Flight Data Object

Federal Aviation Administration

Australia

Strategy Meeting

Agenda

- Background – FO, FDO, SWIM
- FDO Data Exchange via SWIM
- FDO Demonstration History – Task D, Task F
- Goals for Future Asia/Pacific FDO Demonstrations
- Proposed Project Timeline
- Potential Scenarios
- Simulation Environment – FTB

FO Overview

- The Flight Object (FO) is intended as the future medium for capturing and sharing the most up-to-date information on any flight. The FO is the single common reference for all systems' information about a particular flight
- In addition to the route and flight information normally found in a flight plan, the FO contain trajectories, restrictions, versions, and other information for various systems
- The FO is dynamically updated as the flight progresses from gate to gate

FDO Overview

- Distinguish terminology:
  - **Flight Object (FO)** is the flight data structure and concept to be standardized
  - **Flight Data Object (FDO)** refers to the FO data structure used in the series of demonstrations where systems are adapted to allow the exchange of flight information
- The objective of the FDO demonstrations is to establish and validate a business case including potential benefits surrounding the integration and/or synchronization of flight information across multiple systems and air spaces (US and internationally)

Current Flight Data vs. FDO

NAS FP Message

```
FP TTT002 A320/J 0463 MCO P1225 360
MCO..CTY..SZW..MCB..UIM..TXO..ABQ..PGS.TYSSN1.LAS/0412
```

TRACON Messages

AIDC CPL Message

```
(CPL-TTT002-IS
-A320/J-SDIW/C
-KMCO
•-MCB/1444M080F330
-K0463F360 DCT CTY DCT SZW
DCT MCB DCT UIM DCT TXO
DCT ABQ DCT PGS
 TYSSN1
-KLAS0412
-RMK/NRP)
```

AIDC CDN Message

NAS AM Message

NAS RS Message

Flight Data Object

```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
- <FlightRepositoryRequest xmlns:ns8="http://tss.lmco.com/avs/jaxb" xmlns:ns7="http://www.tss.lmco.com/FDIO"
xmlns:ns6="http://www.caar.aero/schema/ETAv1" xmlns:ns5="http://www.tss.lmco.com/SourceData"
xmlns:ns3="http://tfm.faa.gov/tfms/NasXCoreElements" xmlns:ns4="http://tfm.faa.gov/tfms/TFMS_XIS"
xmlns:ns2="http://tfm.faa.gov/tfms/NasXCommonMessages">
- <requestId>
  <source>Atop-DAB</source>
  <uniqueId>0</uniqueId>
  <requestSourceType>ERAM</requestSourceType>
```

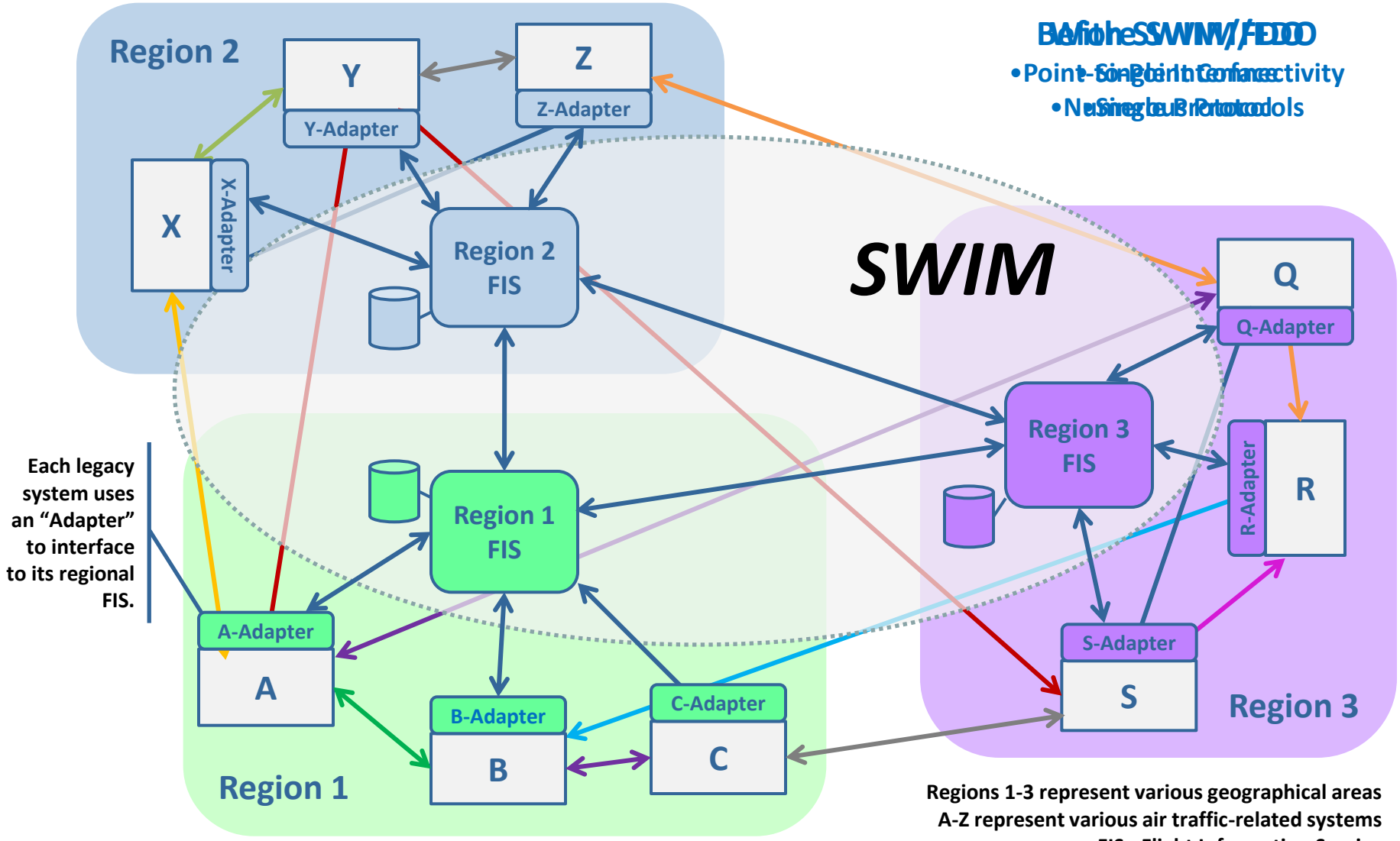
Unlike the rigid interfaces of the past, new or unknown data in a FDO can be ignored by receiving systems

```
  <sourceName>Atop-DAB</sourceName>
  </fluid>
- <flightVersion>
  <versionStatus>COMPLETED</versionStatus>
  <filingStatus>ACTIVE</filingStatus>
  <pairedTrackId>0</pairedTrackId>
  <ICAOAddress>0</ICAOAddress>
- <flightPlan>
  <formatType>ICAO</formatType>
- <initialSource>
```

SWIM Overview

- System Wide Information Management (SWIM) is an IT infrastructure program that operates in the background to provide data to authorized users
- SWIM will:
  - Allow the FAA to create new system interfaces more quickly and cost-effectively than is possible today
  - Facilitate the increased data-sharing that is required for NextGen
- FDOs are exchanged among systems via SWIM-like core services in FDO demonstrations

SWIM Integration Across Multiple Regions



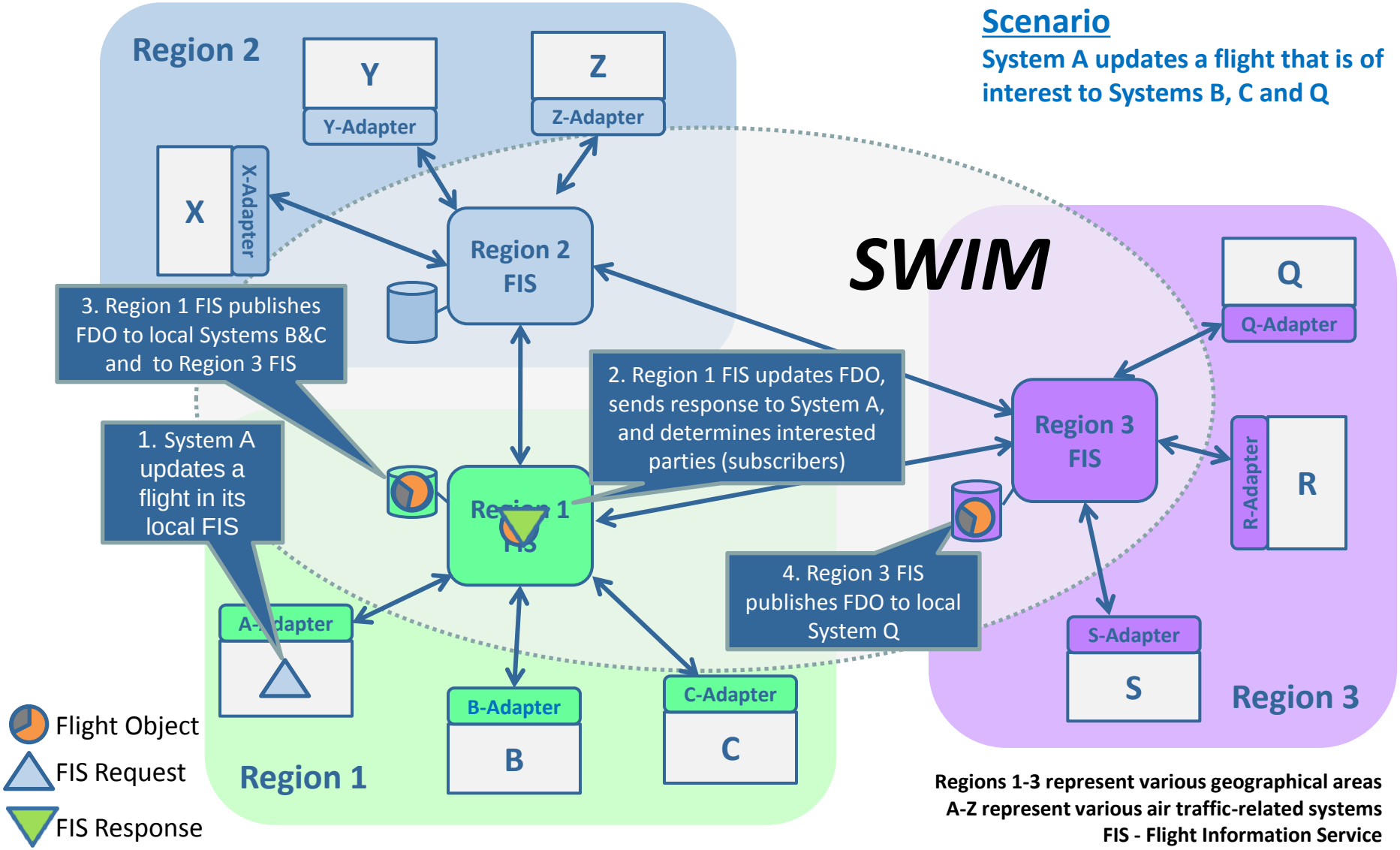
Each legacy system uses an "Adapter" to interface to its regional FIS.

Before SWIM/FEDD
- Point-to-Point Connectivity
- Using Different Protocols

After the SWIM/FEDD
- Single Point of Interface
- Using Standard Protocols

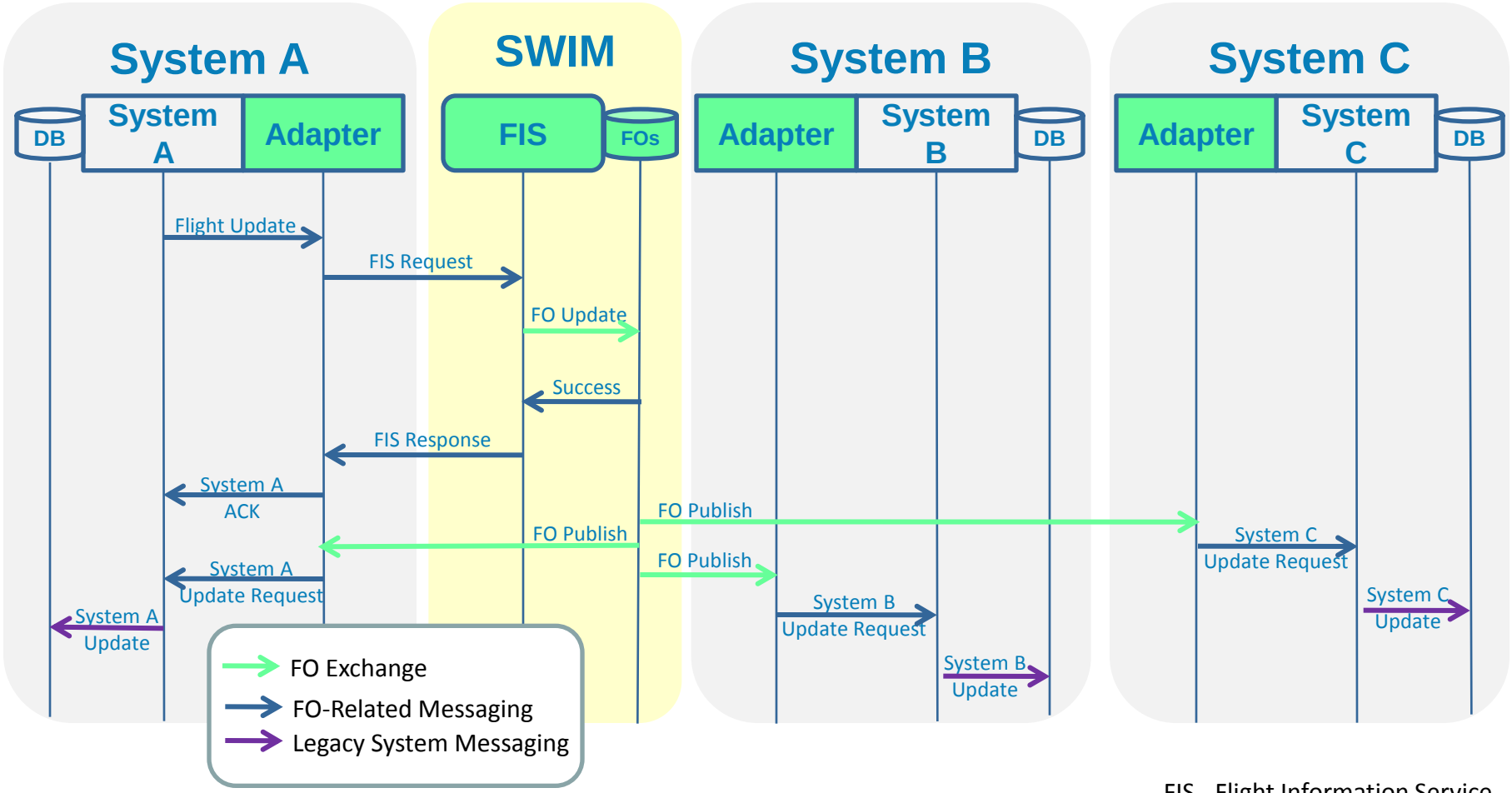
Regions 1-3 represent various geographical areas
A-Z represent various air traffic-related systems
FIS - Flight Information Service

FDO Data Exchange via SWIM



Flight Update using SWIM and Flight Objects

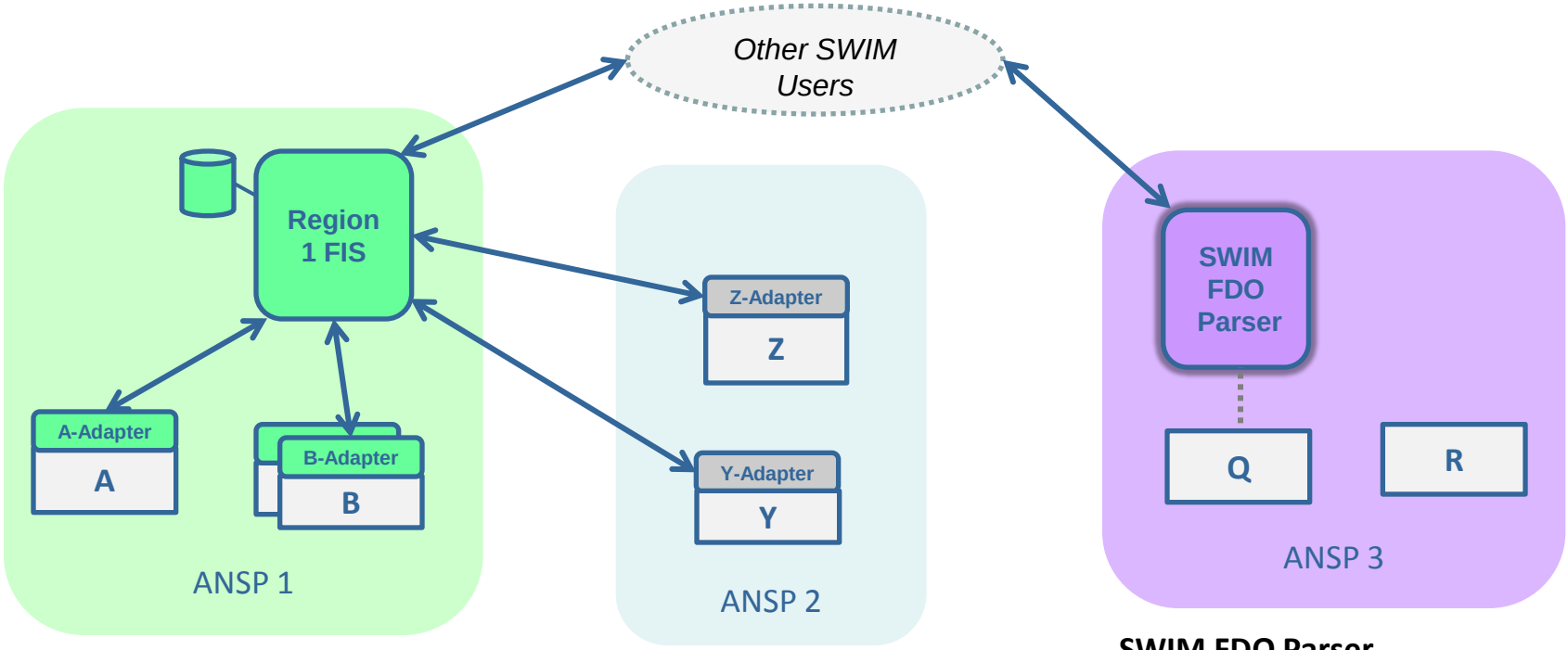
System A makes update, Systems B and C are subscribers



FIS - Flight Information Service

Notional SWIM Implementation Alternatives

Transition and/or Partial Implementations



Local Regional SWIM
Multiple systems in ANSP are SWIM and FDO enabled. Local FIS supports the region.

Remote Regional SWIM
System(s) are FDO enabled. Uses Regional FIS of partner system.
(i.e. Fiji uses FAA SWIM)

SWIM FDO Parser
Separate stand-alone FDO parsing system. Allows display and input of FDO with SWIM functions.
No functional change to System Q

Actual Implementation of SWIM functionality is up to ANSP

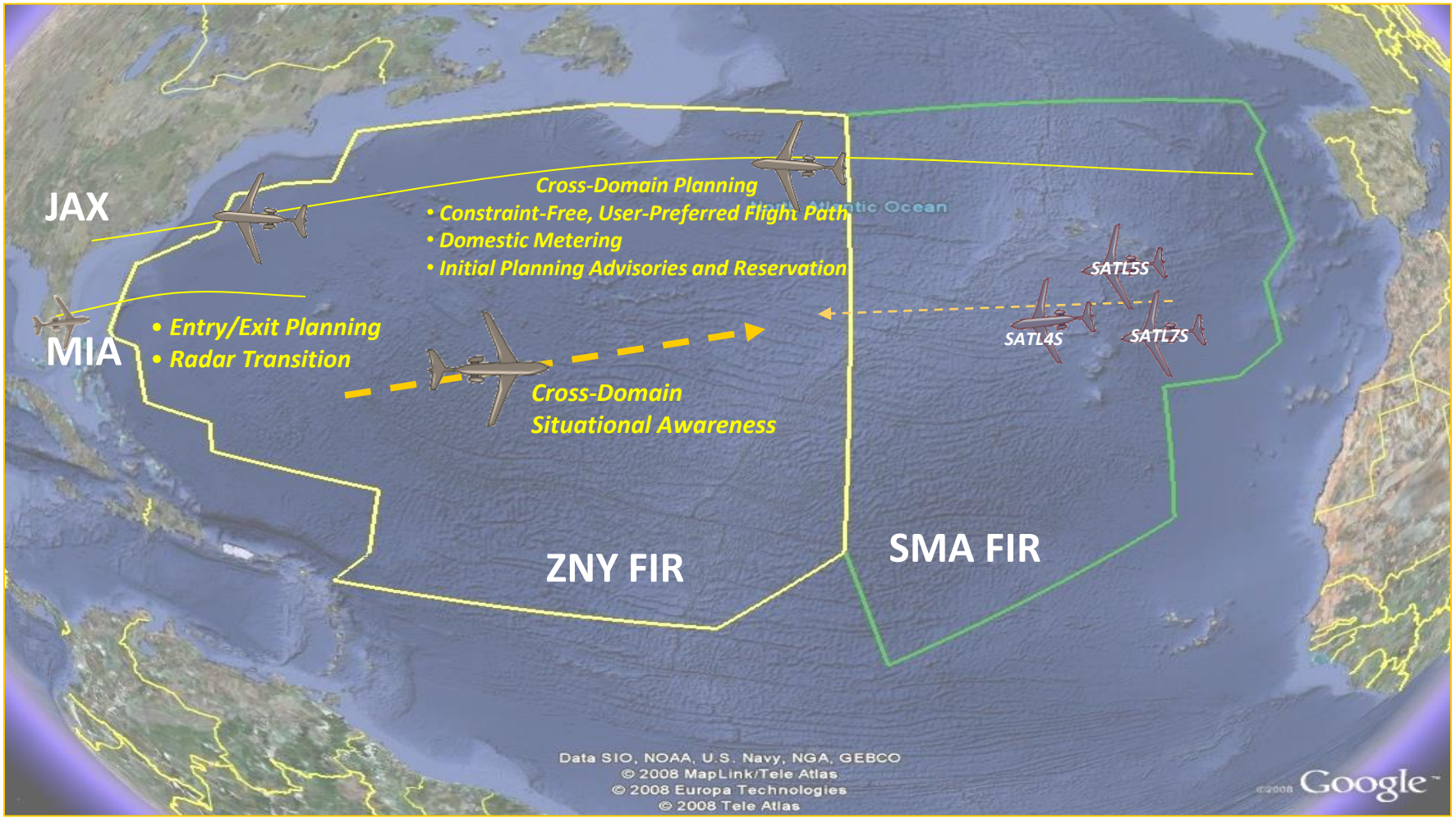
FDO Demonstration History

- **International Flight Data Object (IFDO)**
  - In March 2009, the FAA successfully demonstrated FDO exchange between oceanic Air Traffic Control systems across the Atlantic Ocean (NAV Portugal's Sistema Atlantico-SATL and the FAA's ATOP system)
- **Surface Exchange Flight Data Object (SEFDO)**
  - In November 2009, the FAA successfully demonstrated the potential benefits provided by enabling FDO exchange between airport surface stakeholders, collaborating ANSP entities, and flight operators

IFDO Demonstration (March 2009)

- **Objective**
  - Develop a FDO to support information sharing between NAS domestic and international stakeholders
- **Benefits**
  - Facilitate better coordination, situational awareness and collaborative decision making
- **Description**
  - Atlantic-based demonstration in the Florida NextGen Test Bed (FTB)
  - FAA's ATOP, FAA's ERAM and NAV Portugal's SATL systems were adapted in the lab to exchange FDO via SWIM-like core services

IFDO: ERAM, ATOP, and SATL Are FDO-Enabled

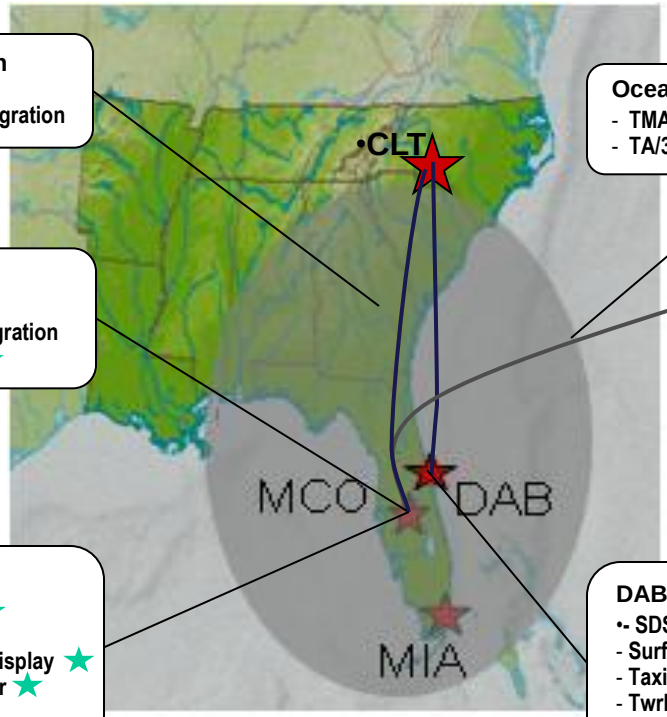


SEFDO Demonstration (November 2009)

- **Objective**
  - Analyze FDO to recommend new content related to surface operations that supports collaborative ATM
- **Benefits**
  - Integrate, via FDO, awareness of surface operational status into NAS for effective collaborative ATM
- **Description**
  - Enable FDO exchange between airport surface stakeholders and collaborating ANSP entities and flight operators

SEFDO Demonstration Concepts

Regional Departure Scenario: MCO/DAB to CLT
Regional ARR Scenario: CLT to MCO
International Scenario: LHR to MCO



TFM/ER Wx integration
- 4D weather cube
- Weather Hazard/TBO integration

Oceanic/ER TMA
- TMA service to ocean
- TA/3D PAM

MCO Arr/Dep Mgt
- TMA SWIM Integration
- TMA, TFM, ERAM integration
- Terminal Conf Mon ★

Oceanic/ER CFPM
- FDO Exchange ★
- CFPM
- AOC Integration ★
- FMS Integration

LHR
- Surface CDM ★
- ARR RTA
- SWIM Integration ★

MCO Surface Mgt
- SDSS/SWIM Enhance ★
- Dep Mgt ★
- TwrFlt DataMgt, TDDS, Display ★
- Taxi DL and Conf Monitor ★
- Surface Data to TFM

DAB Flex Terminal
- SDSS/SWIM Enhance ★
- Surf WL Comm DL
- Taxi DL and Conf Monitor ★
- TwrFlt DataMgt, TDDS, Display ★
- Real Aircraft, EFB

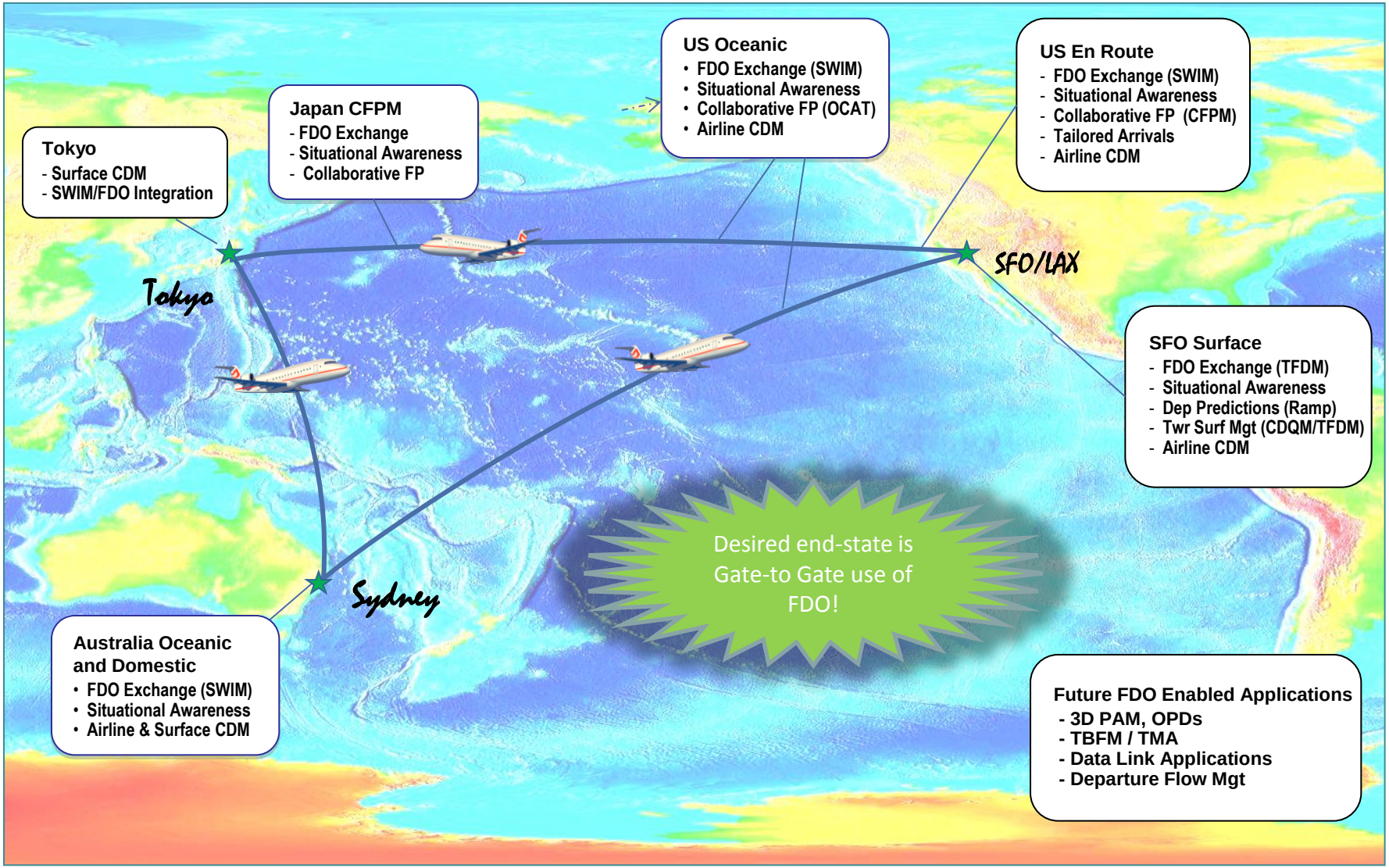
Next Generation Surface Management Activities

★ IFDO
★ SEFDO

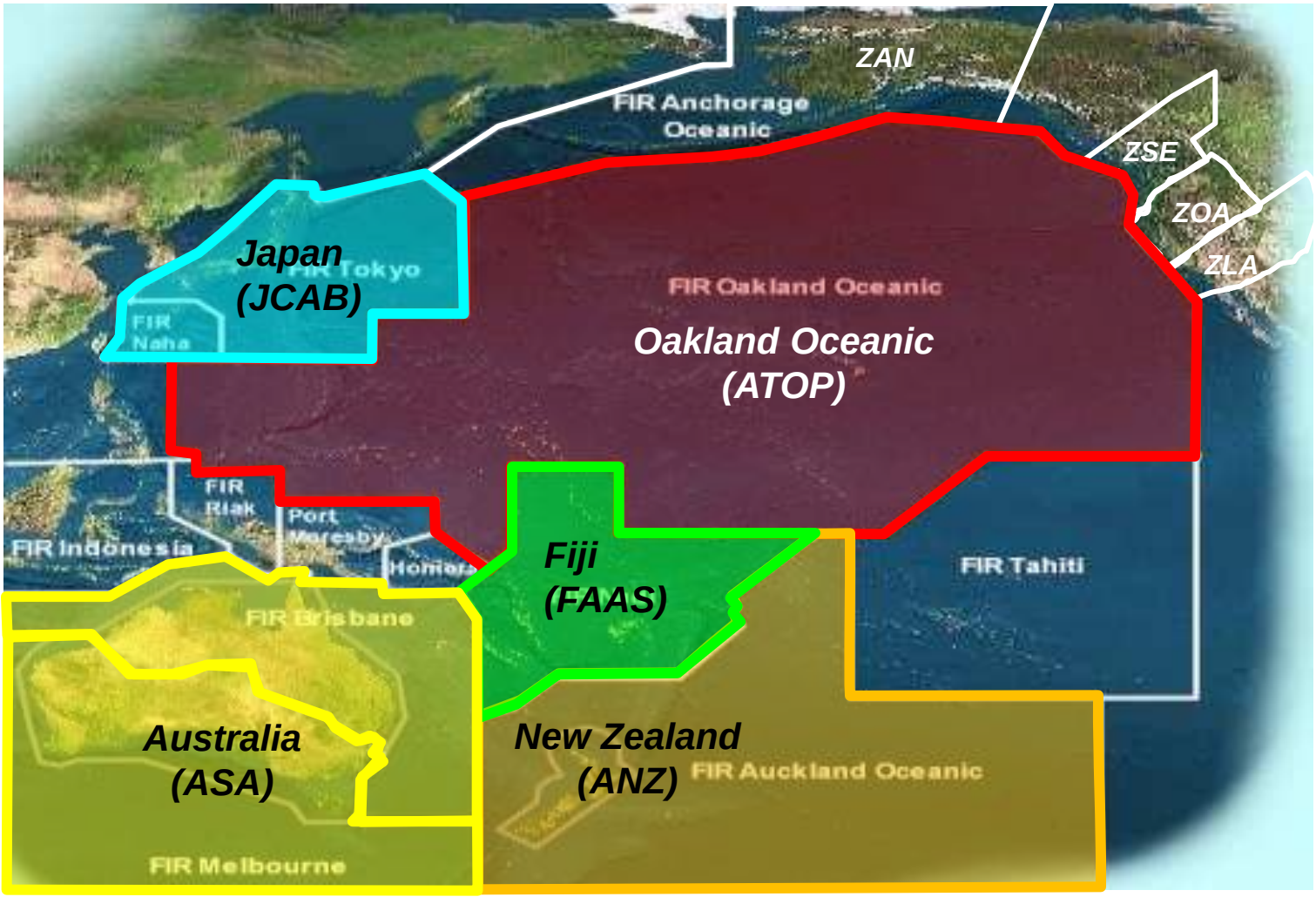
Goals for Future Asia/Pacific FDO Demonstration

- Leverage previous demonstration capabilities and infrastructure
- Demonstrate the benefits of exchanging FDOs via SWIM-like core services between ANSPs over the Pacific
- Define common FDO data structure
- Jointly collaborate on appropriate FDO governance

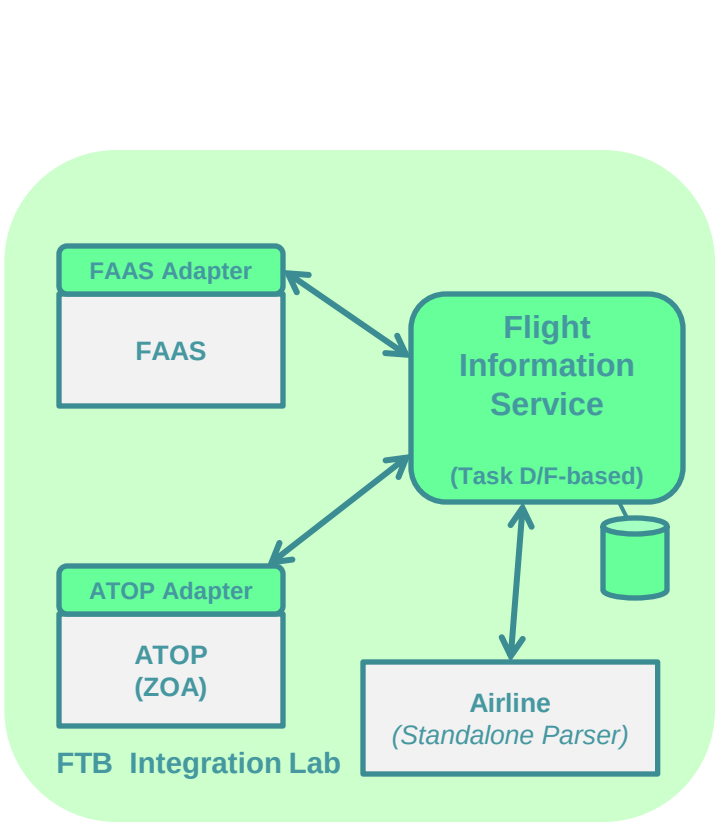
Pacific FDO – Notional Capabilities



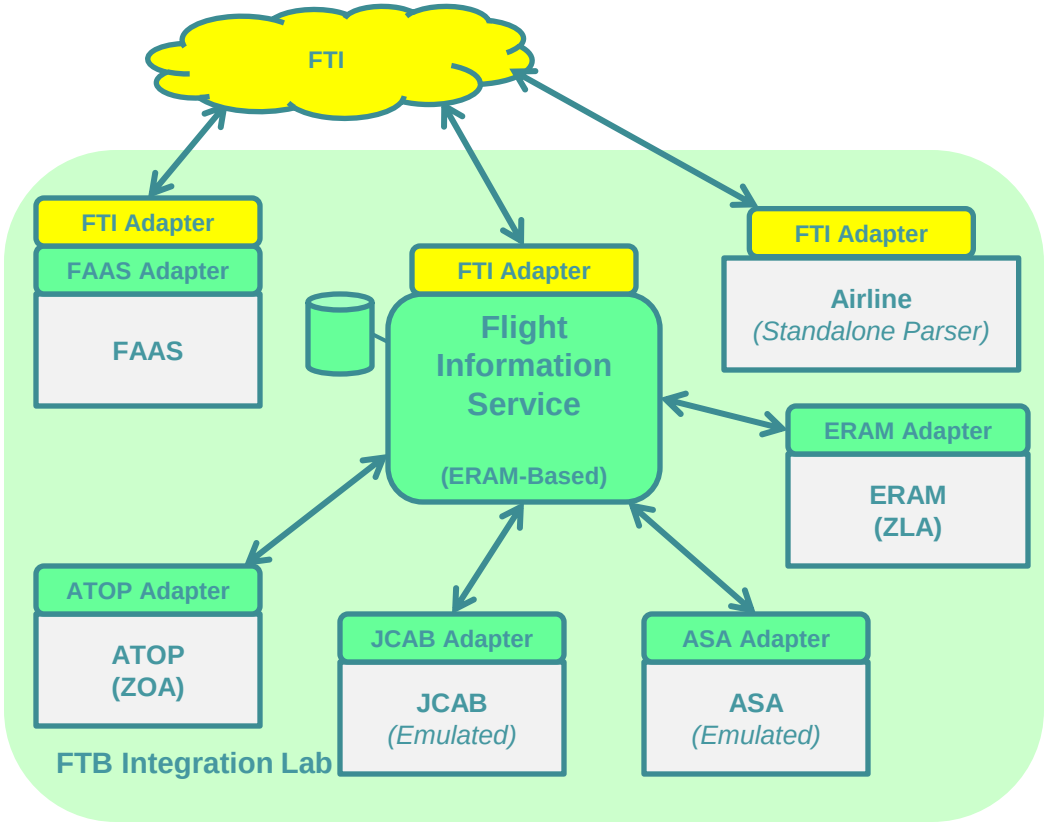
Pacific Ocean – ATOP Neighbors



Concept Lab Demo vs Initial FDO Demo

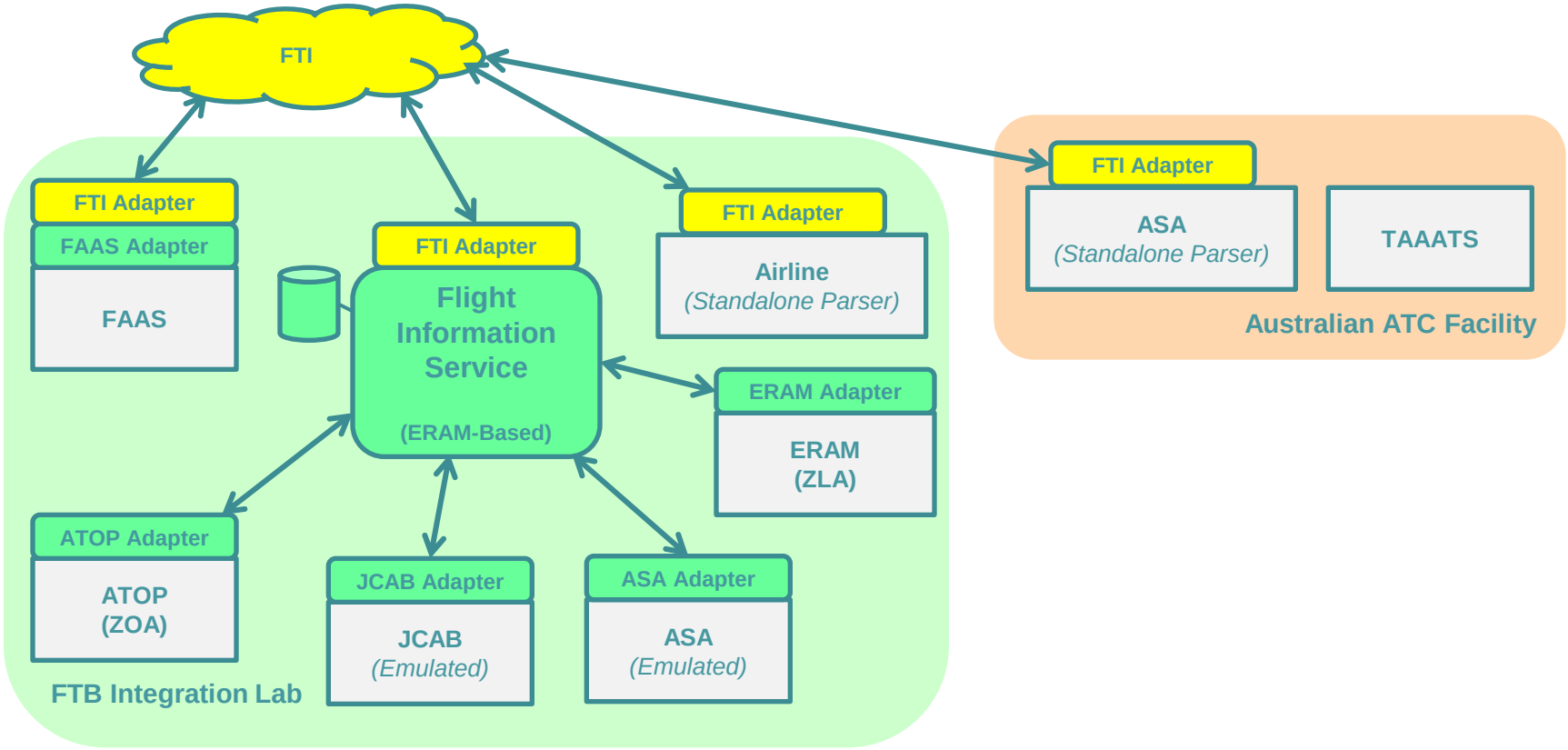


Concept Lab Demo Configuration



Initial FDO Demo Configuration

FDO Demo Configuration with ASA Parser



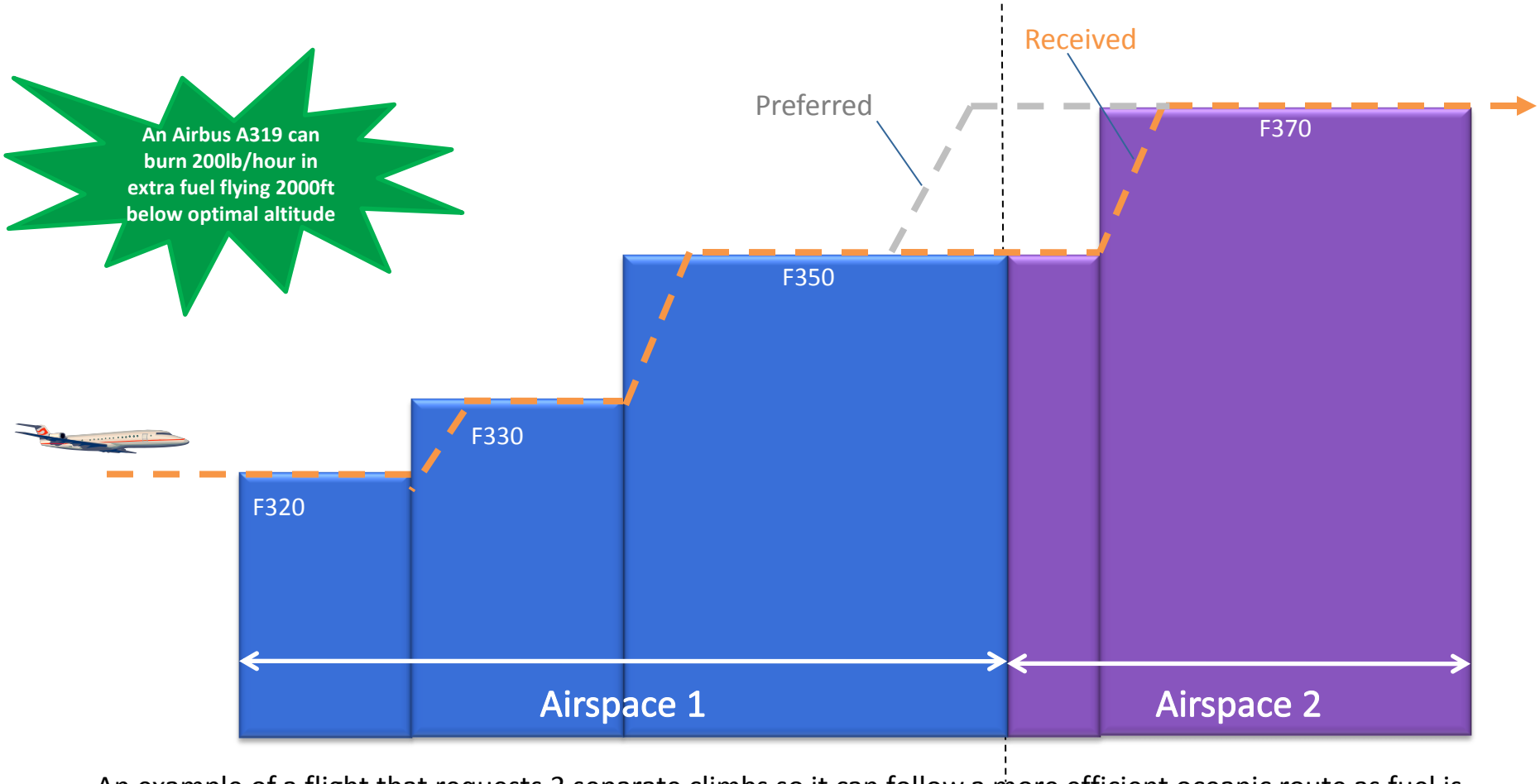
Potential Scenarios – Basic FDO Capabilities

- **Three scenarios are planned to demonstrate the basic FDO capabilities…**
  - **Scenario 1**: *Initialization/Recovery of Flight Data Objects*
    - Shows that each of the demonstration systems can be independently brought online and can successfully communicate with the FIS and download the FDOs of their respective flights. Additionally shows that a system can recover FDOs from the FIS after a failure
  - **Scenario 2**: *Basic Flight Data Object Exchange*
    - In this scenario, flights will be added/modified/deleted/requested by individual systems and it will be shown that these flight changes are reflected on all the appropriate systems via the exchange of FDOs.
  - **Scenario 3**: *Flight Data Object Expandability*
    - This scenario demonstrates how the FDO can be used to exchange additional flight information between interested parties and how this additional data does not affect non-interested parties.

Potential ATC Scenarios

- The following scenarios are based on previous FDO demonstrations
- Once the scenarios are agreed upon, then we can start to identify the systems and data to share (structures and definitions)
- Approach for demonstration:
  - Concept lab demo at FTB (Q1 2011)
  - Series of lab demo at FTB (Q4 2011, Q1 2012)
  - Live/semi-live demo (Q4 2012)

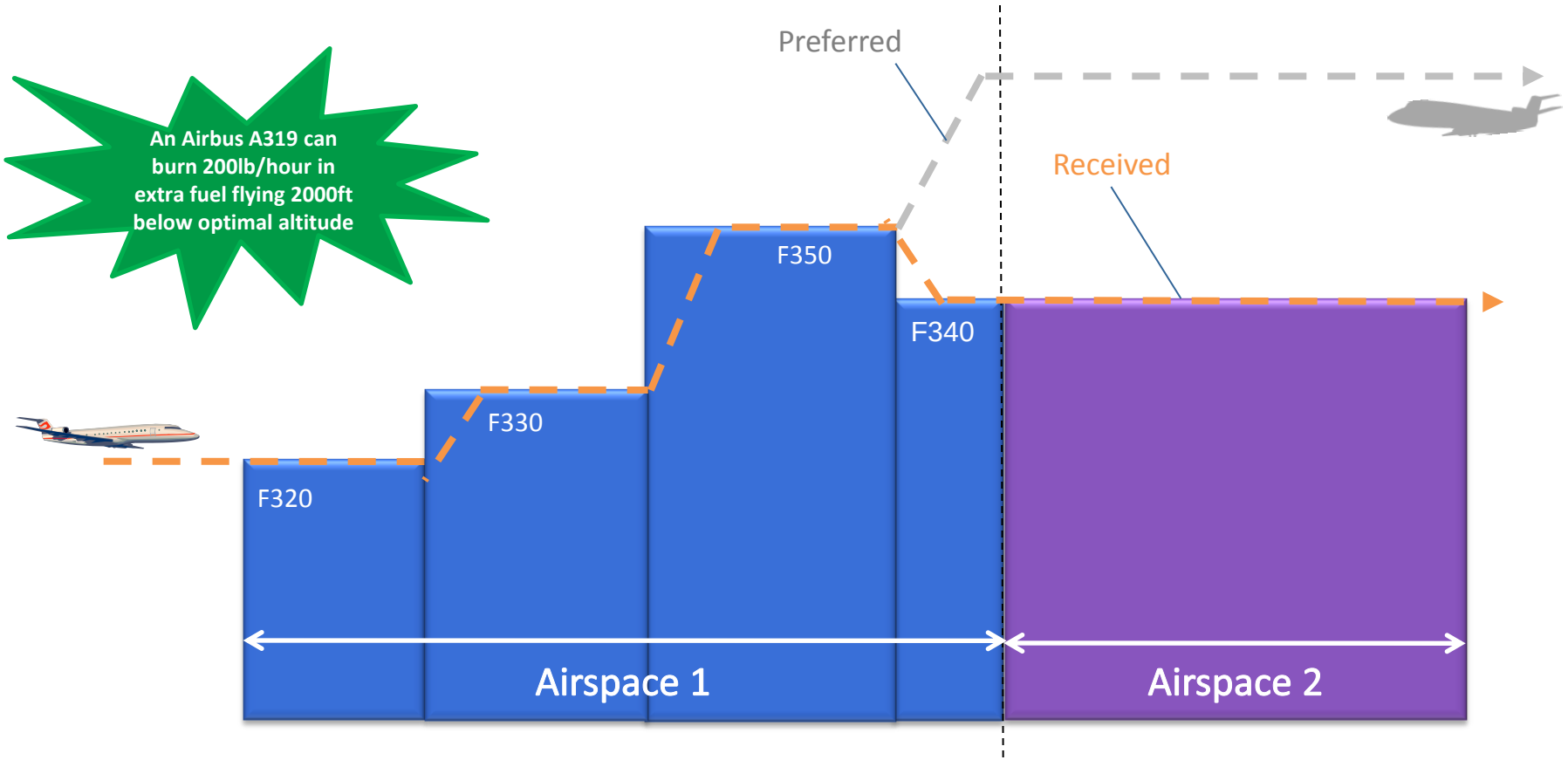
Scenario 1: Flight denied climb due to FIR boundary proximity



An example of a flight that requests 3 separate climbs so it can follow a more efficient oceanic route as fuel is burned and the plane becomes lighter.

The third climb is requested too close to the transfer of control (TOC) point and may not be granted.

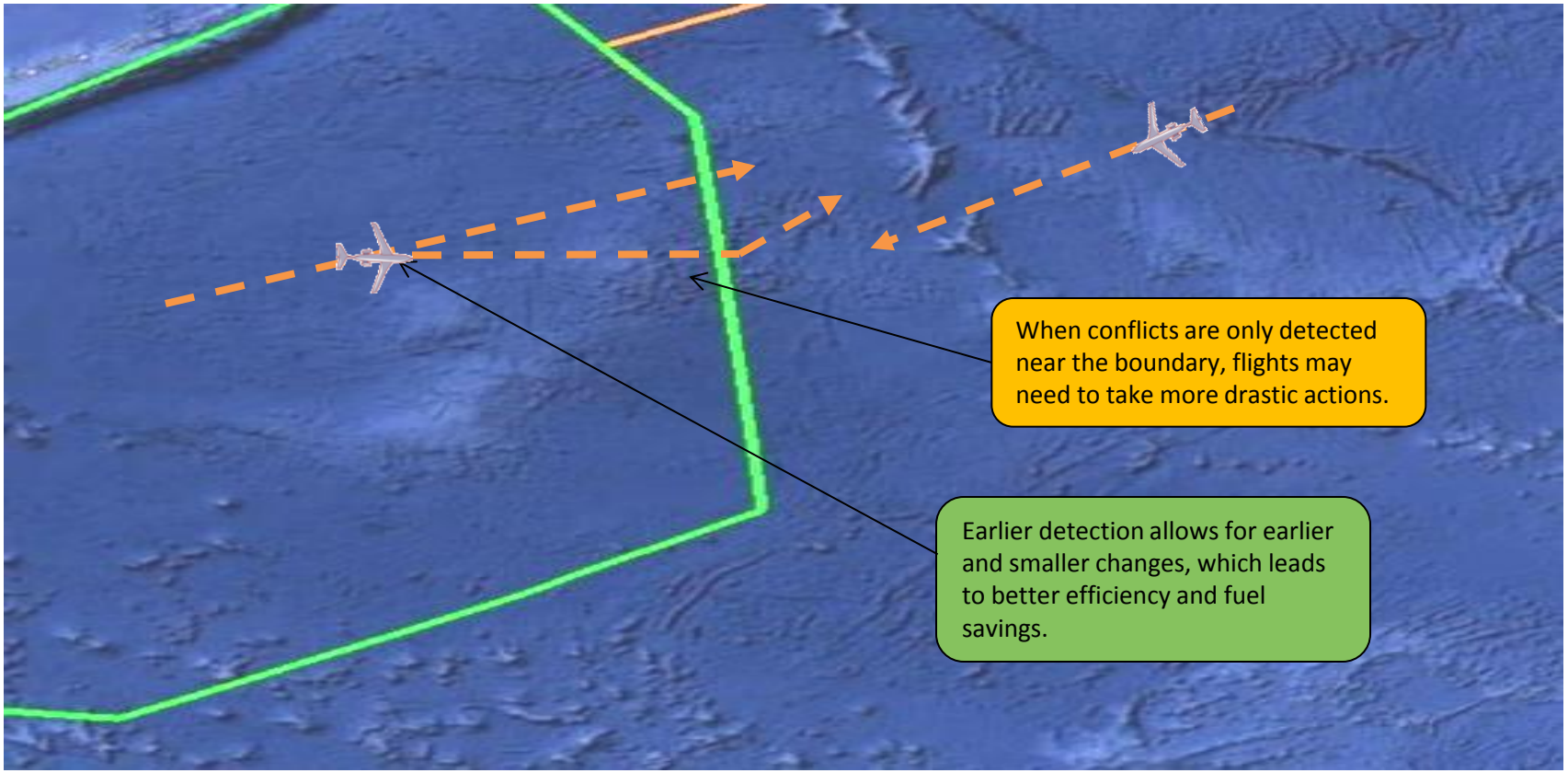
Scenario 2: Flight climbs to F350 then Coordination requires descent back to F340



An example of a flight that requests 3 separate climbs so it can follow a more efficient oceanic route as fuel is burned and the plane becomes lighter.

While coordinating there is conflicting traffic, so the controllers must coordinate at a new altitude and descend the flight.

Scenario 3: Changes to trajectories are given later than optimal



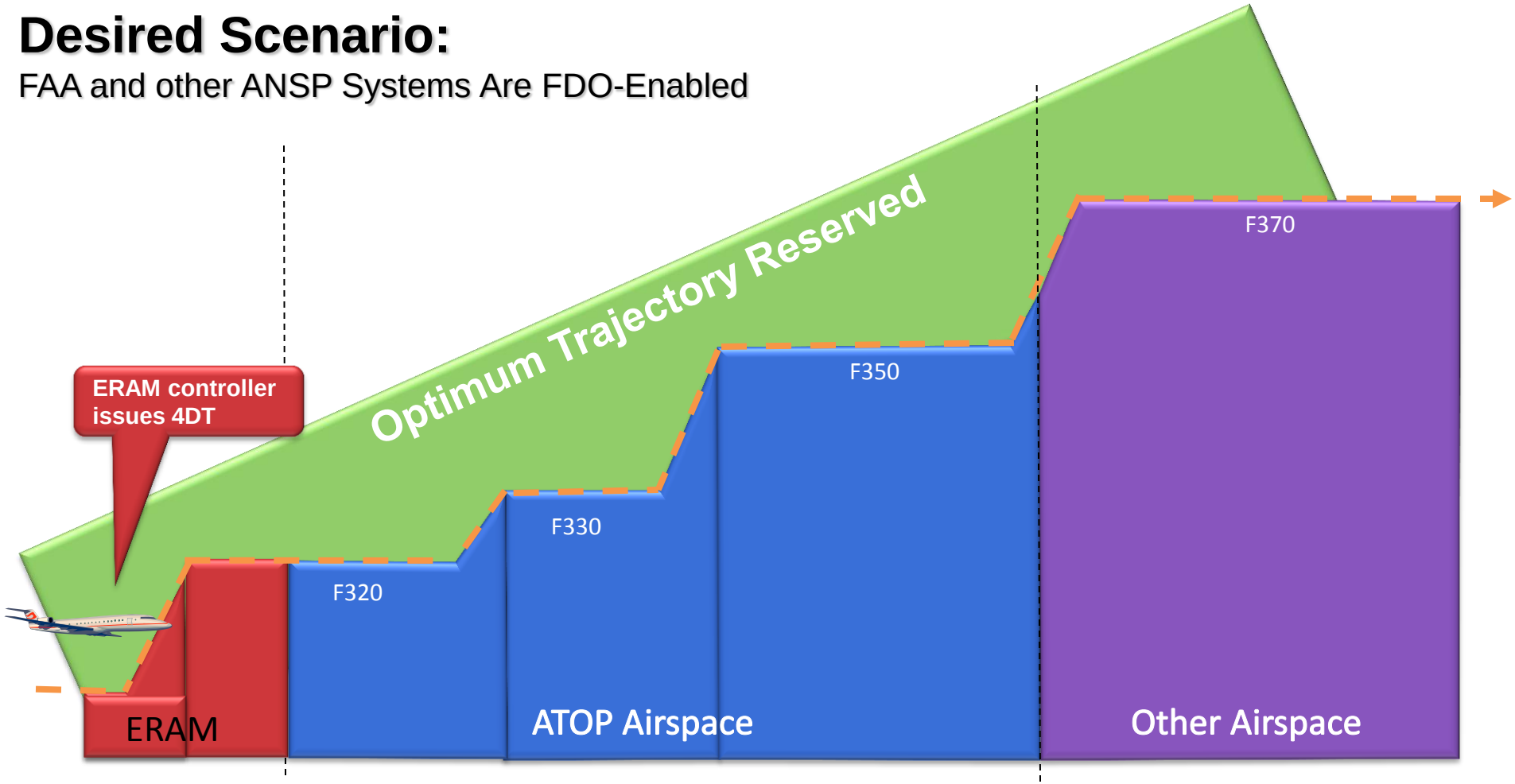
Earlier conflict detection could lead to earlier conflict avoidance

This example shows a flight intending to cross a FIR boundary. When the FDOs are published the ANSP can detect a possible future conflict, then with a minor route change the conflict could be avoided.

The earlier detection and less drastic flight changes lead to better efficiency and fuel savings.

Desired Scenario:

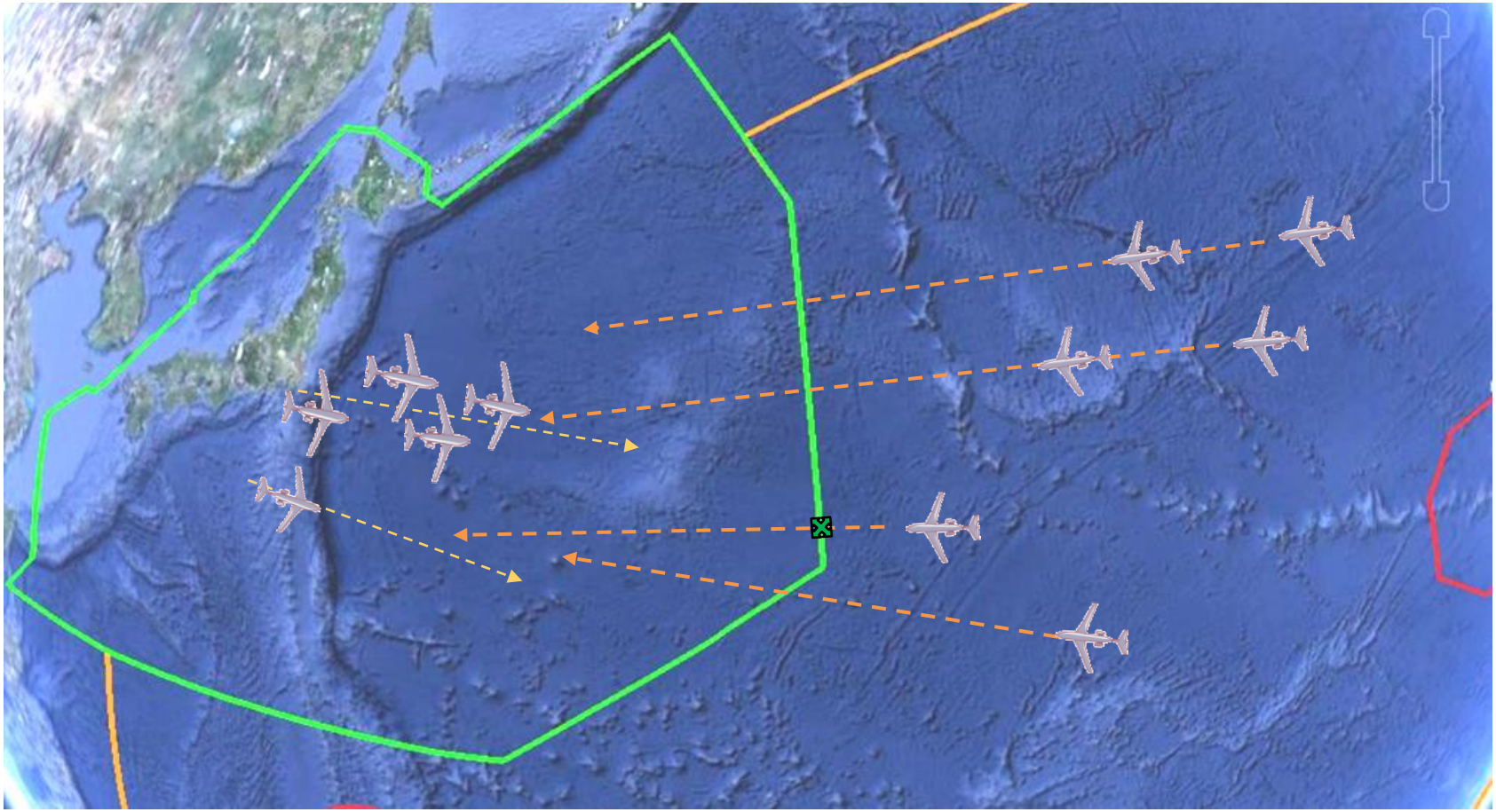
FAA and other ANSP Systems Are FDO-Enabled



A flight is received from the Oakland ERAM system with a 4DT assigned, and the FDO is passed to ATOP and other ANSP system. The FDO includes trajectory information with user preferred routing.

Flight is enabled to fly optimally.

Desired Outcome: Increased Visibility with FDO Exchanged



Without Flight Data Object exchange, the external controller only see:

- Actual positions of flights within Expanded boundary
- Flight Plan and Coordination details

With Flight Data Object exchange, the external controller could now see:

- The crossing traffic that the could create future conflicts
- Heavy traffic toward ATOP FIR with additional time to prepare
- More information on the intentions of flights

Potential Scenarios – Additional ATC Scenarios

- **Other ATC scenarios may be included in the depending on the system capabilities in place at the time of the demonstration such as…**
  - **Scenario 4**: *ANSP prompts change for incoming flight*
  - **Scenario 5**: *ANSP requests change for incoming flight*
  - **Scenario 6**: *Send Tailored Arrival information to ERAM*
  - **Scenario 7**: *Use ATOP OCAT service prior to Coordination*

Simulation Environment – FTB

- The Florida NextGen TestBed (FTB):
  - Is located in Daytona Beach, Florida
  - Provides a platform for demonstration and evaluation of NextGen concepts
  - Allows end-to-end (multi-domain) demonstrations
  - Enables interaction with existing & arising NAS systems
  - Supports integrated demonstrations to validate large scale modeling and simulation efforts

Questions