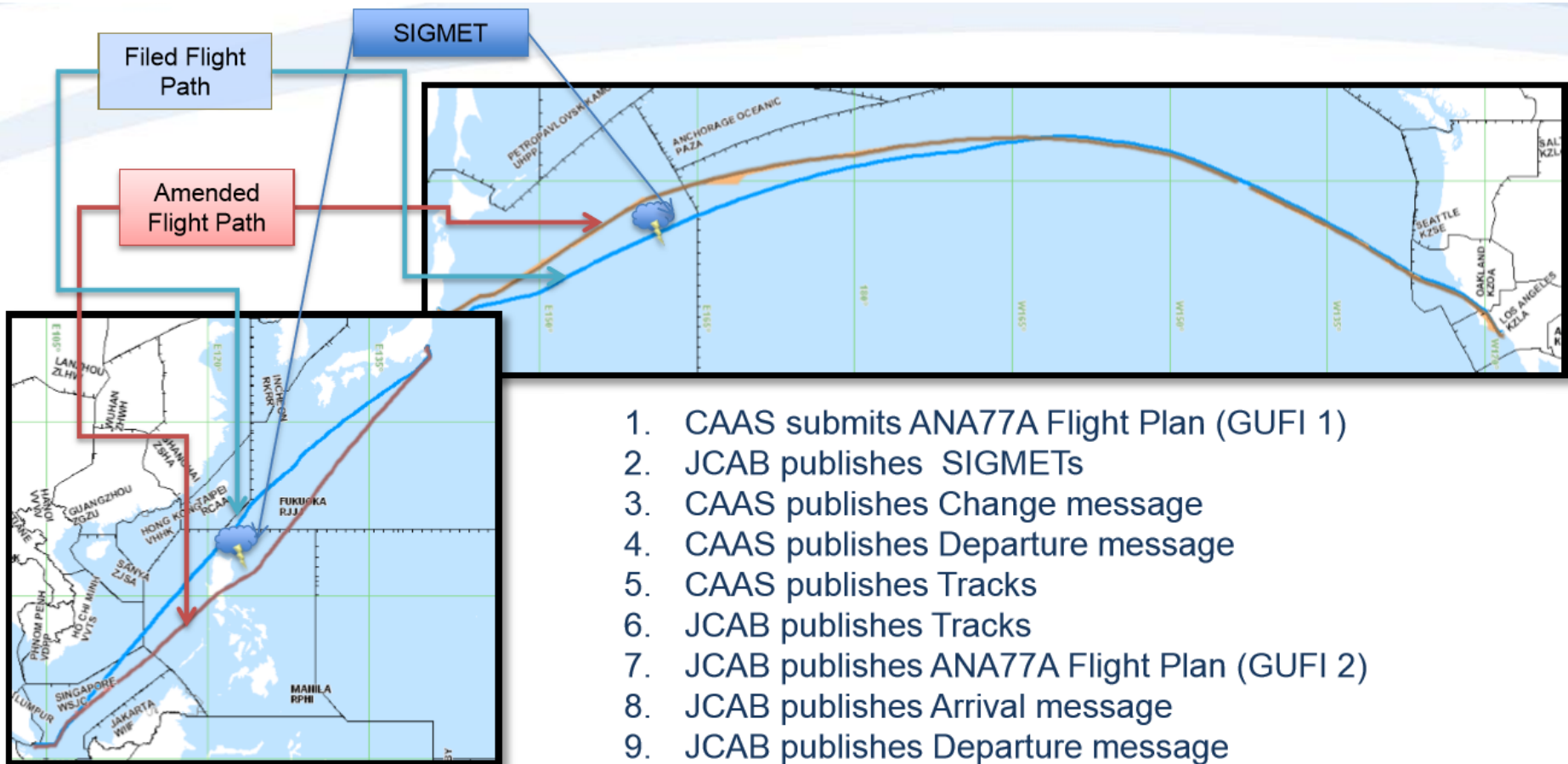
- Data and messages for simulated scenarios

- > SIGMET data for turbulence in iWXXM 1.0
- > Boundary coordination by AIDC protocol in FIXM 3.0.1
- > Flight Plan, Departure, Arrival and Track messages in FIXM 3.0.1

System Architecture



Trans-Pacific Operations



1. CAAS submits ANA77A Flight Plan (GUF1 1)
2. JCAB publishes SIGMETs
3. CAAS publishes Change message
4. CAAS publishes Departure message
5. CAAS publishes Tracks
6. JCAB publishes Tracks
7. JCAB publishes ANA77A Flight Plan (GUF1 2)
8. JCAB publishes Arrival message
9. JCAB publishes Departure message
10. JCAB publishes Tracks
11. JCAB publishes SIGMET
12. JCAB publishes Change message
13. Int'l Boundary Coordination with altitude updates
14. FAA publishes Tracks
15. FAA publishes Arrival message

Benefits

- **FIXM, AIXM and WXXM sharing**
 - Real-time SIGMET data sharing improves the predictability
 - Seamless operations for boundary coordination

- **GUFM based flight object management**
 - Easy to clarify the flight in the operation
 - Easy to manage the flight with multiple legs

- **Multi-layer EMS architecture**
 - Improve the local information security
 - Improve the global connectivity

Lessons Learned

➤ FIXM schema and validation

- Extension of FIXM schema is necessary?
- Different requirements for data validation

➤ Message exchange

- Synchronization between local and global systems
- Flight object management between different systems

➤ GEMS provider

- How to enhance information security?
- How to integrate local, regional and global governance?