THALES

Beijing EasySky Technology BEST

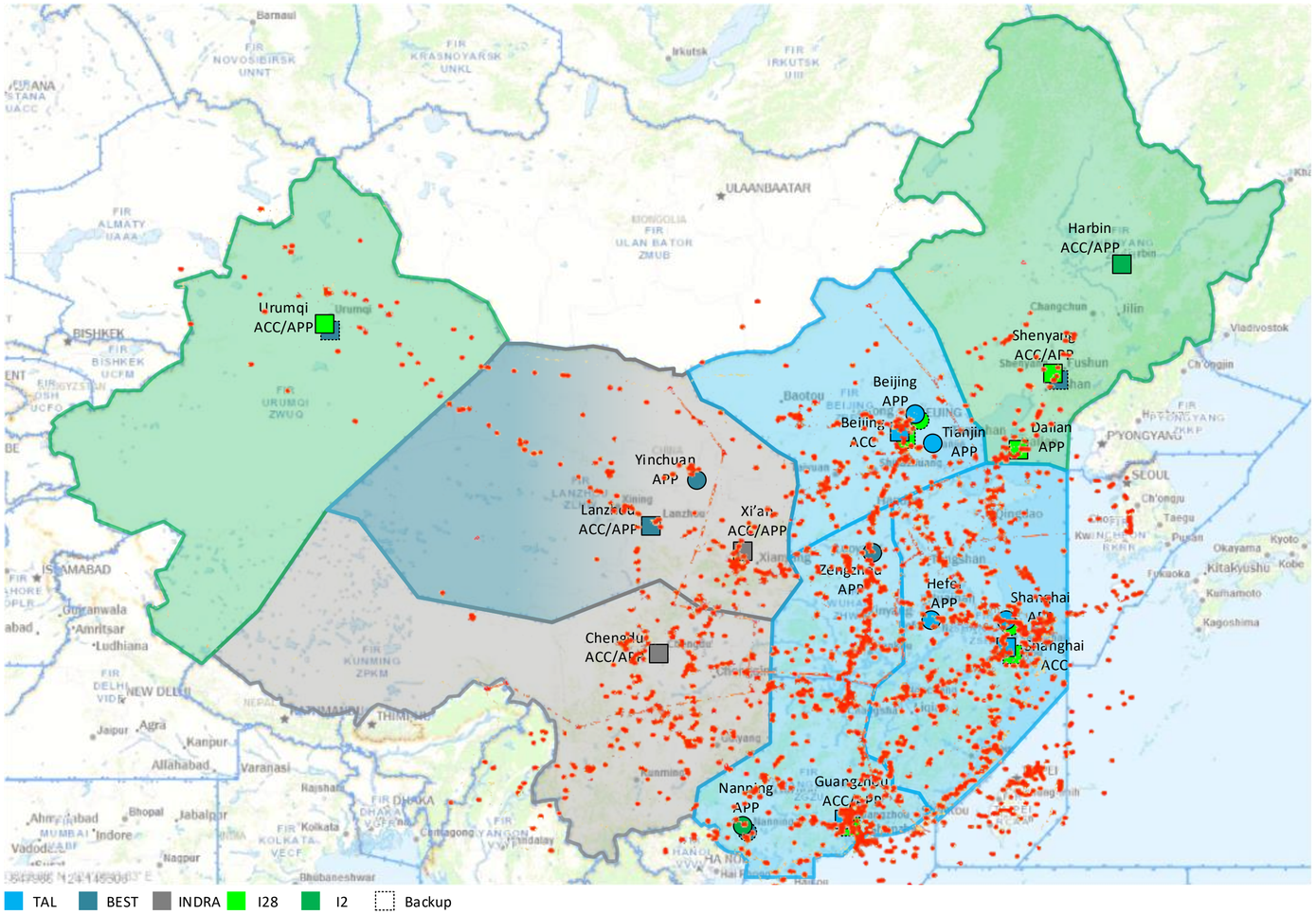
ATC System Interoperability

SWIM IOP R&D Activity in China

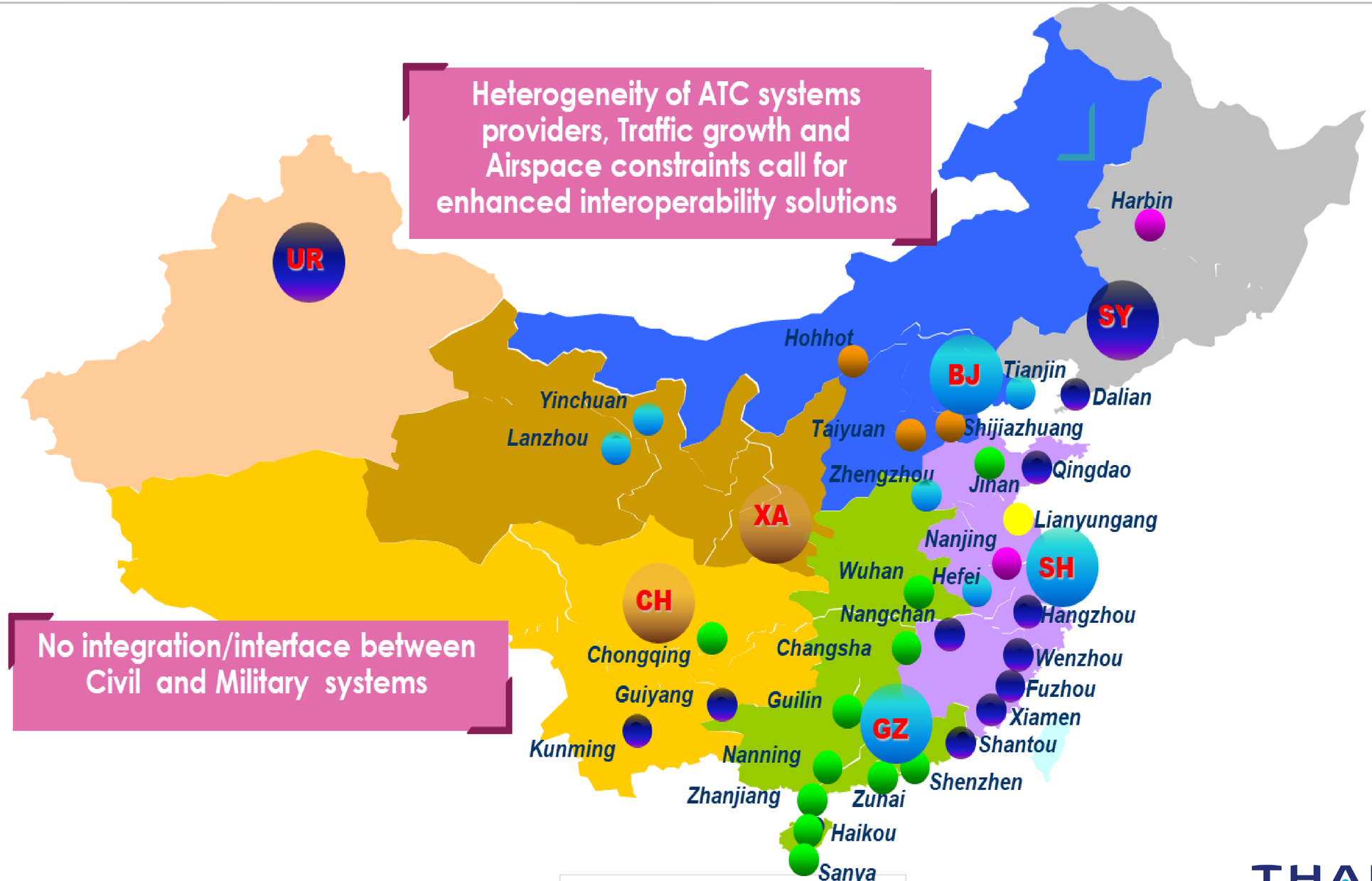
Nov 2018

China ATC Context

- 10+% steady yearly traffic growth
- Number of movements in large airports reaching top ranks in the world
- 7 Major ACCs
- Growing number of large APPs
- Heterogeneous ATC suppliers
- Frequent large scale traffic disruptions due to
  - Weather
  - Airspace constraints



Operational ATC Systems

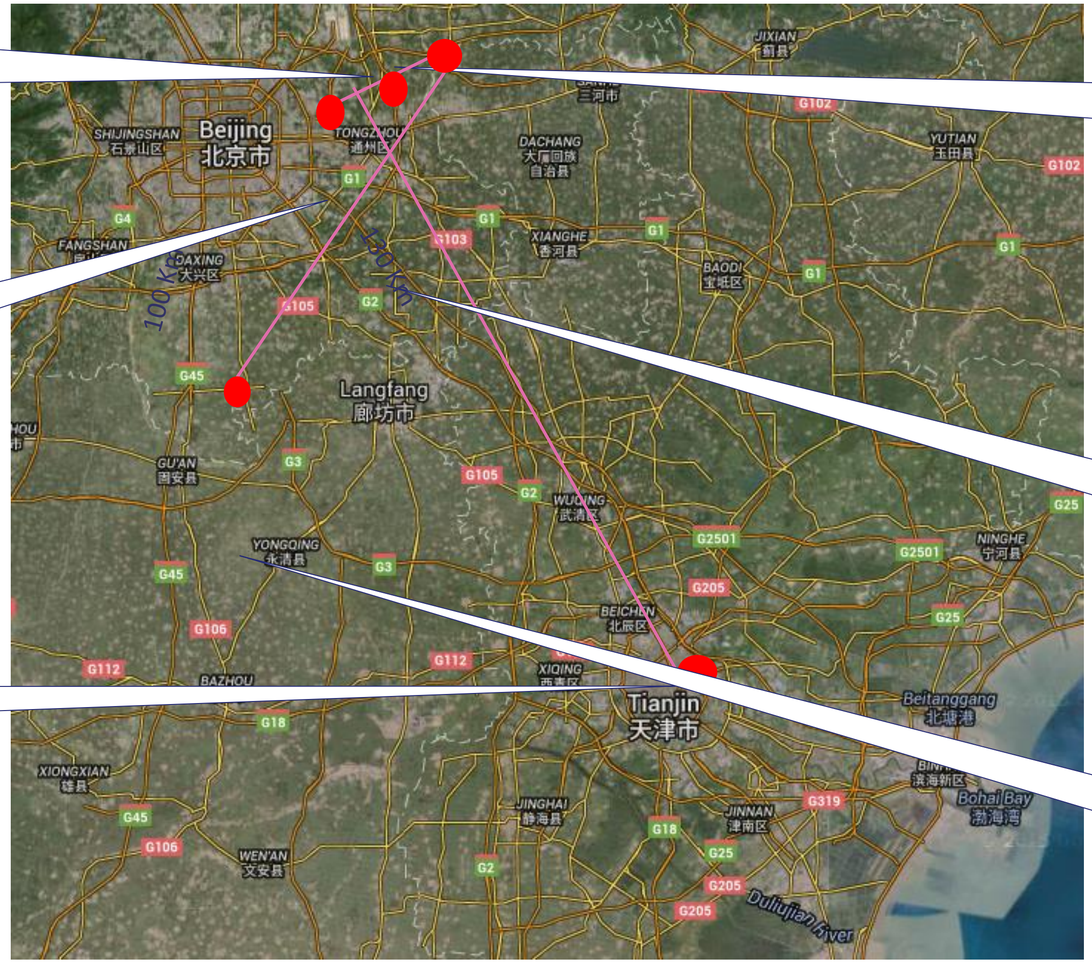


ATC System Sizing: Beijing Example

Overall
~300 CWPs
Centralised Architecture

Beijing ACC
~140 CWPs (Current + Expansion)

Tianjin TCU
~15 CWPs



Beijing Capital Airport
~ 15 CWPs
East Tower + West Tower

Beijing TMA (BTMA)
~ 110 CWPs

Beijing Daxin Airport
~ 15 CWPs
East Tower + West Tower

ATMB Interoperability Requests

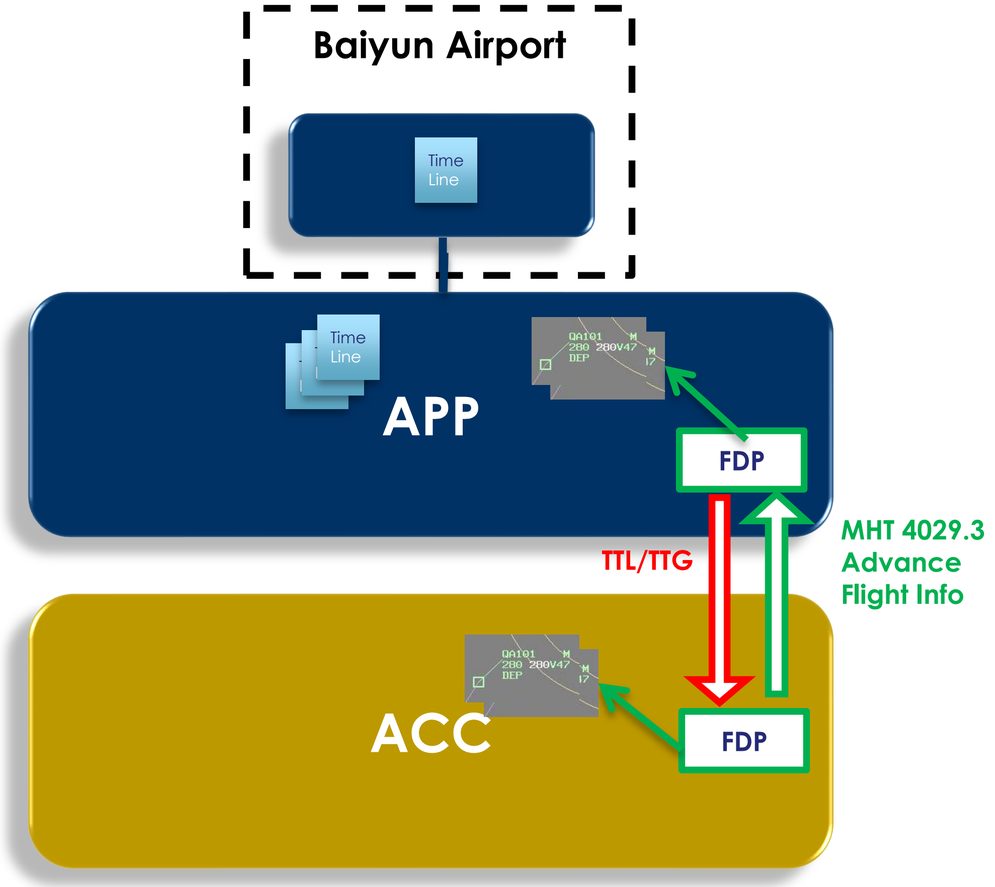
Chinese Civil Aviation Authority is requesting support to address:

- **Replace TCU architecture (Centralised FDP) by fully independent ACC and APP systems, BUT**
  - Maintain the flexibility of the shared ACC & APP air situation display and inter-sector coordination/transfer
  - Rational: Large number of flight movements between ACC and APP and ability to easily and safely cope with external events (weather, military)
- **Improve FPL "Synchronisation" with 3rd-party ATC suppliers**
- **Split current ACC system into 2 independent ACC systems (same FIR)**

Distributed Architecture

Guangzhou TMA Project

- **Distributed System Architecture**
- **Advanced Flight Plan Info Exchange Based on MHT 4029.3 Messages**
  - Synchronization (CFPL SYNC Messages)
  - Coordination (CFPL COOR Messages)
  - Transfer Phase (CHRP & CHRP Messages)
- **Not the preferred solution**
  - One to one interface
  - CPU demanding processing

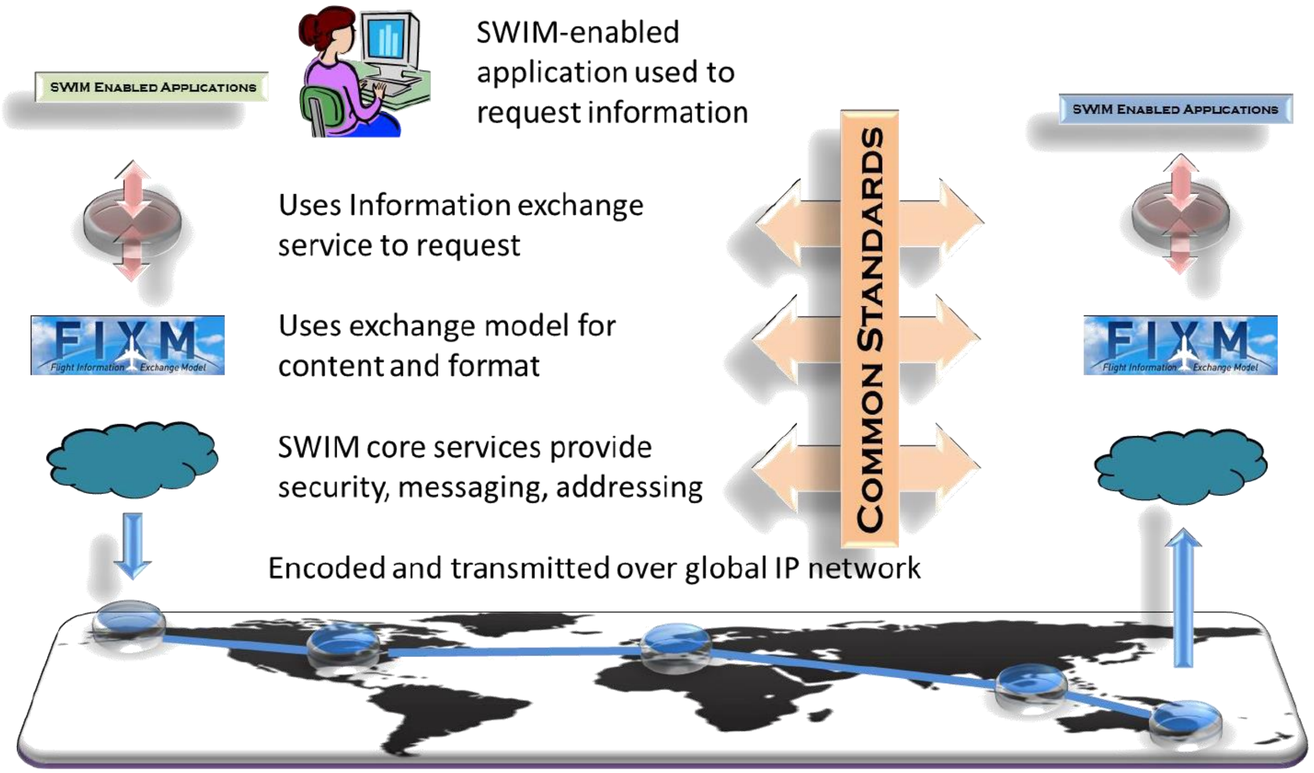


SWIM: ICAO Definition

SWIM : System Wide Information Management

(ICAO Doc 10039 - Manual on SWIM Concept)

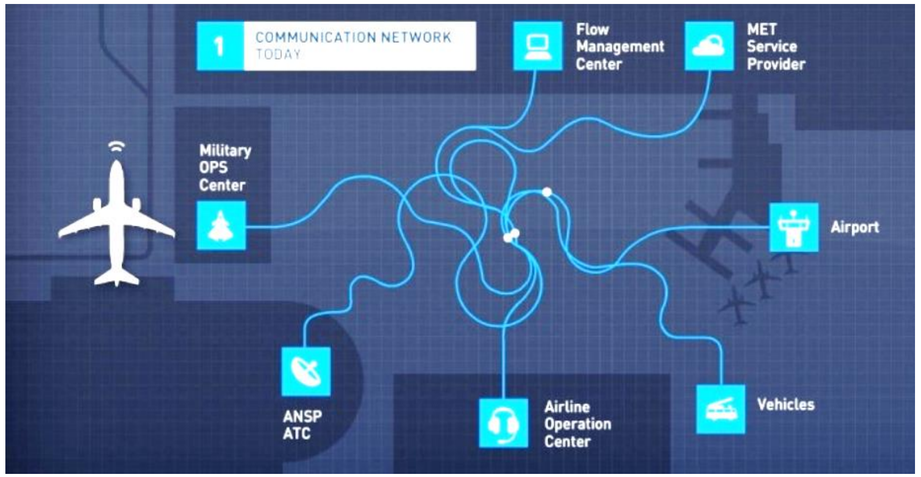
SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services



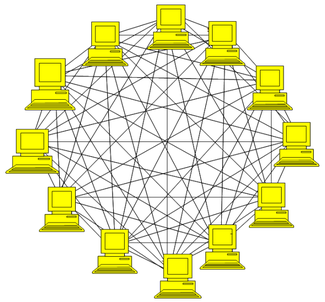
Why SWIM?

One-to-One

For n systems, up to n(n-1) interfaces

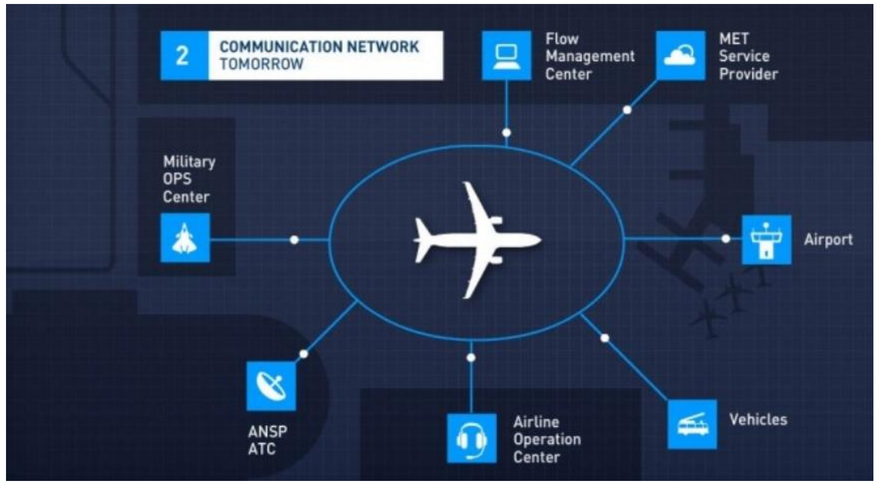


- Many custom communication protocols
- Each interface is custom designed, maintained individually and locally
- Inconsistently updated
- Low reuse, duplication



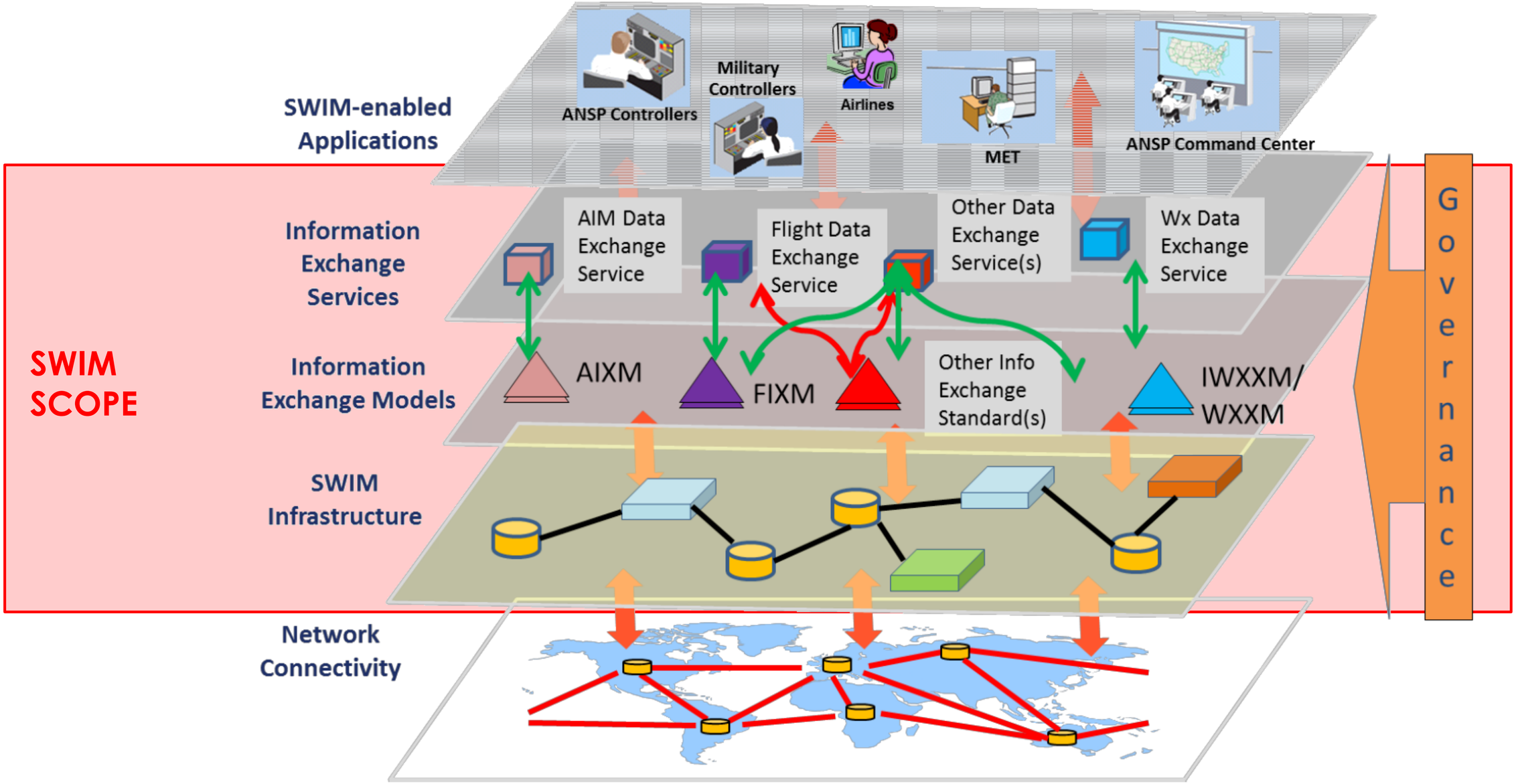
Net Centric

For n systems, n interfaces



- Decouple information producers from consumers (Service Oriented Architecture)
- Use of open standards
- Functionality packaged as a suite of interoperable services

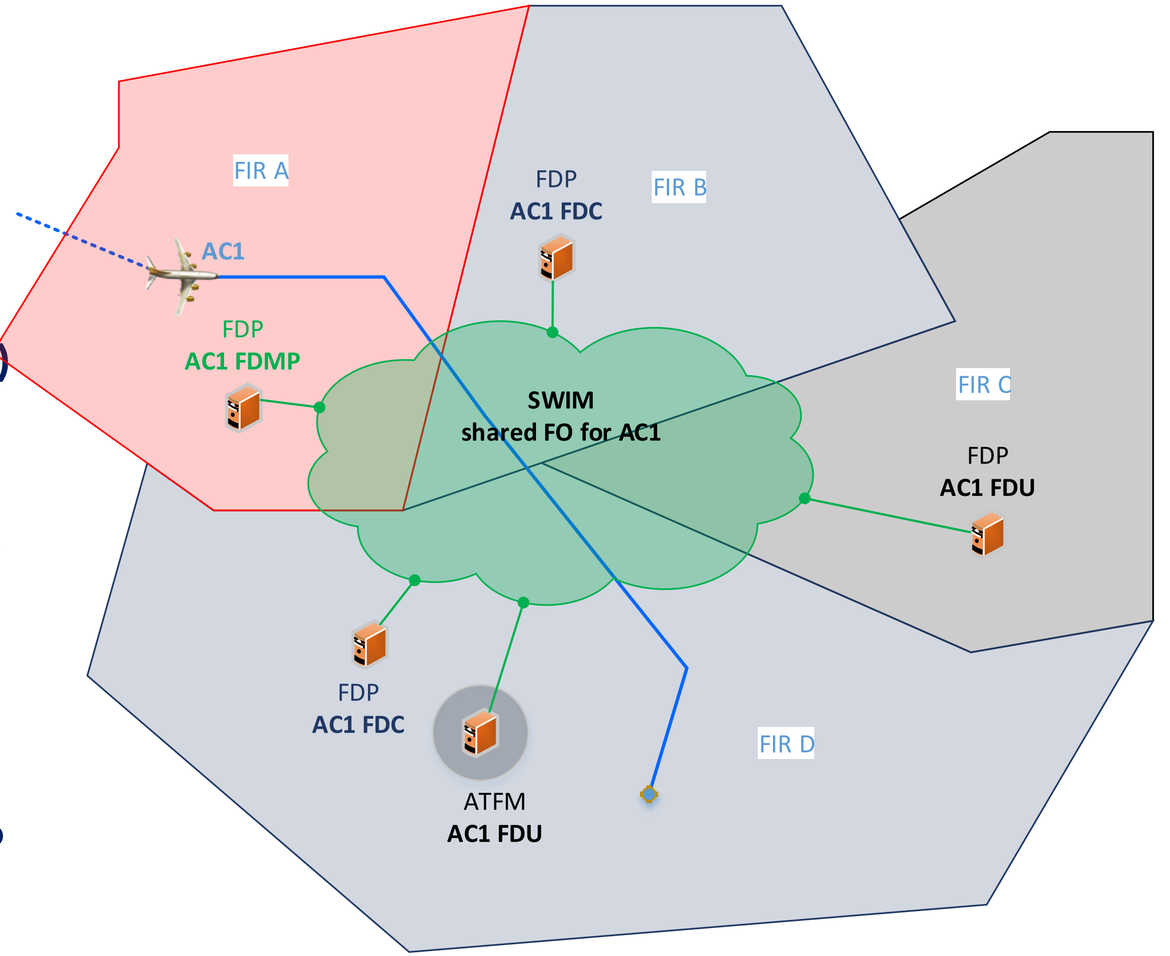
SWIM: Global Interoperability Framework



SWIM: Flight Data Exchange Concept

The Flight Object (FO)

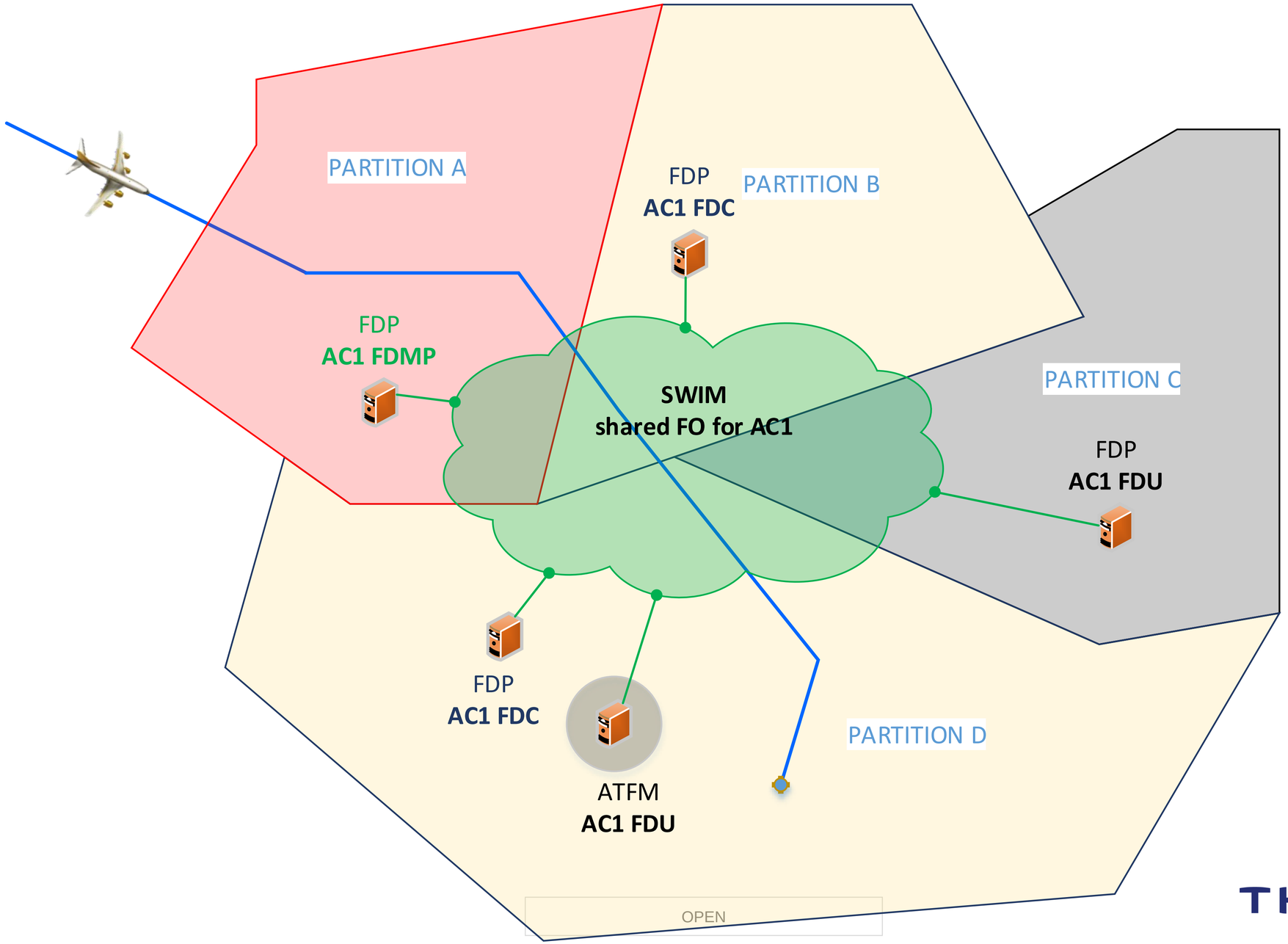
- All connected systems share the FO
- At any given time, an FO is managed by one and only one system (publisher)
- Selected other systems can subscribe to FO updates
- For the European SWIM, FO format and management rules are specified in the ED133 document (part of the SWIM governance)



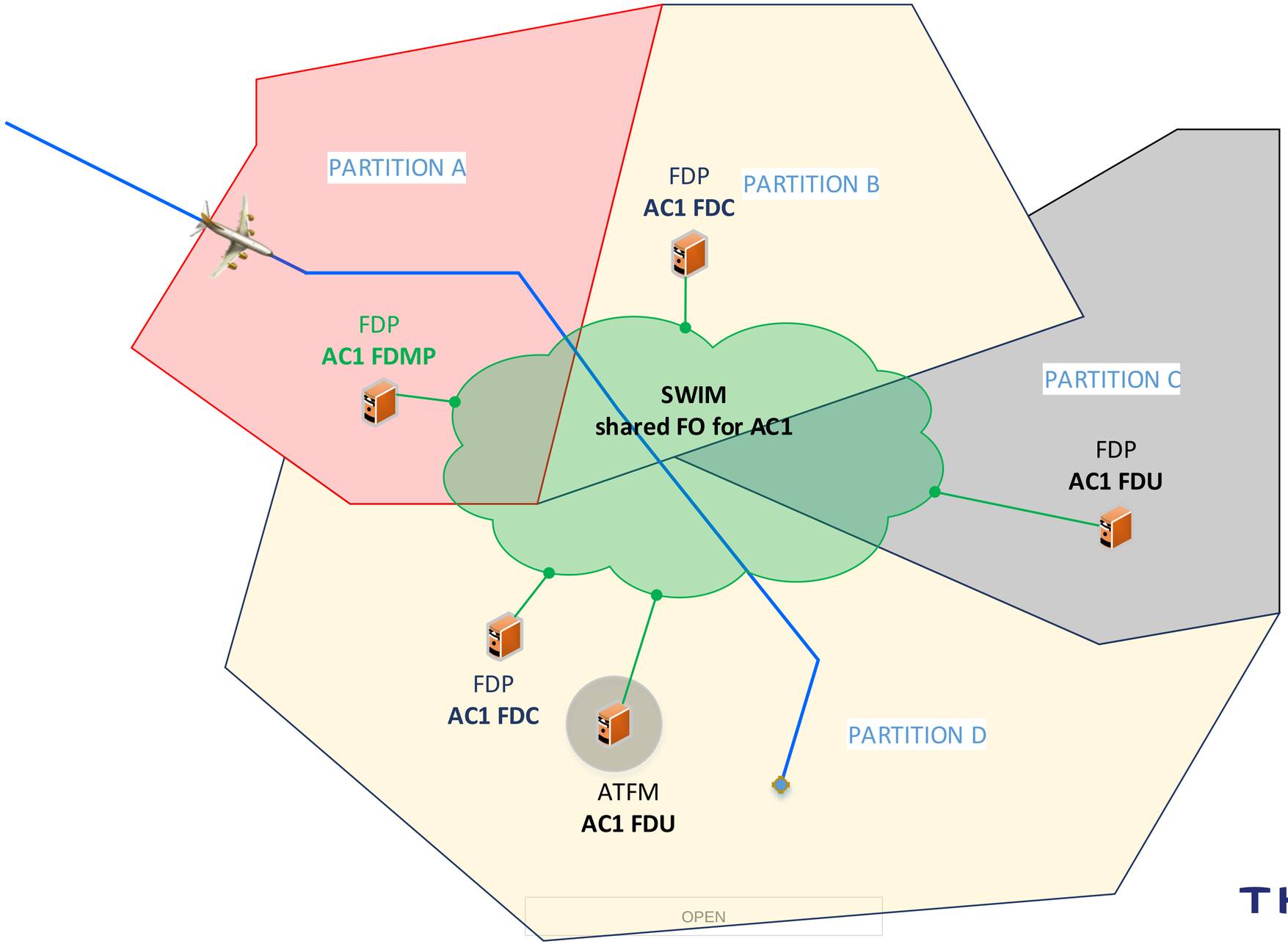
Terminology Surrounding FO

- FDMP: Flight data manager publisher. Designate the system that can modify the FO
- FDC: Flight data contributor. Designate systems that are authorised to request the FDMP to update the FO. For example systems downstream to the FDMP for the flight
- FDU: Flight data user. Any other system with read-only access to the FO

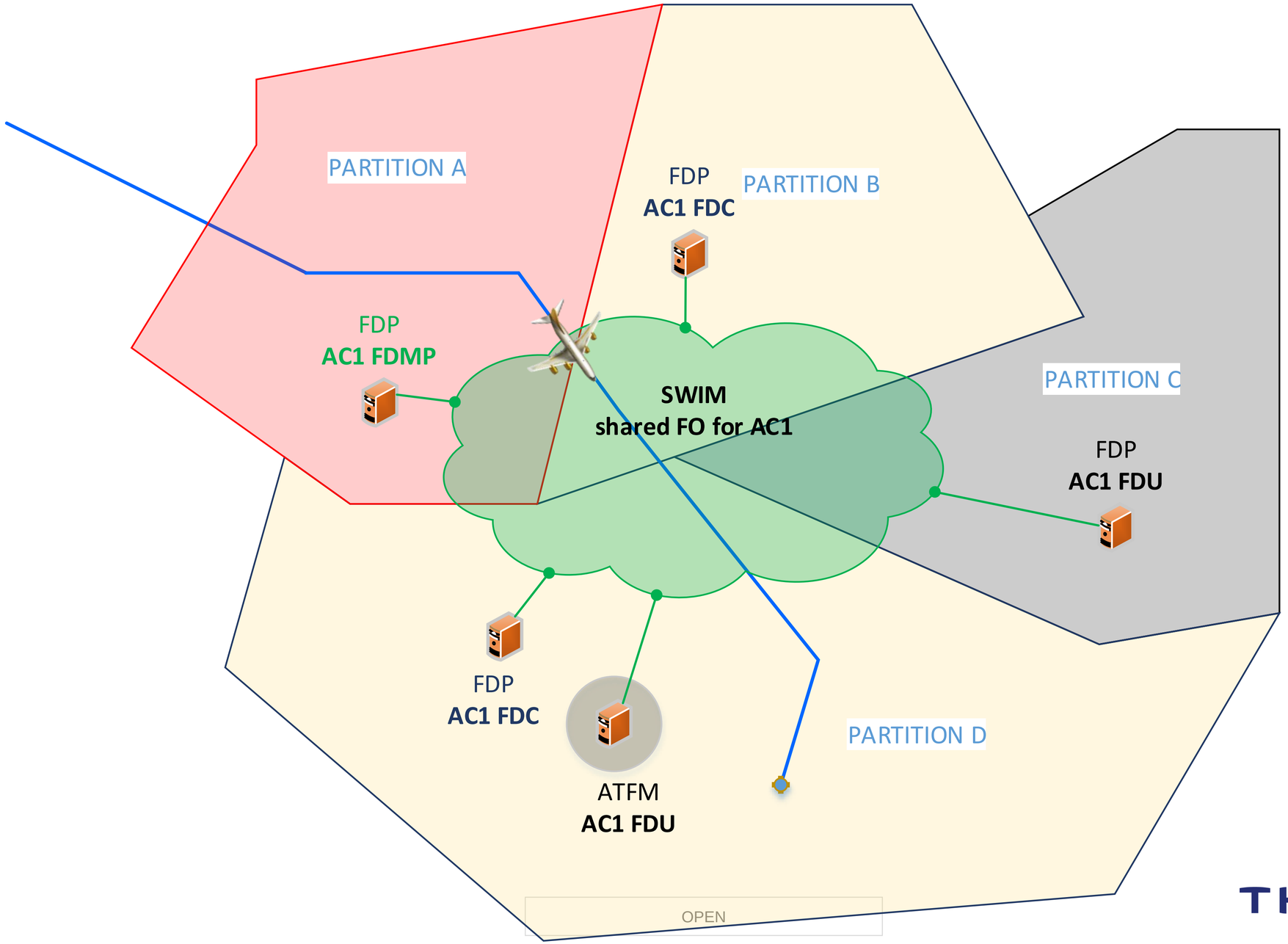
FO Progression



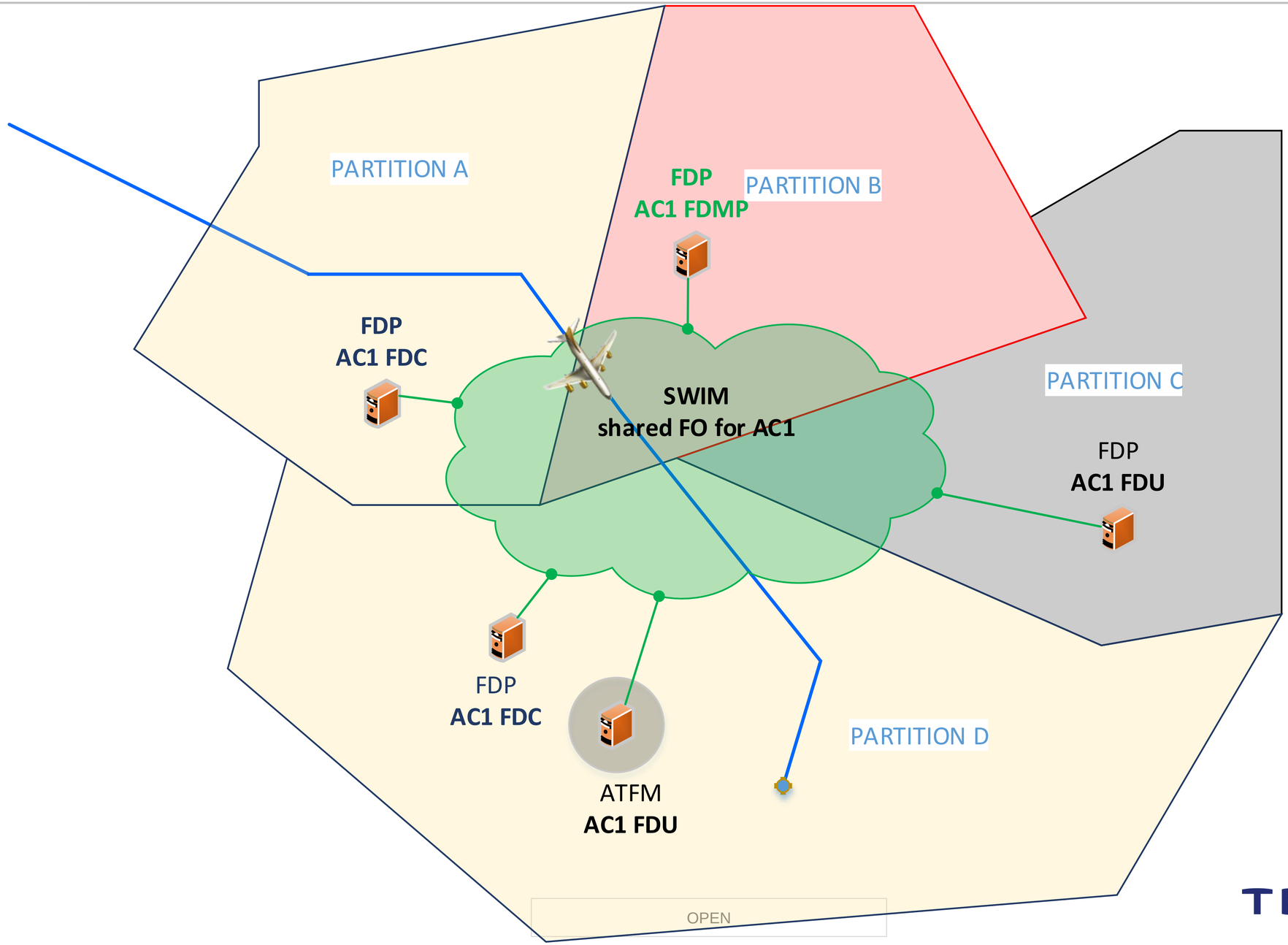
FO Progression



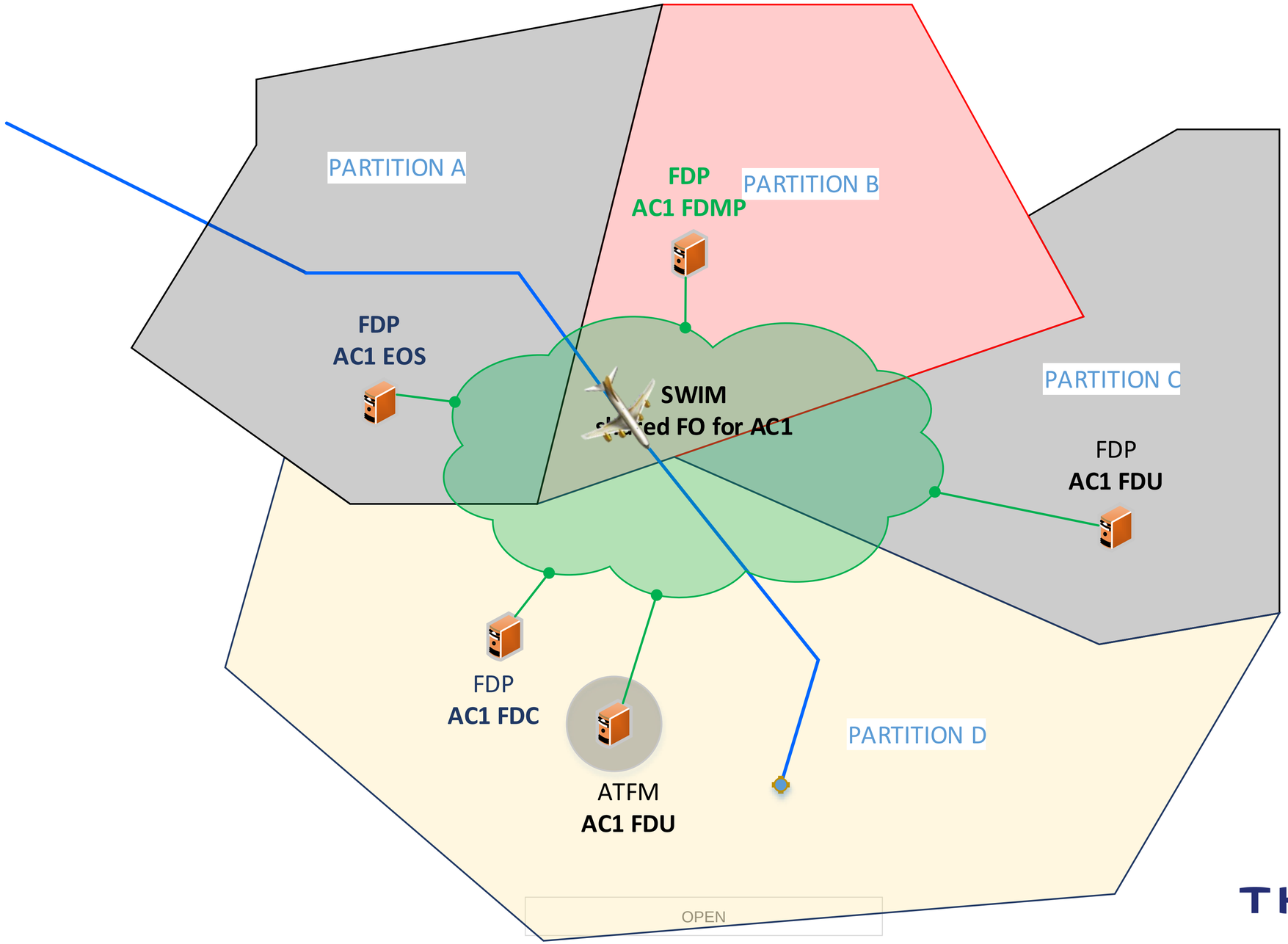
FO Progression



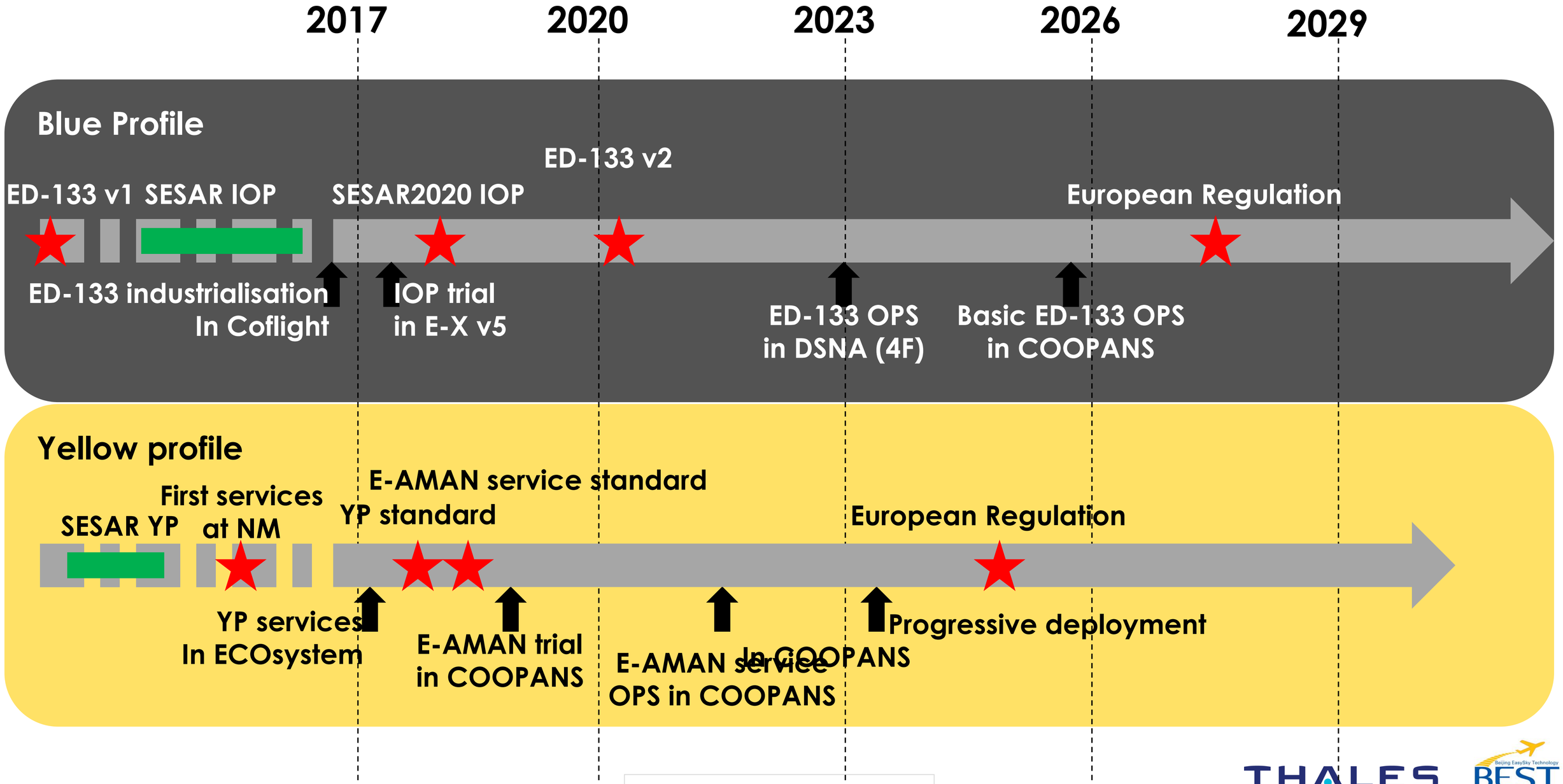
FO Progression



FO Progression



SWIM Roadmap in a nutshell



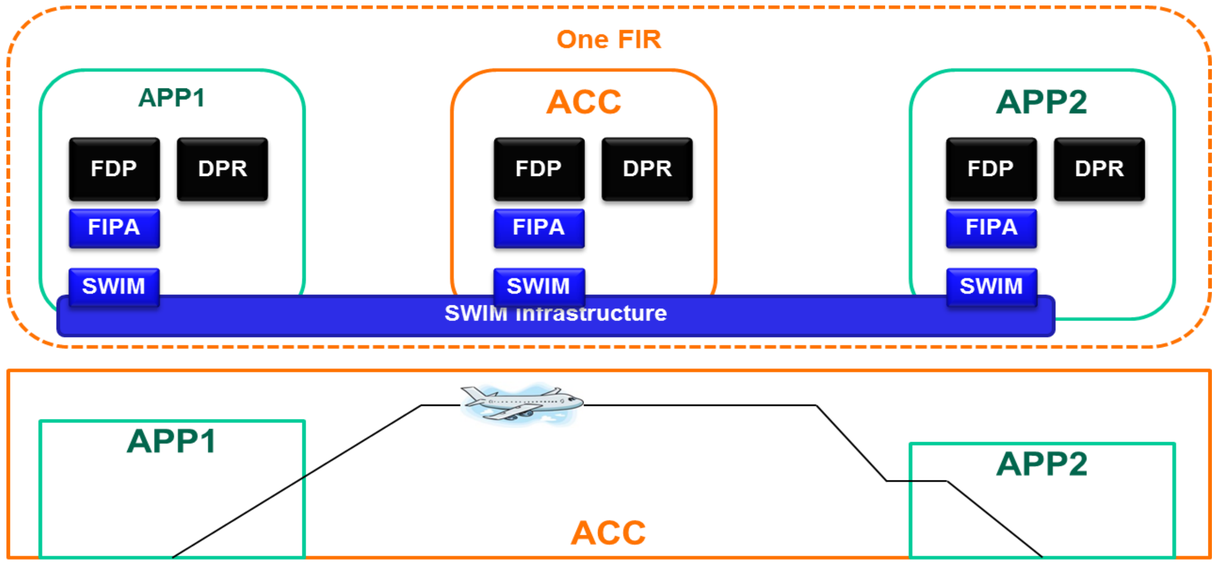
Proposed Solution for China

Use the ICAO SWIM concepts

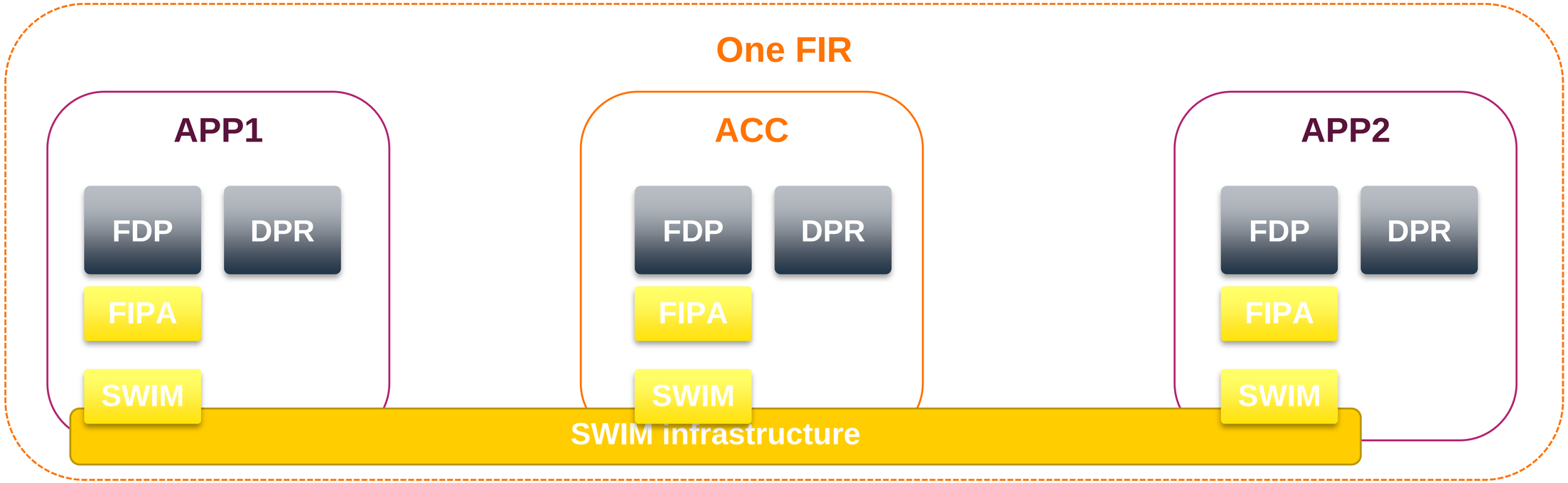
- Adapt European/ICAO IOP concepts to China needs
- Simplifications of ED133 IOP FO
  - Faster time-to-market
  - Reduced impact on existing FDP processor

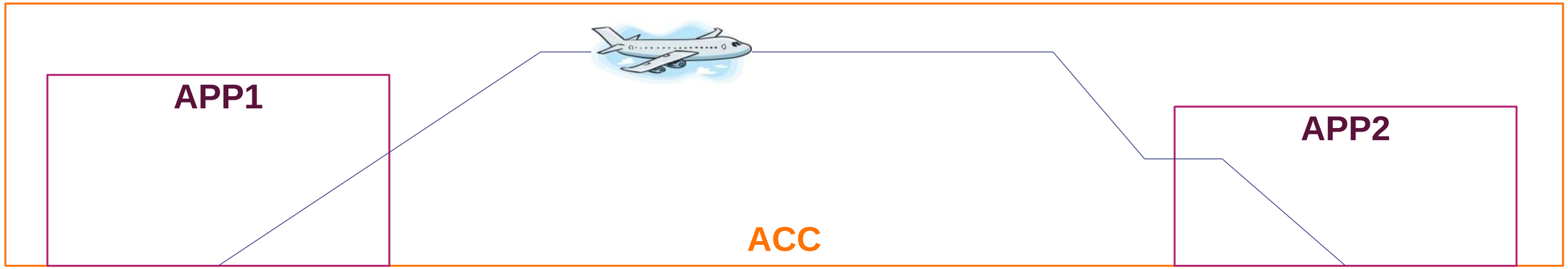
3 Steps

1. Demonstrate/Investigate an implementation on EUROCAT-X V5: One ACC and multiple APPs within one FIR [2017-18]
2. Investigate re-synchronisation, degraded modes [2018-19]
3. Investigate interoperability with 3rd party systems and/or between FIRs [Time Frame TBD]

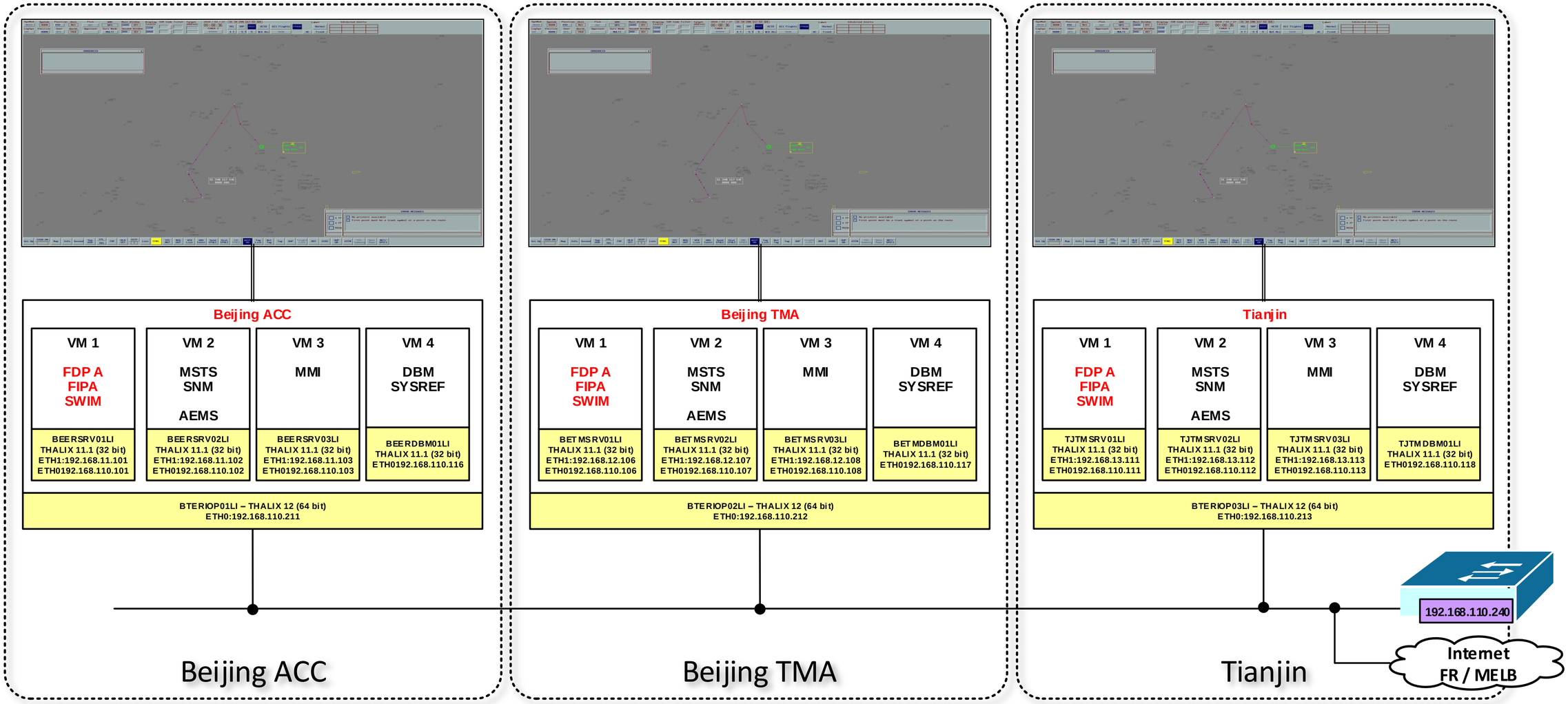


STEP 1 R&D Scope (2017.05~2018.06)



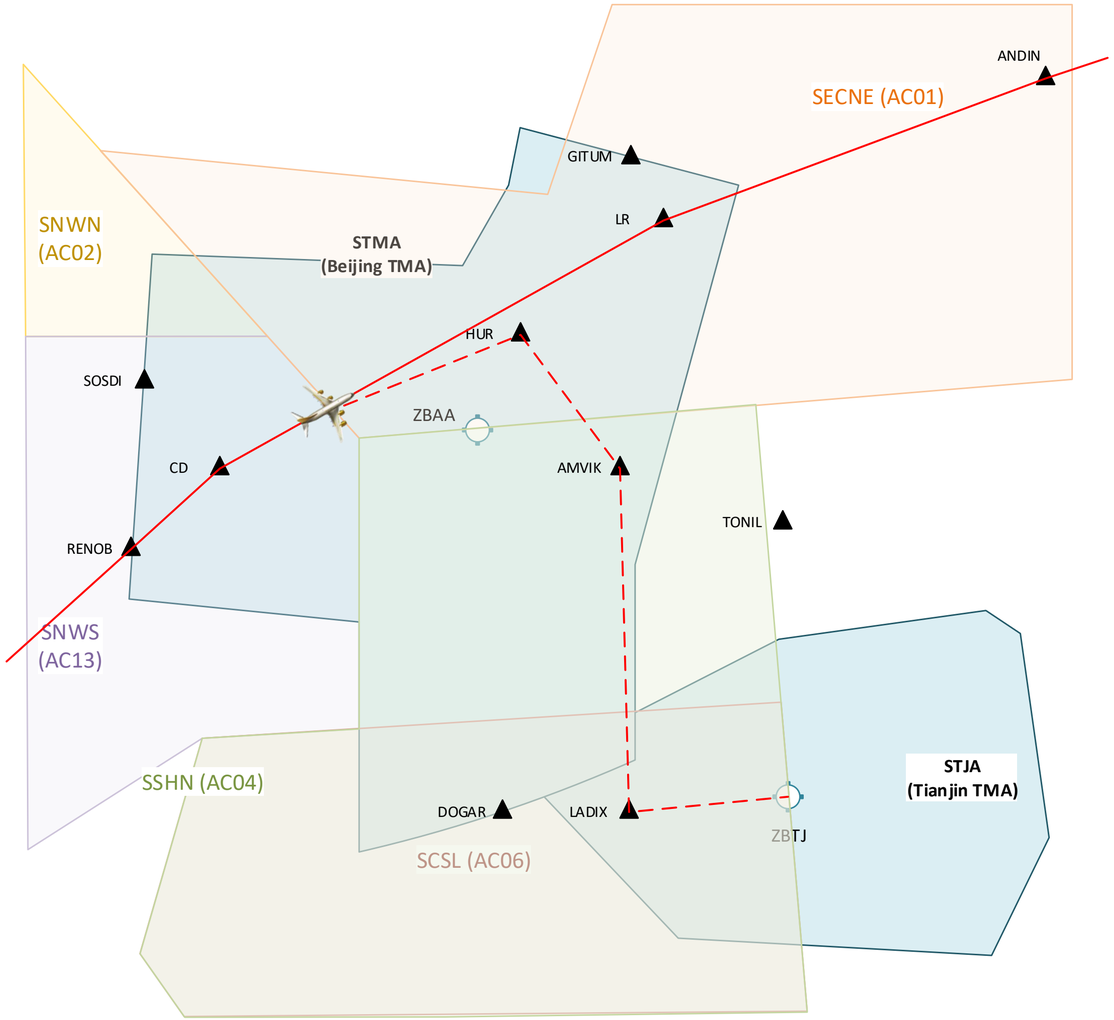


STEP1: Demo Platform

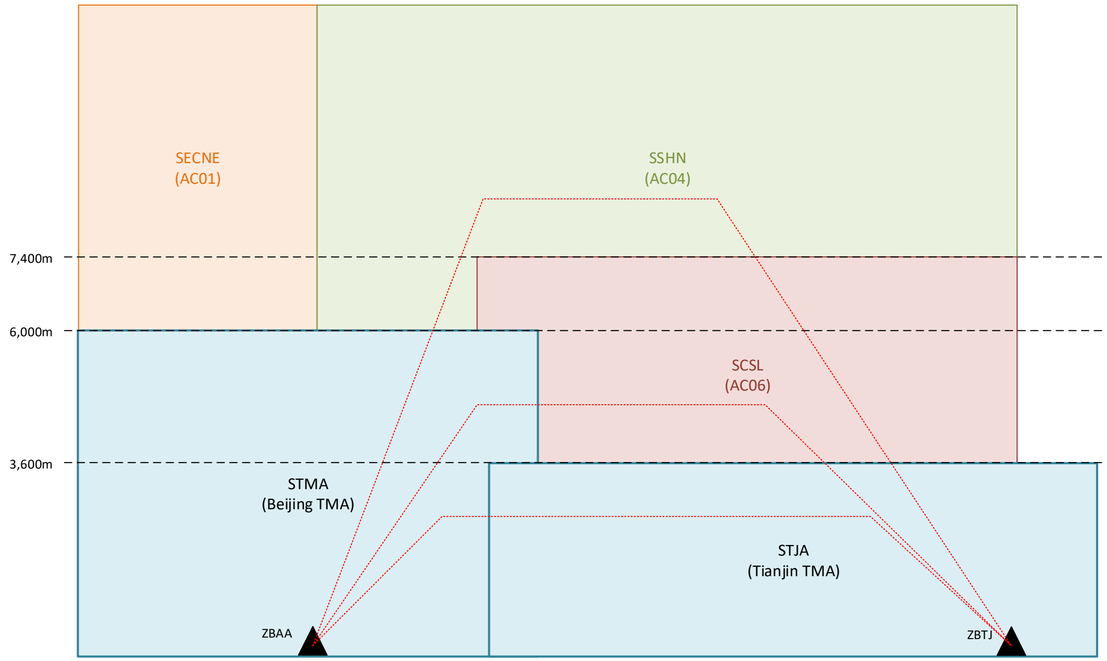


STEP1: Demo Airspace

Airspace: Beijing FIR



3 systems: BJ ACC, BJ TMA, TJ TMA

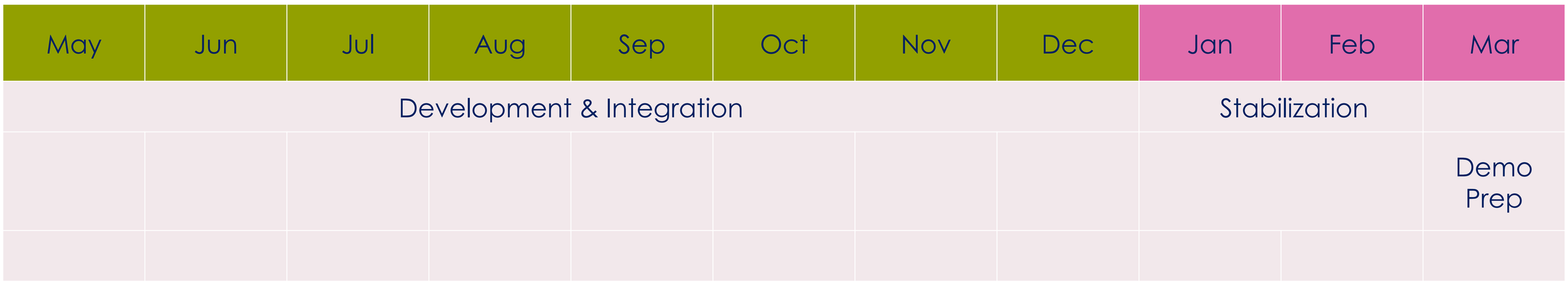


STEP 1: Workshop and Demo

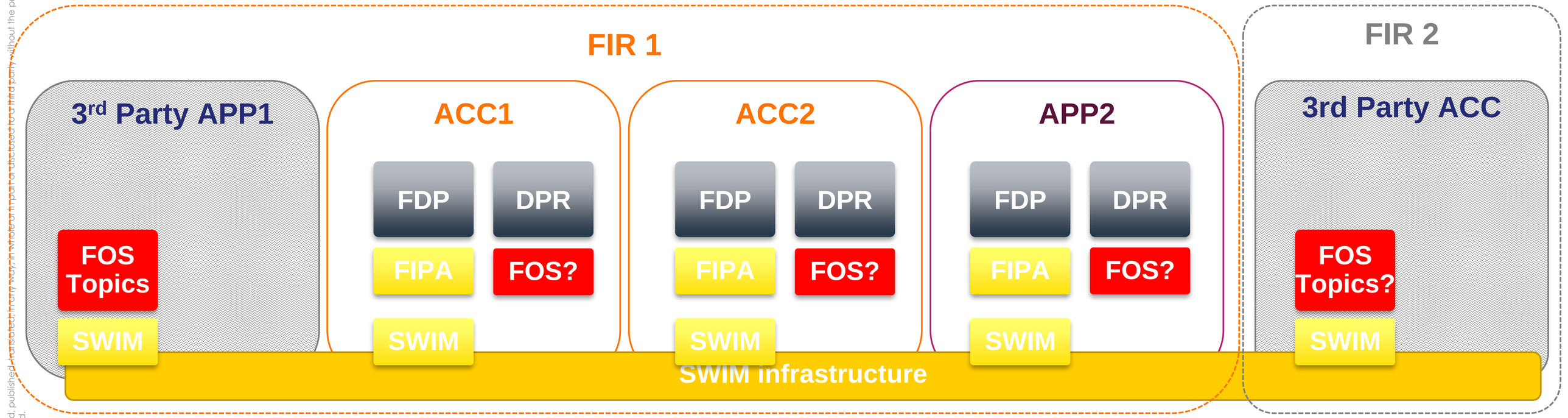
STEP 2: R&D Scope

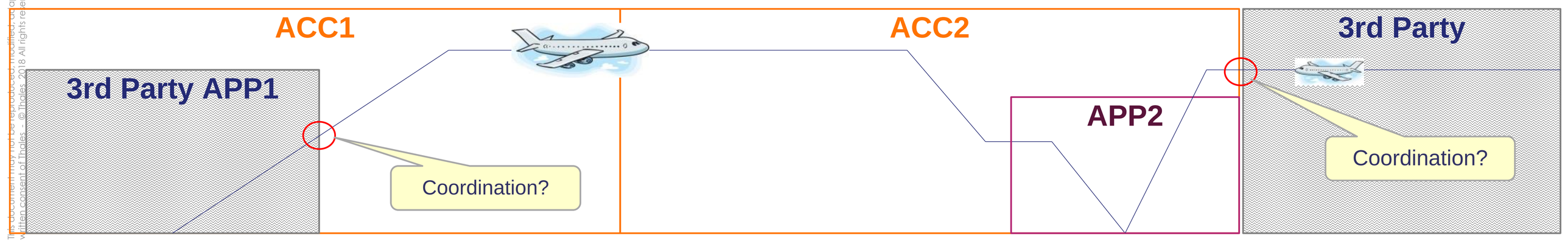
Scope of Work

- Partition Disconnection
- Partition Re-Sync
- Degraded Modes
- Connection to Backup System
- DPR Dependency Optimisation
- TMA Data Synchronisation
- Other Synchronised Data
- Performance Model & Testing



STEP 3: R&D Scope





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Thank You