



Mini Global - SESAR Interoperability Scenario Overview

April 16, 2015



FAA

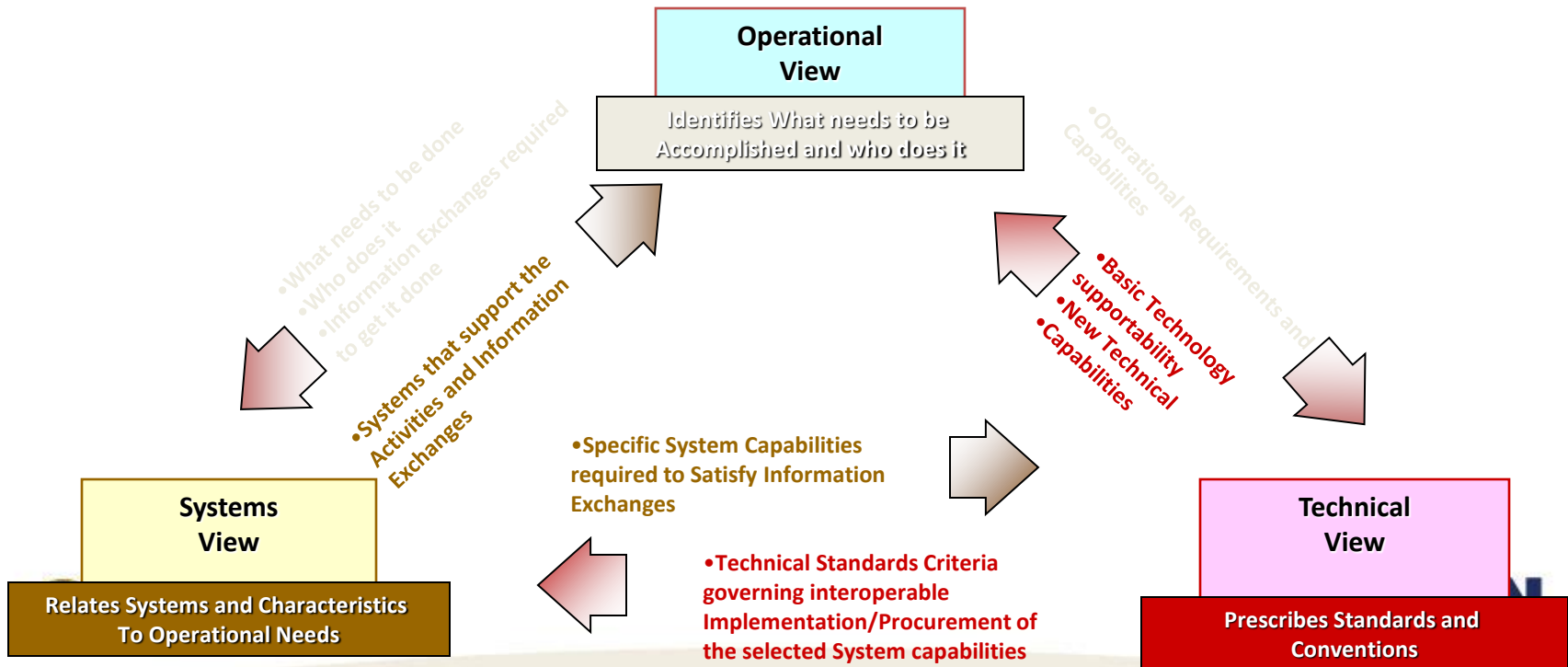


MINI GLOBAL DRAFT NSV-1

IT Framework Description

DoDAF guidelines:

- To create IT systems and architectures that cross organizational and national boundaries
- To provide a common denominator of understanding, comparing and integrating these Families of Systems (FoSs), System of Systems (SoSs) and interoperating and interacting architectures



Identified Name of Operational Strategy	SIC	Values of Information										Information Source				Information Distribution		
		Identified Name of Information Technology	Company Size (Number of Employees)	Company Type (Export/Import)	Company Location (City/State)	Company Age (Years)	Company Size (Number of Employees)	Company Type (Export/Import)	Company Location (City/State)	Company Age (Years)	Company Size (Number of Employees)	Company Type (Export/Import)	Company Location (City/State)	Company Age (Years)	Company Size (Number of Employees)	Company Type (Export/Import)	Company Location (City/State)	Company Age (Years)
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24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
25	26	27	28	2														



SCENARIO WITH OV-2, IER TABLE, OV-6B, OV-6C

Scenario Overview

Purpose

This use case demonstrates the use of FIXM, WXXM, and AIXM on a flight from Atlanta to Rome.

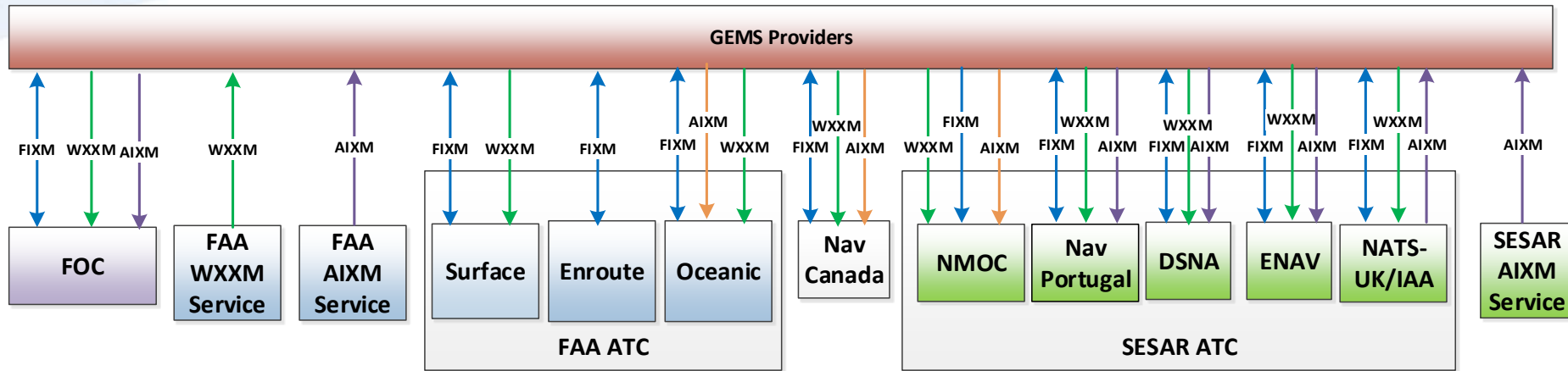
It includes steps from departure through multiple Air Navigation Service Providers (ANSPs) handovers to arrival.

All data exchanged during the execution of the steps is enabled by both local Enterprise Messaging Services (EMS) and Global Enterprise Management Service (GEMS) technologies.

Airspaces

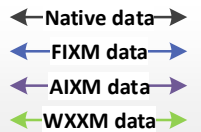
- **United States**
 - ✦ Atlanta Center
 - ✦ Washington DC Center
 - ✦ New York Oceanic
- **Portugal**
 - ✦ Santa Maria Oceanic
- **Canada**
 - ✦ Gander Oceanic
- **UK/Ireland**
 - ✦ Shanwick Oceanic
- **France**
 - ✦ Brest Center
 - ✦ Bordeaux Center
 - ✦ Marseille Center
- **Italy**
 - ✦ Roma Center

ATL – Rome OV-2



OV-2 Description: The Operational Node-Connectivity Description contains the operational nodes and elements, the needlines between them, and the characteristics of the information exchanged.

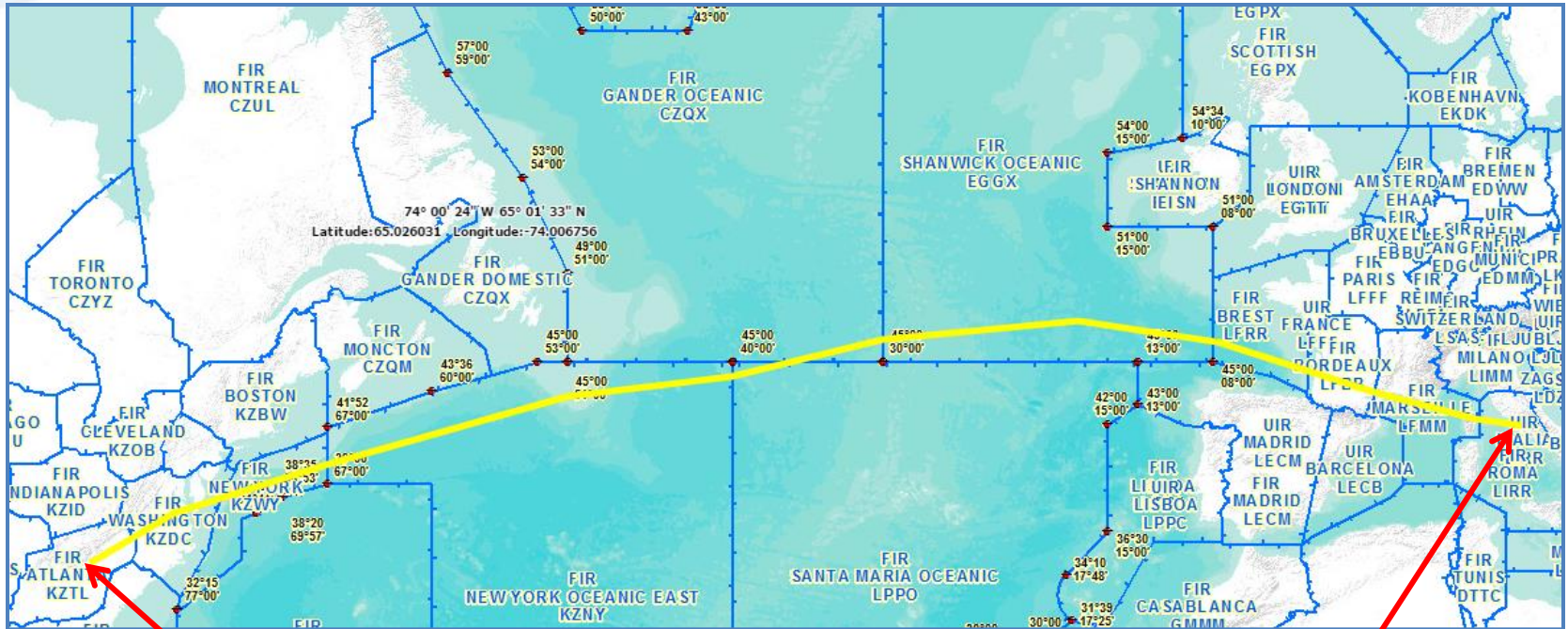
Legend



Assumptions

- Handover procedures follow current day processes in terms of timing.
- There is no new data requirements for the handover procedures, rather the current available data is translated into FIXM and exchanged using GEMS technologies.
- The focus of the use case is on system-to-system data exchange and will not require a large amount of operator input.
 - ✦ There is no pilot or pilot simulation system
- Each ANSP is responsible for providing the data identified in the steps below for this use case. That data may be provided by emulated operational systems or by simulated systems.

Flight Path



Depart Hartsfield-Jackson
Atlanta International
Airport (KATL) in Atlanta,
Georgia

Arrive Leonardo da Vinci
International Airport
(LIRF) in Rome, Italy



Actors

ANSPs

- **FAA (Federal Aviation Administration) – ANSP responsible for operations in United States airspace**
- **NavPortugal – ANSP responsible for operations in Portuguese airspace¹**
- **NavCanada – ANSP responsible for operations in Canadian²**
- **NATS-UK and IAA (Irish Aviation Authority) – Joint ANSPs responsible for operations in Shanwick Oceanic airspace and for publishing Organized Track System (OTS)³**
- **DSNA (Direction des Services de la navigation aeriennne) – ANSP responsible for operations in French airspace⁴**
- **ENAV (Ente Nazionale di Assistenza al Volo) – ANSP responsible for operations in Italian airspace**
- **NMOC (Network Manager Operation Centre) – Eurocontrol organization responsible for publishing North Atlantic European Routing Scheme (NERS)**

FAA and Mini Global Systems

- **FAA Enterprise Messaging Service (EMS) – Responsible for message routing between FAA systems and to MG GEMS provider**
- **FAA Flight Object Exchange Service (FOXS) – Responsible for generating and maintaining Flight Objects (FO) for the FAA.**
- **GUFI (Global Unique Flight Identifier) Service – Responsible for generating GUFIs in support of FO exchange.**
- **GEMS Providers (Global Enterprise Messaging Service) – Responsible for message routing between Local EMS instances (i.e. between ANSPs).**
- **SDSS (Surface Decision Support Tool) – Tool at the FTB used to control movement of the flight on the airport surface and to issue surface status updates and arrival and departure messages.**
- **NCR (NAS Common Reference) – Tool at the FTB used to publish and subscribe to AIXM and WXXM data.**
- **ATOP (Advanced Technologies and Oceanic Procedures) – Emulated version of operational system at the FTB used to control flight movement in oceanic airspace and to perform boundary coordination.**
- **ERAM (En Route Automation Modernization) – Emulated version of the operational system at the FTB used to control flight movement in en route airspace.**
- **FOC (Flight Operations Center) Tool – Tool used to submit flight plans and flight plan amendments**



FAA

1) NATS Bulletin 2013-001 Oceanic Clearance Delivery in Santa Maria FIR

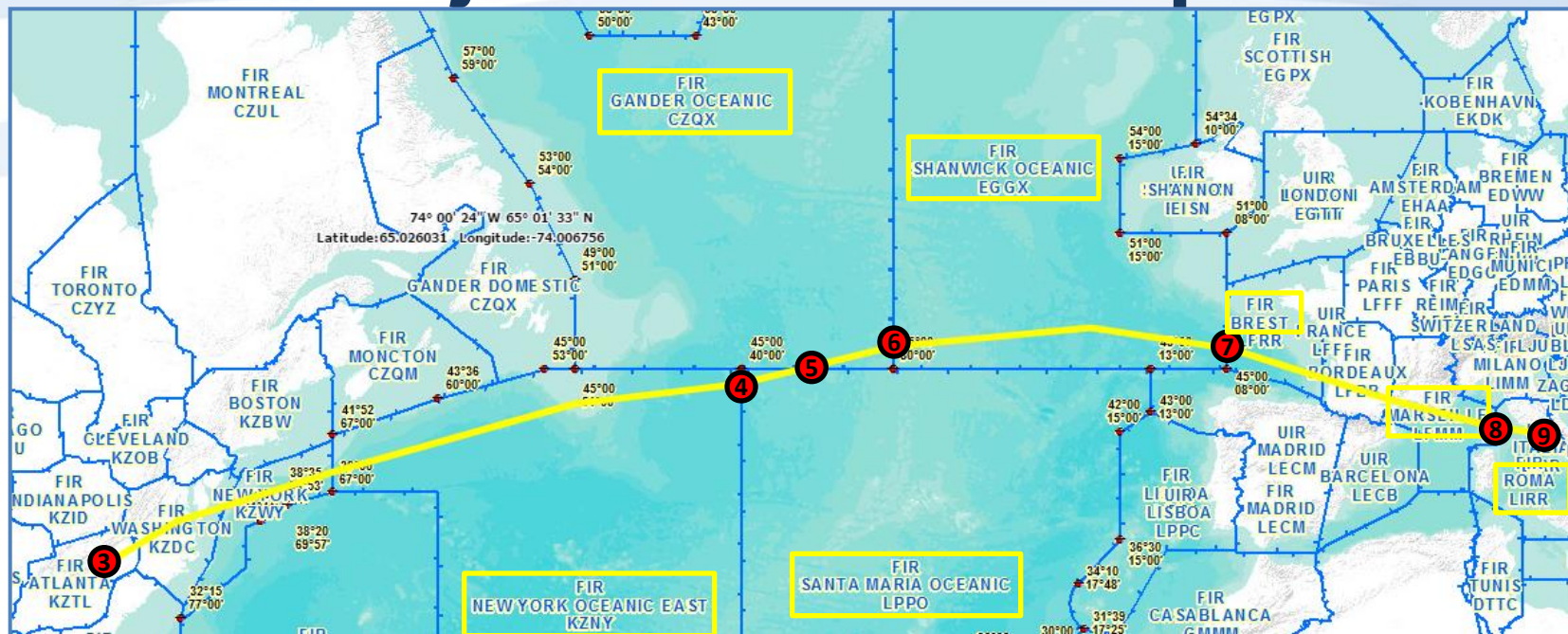
2) NAT OPS Bulletin 2014-007 Gander Data Link Oceanic Clearance Delivery (OCD) Crew Procedures

3) NAT OPS Bulletin 2010-006 ORCA Procedures for Shanwick

4) http://www.skybrary.aero/index.php/Regulation_1032/2006_-_Exchange_of_Flight_Data_Between_ATC_Units

NextGEN

Major Use Case Steps



- 1 Organized Track System (OTS) plan development and distribution
- 2 File flight plan
- 3 Departure from KATL
- 4 New York Oceanic to Santa Maria Oceanic boundary crossing
- 5 Santa Maria to Gander Oceanic boundary crossing
- 6 Gander Oceanic to Shanwick boundary crossing
- 7 Shanwick to Brest boundary crossing
- 8 Marseille to Roma boundary crossing
- 9 Arrival into LIRF



QUESTIONS

OV-6b & OV-6c



FAA

Next**GEN**

Pre Departure - Step 1 OV-6b



Step 1 Activities – OTS Plan Development and Dissemination

- a) An FOC's preferred routes are considered in construction of daily OTS.
- b) Shanwick publishes the agreed upon east-bound OTS in a NAT Track Message⁵ via AIXM through a GEMS provider.
- c) GEMS providers route this data to FAA, NavPortugal, NavCanada, NATS-UK/IAA, DSN, ENAV, FOC and EUROCONTROL Network Manager Operations Center (NMOC).
- d) [NMOC updates the North Atlantic European Routing Scheme (NERS) and publishes the NAT Track Message via AIXM through a GEMS provider.]



Pre Departure – Step 1 OV-6c

OTS Exchange

This data flow describes the steps required to distribute OTS

Preconditions

FOCs are communicated their preferred routes to Shanwick through legacy means

Acronyms

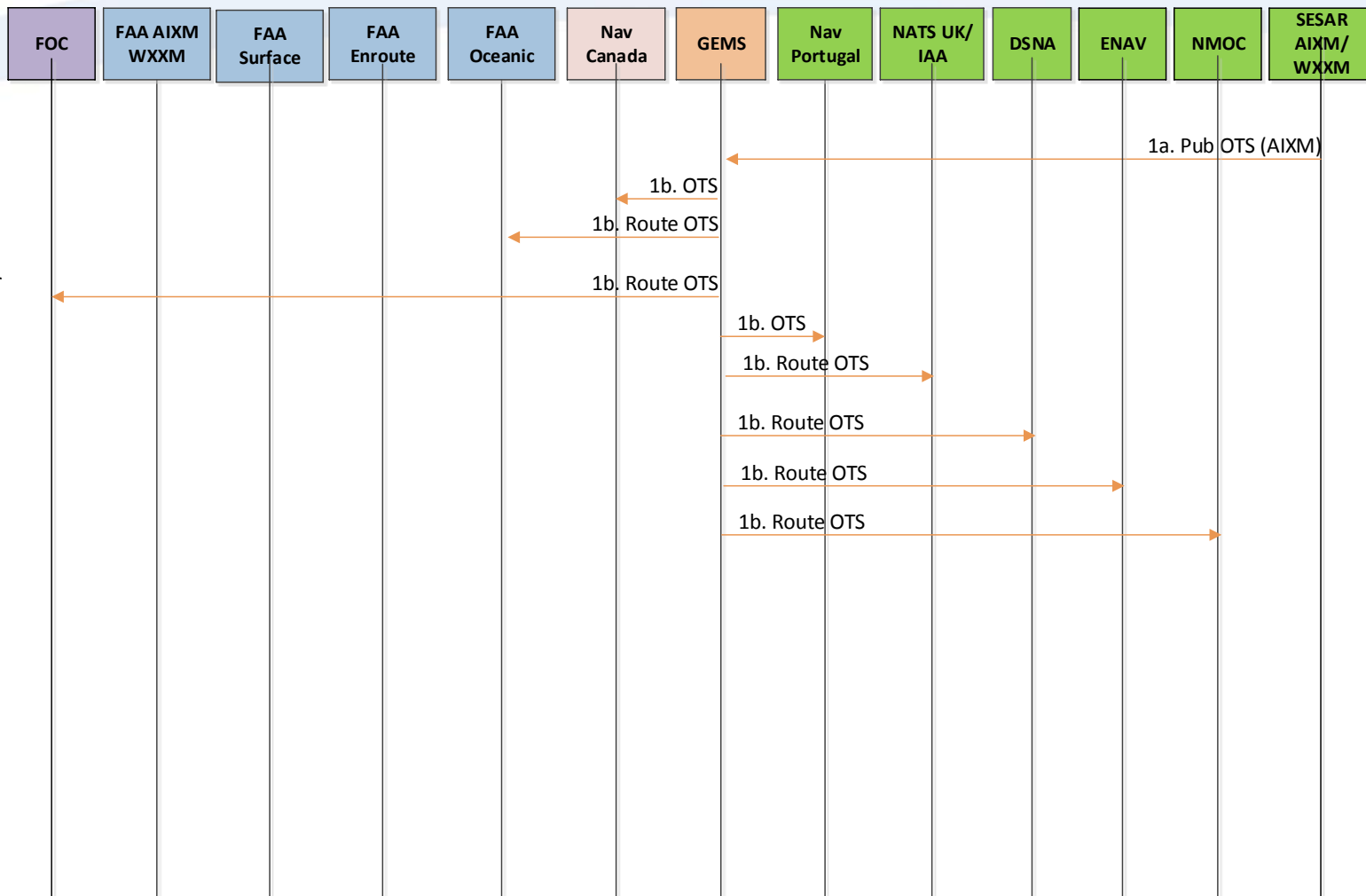
- Organized Track System (OTS)

Rev 0.1 Summary

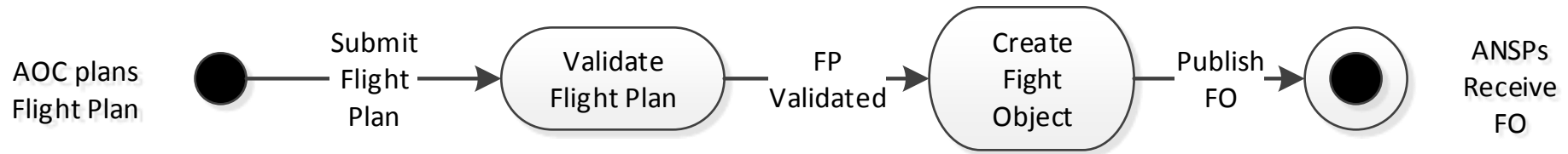
- Initial

LEGEND

Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



Pre Departure – Step 2 OV-6b



Step 2 Activities – File flight plan

- a) AOC tool submits flight plan through local Enterprise Messaging Service (EMS).
- b) FAA FOXS requests GUF1 from GUF1 Service.
- c) FAA FOXS creates Flight Object (FO).
- d) FAA EMS routes FO to other systems and GEMS providers.
- e) GEMS providers route FO to NavPortugal, NavCanada, NATS-UK, IAA, DSNA, and ENAV.

Pre Departure – Step 2 OV-6c

Pre-Departure Flight Plan

This data flow describes the steps required to distribute the flight plan

Preconditions

Flight Plan has not yet been submitted

Acronyms

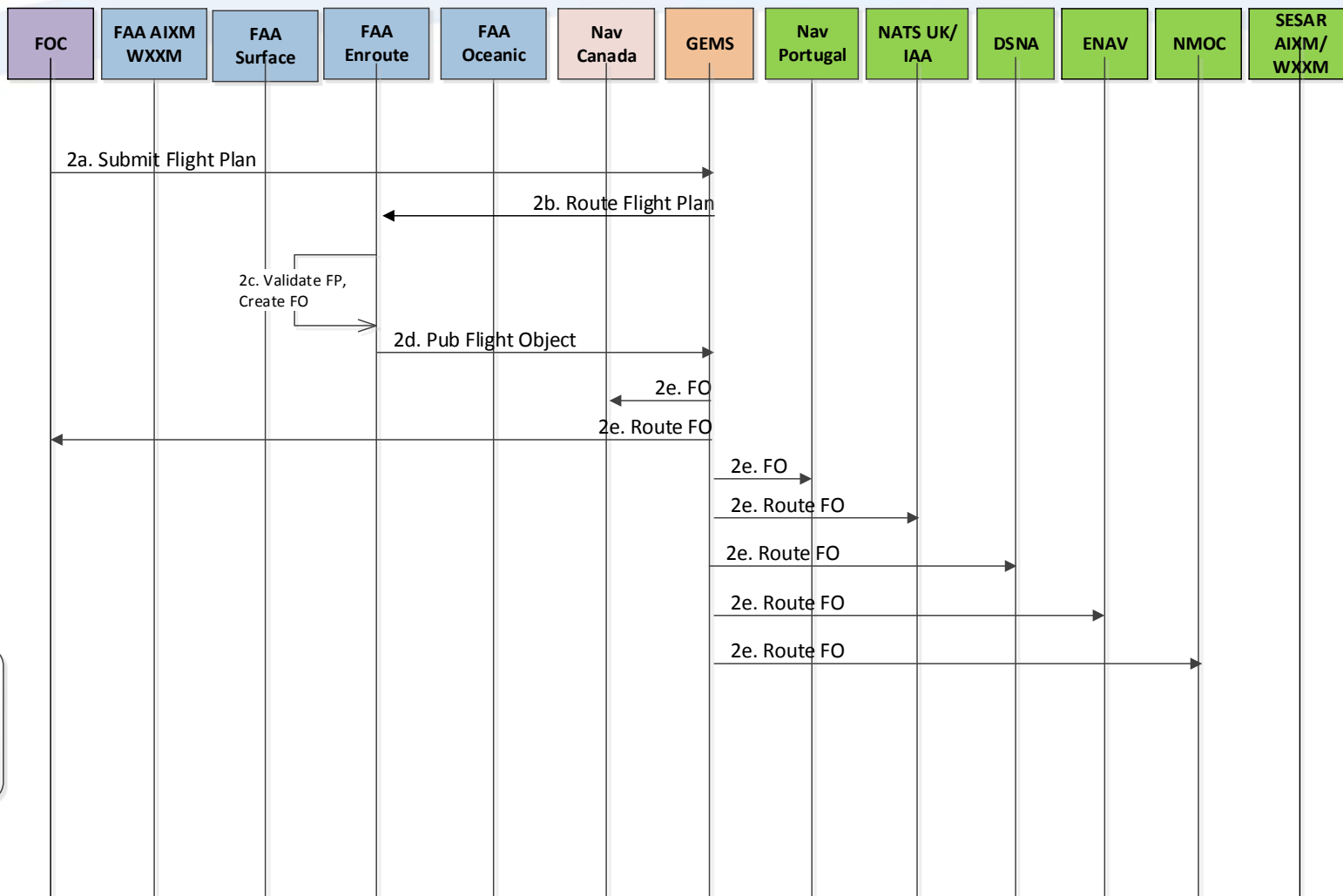
- Flight Plan (FP)
- Flight Object (FO)

Rev 0.1 Summary

- Initial
- NEMS/FOXS shown included in FAA ATC Systems

LEGEND

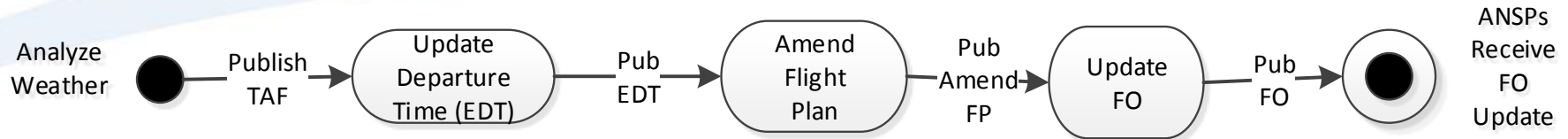
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Orange lines = AIXM



FAA

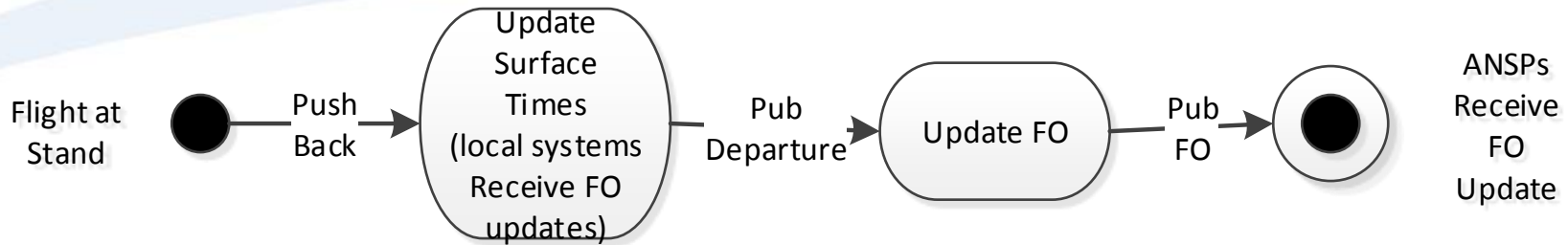
NextGEN

KATL Departure – Step 3, part 1 OV-6b



- a) Terminal Area Forecast (TAF) issued by NCR for Atlanta TRACON, published to FAA EMS
- b) FAA EMS routes TAF data to the Atlanta SDSS
- c) Atlanta SDSS determines departure delay is needed based on TAF and/or ATM delay
- d) Amended departure time issued by Atlanta SDSS through the FAA EMS
- e) FAA EMS routes amended departure time to AOC Tool
- f) Amended Flight Plan issued by AOC Tool through FAA EMS
- g) FAA FOXS updates the FO
- h) FAA EMS routes updated FO to other systems and GEMS providers
- i) GEMS providers route updated FO to NavPortugal, NavCanada, NATS-UK, IAA, DSNA, and ENAV

KATL Departure – Step 3, part 2 OV-6b



- a) Surface Status Updates issued by Atlanta SDSS periodically while the flight is on the airport surface to the FAA EMS. The FAA FOXS updates the FO and publishes the updated FOs to local systems via the FAA EMS. The local systems that would receive these types of updates may include AOC Tool, Atlanta Center ERAM, Washington DC Center ERAM, and FTB Displays
- b) Departure Message issued by Atlanta SDSS through the FAA EMS
- c) FAA EMS routes message to FAA FOXS
- d) FAA FOXS updates the FO
- e) FAA EMS routes the updated FO to other local systems and GEMS providers
- f) GEMS providers route updated FO to NavPortugal, NavCanada, NATS-UK, IAA, DSNA, ENAV, FOC, and NMOC

KATL Departure – Step 3 OV-6c

KATL Departure

This data flow describes the steps required during departure from KATL

Preconditions

The Flight Object exists for this flight

Acronyms

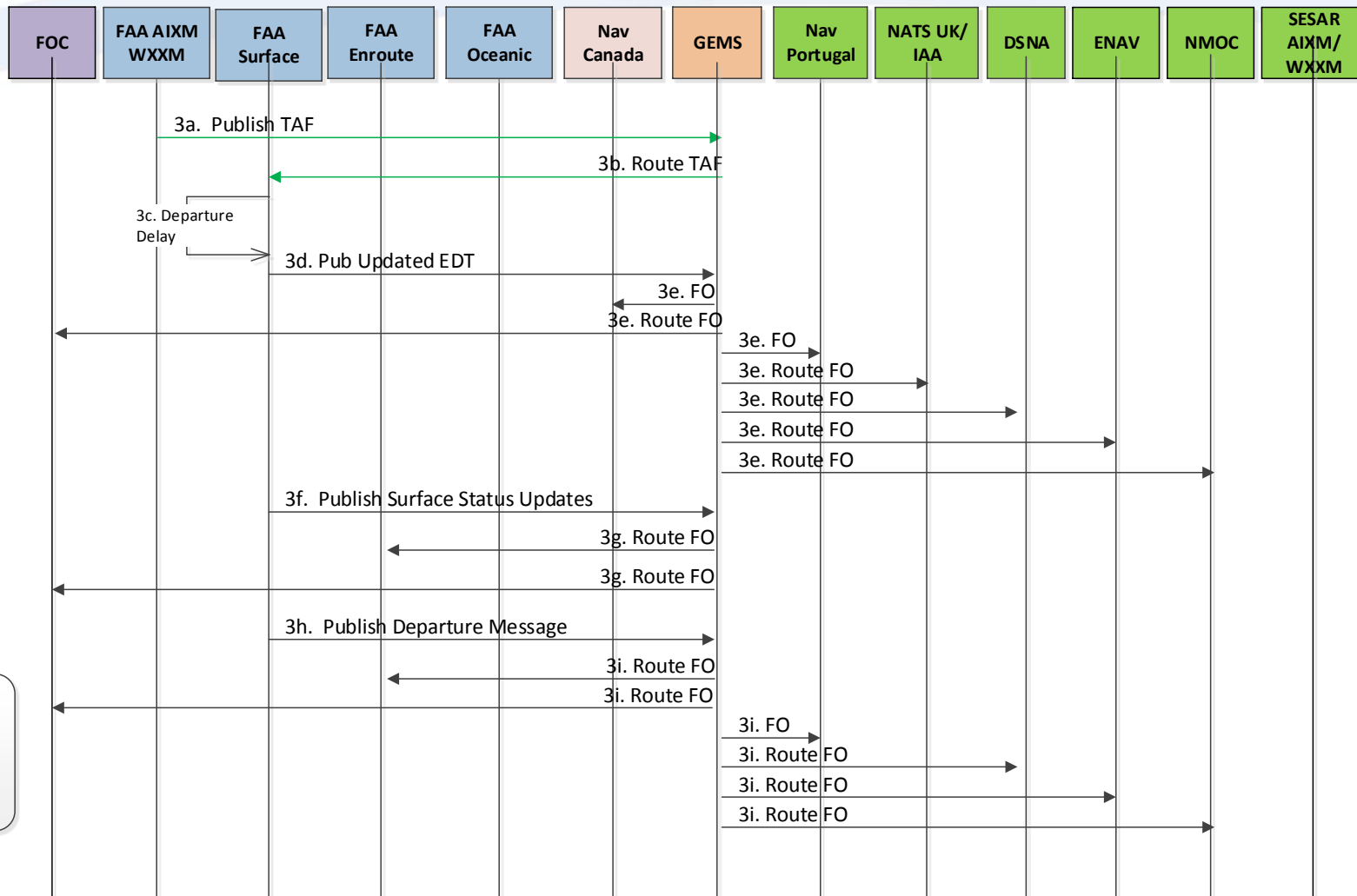
- Terminal Area Forecast (TAF)
- Estimated Departure Time (EDT)

Rev 0.1 Summary

- Initial
- NEMS/FOXS shown included in FAA ATC Systems

LEGEND

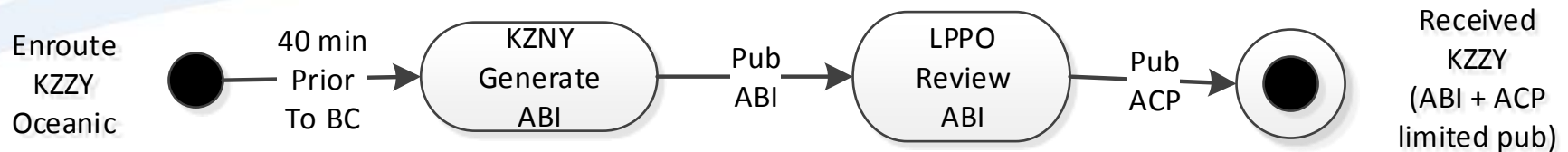
Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



FAA

NextGEN

FAA/Nav Portugal BC, Step 4 part 1 OV-6b



Step 4 part 1 Activities – New York ATOP to Santa Maria Boundary Coordination

- a) 40 minutes prior to boundary crossing point between New York and Santa Maria airspaces, ATOP issues an Advanced Boundary Information (ABI) message that contains the position (latitude, longitude), flight level (i.e. altitude) and time that the flight plans to cross into Santa Maria airspace through a GEMS provider.
- b) The GEMS providers routes the ABI message to Santa Maria.
- c) Santa Maria accepts the bc position and time identified in the ABI message by issuing an Accept (ACP) message to ATOP through the GEMS providers.

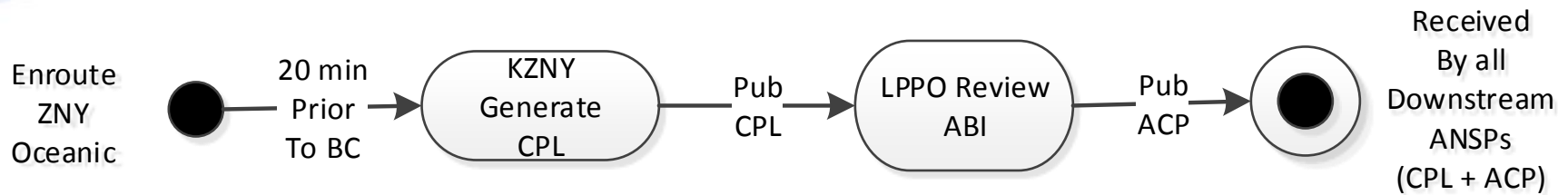
FAA/Nav Portugal BC, Step 4 part 2 OV-6b



Step 4 part 2 Activities – New York ATOP to Santa Maria Boundary Coordination

- a) NCR issues a Pilot Report (PIREP) for turbulence along the flight path in WXXM
- b) The ATOP controller views this PIREP and uses ATOP to send an updated ABI message to Santa Maria with a different altitude through the GEMS providers.
- c) Santa Maria responds to ATOP with a Negotiate (NEG) message that contains an alternate altitude through the GEMS providers.
- d) ATOP accepts the alternate altitude by issuing an ACP message to Santa Maria through the GEMS providers

FAA/Nav Portugal BC, Step 4 part 3 OV-6b



Step 4 part 3 Activities – New York ATOP to Santa Maria Boundary Coordination

- a) 20 minutes prior to the flight reaching the boundary crossing point, ATOP issues a Current Plan (CPL) message to Santa Maria through the GEMS providers.
- b) Santa Maria accepts the CPL message by issuing an ACP message to ATOP through the GEMS providers.
- c) Upon acceptance of the CPL, the GEMS providers route the CPL message to NavCanada, NATS-UK, IAA, DSN, ENAV, AOC Tool, and NMOC.

FAA/Nav Portugal BC – Step 4 OV-6c

FAA/NavPortugal Boundary Coordination

This data flow describes the steps required during boundary coordination between New York Oceanic (KZZY) and Santa Maria (LPPO)

Preconditions

The flight is in KZZY airspace

Acronyms

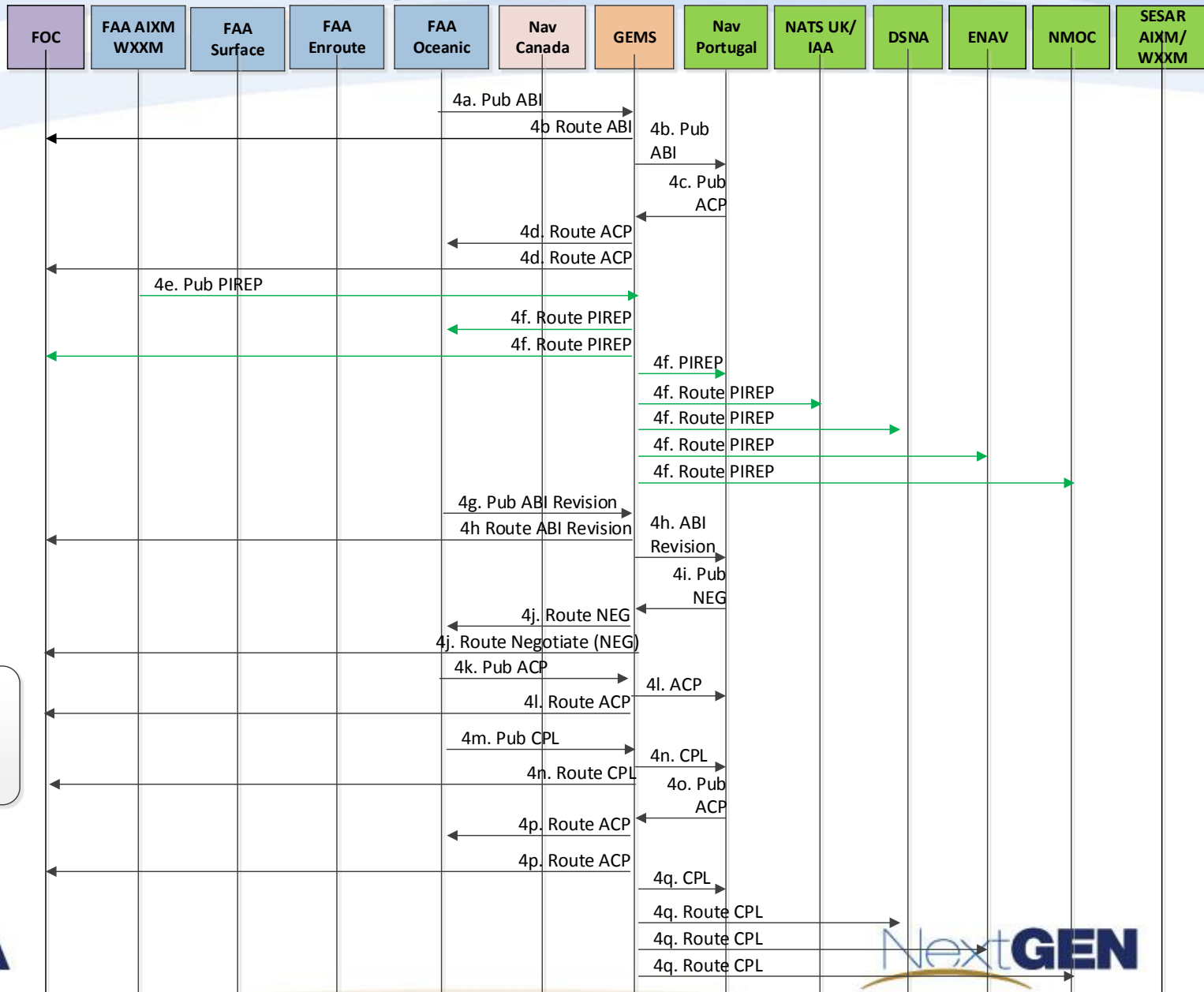
- Advanced Boundary Information (ABI)
- Current Plan (CPL)
- Accept Message (ACP)
- Negotiate Message (NEG)
- Pilot Report (PIREP)

Rev 0.1 Summary

- Initial

LEGEND

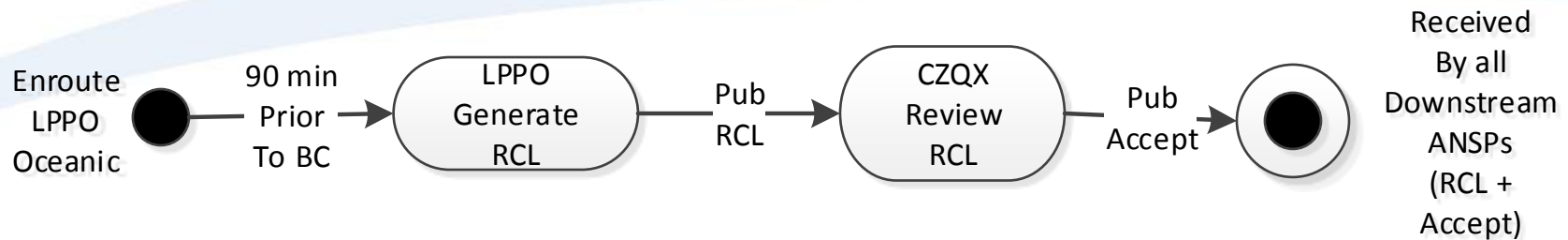
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Orange lines = AIXM



FAA

NextGEN

Nav Portugal/Nav Canada BC – Step 5 OV-6b



Step 5 Activities – Santa Maria to Gander Boundary Coordination

- a) 90 minutes prior to the flight reaching the boundary crossing point between Santa Maria and Gander airspaces, Santa Maria issues a Clearance Request (RCL) message through a GEMS provider that includes the following information:
 1. Oceanic Entry Point (OEP)
 2. OEP Estimated Time of Arrival (ETA)
 3. Requested Mach Number
 4. Requested Flight Level
 5. Highest acceptable Flight Level at the OEP
- b) The GEMS providers routes the RCL message to Gander.
- c) Gander accepts the clearance by issuing an acceptance message (format TBD) through the GEMS providers to Santa Maria
- d) Upon acceptance of the clearance, the GEMS providers route the RCL message to all downstream ANSPs (NATS-UK/IAA, DSN, ENAV) the FOC, and NMOC



NAV Portugal/NAV Canada BC – Step 5 OV-6c

NavPortugal/ NavCanada Boundary Coordination

This data flow describes the steps required during boundary coordination between Santa Maria (LPPO) and Gander (CZQX)

Preconditions

The flight is in LPPO airspace

Acronyms

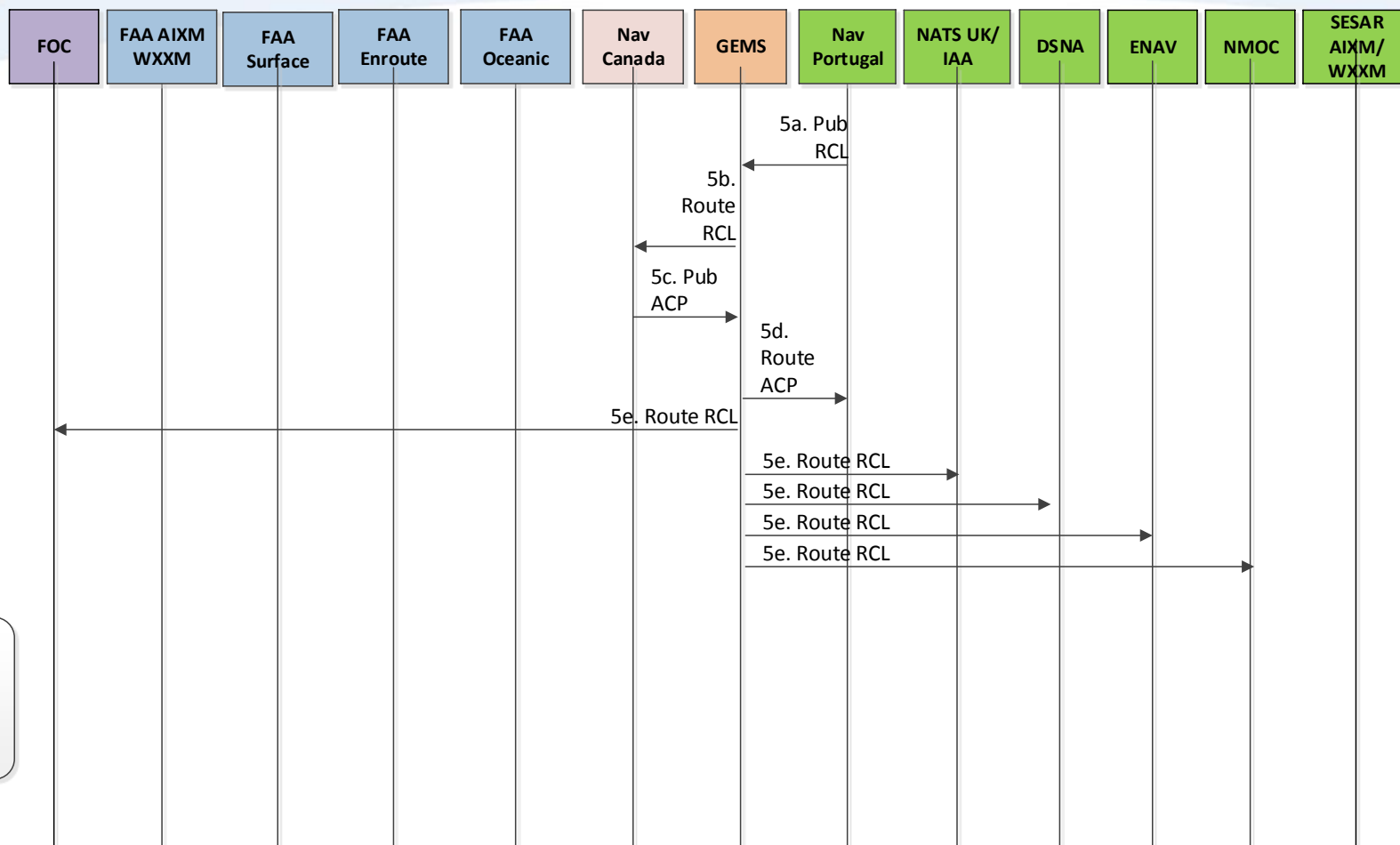
- Clearance Request (RCL)

Rev 0.1 Summary

- Initial

LEGEND

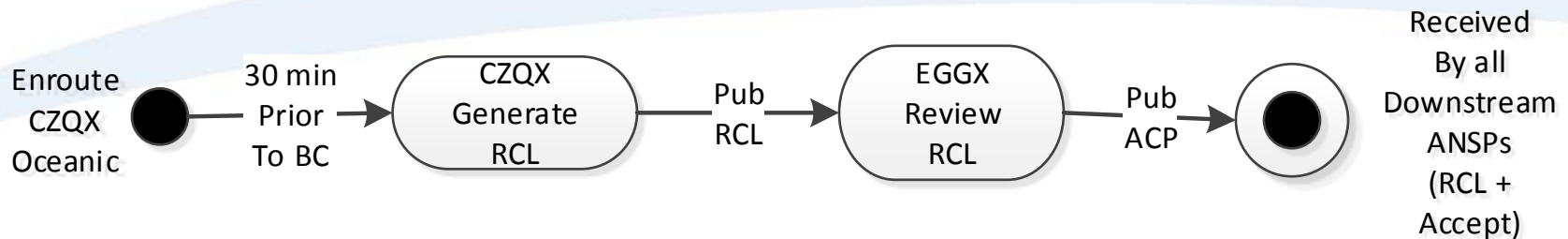
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Orange lines = AIXM



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Next**GEN**

NAV Canada/NATS-UK, IAA BC – Step 6 OV-6b



Step 6 Activities – Gander to Shanwick Boundary Coordination

- a) 30⁶ minutes prior to reaching boundary crossing point between Gander and Shanwick, Gander issues an Clearance Request (RCL) message through a GEMS provider that includes the following information:
 1. Shanwick Entry Point
 2. Estimated Time of Arrival (ETA) for Entry Point
 3. Requested Mach Number
 4. Requested Flight Level
- b) The GEMS providers routes the RCL message Shanwick
- c) Shanwick accepts the clearance by issuing an acceptance message (format TBD) through the GEMS providers to Gander
- d) Upon acceptance of the clearance, the GEMS providers route the RCL message to downstream ANSPs (DSNA, ENAV), the FOC, and NMOC

NAV Canada/NATS-UK,IAA BC – Step 6 OV-6c

NavCanada/NATS-UK,IAA Boundary Coordination

This data flow describes the steps required during boundary coordination between Gander (CZQX) and Shanwick (EGGX)

Preconditions

The flight is in CZQX airspace

Acronyms

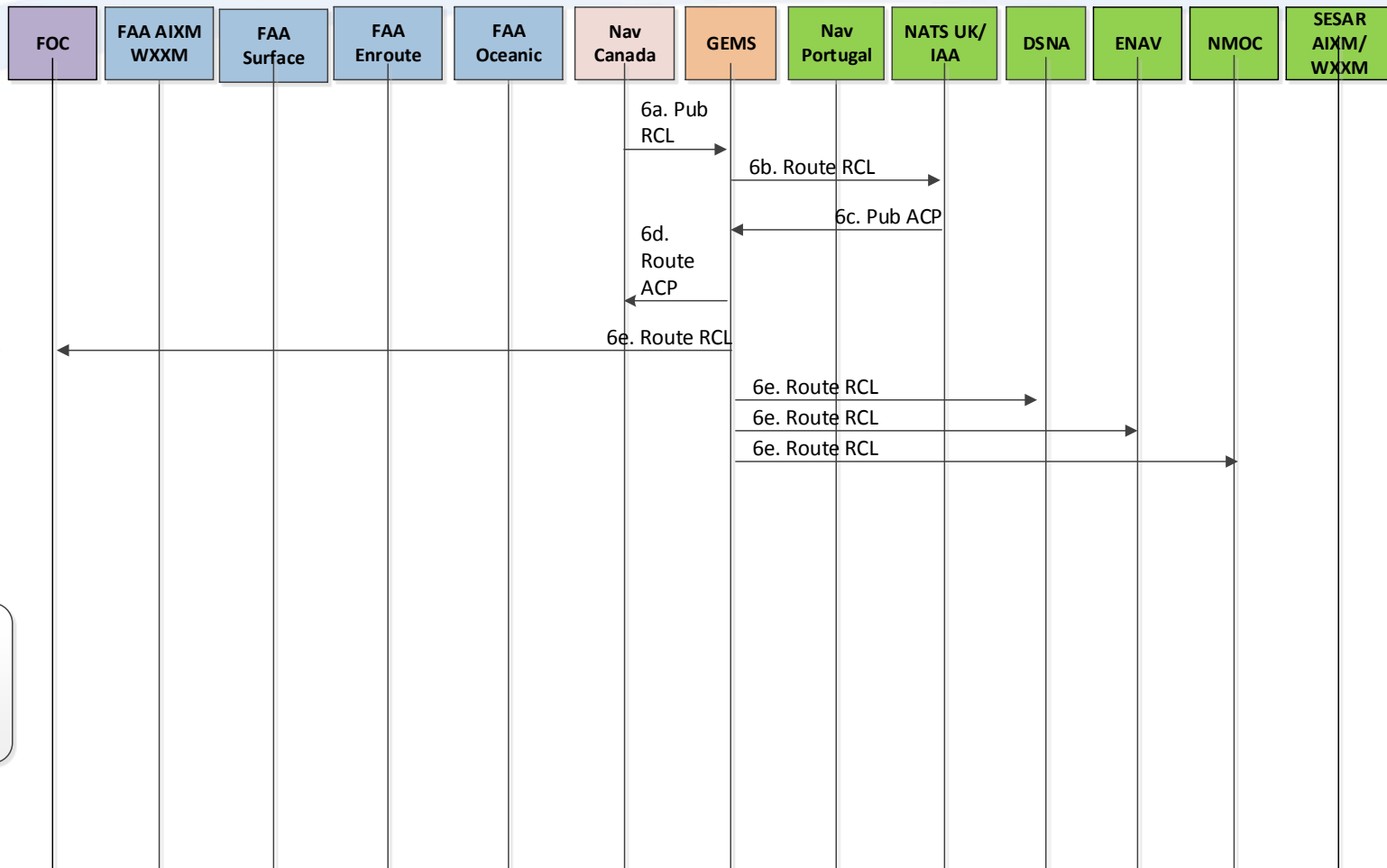
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Rev 0.1 Summary

- Initial

LEGEND

Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



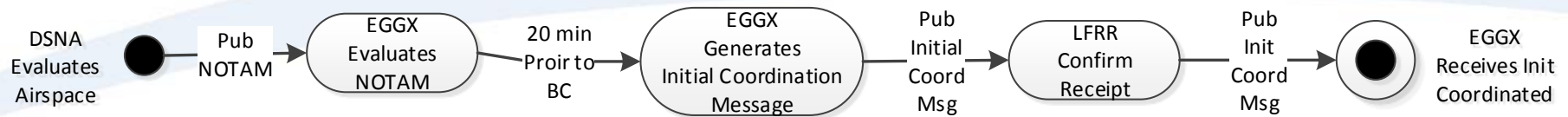
NATS-UK,IAA/DSNA BC – Step 7 part 1 OV-6b



Step 7 Activities – Gander to Brest Boundary Coordination, part 1

- [30] minutes prior to BC point between Shanwick and Brest, Shanwick issues a Notification message through the GEMS providers that includes the following:
 - + Aircraft Identification, Secondary Surveillance Radar (SSR) mode and code, Departure Aerodrome, Estimate Data (coordination point (COP) and estimated time at COP), Destination Aerodrome, Number and type of aircraft, Type of Flight, Equipment Capability and Status
- The GEMS providers route the Notification message to DSNA

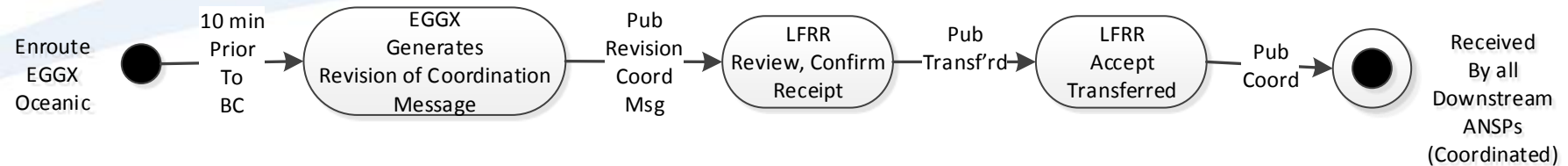
NATS-UK,IAA/DSNA BC – Step 7 part 2 OV-6b



Step 7 Activities – Gander to Brest Boundary Coordination, part 2

- [25] minutes prior to BC point, DSNA updates their restricted airspace and publishes a NOTAM which would normally require a reroute after “coast in”. However, since the NOTAM was received while the flight is still in Shanwick airspace this reroute can be accomplished in a less busy environment.
- [20] minutes prior to BC point, Shanwick issues an Initial Coordination message that includes the same information as the Notification message except for updated Estimate Data to accommodate the reroute
- The GEMS providers route the Initial Coordination message to DSNA
- DSNA confirms receipt of the Initial Coordination message and notifies Shanwick that the flight is now “coordinated” by sending TBD message through a GEMS provider.

NATS-UK,IAA/DSNA BC – Step 7 part 3 OV-6b



Step 7 Activities – Gander to Brest Boundary Coordination, part 3

- [10] minutes prior to BC point, Shanwick issues a Revision of Coordination message through a GEMS provider that includes the following information:
 - SSR mode and code, Estimated time and flight level at COP, Equipment capability and Status
- The GEMS providers route the Revision of Coordination message to DSNA
- DSNA confirms receipt of the Revision of Coordination message and notifies Shanwick by sending TBD “transferred” message through a GEMS provider.
- Upon acceptance of the “transferred” message, the GEMS providers route the Coordination message to downstream ANSPs (ENAV), the FOC, and NMOC.

NATS-UK,IAA/DSNA BC – Step 7 part 1,2 OV-6c

NATS-UK,IAA/DSNA Boundary Coordination

This data flow describes the steps required during boundary coordination between Shanwick (EGGX) and Brest (LFRR)

Preconditions

The flight is in EGGX airspace

Acronyms

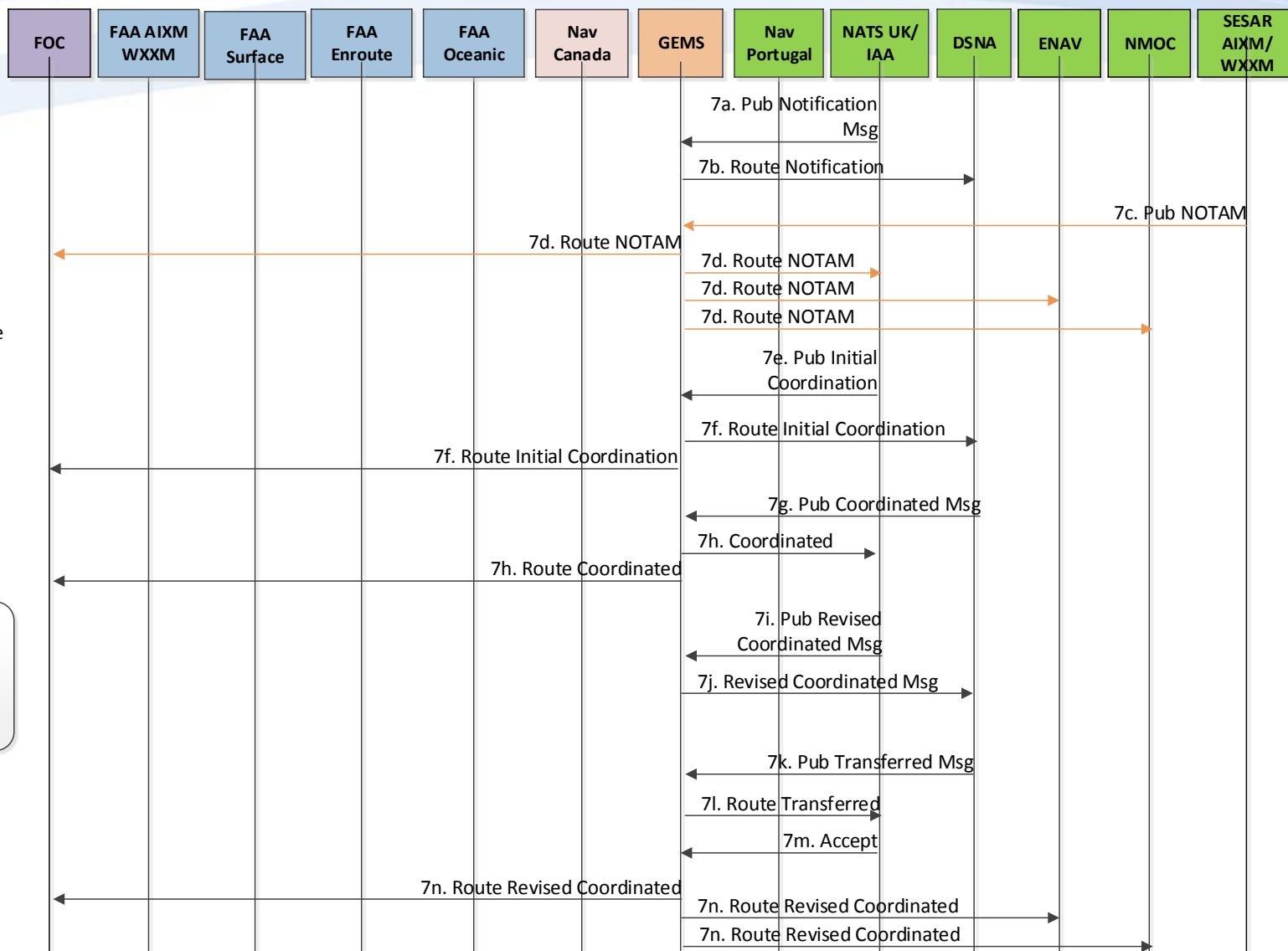
- Notice to Airmen (NOTAM)

Rev 0.1 Summary

- Initial

LEGEND

Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



FAA

NextGEN

DSNA/ENAV – Step 8

Step 8 Activities – Marseilles to Roma Boundary Coordination

- a) This boundary crossing uses the same coordination process as Shanwick to Brest boundary crossing; however coordination is done through DSNA and ENAV, and the message timing may be different as specified in ENAV Aeronautical Information Package (AIP)
- b) Upon acceptance of the “transferred” message, the GEMS providers route the Coordination message to the FOC, and NMOC

DSNA/ENAV BC – Step 8 OV-6c

DSNA/ENAV Boundary Coordination

This data flow describes the steps required during boundary coordination between Marseille (LFMM) and Roma (LIRR).

This boundary crossing uses the same coordination process as Shanwick to Brest boundary crossing; however the message timing may be different as specified in ENAV Aeronautical Information Package (AIP)

Preconditions

The flight is in LFMM airspace

Acronyms

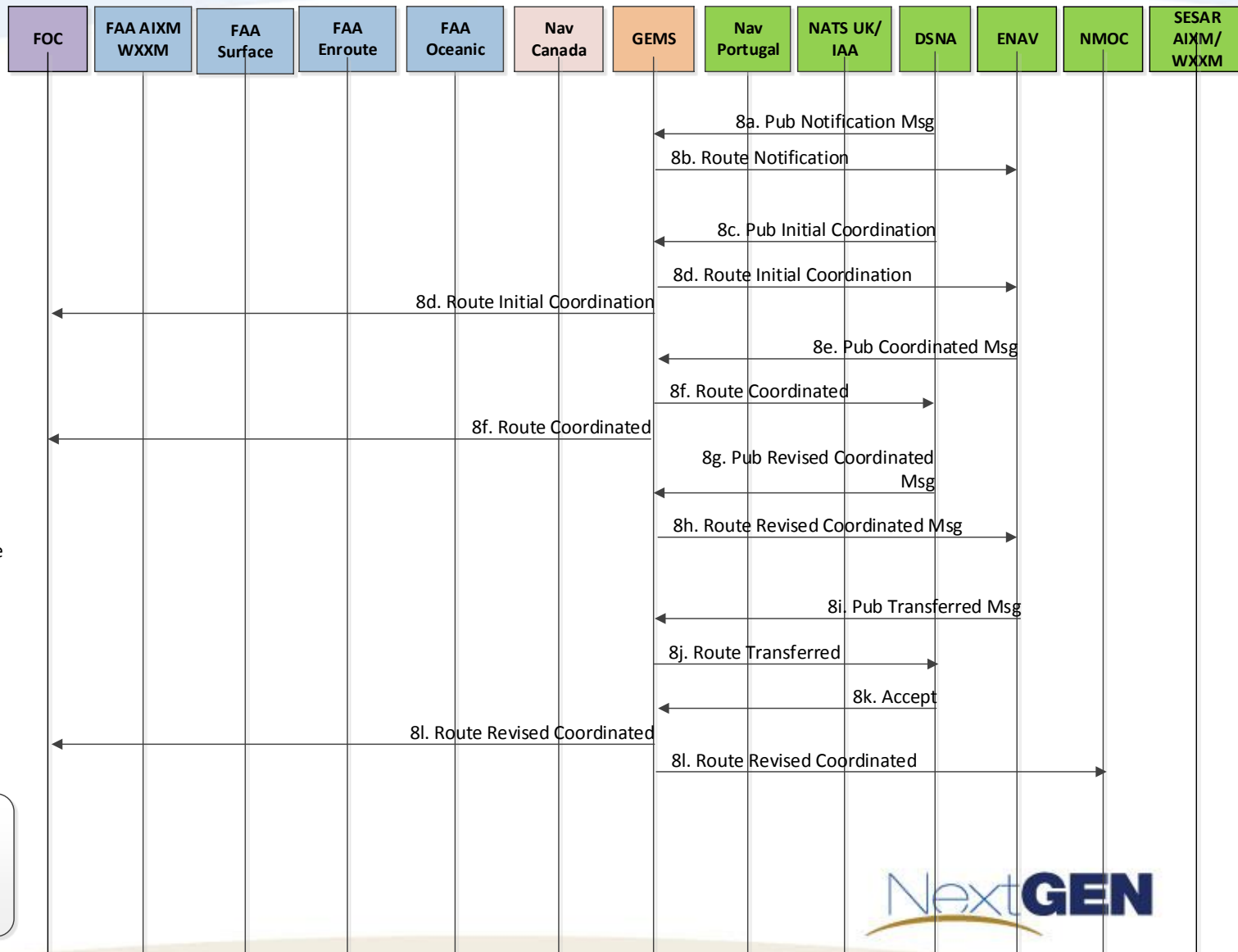
- Notice to Airmen (NOTAM)

Rev 0.1 Summary

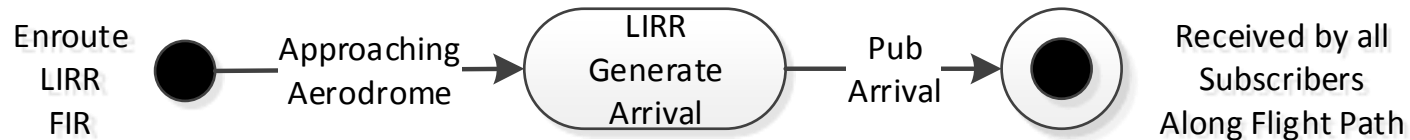
- Initial

LEGEND

Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



Arrival into LIRF – Step 9 OV-6b



- a) Arrival Message issued by ENAV through a GEMS provider. Because accurate ETA information is available much further in advance through Mini Global, ground services can begin preparing for the flight's arrival for a more efficient turn
- b) The GEMS providers route the message to all ANSPs along the flight route (FAA, NavPortugal, NavCanada, NATS-UK/IAA, DSNA), the FOC and NMOC

Arrival into LIRF – Step 9 OV-6c

Rome Arrival

This data flow describes the steps required during the arrival into Rome (LIRF)

Preconditions

The flight is in LIRR airspace

Acronyms

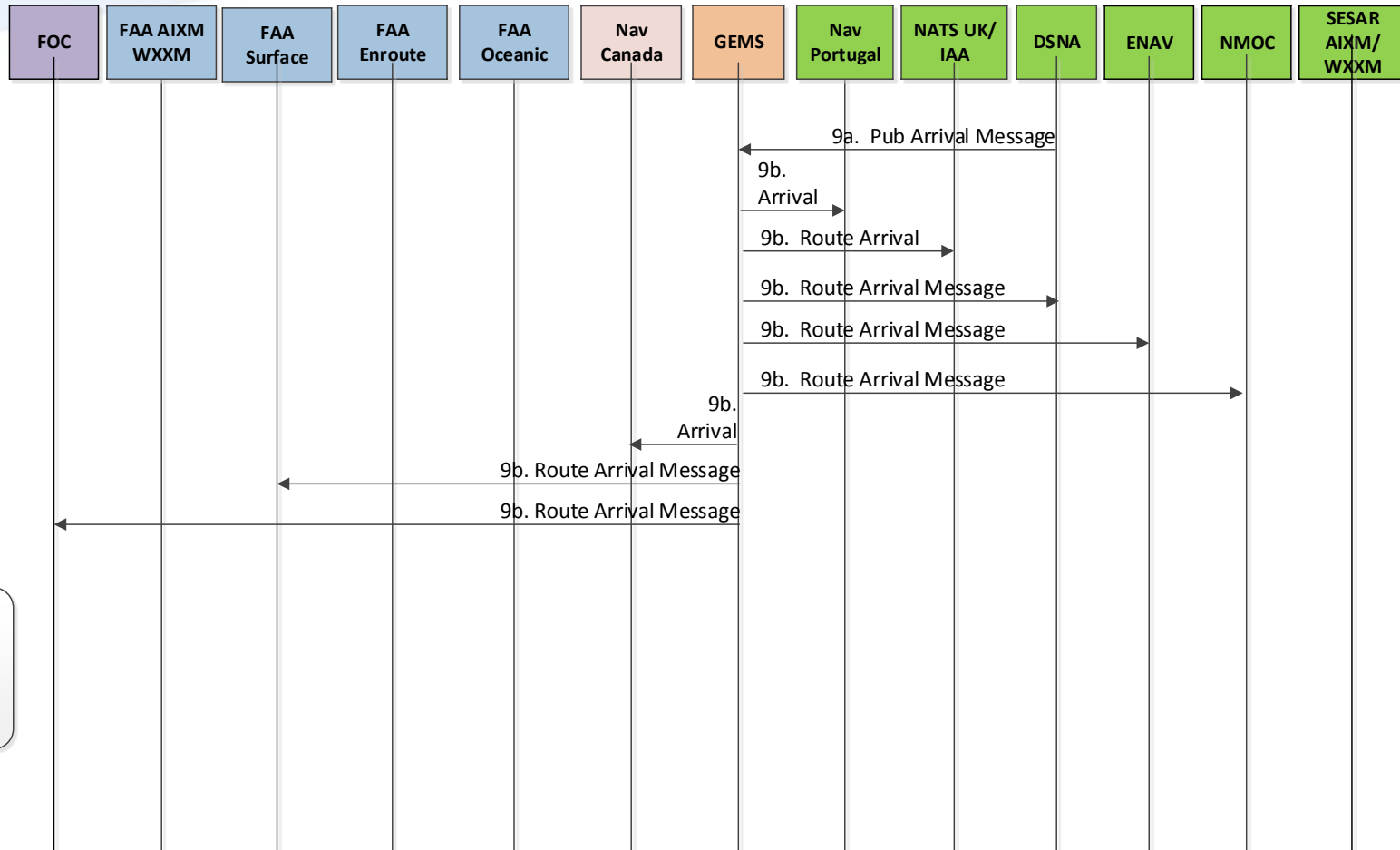
N/A

Rev 0.1 Summary

- Initial

LEGEND

Black lines = FIXM
Green lines = WXXM
Orange lines = AIXM



FAA

Next**GEN**

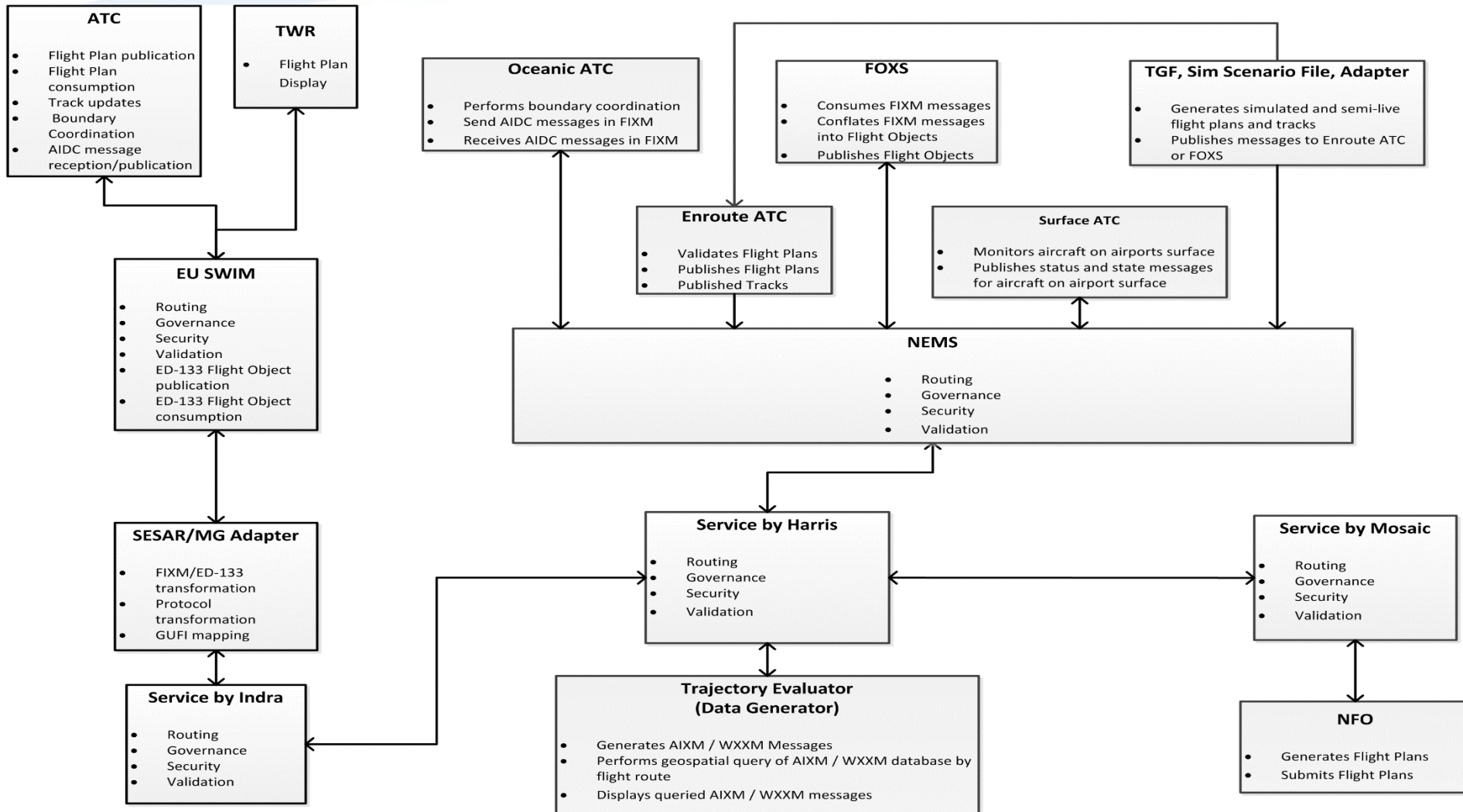
Atlanta to Rome Scenario

- For scenario from ATL to Rome, it is assumed that as a flight crosses boundaries from U.S. to Europe, services must be discovered via the SESAR SWIM Registry
 - ✦ FAA submits flight plan via EMS to SESAR via request/response
 - FAA publishes flight plan to EMS which includes the headers for all flight domains in which the flight would cross (headers taxonomy must be well defined)
 - Data is consumed by EMS Data Manager
 - EMS Data Manager inspects headers and accesses SESAR SWIM registry (or Global SWIM registry) to discover services
 - EMS Data Manager makes necessary web service calls to inject flight plan into each service
 - ✦ FAA submits flight plan via EMS to SESAR via publish/subscribe
 - FAA publishes flight plan to EMS which includes the headers for all flight domains in which the flight would cross (headers taxonomy must be well defined)
 - Data is consumed by EMS Data Manager
 - EMS Data Manager inspects headers and accesses SESAR SWIM registry (or Global SWIM registry) to discover pub/sub endpoints
 - EMS Data Manager publishes to appropriate SESAR pub/sub endpoints



MINI GLOBAL DRAFT SOV-2

Draft SOV-2

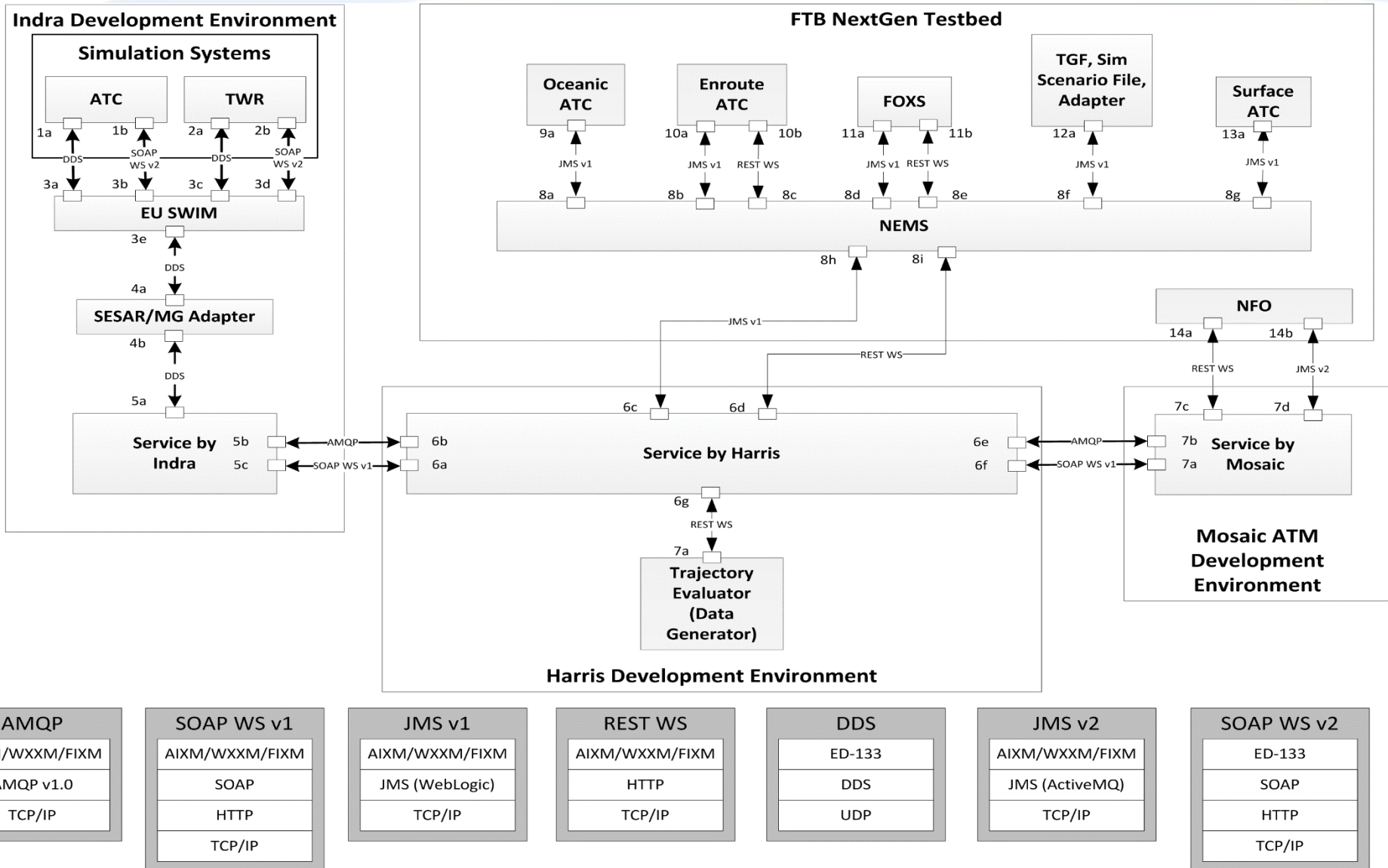


SvcV-2 (SOV-2) Description: SvcV-2 identifies and describes resources consumed and produced by services within a described architecture; in presentation, architectural data are grouped by service and, within service, by service parts.



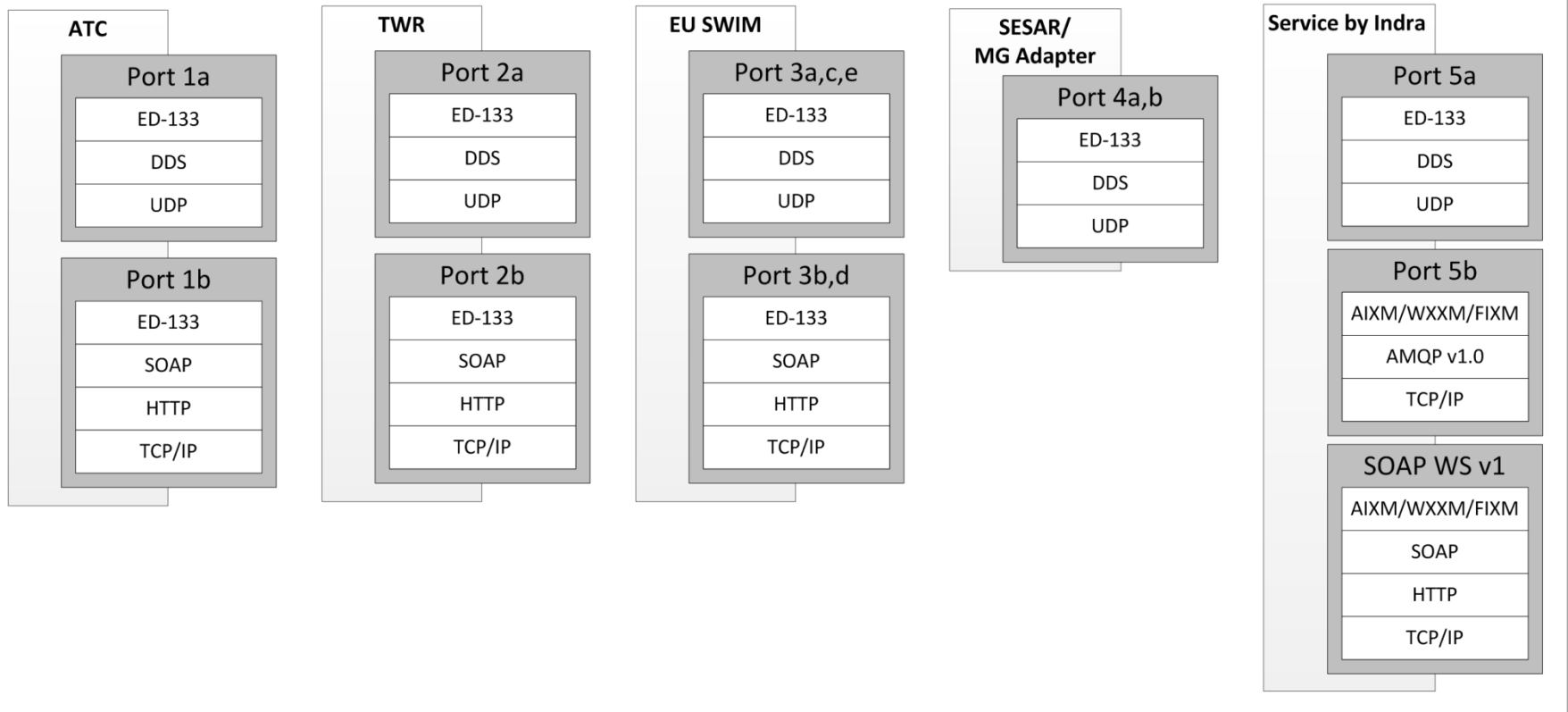
DRAFT NSV-2

Draft NSV-2b

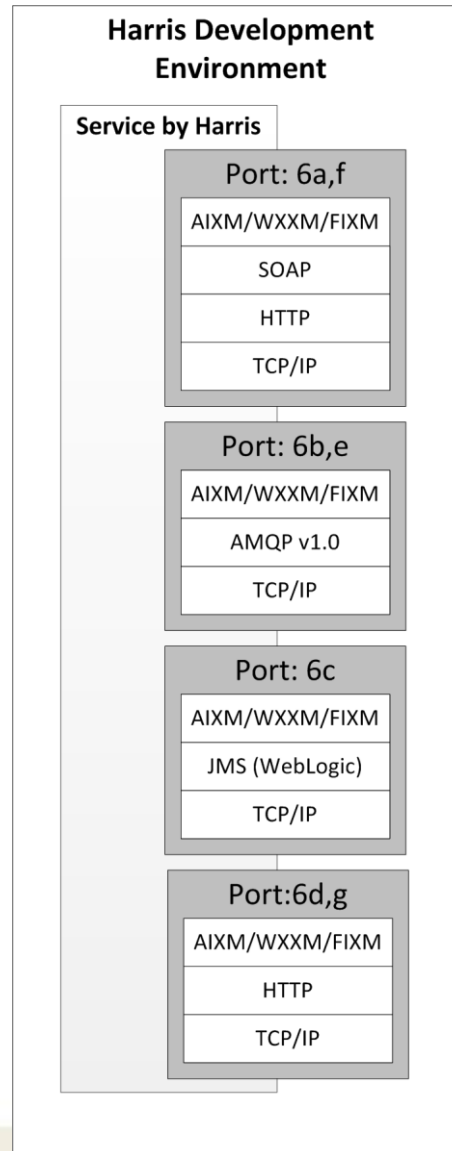


Indra NSV-2a

Indra Development Environment



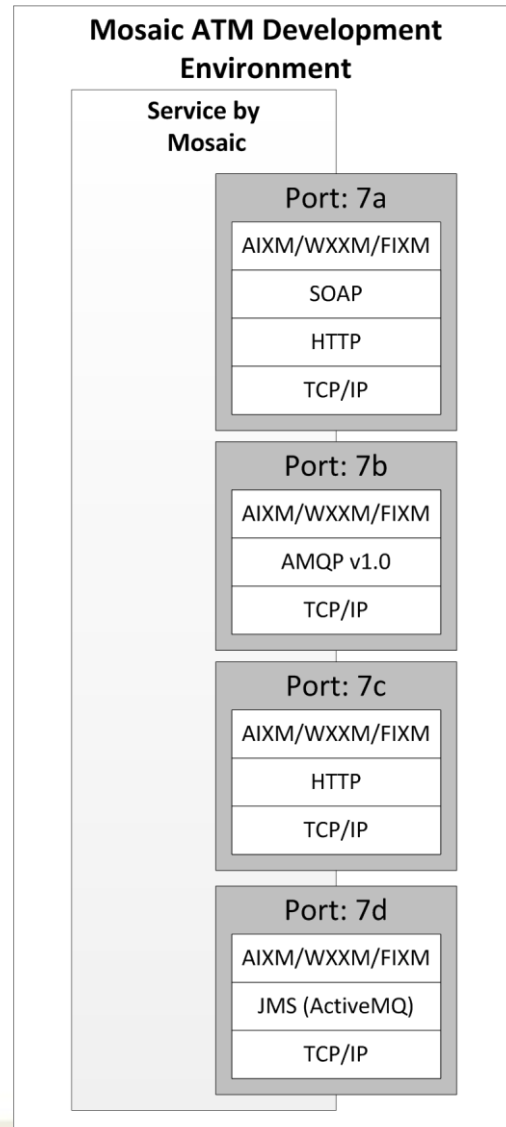
Harris NSV-2a



FAA

Next**GEN**

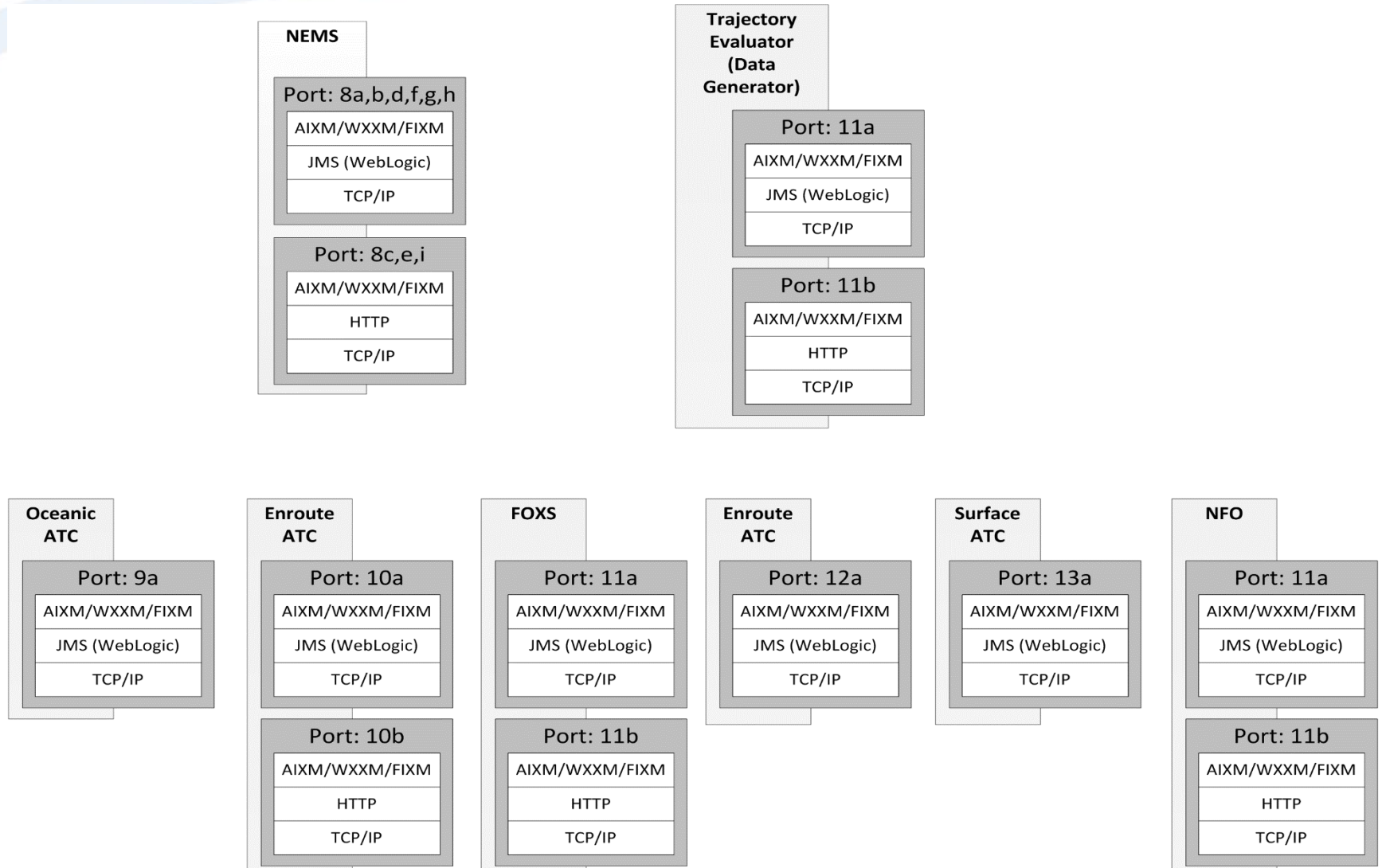
Mosaic NSV-2a



FAA



FAA NSV-2a





SCHEDULE RELEASE OF -XM

Identification of Available Version

- FIXM
 - ✦ Version 3.0.1 (Core)
 - ✦ Version 3.1 (NAS Extension)
- AIXM
 - ✦ Version 5.1
- WXXM
 - ✦ Version 1.1