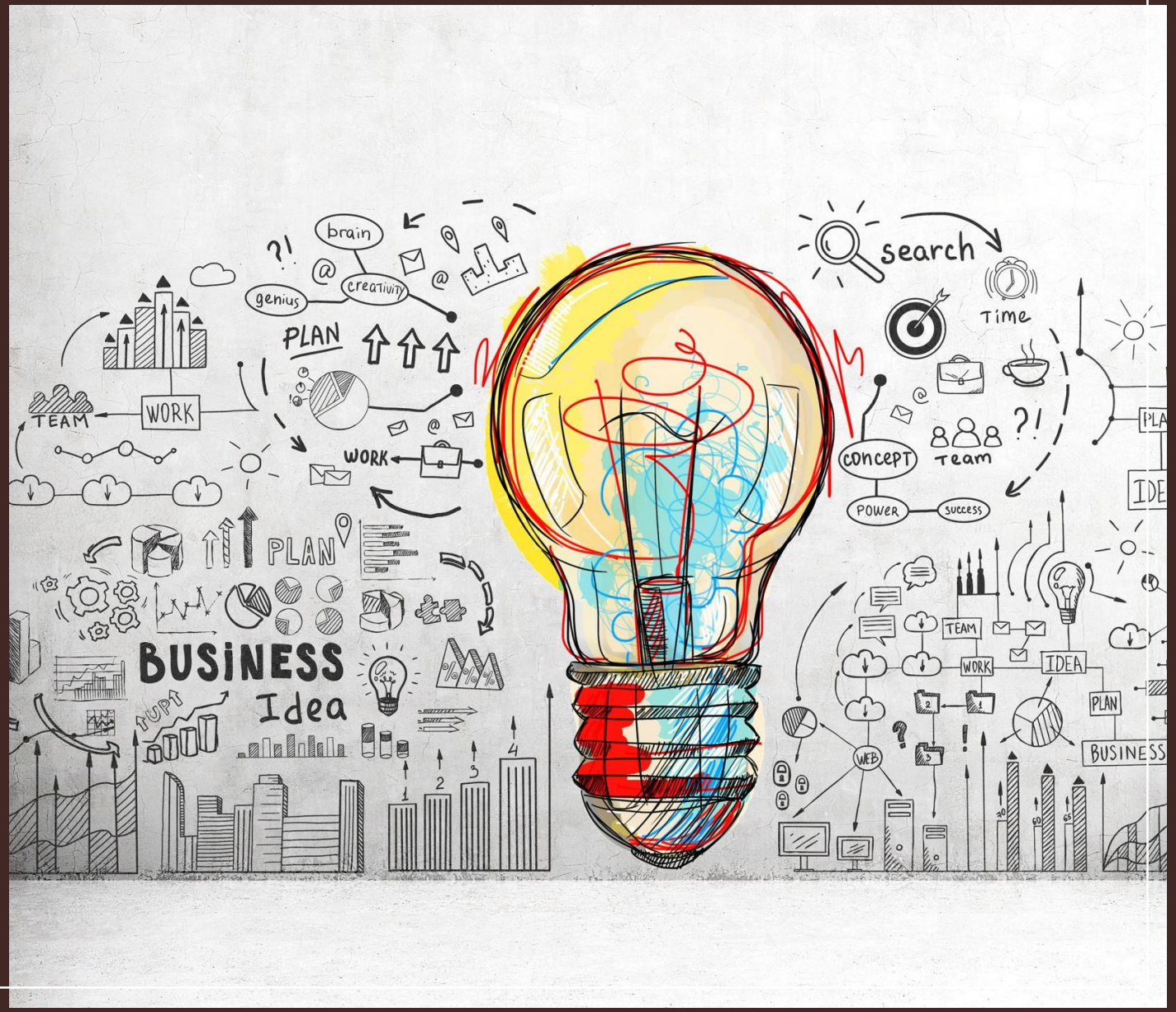

SWIM PROJECT UNDERTAKEN BY AAI AND LESSONS LEARNED FROM SWIM JOURNEY

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Airports Authority of India

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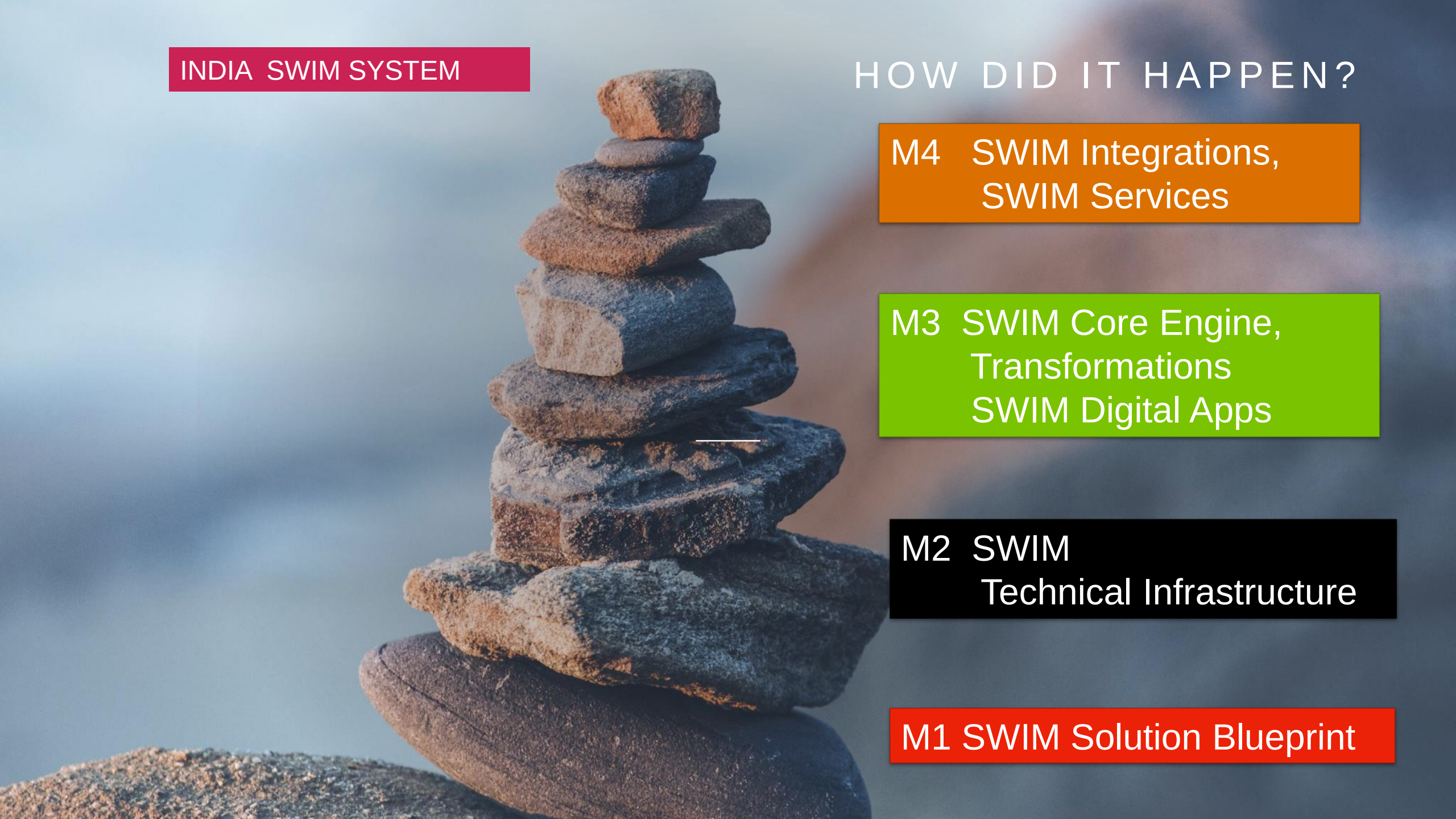


INDIA SWIM SYSTEM

HOW DID IT HAPPEN?

M4 SWIM Integrations,
SWIM Services

M3 SWIM Core Engine,
Transformations
SWIM Digital Apps

M2 SWIM
Technical Infrastructure

M1 SWIM Solution Blueprint

CAPABILITIES OF INDIA SWIM SYSTEM

- You have new way of representing AIM/ATM information
- You have new way of distributing information – SWIM Channel
- You have new way of visualizing the information – SWIM Apps
- You can redistribute MET messages from AMHS channel as equivalent IWXXM messages
- You can issue a digital Flight Plan and view its Trajectory on a Digital Map.
- You can monitor Routes, Airspaces, Traffic in Live through Digital Briefing App.

SWIM INFRASTRUCTURE

Database Engine – Core infrastructure to store SWIM Information

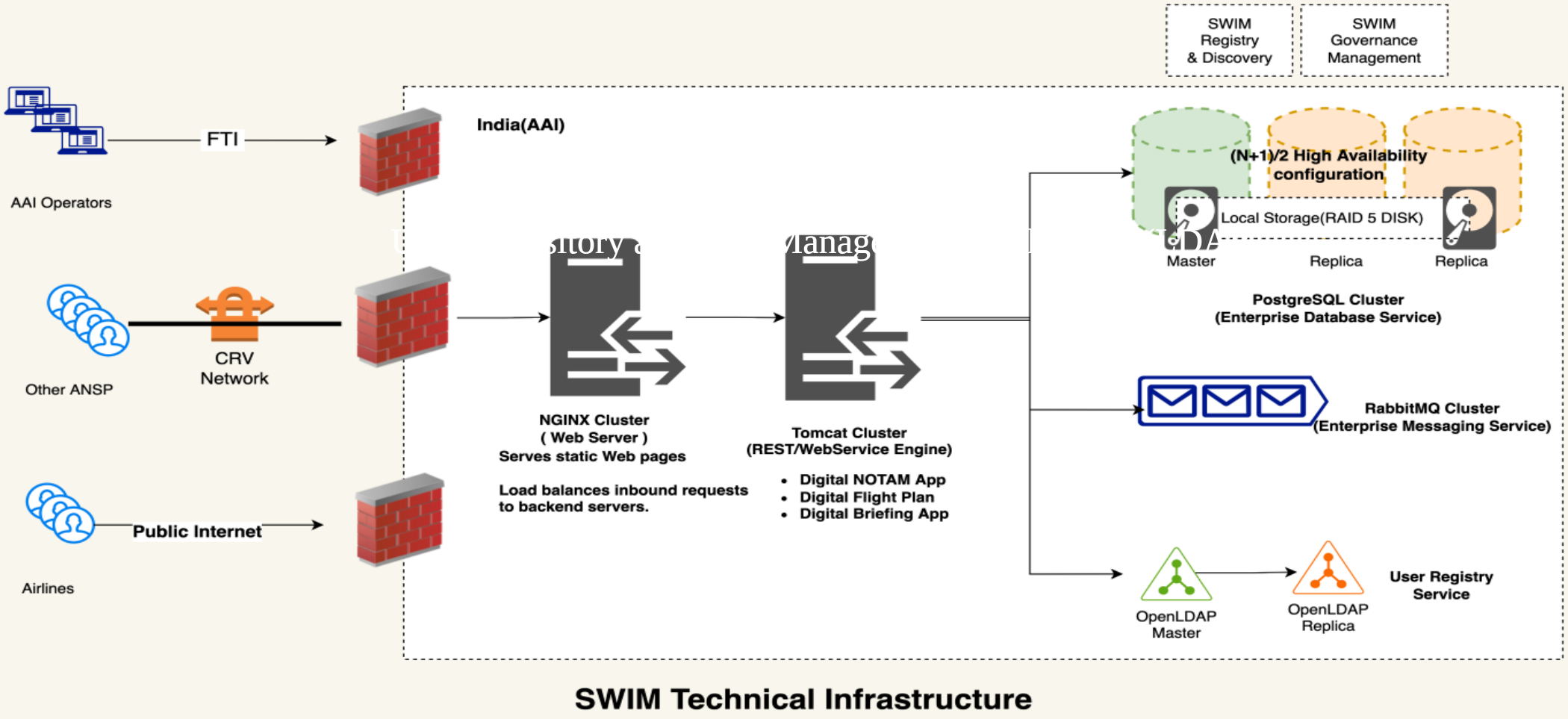
Messaging Service – Core infrastructure to exchange SWIM messages

Application Server – Core infrastructure to host SWIM Services

Web Server – Core infrastructure to serve SWIM Applications

PKI Service – To establish TRUST between SWIM stakeholders

AAI SWIM System Technical Infrastructure



SWIM Technical Infrastructure

INFORMATION EXCHANGE MODELS AND DATABASES

CAPABILITY - TO REPRESENT AND EXCHANGE ATM DATA IN DIGITAL FORMAT.

AIXM v5.1.1

- Engine that processes, validates, and stores AIXM XML messages in AIXM DB.

FIXM v4.2

- Engine that processes, validates and stores FIXM XML Messages in FIXM DB

IWXXM v3.0

- Engine that processes, validates, and stores iWXXM messages in iWXXM DB.

Transform

- Converts ATS to FIXM
- Converts TNOTAM to AIXM
- Converts TAC to IWXXM

FPL DB

- Schema for storing FIXM elements in a relational format.

AIXM/DNOTAM DB

- Schema for storing AIXM/DNOTAM information in relational format with GIS support.

iWXXM DB

- Schema for storing iWXXM information in relational format with GIS support.

SWIM DIGITAL APPS

CAPABILITY – ENABLES NEW GENERATION HMI CONTROLS FOR OPERATORS AND CONTROLLERS.

Digital NOTAM

- Allows to create and visualize Digital/Traditional NOTAMs.

Digital FPL

- Allows to issue and receive ATS messages in both FIXM/Doc 4444 standards.

Digital Briefing

- While it allows to generate PIB reports, it essentially helps visualize the information on a digital map for better situational awareness

Backend Engine

- Validates HMI users, fetches data from DB, translates into HMI requested format(json).

UI Engine

- Provides HMI Control, fetches data from backend, renders the data as tables and maps.

Security Administration

- Provides framework to manage HMI users and assign/revoke privileges.

SWIM GOVERNANCE

CAPABILITY – MANAGE AND CONTROL SWIM SERVICES AND THEIR ACCESSIBILITY.

- For other ANSPs to discover our SWIM capabilities
- Exposed via Service/Registry

Discovery service

- Create and/or retire SWIM Services.
- Manage service versioning

Service Lifecycle Management

SWIM INTEGRATIONS

CAPABILITY – ENABLES EXCHANGE OF MESSAGES WITH OTHER ANSP, SYSTEMS.

AEROTHAI

- Enables ANSP to ANSP communication via SWIM channel

AMHS

- Enables SWIM to Traditional System inter-operability.

Queue Network

Regional Adapter(s)

AMQP Client

P3 Client

INTERFACING WITH AERO THAI SWIM SYSTEM

Objective

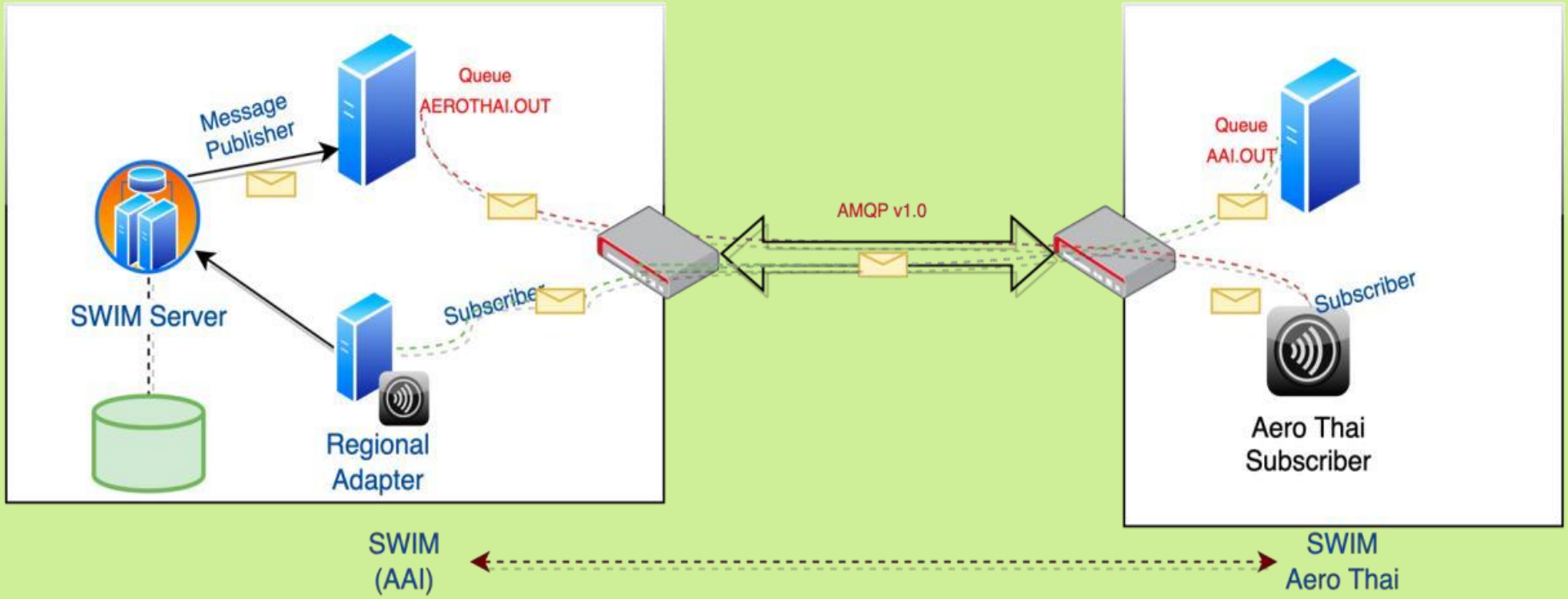
- The core objective of Aero Thai SWIM system integration is :
- ✓ ✓ To verify SWAAIM system inter-operability with Aero Thai SWIM Systems.
- ✓ ✓ To exchange and validate the SWIM messages between 2 ANSPs.

Prerequisites:

- ✓ Network Connectivity – VPN/Internet
- ✓ Agreement on Technical Interface – Publish / Subscribe
- ✓ Agreement on System Protocol – AMQP v1.0
- ✓ Agreement on Message Types and Sub Types – AIXM, FIXM, IWXXM.
- ✓ Agreement on Integration Metadata

THE INTEGRATION ARCHITECTURE BETWEEN AEROTHAI & AAI SWIM SYSTEM

The following diagram depicts the integration architecture between Aero Thai & AAI SWIM Systems



CHALLENGES ENCOUNTERED AND RESOLVED

- SWIM system supports AIXM v5.1.1 while Aero Thai supports v5.1.
- The difference was nullified by implementing implementing an SWIM Adapter Software Module

AIXM Version difference

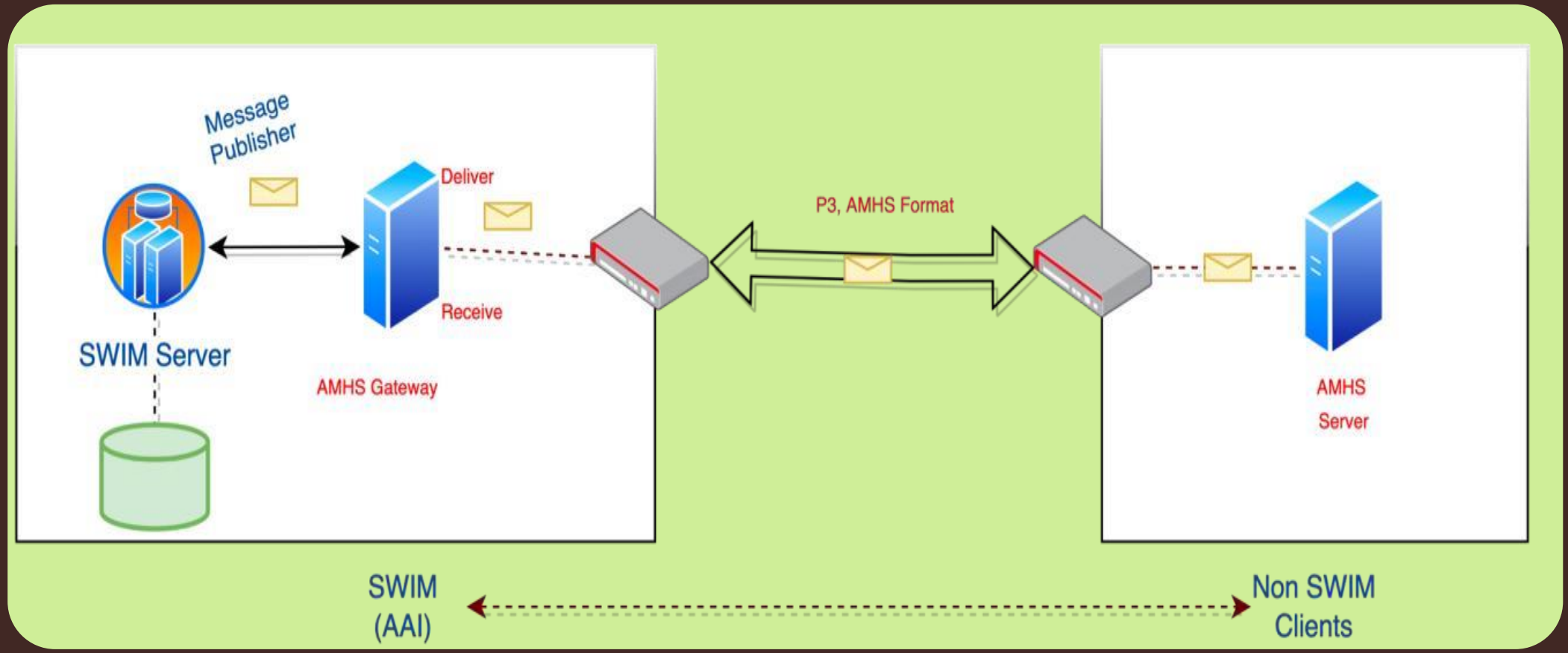
- Aero Thai use AMQP v1.0, while AAI SWIM used v0.9.1
- Upgraded EMS Server to support AMQP v1.0.

AMQP Version difference

- The Aero Thai team received the message body but not properties in the header. The same message when viewed through our EMS web interface, the properties were indeed present.
- Developed a AMQP Message Converter module to to convert the message structure used by our EMS EMS server into the one respected by Aero Thai EMS Server.
- Every message published by AAI SWIM system converted by this converter before publishing into into AEROTHAI.OUT Queue

Message Header Properties Properties Not Set properly

THE INTEGRATION ARCHITECTURE BETWEEN SWIM SYSTEM AND MUMBAI AMHS



CHALLENGES FACED AND RESOLVED

AMHS P3 Address Format:

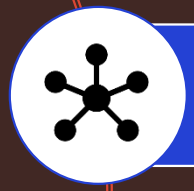
- Modified the P3 Address format to change the IP Address to point to Mumbai AMHS server

AMHS Message Format:

- Messages were dropped to Error Queue.
- Message Body not fully complying with Doc-9880 format.
- Corrected our software to make the AMHS body fully compliant with the specification.
- Now messages are found in AMHS ‘INBOX’ folder.

LESSONS LEARNED FROM SWIM JOURNEY IN AAI SO FAR

•Very few digital NOTAM scenarios are available as of now. Other Digital NOTAM scenarios need to be identified.



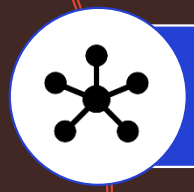
•SWIM adapter is required for interfacing with other SWIM system. Difficult to manage so many adapters

Collective efforts required by all stakeholders like airlines, regulators, Defense, ANSPs for deciding usage and scope of operationalization of SWIM implementation.

•The readiness of airlines operators to come on SWIM platform and their infrastructure requirements needs to be ascertained for SWIM implementation

EXPECTATIONS FROM REGIONAL SWIM TASK FORCE

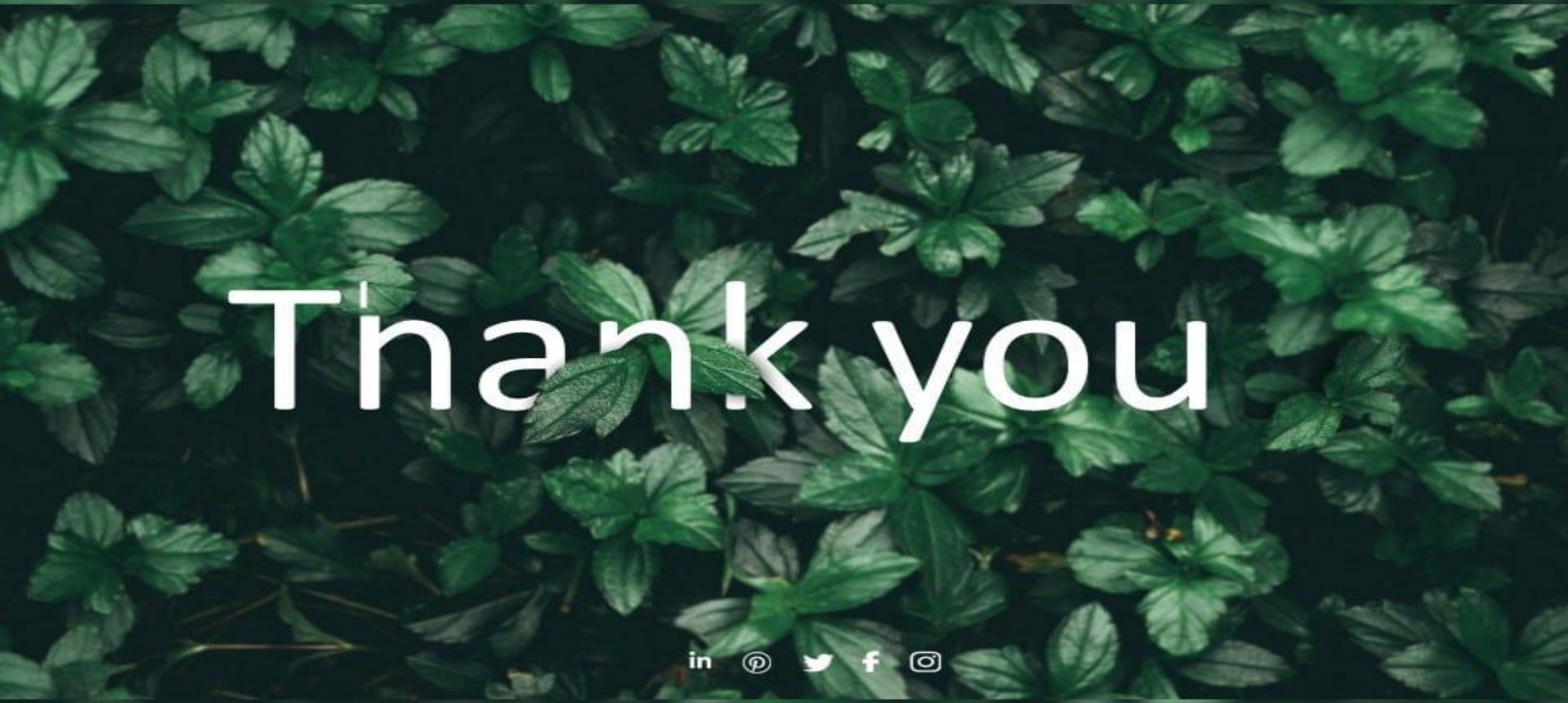
•The use of CRV to support SWIM may result in additional bandwidth demands due to the nature of XML based messages. What will be cost sharing mechanism for producer and consumer of SWIM services on CRV.**scenarios need to be identified.**



• SARPS to integrate with 3rd party SWIM systems amid the technological and implementation differences between the different SWIM systems. and regional SWIM. For instance , AAI had to develop SWIM adapter to harmonize different SWIM implementations of AAI (AIXM 5.1.1) and AeroThai. (AIXM 5.1).

Any case study on regulatory body governance model to ensure that common set of policies, rules and standards that are applied for internal stack holders in any member stateand enforced throughout the Asia/pacific region.

•Update on Asia/Pacific regional SWIM cyber security architecture framework and SWIM security strategy in line with ICAO international Aviation Trust framework (IATF).


Thank you