Joint Event - Lessons Learnt from the SWIM Perspective

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CAAS
Civil Aviation Authority of Singapore

SWIM Support for the Joint Event

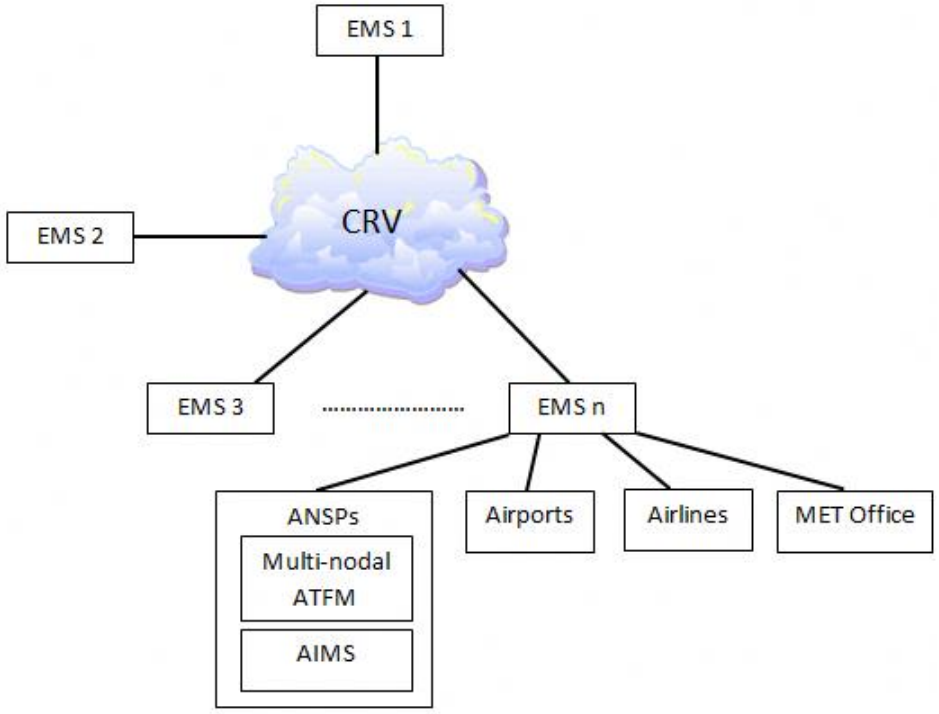
Civil Aviation Authority of Singapore

Joint event Timeline

- In 2019, the DG of CAAS, DG of HK CAD and President of AEROTHAI agreed to organize demonstration of SWIM operating over CRV.
  - Goal is to show that the CRV is a suitable IP infrastructure upon which SWIM can be built.
  - Target date was between end 2020 and beginning of 2021
- Covid disrupted these plans
- Surveillance Study Group tasked with investigating the possibility of sharing Surveillance data over SWIM
  - Established the S3TIG to support the trial implementation in Dec 2022.
- In SWIM TF/7 proposal to combine both events into a Joint Event
  - Both will be using SWIM
  - More efficient use of resources to have both run on the same infrastructure.
  - Able to generate more realistic IP traffic loads.
- SIPG established to construct the APAC SWIM prototype
  - SWIM TF/8 proposal to use the APAC SWIM prototype for the Joint Event

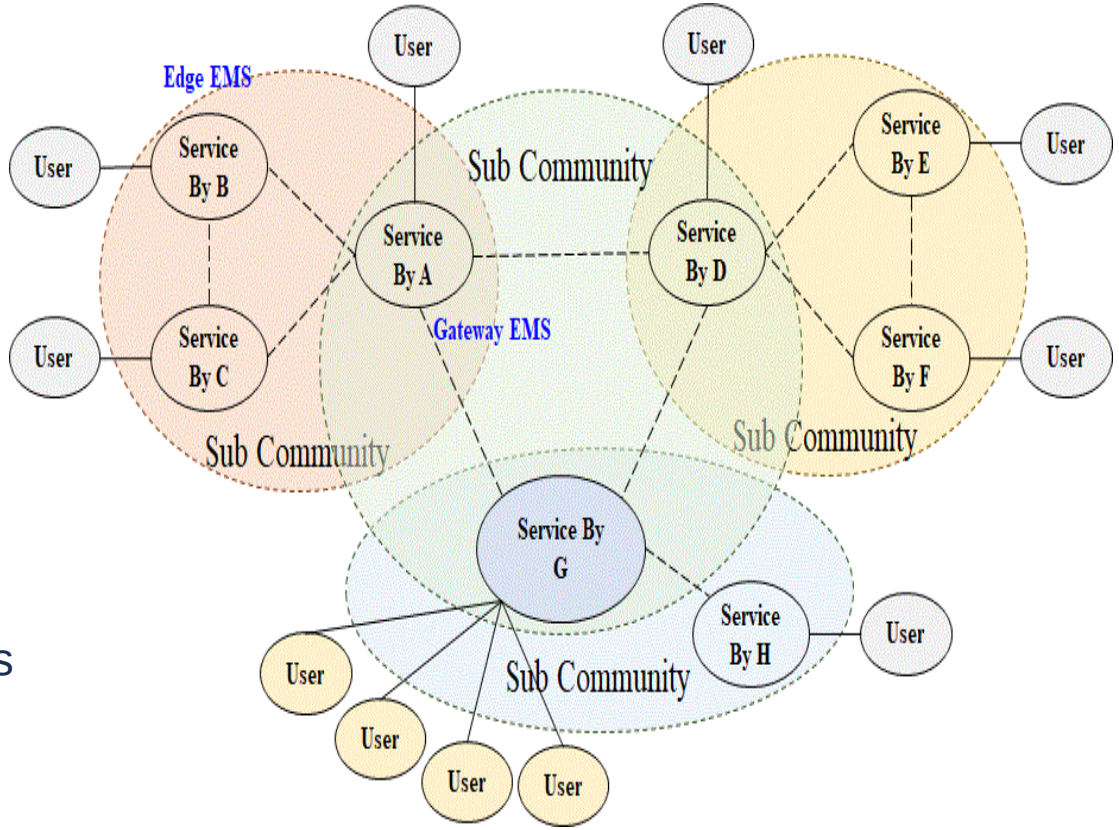
SWIM Architecture

- Planned to adopt the architecture as agreed during SWIM TF/2 WP/15 (See figure)
  - Use of CRV as the base IP network
  - Multi EMS architecture
- Assumptions
  - That the operational CRV could be used to construct this architecture
  - That the CRV can support any-to-any connections between subscribers
  - EMS will use AMQP 1.0



SWIM Architecture

- Actual situation
  - The operational CRV could not be used due to various reasons. PCCW setup a pseudo-CRV to facilitate the SWIM architecture
  - Connections between subscribers is done thru GRE tunnels.
    - 1 tunnel per communicating pair.
    - Puts some restrictions on the eventual SWIM implementation
  - EMS all have slightly different implementations of the AMQP 1.0 standards.
    - Puts some restrictions on how the message queues can be setup and managed
- SWIM Architecture
  - Adopted a 2-tiered hierarchical architecture



SIPG Lessons learnt

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Lessons learnt (1)

- Importance of metadata and consistency of the metadata format and naming for message routing
- Monthly meetings are useful; however, they are limited in what can be achieved
  - Usually dominated by a few participants
  - Hard to have free flowing discussions where participants can air their issues and get help or advice
- A lot of coordination needed in the initial stages to get all the message queues setup properly
  - Daily calls were setup between key EMS participants to ensure messages were transmitted and processed correctly.
- Demo trial runs necessary and were done close to the event.
  - Implies that onboarding of services will need a lot of testing and coordination.

Lessons learnt (2)

- Different EMS models created constraints even though all using AMQP 1.0
- Having to create a JSON model to share surveillance information
  - Not complete yet. Good enough for this trial.
- Moving ADS-B data over SWIM at the default update rate of 1 sec uses up a lot of bandwidth.
  - Causes message queues overload and failure.
- Not all initial assumptions were true.
  - Will need to generate a list of SWIM requirements and expectations for the supporting IP infrastructure.

Questions?

Thank You

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