

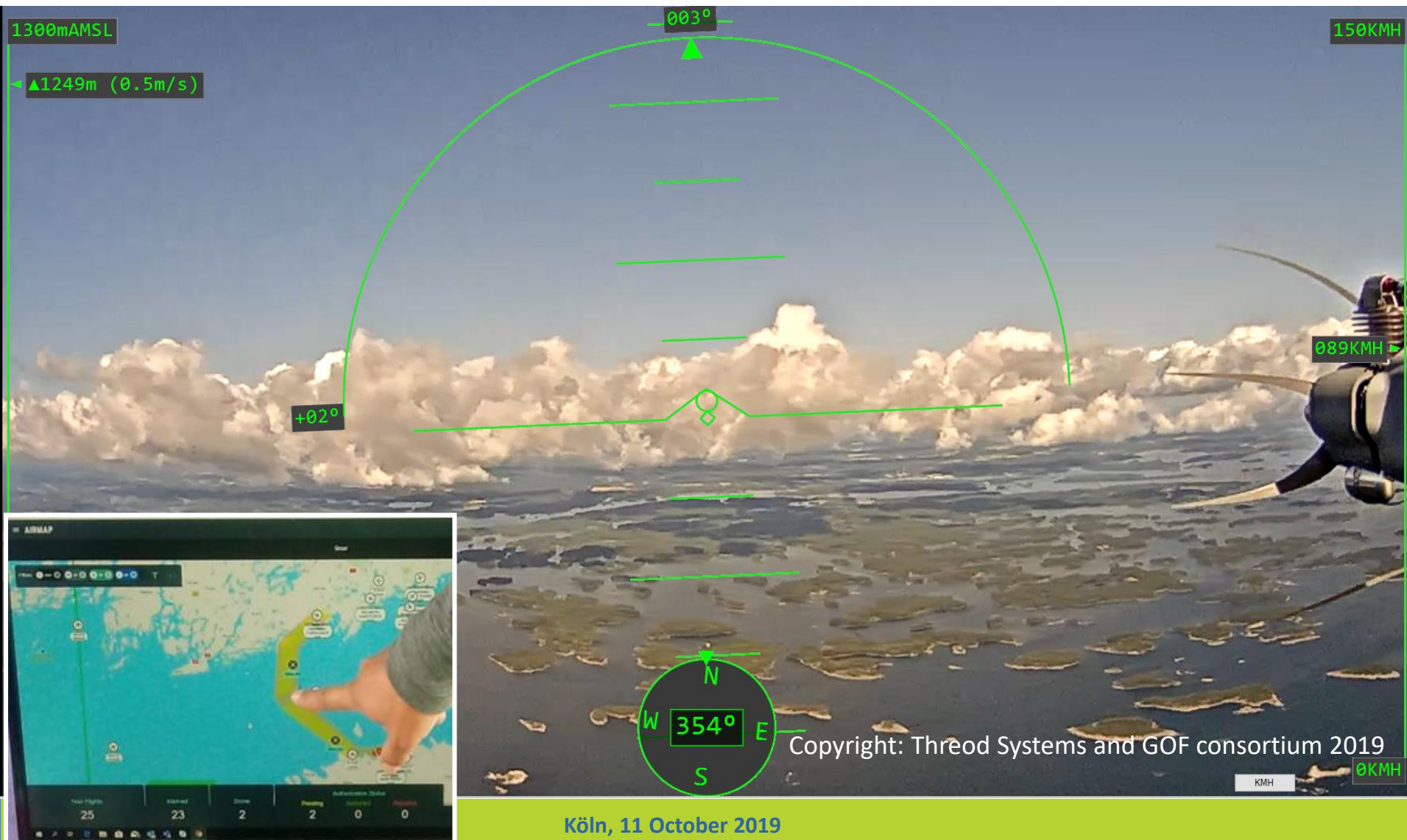


“How does it work” GOF U-space Finnish- Estonian VLD 2019

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Approaching Finland in U-space at 1300 m AMSL



GOF objectives: Integration & Operation for shared situational awareness

“The GOF (Gulf of Finland) USPACE demonstration will create a pre-operational authority Flight Information Management System (FIMS) by creating an interoperability architecture for integrating existing commercial off the shelf (COTS) UTM components to perform demonstration activities based on operational scenarios and concepts of operation.”

“... translates the workflow into services and interactions with external parties and other infrastructures enabling shared situational awareness for all aviation stakeholders.”

GOF USPACE

Finnish-Estonian "Gulf of Finland" very large U-space demonstration 2019

U2

U3



**INTERNATIONAL FLIGHT
OVER GULF OF FINLAND**

Torbacka, Finland – Muraste, Estonia

22
AUG

28
AUG

**URBAN AIR TAXI FLIGHT
HELSINKI INTERNATIONAL AIRPORT**

Vantaa – Helsinki, Finland

29
AUG



**100+ KM FORESTRY
INSPECTION**

Evo, Asikkala, Finland

20
AUG

**URBAN DRONE FLEET
OPS WITH POLICE**

Helsinki, Finland

13
AUG

MARITIME SAR EXERCISE

Kärdla, Hiiumaa, Estonia

14
JUNE

**URBAN DRONE OPS IN
CONTROLLED AIRSPACE**

Tallinn, Estonia

11
JUNE

**DRONES, GA AND MODEL FLYERS
SHARING AIRSPACE**

Pyhtää, Finland

TESTING DAY

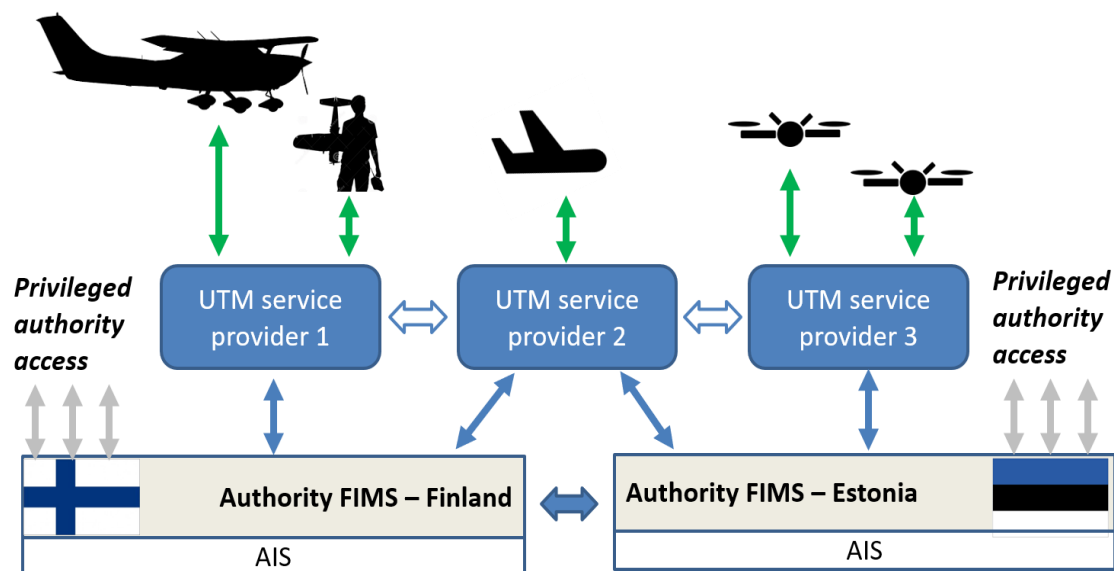
Helsinki, Finland

4
JUNE

GOF U-space architecture

Flight Information Management System (FIMS) was established to enable collaboration and data exchange between:

- 2 ANSPs
- 3 U-space Service Providers
- 1 Supplemental Service Provider
- 8 Drone Operators (incl. Police)
- 2 Manned Aircraft operators



Flight Planning works best when integrated into drone GCS to ensure acceptance, data quality and safety

FPL management works best when integrated part of operator mission planning

- Flight plan submission for sake of reporting activity was not seen as useful by drone operators
- *“UTM in addition to GCS adds considerably to operator workload.”*



FIMS demonstrated as an open platform for service providers and operators

FIMS was demonstrated as an open platform for service providers and operators. It ensures/supports fair access and fair certification processes.

FIMS connected U-space & ATM

- ATM side of FIMS should follow applicable ATM regulations, e.g. regarding software development standards. Certification would ensure compliance.

FIMS boosts resilience by enabling transparent and supervised failover to redundant instances of mandatory & geographically unique services, either provided by other U-space service providers connected or even to other FIMS

Service Registry – managing combination of unique and delegated services

FIMS offers access to a single source of truth – the system of record for a specific area and specific type of information.

- This system of record can be in existing ATM systems, embedded in FIMS, or delegated to service providers.

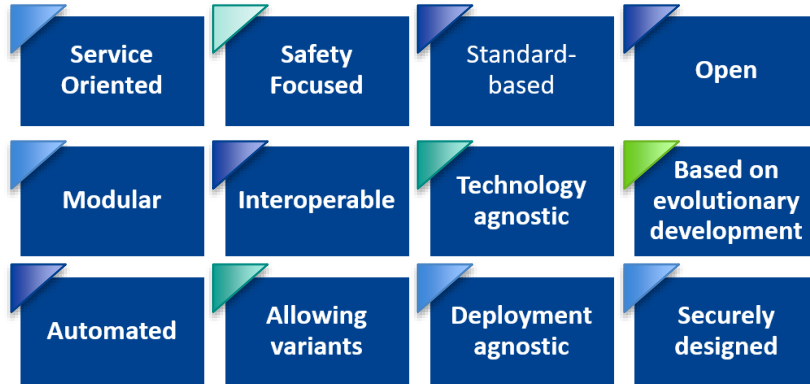
FIMS provides means for service lookup in U-space

- FIMS provides transparent and clear delegation of responsibility / service provision
- Delegation can be used to oversee a huge system of systems. Similar approach as used in the Domain Name Service, DNS.

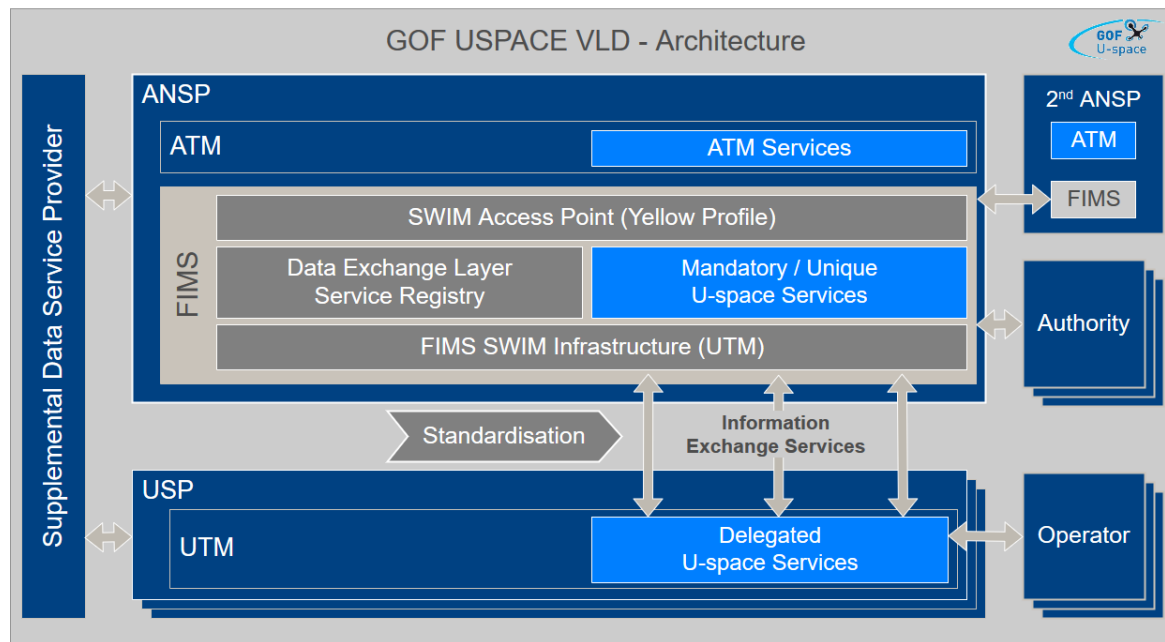


- Lookup “.eu”
 - further lookup “eu.europa”
 - finally “eu.europa.easa”
- > Retrieve service for www

GOF USPACE Architecture based on SESAR Principles



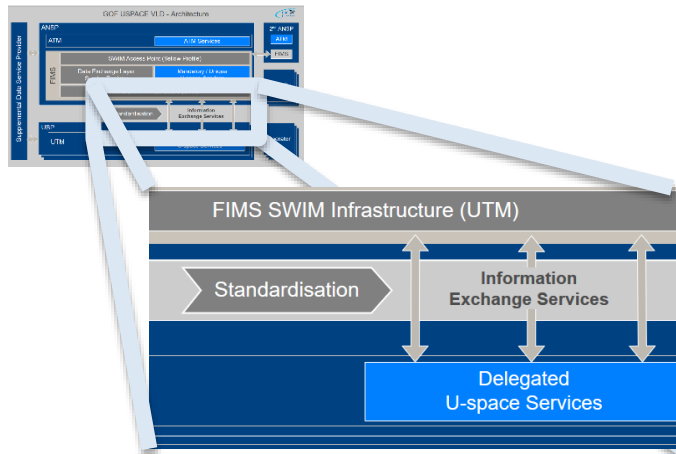
- Service Registry & SWIM based FIMS
- Information Exchange Services
- 3 USP, 2 FIMS
- Enhancements added during trials
- Common Situational View established



Interoperability achieved in a 2-step approach - based on SWIM principles

Output-driven objectives

Advanced use cases shaped requirements



Step 1. Common Understanding

- Analyse Data Flow
- Identify Information Exchange Services
- Describe (without technology)
 - Context
 - Model
 - Interface
 - Behaviour

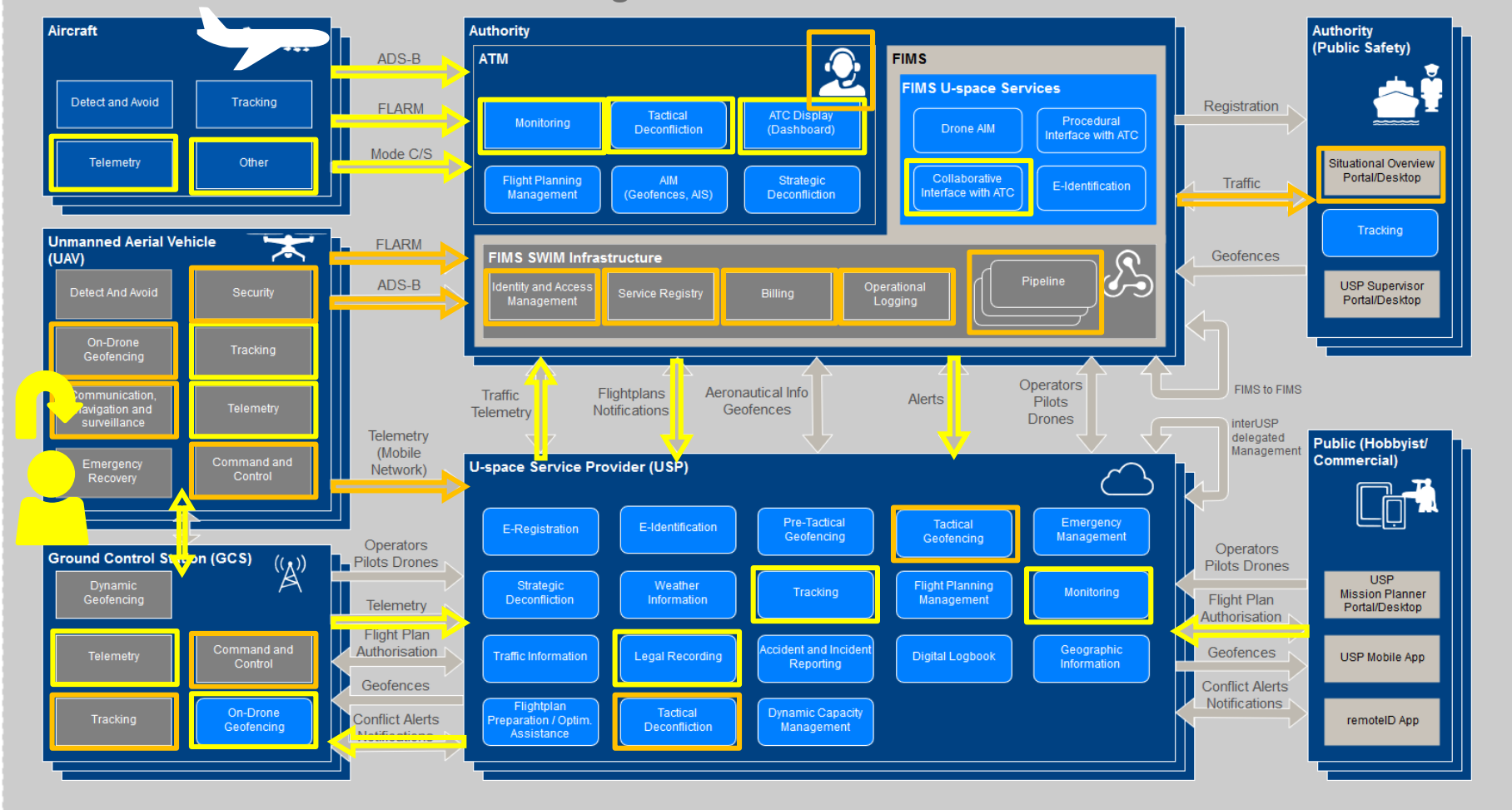
Step 2. Technical Interfaces & Integration

1. Map existing technical interfaces
2. Test integration

Service Specifications delivered for:

Telemetry Flight plans AIM/Geofences Alerts Registration

In Flight – collaboration with ATM



Summary: GOF lessons learned



- Need for European interoperability standards and stress test environments
- A dataflow has many services, most likely one of them a more central one – a single source of truth for a region
- Aim to have basic U-space services tracking, flight planning and flight conformance monitoring integrated in Ground Control Stations
- Tracking solutions need significant additional work
- U-space services must be resilient to poor mobile network coverage
- Stakeholder involvement is key – it's people behind safety, systems help

