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FOR A SAFER WORLD

ICAO Drone Enable/2 RFI Response Presentation

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Chengdu, Sep 12-14

Markus Klopf

20+ yrs Telecoms and ATM background

Product-focused

Implementing solutions on a global scale

Director Strategic Marketing ATM+UTM

Frequentis AG

AUSTRIA

Drone Enable/1: Voice and UTM

UTM solutions highly innovative, but how do they integrate into the airspace?

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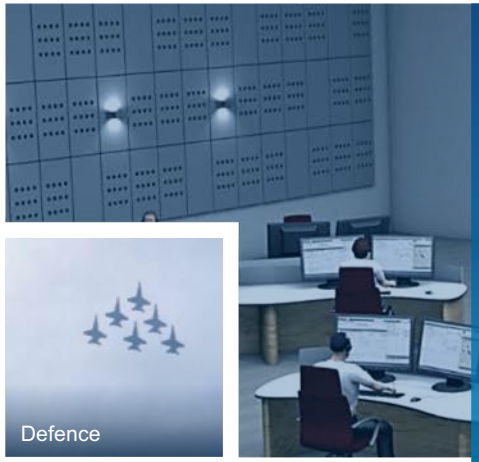
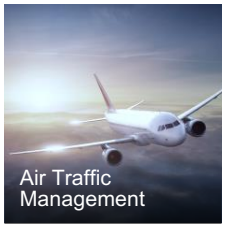
Highly reliable communication and information solutions for a safer world

70 years of innovation in safety-critical applications





¼ B EUR

Total operating performance 2017*

1,697

Employees

12%

R&D

75% STEM*

Headquarters Vienna, Austria

1947

Established

Five business units in safety-critical industries

Solutions partners and regional offices in 50+ countries

We set standards+

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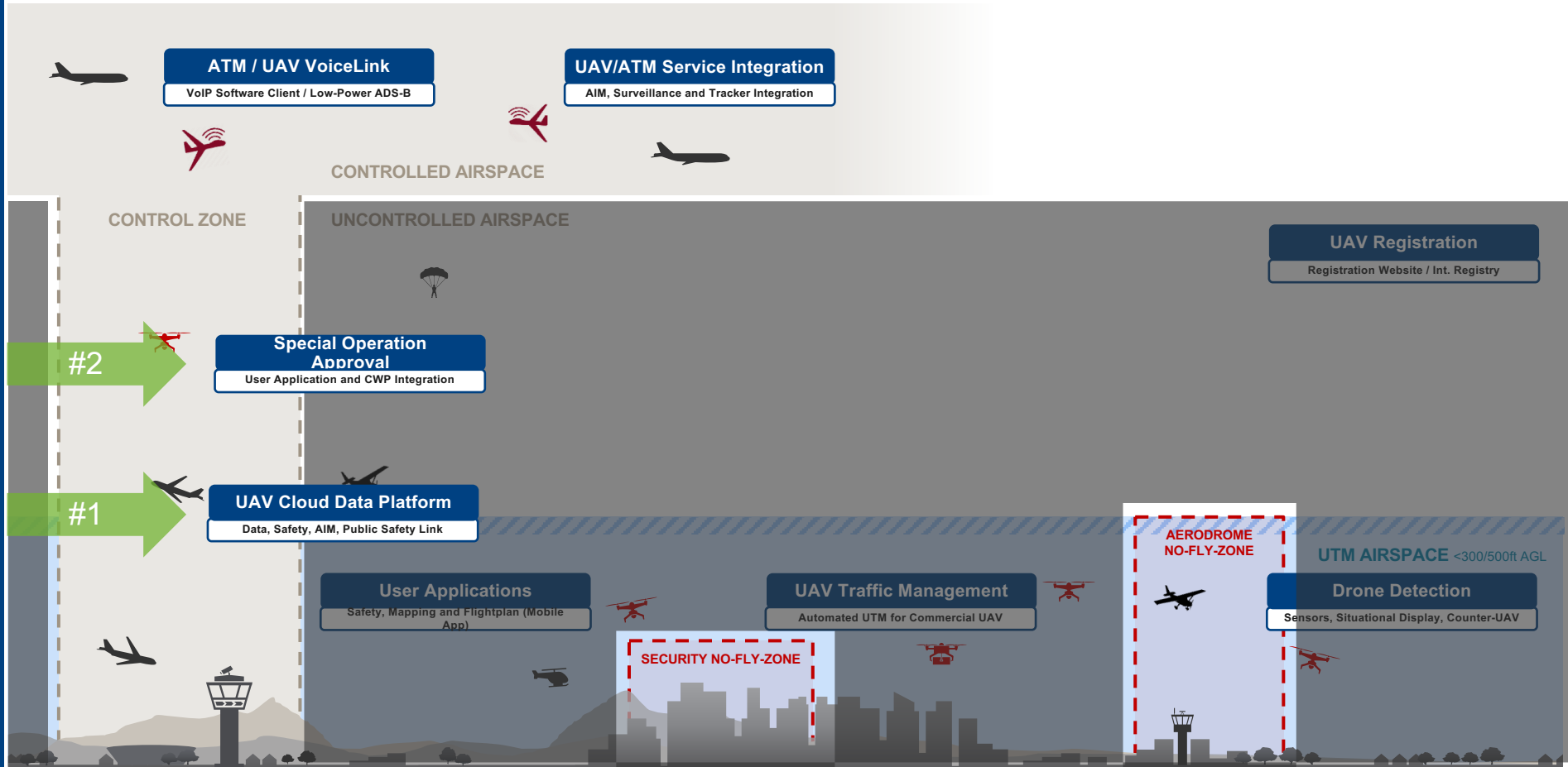
Problem statement: Drones operating in / near controlled airspace

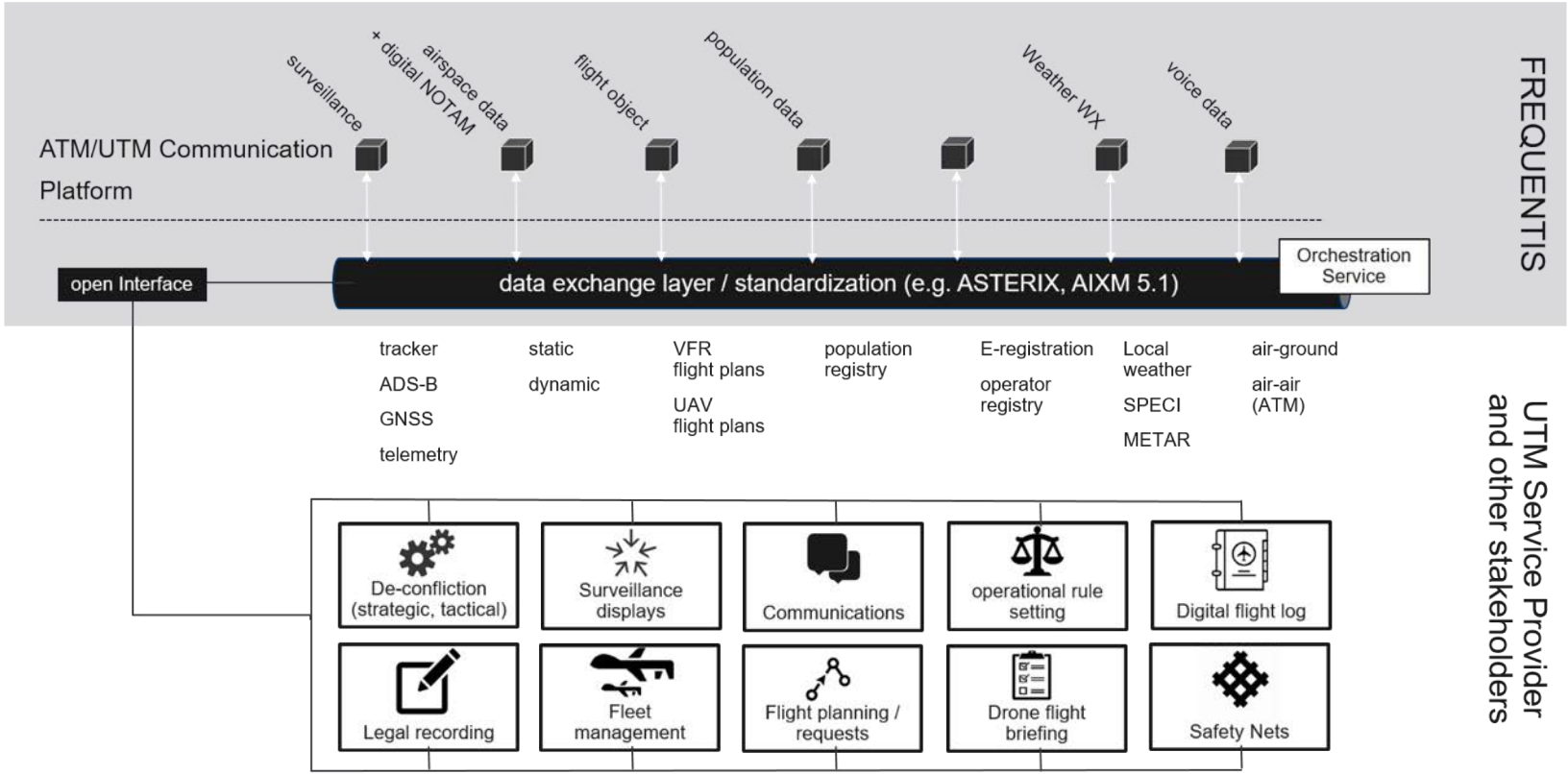


#1: UAV Cloud Data Platform

Service-oriented, harmonized, ATM-grade data exchange

ATM/UTM communication platform high level architecture

MosaiX TM



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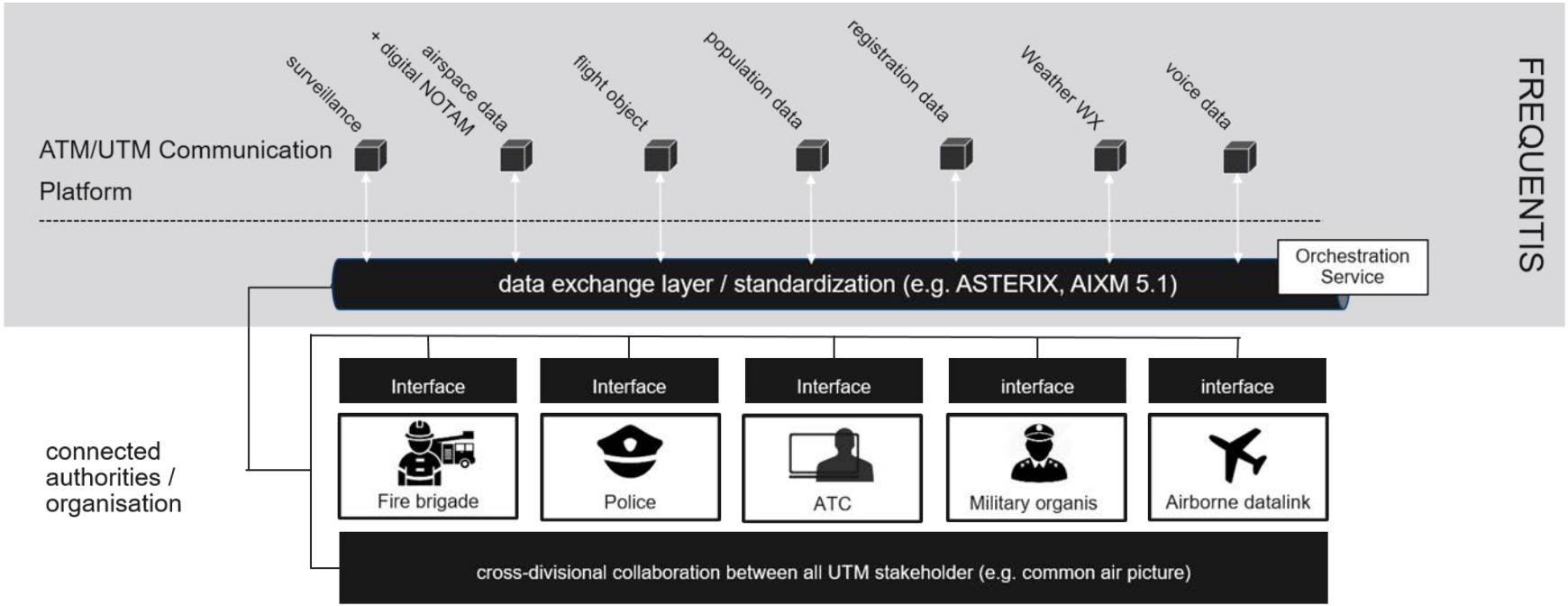
Stakeholders

MosaiX TM



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#2: ATM/UTM integration at aerodromes
Special operation approval

Results of research and testing

UAV surveillance information

Problem statement

UAVs operating in the vicinity of aerodromes an especially in the CTR shall be visible to the ATCO

Solution

Surveillance cloud including conversion and processing of UAV surveillance data and to be forwarded and visualized on ATM-grade display components

Type of UAV surveillance equipment

- ADS-B / Mode S Transponder
- GNSS Hook-on devices
- Telemetry data

Standards and protocols

- ADS-B in ASTERIX Cat 21 Vx
- GNSS and telemetry proprietary formats into ASTERIX

Enables services

- Flight information service
- Air traffic Control service

by provision of Common traffic picture (correlated targets)

- "one-way" TCAS if provided to airborne equipment
- Situational awareness (cockpit) for GA, if provided to glass cockpits or mobile devices

Safety benefits

Increased situational awareness including broadcast to airborne systems

Cost Savings

Data can be processed by existing ATM infrastructure (e.g display systems and SNET components)

Necessary equipment

- UAV GNSS hook-on devices
- Availability of mobile networks in the vicinity of airports
- Data link capabilities for surveillance data broadcast

UTM/ATM flight plan (FPL) interface

Problem statement

UAV flight requests shall be visible to the ATCO for further interaction and traffic planning

Solution

UAV flight requests are converted in a standard format which can be processed by existing ATM infrastructure
(e.g. AMHS and AIM systems)

Type of information exchanged

UAV flight requests including VLOS and BVLOS

Standards and protocols

Conversion of proprietary UAV flight request formats into ICAO 4444 (similar) via AMHS / AFTN

Enables services

- Flight information service
- Air traffic Control service

by provision of Common traffic picture (planning), enabling additional functionality

Affected ATC systems

- Safety Net
- Airborne safety systems
- Airborne traffic displays

Safety benefits

No additional systems leading to no additional head-down times

Cost Savings

Data can be processed by existing ATM infrastructure – no additional HW / SW components

Affected ATC systems

- Safety Net
- Communication
- AMHS/AFTN/SWIM
- AIM

ATM/UTM Interface

Test Environment

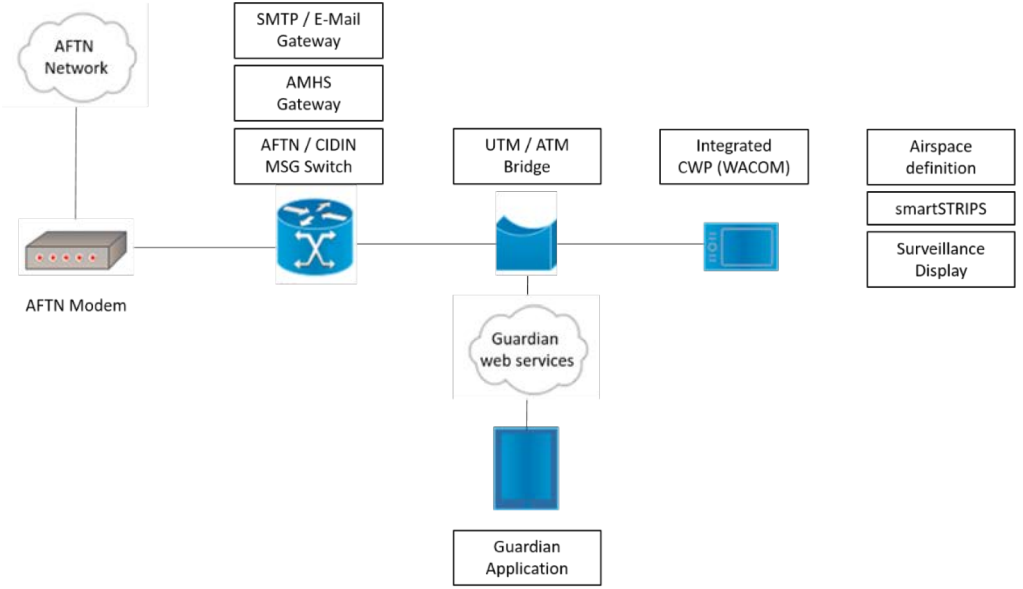
Karslruhe (Frequentis Comsoft)
Vienna (Frequentis AG)
Washington (Frequentis USA)

Test set-up

- GuardianUTM
- UTM/ATM Bridge
- AMHS (AIDA-NG)
- CADAS-ATS
- Voice Communication System

UTM

ATM



TRL 6

System/subsystem model or prototype demonstration in a relevant environment (ground or space)

Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.

How did the test environment differ from the operational environment?

- The test environment is based in TRL 9 ATM-grade and proven components
- Next step: Connect the UTM/ATM Interface
  - 1st in a TWR test system
  - 2nd in a TWR live environment

Who performed the tests?

- Air Traffic Control Officers (ATCOs)
- Drone Operators

How did the test compare with expectations?

- No additional TWR equipment needed
- Existing infrastructure components can be used
- No impact to AFTN/AMHS Messages

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Interface integration in the TWR environment

At an ANSP

TRL 7/8

System prototype demonstration in an operational environment.

Actual system completed and qualified through test and demonstration.

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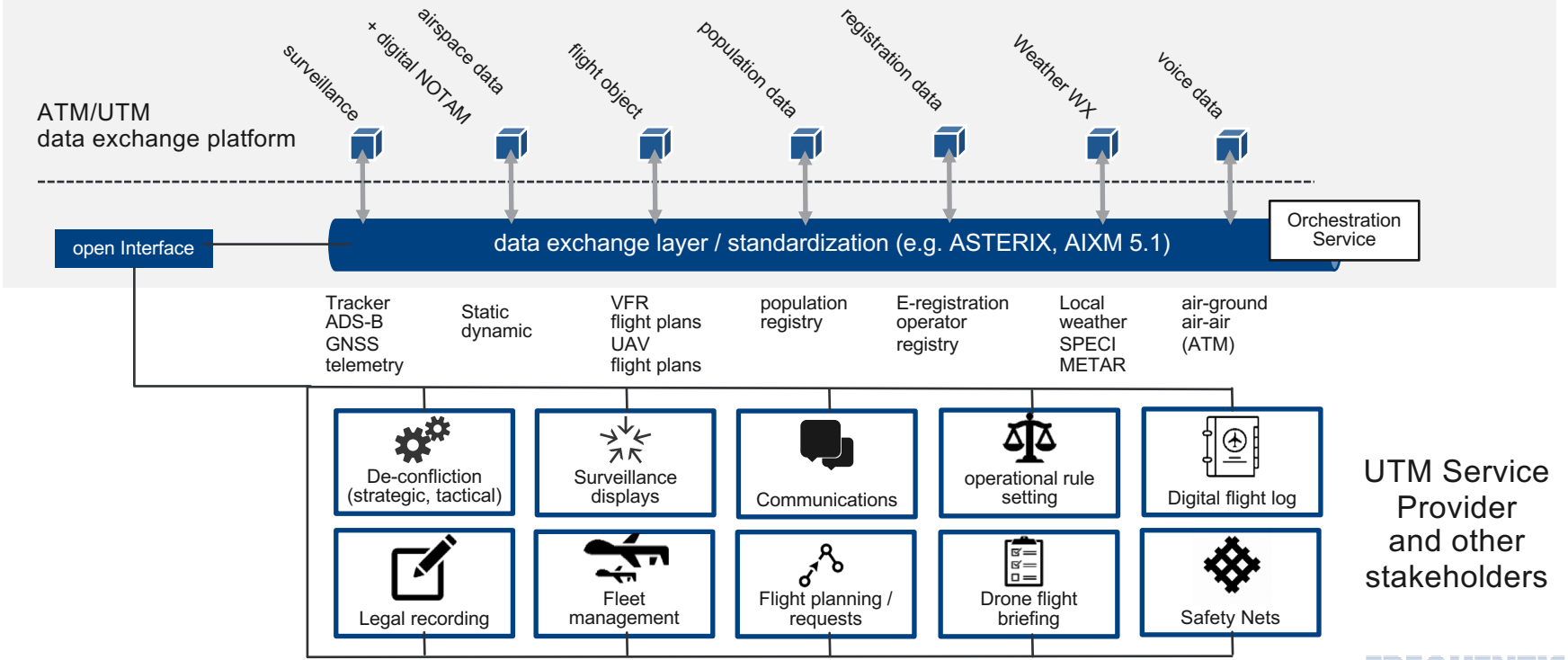
Next: GOF U-Space: SESAR VLD

Seven live use cases

1. International parcel delivery between Helsinki and Tallinn,
2. Dense urban drone fleet ops in Helsinki with Police intervention
3. Dense urban drone fleet ops in Tallinn in controlled airspace
4. 100km+ BVLOS multisensory inspection flights in forestry and utility inspection
5. Co-operation with general aviation and recreational users at uncontrolled airport
6. Maritime traffic surveillance combined with search-and-rescue over Gulf of Finland
7. In co-operation with Urban Air Mobility, the Consortium plans to demonstrate the use of UTM for controlling Drone Taxi traffic, by demonstrating a live DroneTaxi flight from Helsinki-Vantaa airport to downtown Helsinki.

MosaiX TM: Seamless integration of ATM / UTM

MosaiX TM



UTM Service Provider and other stakeholders

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Air Traffic Management
Defence
Maritime
Public Transport
Public Safety