Simulated SWIM services in ATM

Niklas Häggström, Knowledge Agency
SWIM – System Wide Information Management

“SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services.”
The right information to the right stakeholders, at the right time, in a secure way

- Connecting the ATM stakeholders
- Creating an interoperable information infrastructure
- Making the ATM system adaptable
- Increasing the level of automation
- Integrating the Aircraft as a node in the ATM network
SWIM & SIM High Level Architecture

**SWIM**

Services:
- Flight Information
- MET
- Aeronautical Information
- Etc.

**SIM**

Services:
- Ground truth generation
- Simulation Management
- Recording

Prototype

Industry Based Platform

SWIM Simulator

Simulator
Use Cases for a SWIM Simulator – our experiences

**Set-up**
- A stand-alone SWIM Simulator can be used by each developer
- The SWIM Simulator provides all necessary SWIM infrastructure in addition to the ATM Services
- Non-complex, deterministic simulations

**Benefits**
- Enables the developers to test and verify their Service providers/consumers in their local development environment
- No connection to other systems required

RAeS Modelling & Simulation in Air Traffic Management Conference
London, 14-15 November 2015
Use Cases for a SWIM Simulator – our experiences

**Set up**
- The SWIM Simulator will provide/consume services
- Non-complex, deterministic simulations
- IBPs and Prototypes are integrated when ready, in a stepwise approach

**Benefits**
- Minimizes dependencies between development teams and eases integration planning
- Allows for multiple, parallel integration environments
Use Cases for a SWIM Simulator – our experiences

- The SWIM Simulator provides simulated services that can be used by prototypes
- Simulation technique depends on scenario/operational context
- Normal or fast time simulation
- Playback can be performed to inject scenarios into concept development exercises
- Recording can be performed to analyse results at a later stage
Use Cases for a SWIM Simulator – our experiences

A SWIM Simulator can have many roles in Validations:
- Provide/Consume simulated ATM Services
- Distributed simulation
- Record and playback of data
- Provide Infrastructure Services
- Allows for complex validation scenarios in a limited technical set-up
Use Cases for a SWIM Simulator – our experiences

Combining all of the previous functions, the SWIM Simulator can be used to:

- Prepare large scale demonstrations (development & Integration)
- Scale demonstrations by simulation
- Record and playback demonstration scenarios

Industry Based Platform           Prototype             SWIM Simulator
SWIM Prototype Airport Digital Services - SPADS

- Research project to investigate:
  - *In what way will digital services and digitalisation support ATM locally in Sweden?*
  - *What needs to be developed in order to withdraw maximum benefit and effects of the digitalisation?*
- Running from October 2016 to December 2018 with large demonstrations in June 2017 and April 2018
SPADS Scenarios - overview

**SNOWTAM**
- MET-induced operational scenario
- Airport Operations Centre (APOC) and Air Traffic Control (ATC)
- SNOWTAM, Runway Capacity & Flight Information
- SESAR SWIM Services

**MEDICAL**
- Medical event scenario
- Airspace User, APOC and ATC
- Event, File and Flight Information
- Mix of SESAR and SPADS research services

**TECHNICAL**
- API catalogue / SWIM Registry
- Service configuration and orchestration
- SWIM Technical Infrastructure Profiles and bindings
Observed benefits

- **SWIM has an impact on business**
  - Forces stakeholder responsibilities to be clarified
  - Discussions on value and revenue can be held

- **SWIM enables flexibility**
  - Same type of services can be used in several contexts
    - E.g. remote/traditional tower implementations

- **The same service can be implemented using different technologies**
  - SOAP, REST and AMQP implemented successfully for all SESAR Services

- **Simulation is key to perform demonstrations and achieve stakeholder buy-in**
Our view on the main challenges

• **Establishing SWIM Governance**
  • To agree on a core set of ATM services and who should provide/consume them
  • While leaving freedom for stakeholders to create added-value services where applicable

• **Creating a common, reusable design**
  • To avoid unique implementations at each ATM stakeholder

• Likely implications if not resolved:
  • Fragmented and costly implementation of new concepts
  • Low level of interoperability among stakeholders
  • **Decreased** efficiency in ATM

Simulation will help address the challenges by quickly making SWIM tangible, visible and quality assured in a cost efficient way.
Thank you

niklas.haggstrom@knowledgeagency.se