Singapore's SWIM Journey

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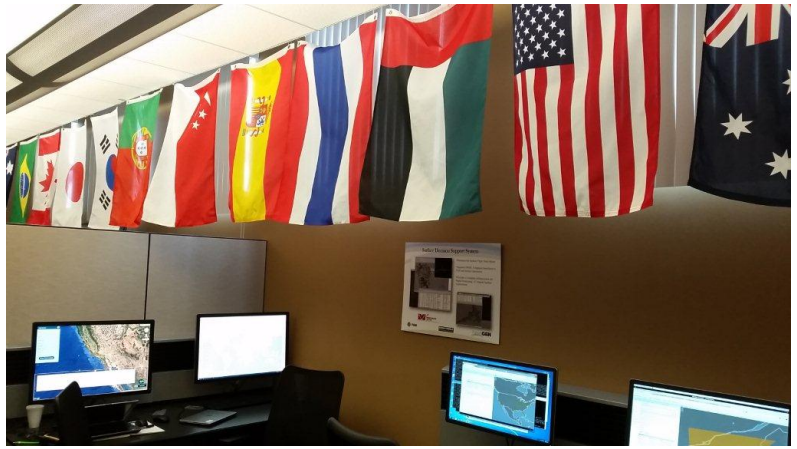
CAAS
Civil Aviation Authority of Singapore

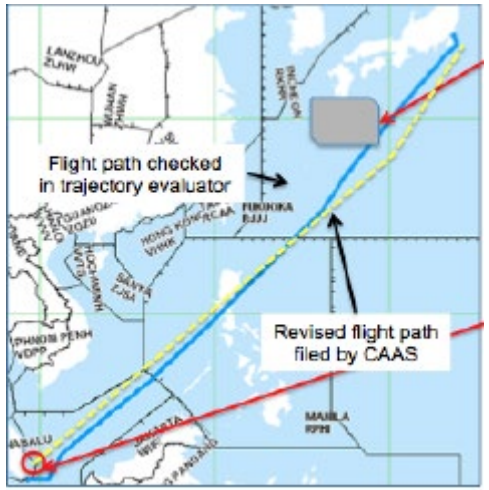
In The Beginning

Civil Aviation Authority of Singapore

Days of Exploration (1)

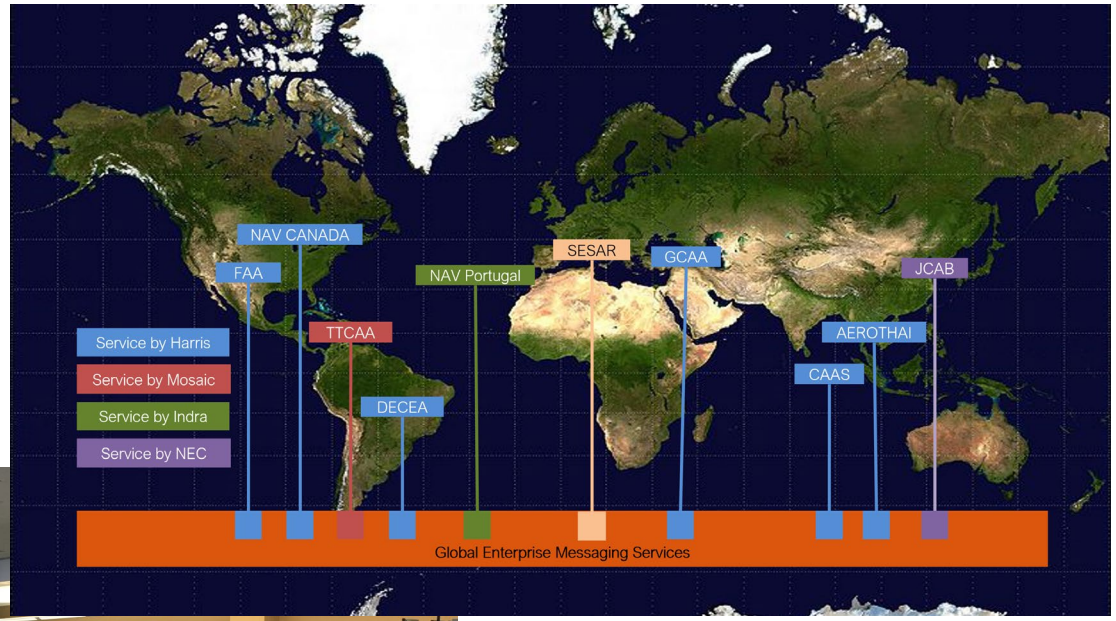
- Civil Aviation Authority of Singapore first introduced to the concept of SWIM through the Mini Global Demonstrations
  - Mini Global I demonstration in 2013 organized by US-FAA
    - Introduction to idea of Service Oriented Architecture
    - Data models
    - SWIM Services
    - Use cases for SWIM

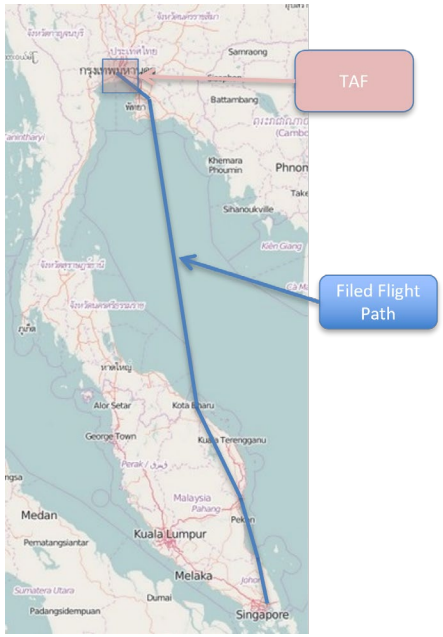


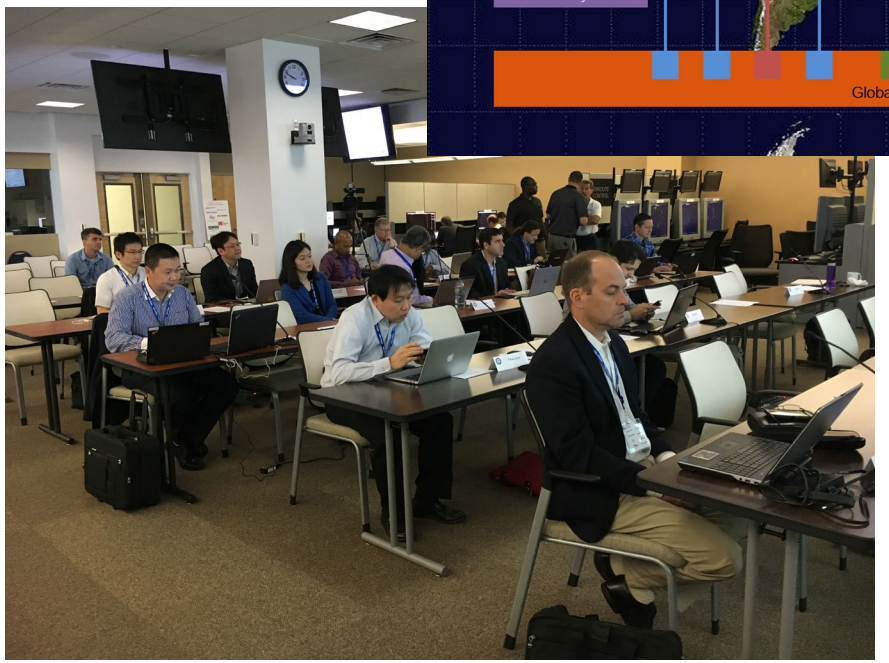


Days of Exploration (2)

- Mini Global II demonstration in 2016
  - More detailed use cases
  - More elaborate use of the data models.
  - Provide more clarity on potential benefits







First Steps

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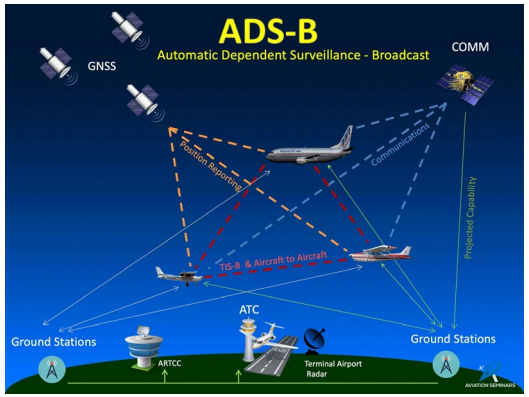
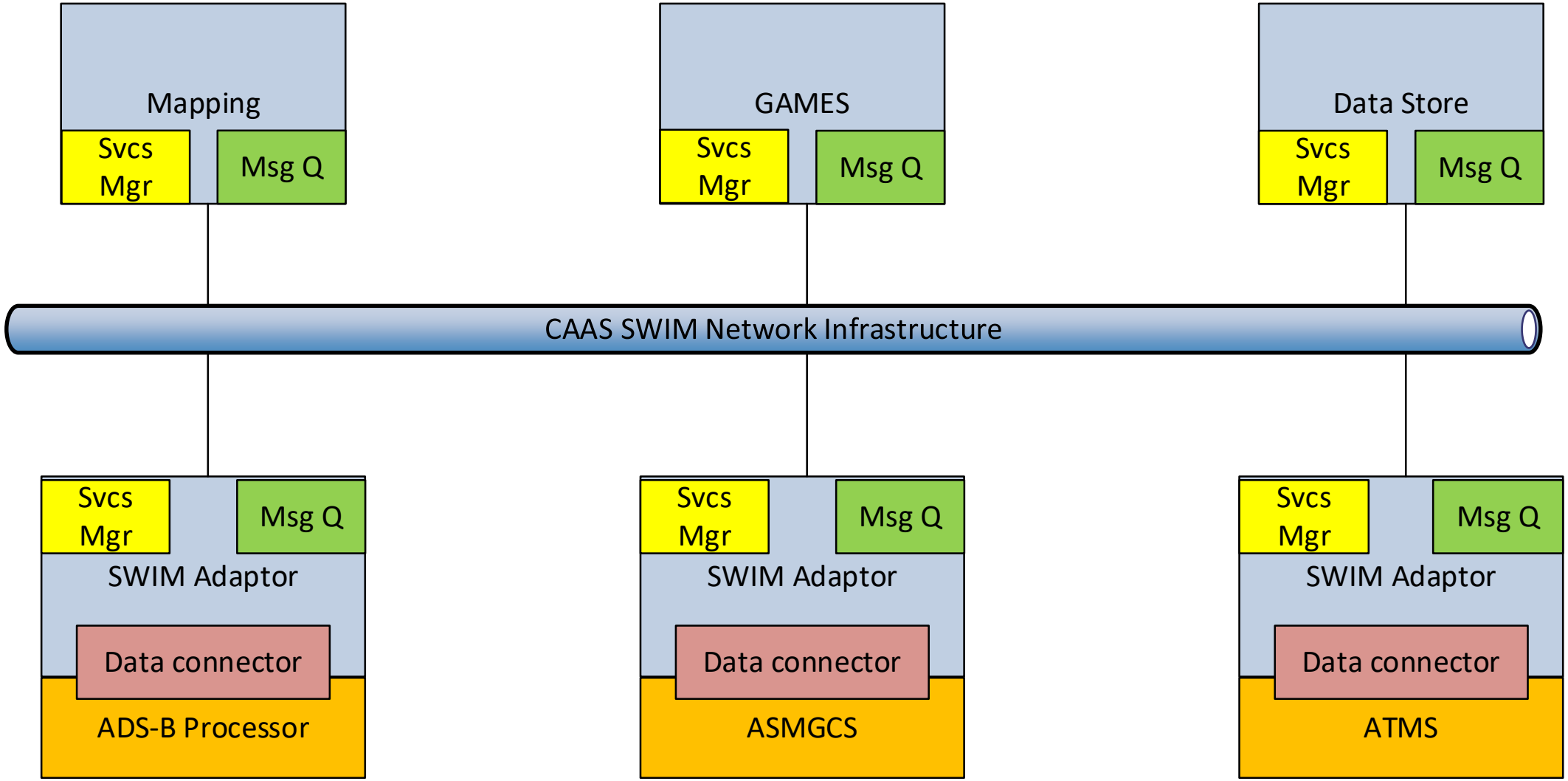
Initial Foray

- Experiment with Prototype SWIM in 2015
  - Decision was made to build a decentralized message management SWIM
    - Each information producer manages its own message publication
  - No web based registry.
  - Completed implementation in 2017
    - Information producers were surveillance systems e.g. ADS-B and A-SMGCS
    - Information consumers were analytical systems and data storage system

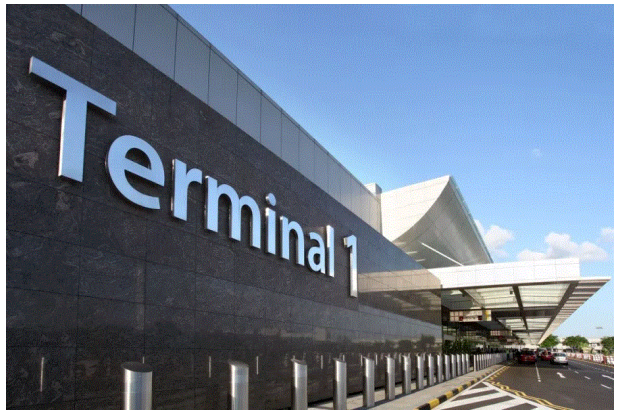


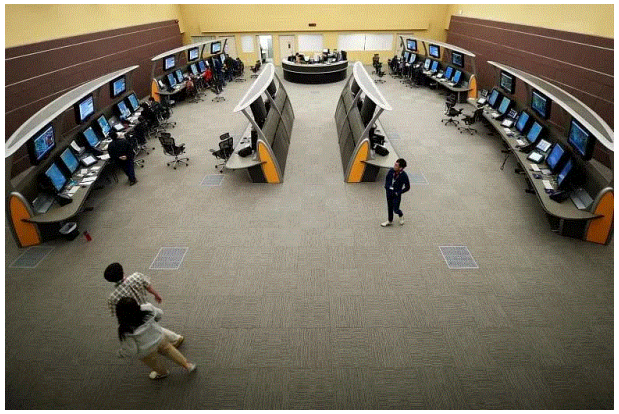
CAAS SWIM Prototype



Coverage

- Physical coverage of the CAAS SWIM
  - No end-points for public access
  - Limited to only end-points within CAAS premises
    - Singapore Air Traffic Control Centre
    - Changi Control Tower
    - Changi Airport Terminals 1 and 2





SWIM Education and Next Steps

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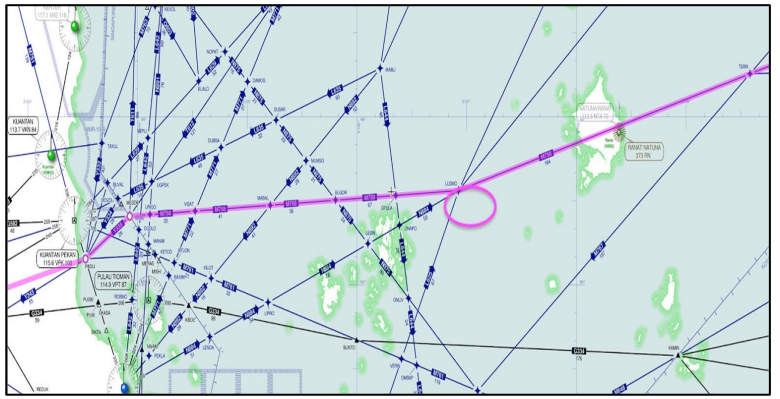
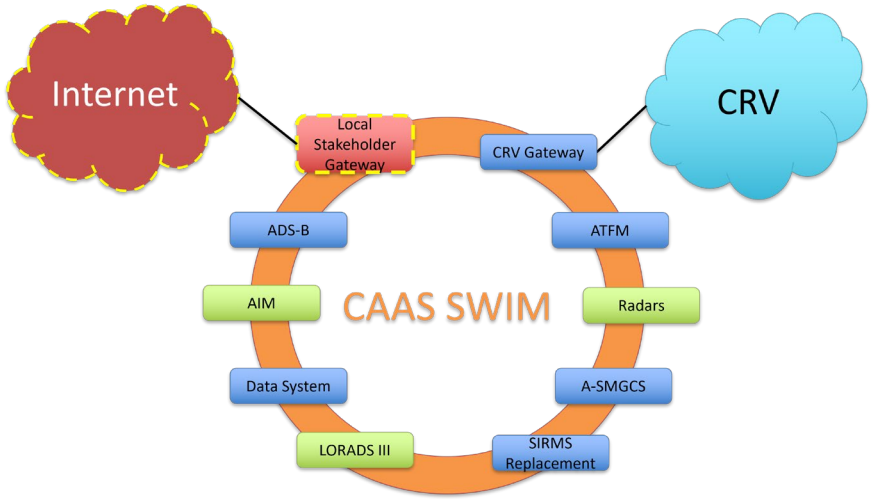
Subsequent work

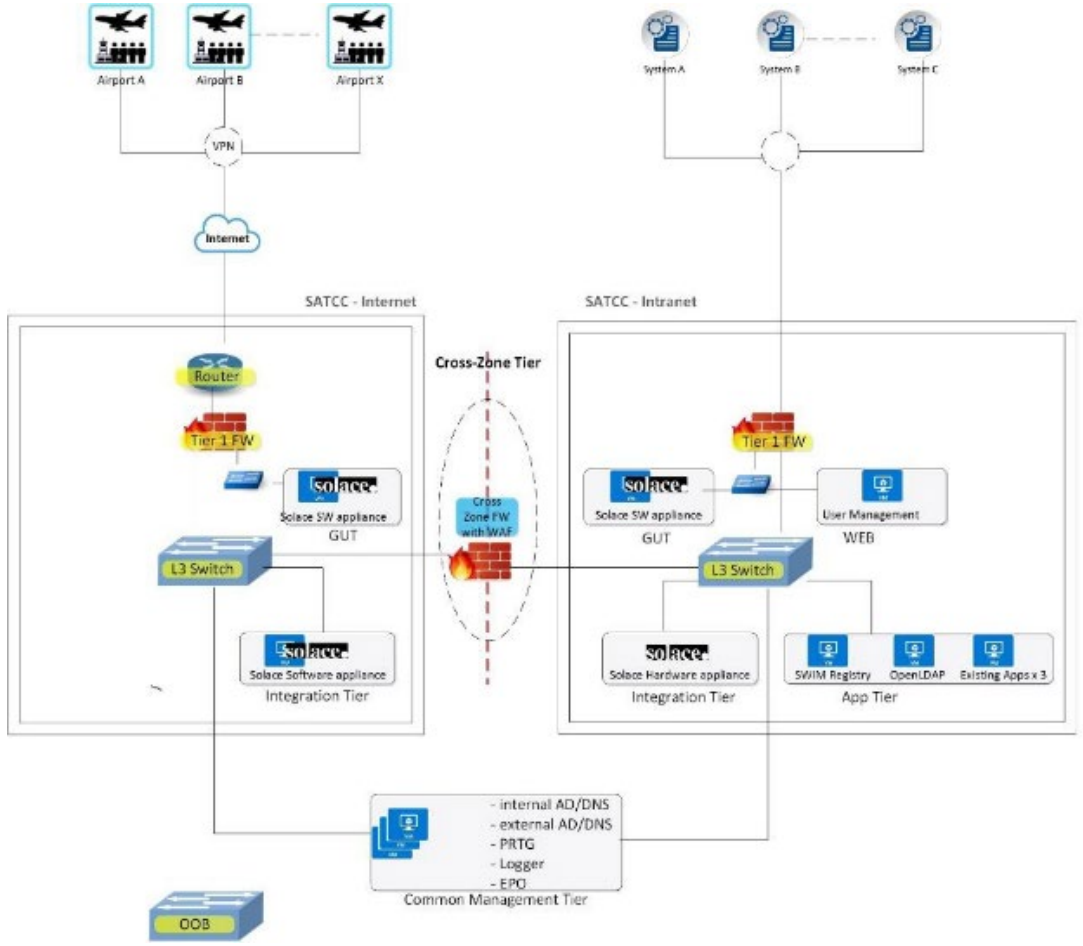


- ASEAN SWIM Demonstration in 2019
  - Focused on use cases relevant to the region
  - Built a distributed EMS architecture suitable for the demonstration
  - Many lessons learnt during the demonstration that influenced the direction of the SWIM TF, e.g. the Distributed EMS architecture.
- 2020, decision to upgrade the CAAS prototype SWIM to be capable of support ATM operations.



SWIM Upgrade

- Move from a decentralized message management to a central EMS
- Web based SWIM registry
- Extend physical reach to the Singapore Aviation Academy
- Provision for CRV Gateway (2023)
- Provision for Internet Gateway (2024)
- Support ATFM operations
- Support ADSB data sharing initiatives



Lessons Learnt

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From the MG I and MG II demonstrations

- SWIM simplifies inter-system / inter-application communications
  - Loose coupling between consumer and producer
- SWIM enables interoperability
  - Standardized data models
  - Standardized communication protocols
- SWIM creates new opportunities and innovations
  - Make data widely available
  - Opportunities for data mining and machine learning applications

From the ASEAN SWIM Demonstration

- Distributed EMS architecture
  - One most likely to work in the Asia-Pacific region
- Many clear use cases for SWIM implementation in APAC
  - Strong aviation growth projected for this region
  - Need to share information to optimize regional air space
  - Not difficult to get started
- There needs to be a transition plan into APAC SWIM from AMHS / AFTN
  - No big bang approach
  - Likely to have both for years to come
  - Need to ensure that aviation safety in this transition phase is maintained.

From implementation of the CAAS SWIM (1)

- Do not confuse SWIM infrastructure and SWIM infrastructure services with SWIM enabled applications and SWIM information services.
  - Confuses your users about where the boundary for SWIM is.
- SWIM is essentially communications infrastructure
- Decide early on the suitable SWIM architecture for your purpose
  - Do study visits
  - Attend SWIM seminars
  - Read the papers, ICAO manuals.
  - Seek help
- Develop a SWIM policy for your organization
  - Do all your systems need to be on SWIM?
  - Do you want all new systems to be acquired to be SWIM capable?
  - Create clear on-boarding process to bring in new applications and services.
  - Have a clear policy on how to deprecate (retire) applications and services.
    - There are dependencies that need to be take care of
  - Have a maintenance plan.

From implementation of the CAAS SWIM (2)

- Design from the CAAS SWIM Prototype ideal for Cloud implementation
  - Focused on microservices
  - Distributed design easy for expansion
  - Consumes significant network bandwidth
  - Distributed monitoring
  - Service management and maintenance complexity
- CAAS SWIM upgrade
  - Central EMS to easy the management and monitoring of message queues and bandwidth.
- Original design is not abandoned but may be taken up again when moving to cloud based.

Singapore’s Expectations from the SWIM Task Force

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What we hope the SWIM Task Force will provide

- Hybrid EMS architecture to be implemented across APAC
- Standards to govern inter-registry communications
- Framework for SWIM Security Services
- List of common Information Services
- Transition plan
  - From non-SWIM to SWIM
  - Integrating with AMHS and transiting from AMHS to SWIM by 2030
- Onboarding Framework
  - Process to on-board stakeholders into the APAC SWIM.

Questions?

Thank You

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