



Urban mobility

Introduction

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Programme Manager

SESAR Joint Undertaking



Keeping drones safe, secure and green

"Drones are a key part of the future of aviation and will become part of our daily lives. All players can mutually learn and exchange practical expertise to keep drone operations safe, secure and clean. That exactly is the purpose of this EU wide network."

Violeta Bulc, Commissioner for Transport

What is the problem



Now	–	by 2035:
30k flights	–	20k flights
in EU	–	over 1 city
per 24 h	–	per 1 h

We need a digital system automating air navigation service provision

The European Commission wants to develop the drone services market and is therefore creating an enabling regulatory framework

U-space



A system that connects all drones flying in the air and makes all drones visible

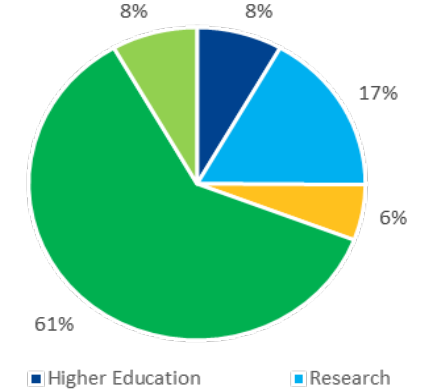
The European Commission created a European Network of U-space Demonstrators, together with European Aviation Safety Agency (EASA), SESAR JU & EUROCONTROL

SESAR: Technological pillar of Single European Sky and key enabler for the Aviation Strategy

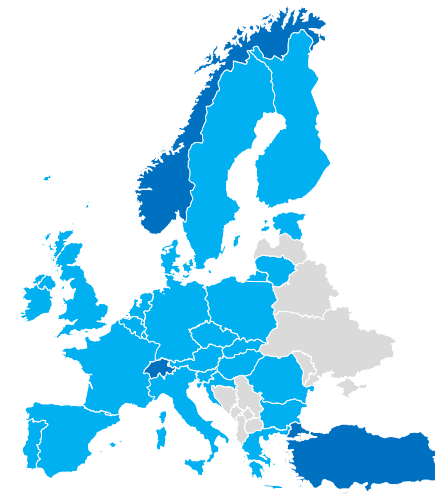
SESAR 2020 projects: blended academic & industrial expertise



Types of beneficiaries (Sept. 2018)



26 EU Member States participating



EU Member States with SESAR 2020 funding

Third-countries with SESAR 2020 funding (also incl. Israel, Australia, United States, Canada...)

Drones in SESAR



From accommodation of drone traffic to integration

Accommodation of IFR RPAS

Integration of IFR and VFR RPAS

Full Integration/
Evolution of Manned
and Unmanned
Aviation

Development of U-space Services

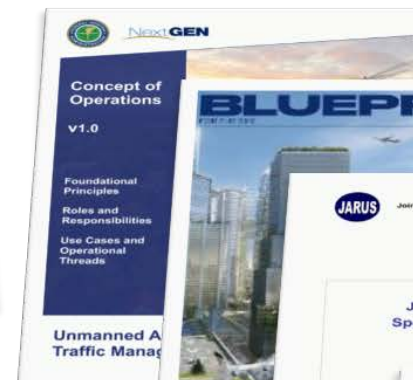
2 key enablers

- Gradual increase in the level of **connectivity** and **automation**

Central to the vision

- **Urgency to act** (shorter innovation cycles applied)
- **U-space** (what it is, and what it is not)
- **Urban air mobility** potential integrated (main change compared with Drones Outlook Study)
- Securing key European programmes for RPAS (such as **MALE**)

Our inputs

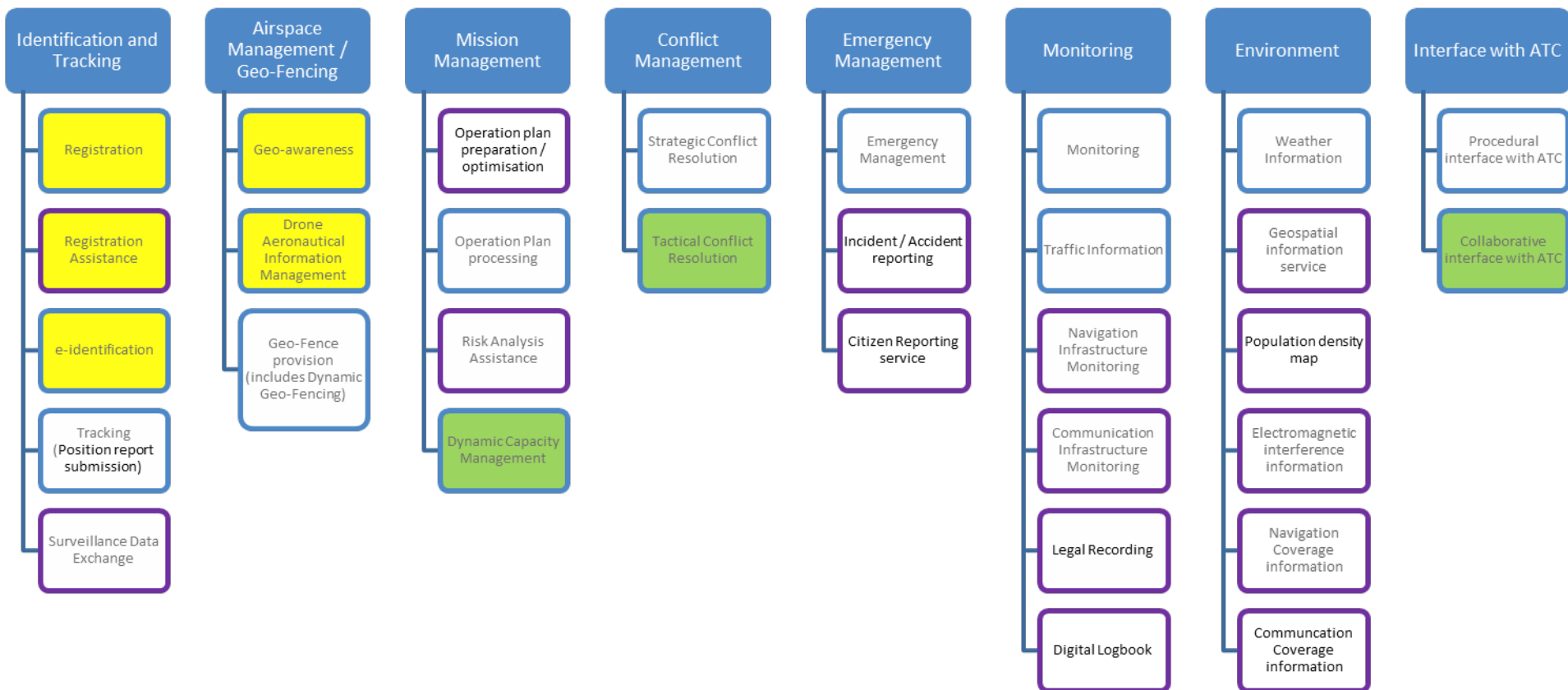


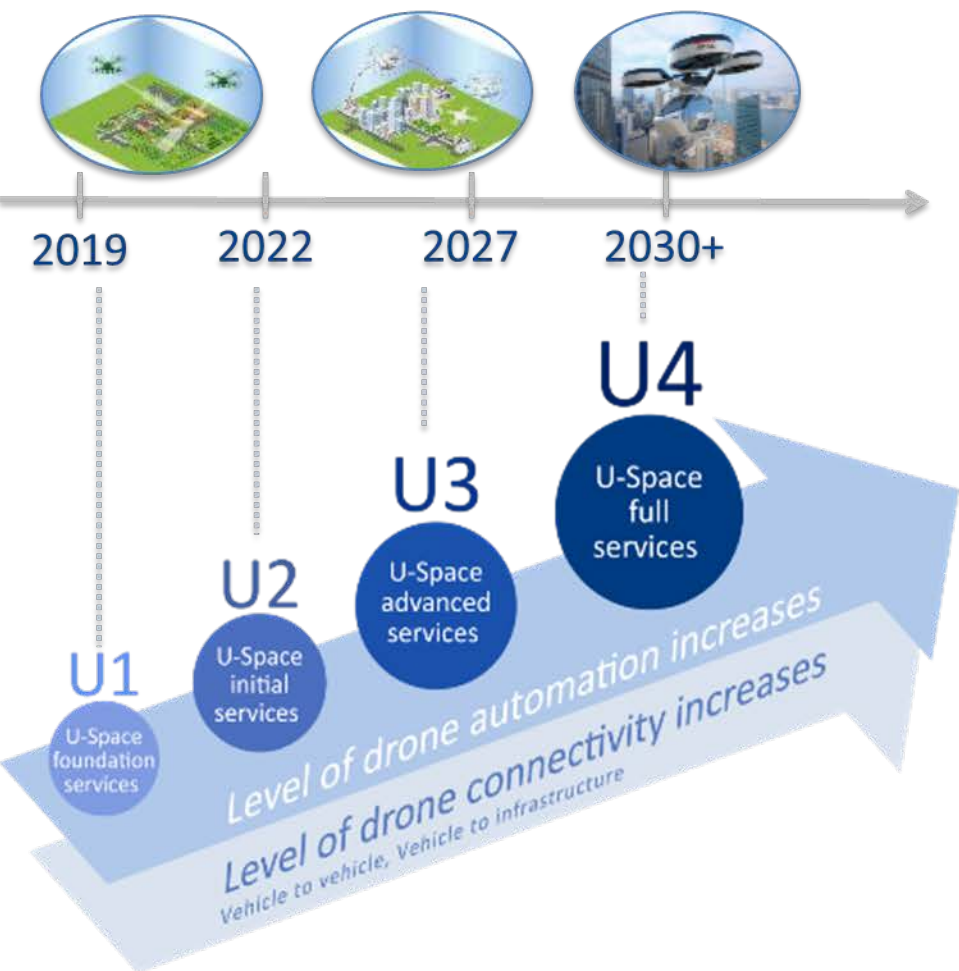
U-space is



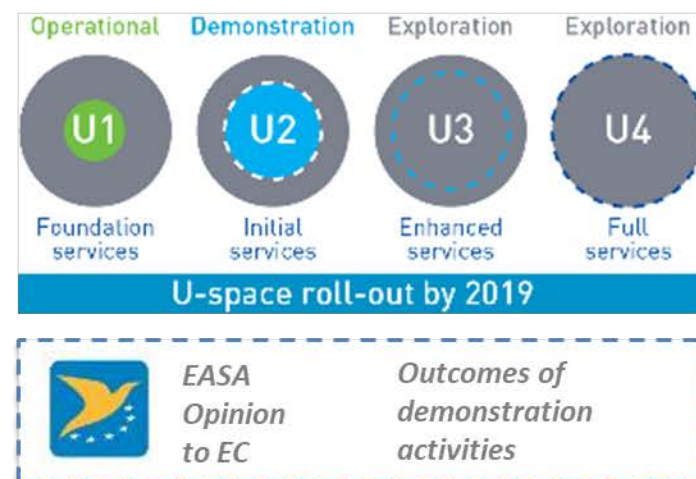
- New set of digital and automated data services
- Safety: dynamic geo-fencing, management of emergencies & contingencies
- Interface with conventional aviation
- Highly automated vehicles equipped with D&A and using V2X communication
- Drones like any other IoT device: leveraging mobile and satellite communication networks
- Security: registration, authentication, Secure Drone2X communication

U-space is





U-space in 2019



U1

Foundation

- e-registration
- e-identification
- geofencing

U2

Initial

- planning & approval
- tracking
- airspace dynamic information
- procedural interface with ATC

U3

Enhanced

- capacity management
- assistance for conflict detection

U4

Full

- integrated interfaces with manned aviation
- additional new services

Full speed in 2019



2nd edition



3rd edition sept..2019

U-space
architecture



Programme consolidation

(up to Feb. 2020)

Prepare the demonstrations
10 projects

Flight trials

Conclusions

Other U-space projects deliveries
9 projects, more than 100 technical deliverables

2018

2019



Bucharest, 27-30 May 2019



Our story



CORUS

key
challenges
and
proposed
solutions.

GEOSAFE

Geo-fencing
as an
example of a
set of U-
space
services &
capabilities.

IMPETUS

A focus on
the Flight
Planning and
micro
services as
an example
of the kind of
technology
we propose.

GOF- USPACE

A strong &
flexible
logical
architecture
as there are
a lot of
stakeholders
and possible
missions to
consider.



Thank you !



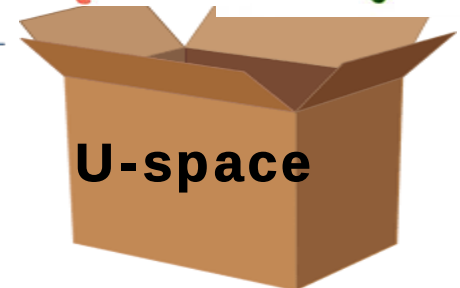
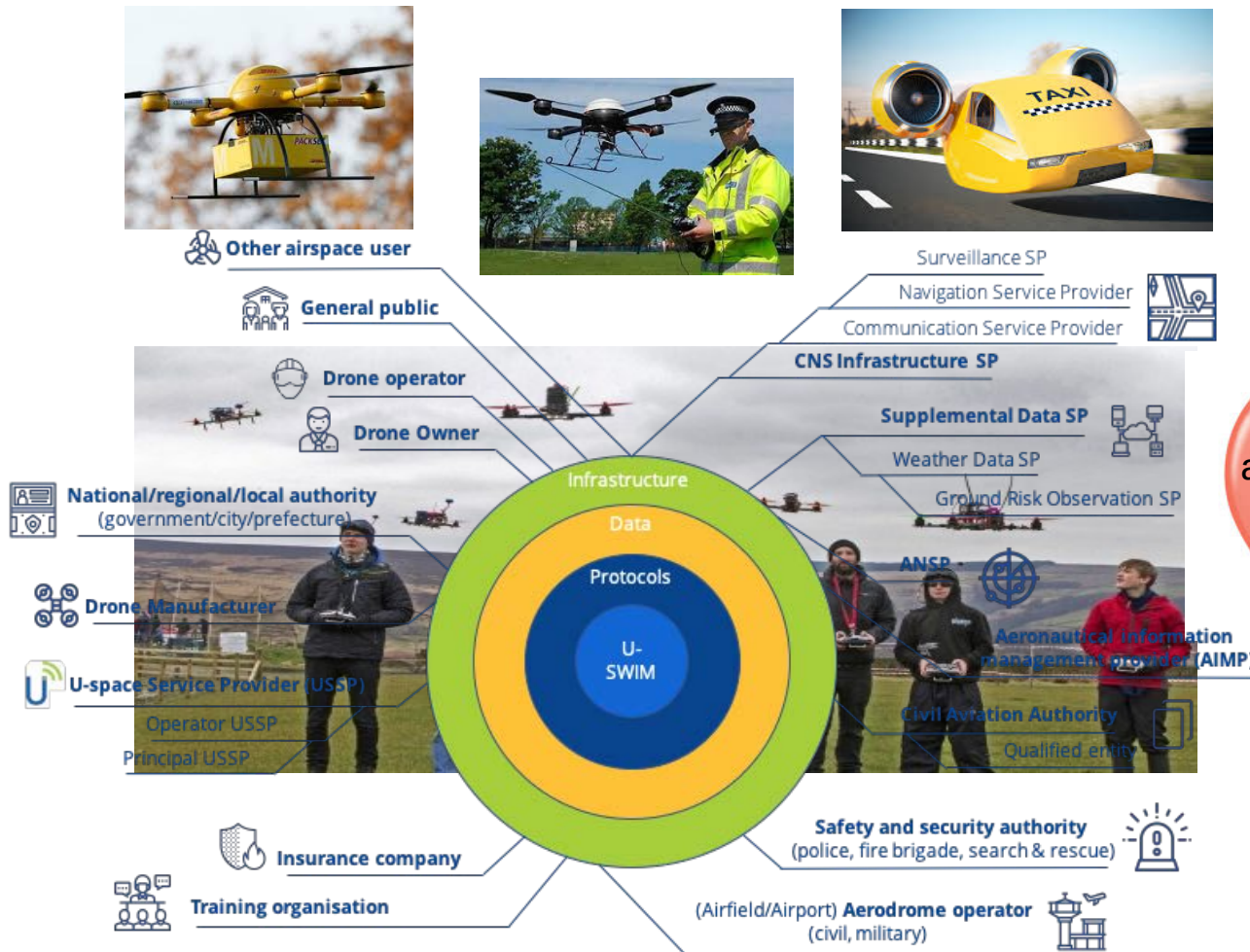
D5: Urban Air Mobility

CORUS

Cristina Barrado
UPC BarcelonaTech



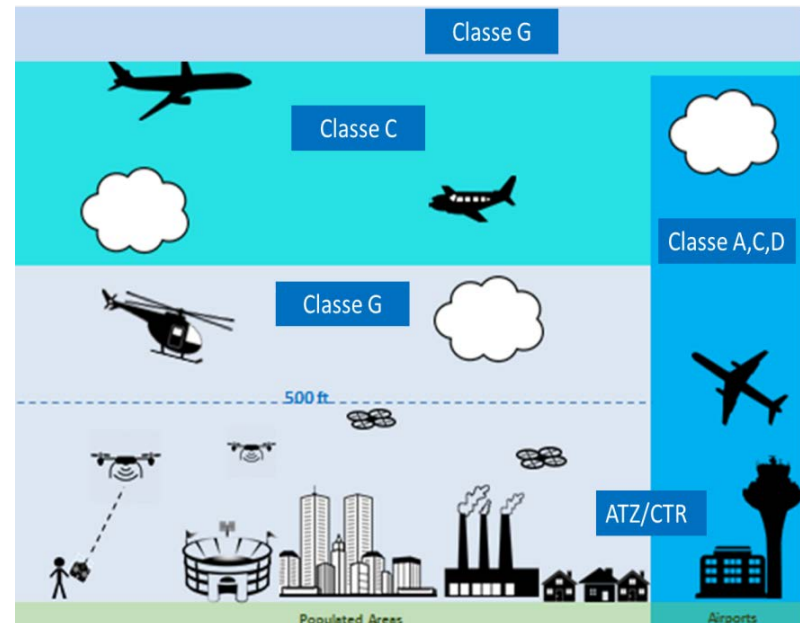
U-space: the European solution to new airspace challenges



Scientific & technical goals



- *CORUS aims at*
 - the development of the Concept of Operations (CONPOS)
 - for drones flying at the Very Low Level (VLL)
- Including:
 - VLL limits
 - Airspace organisation
 - Separation
 - Safety procedures
 - U-space services
 - Classification
 - Refinement
 - Architecture
- ... with emphasis in the social acceptance



-
- A large group of people, mostly men in business attire, posing for a group photo in a conference room. A presentation screen in the background displays the title "Generation of Opportunities for European SME Systems".

-

Main results



- *Airspace volumes*
 - linked to U-space services

X
Y
Z



- *Assessment of social acceptance*
- *And more: safety, architecture, contingencies, etc.*

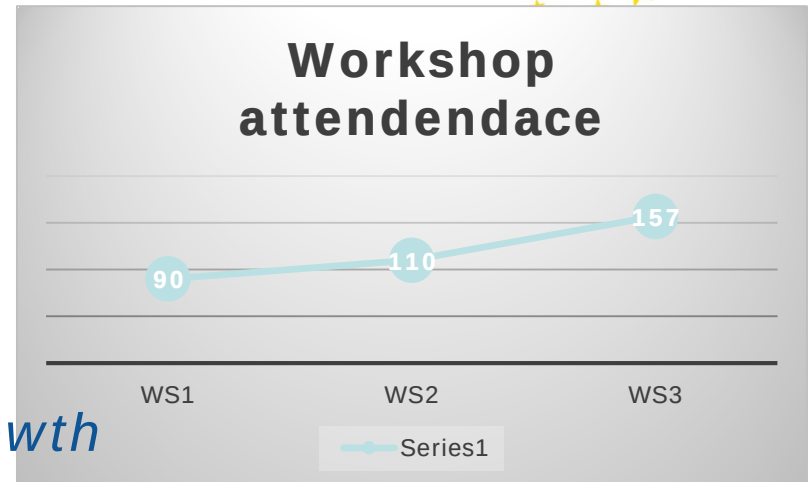
Cross-cutting issues

- *Technical*
 - **Noise**
 - **Tracking**
 - **Vehicle-to-vehicle**
 - **Counter-drone**
 - **Capacity estimation**
- *Non-technical*
 - **Cross-border**
 - **Training of pilots**
 - **Costs distribution**
 - **Public inclusiveness**



Impact

- *Workshops attendance*
 - **WS1 - Barcelona Jan'18**
 - **WS2 - Toulouse Jun'18**
 - **WS3 - Rome Apr'19**
- *U-space Community Network growth*
 - May'19: up to **514** subscribers
- *Invitation to dissemination activities*
 - **UVS International**
 - **ATM World Conf**
 - **ETNA**
- *Cross-fertilisation with regulatory bodies*
- *Coordination with CORUS sibling projects*



Usefull information



- *Links*

- Project web: <https://www.sesarju.eu/projects/corus>
- CONOPS V2: corus-info@eurocontrol.int
- Videos: https://youtu.be/x5krDj_S-W0
- CORUS Partners:



- *Acknowledgements*



This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 824238



Thank you !

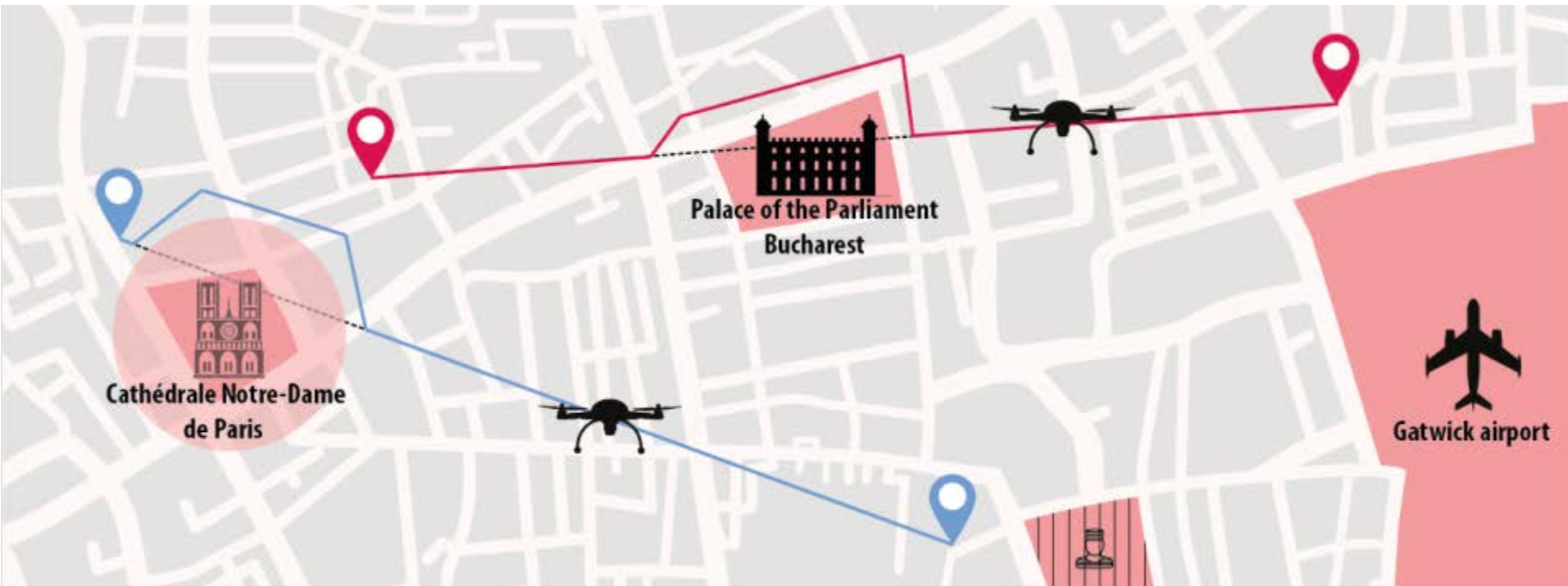


Geofencing solutions state of the art

GEOSAFE
Arthur MOUSSIERE
THALES

GEOSAFE
GEOFENCING FOR SAFE
AUTONOMOUS FLIGHT IN EUROPE

What is geofencing ?



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SDH UNIKLINIKUM
HEALTH CARE & RESEARCH



AEROWAPPER
AERIAL MAPPING & INSPECTION

Atechsys
AERIAL TECHNOLOGIES

AIRMAP

2019
2020
aerodays
T A N D E M

Bucharest, 27-30 May 2019



European
Commission

Geofencing service : U-space level



U1 LEVEL

Pre-tactical geofencing

The service provides the operator with geo-information about predefined restricted areas (prisons, airports, etc.) used during the flight preparation

U2 LEVEL

Tactical geofencing

The service brings the possibility to update the operator with geofencing information even during the flight

U3 LEVEL

Dynamic geofencing

The service targets the drone itself and then this service requires data-link connectivity to a geofencing system that allows the data to be updated during the flight

U4 LEVEL

Full services

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SDH



AEROMAPPER

Atechsys

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2019
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GEOSAFE project



WHAT ?

To establish state-of-the-art geofencing solutions regarding U-space regulation
To propose improvements and recommendations for future geofencing system definition.

HOW ?

One-year long flight-test campaign:

- 290 tests (**rural and urban environments**)
- 16 drones
- 18 mission planners
- with 7 objectives to test

WHY ?

To be able to deploy U-space. U1 and U2 should be validated and a part of U3 too. Project will provide recommendations for standardization

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Solutions



DJI - Phantom 4



DJI - Matrice 100



DJI - Mavic Air



DJI - Matrice 600 / S900



DJI - Inspire 2



INTEL - Aero



YUNEEC - H520 Pro



INTEL - Falcon 8



DELAIRTECH - DT18



ATECHSYS - HE 190



AEROMAPPER - Avem



Pixhawk



ATECHSYS X10



PARROT Bebop 2



PARROT - Disco



SENSEFLY - Ebee

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European
Commission

First results



- *Restricted area are not in line with current regulations*
- *➔ Problem should be solved with the EASA regulation :*

Article 15

3. When pursuant to paragraphs 1 or 2 Member States define UAS geographical zones for geo awareness purposes, they shall ensure that the information on the UAS geographical zones, including their period of validity, is made publicly available in a common unique digital format.

First results



We have not succeed to infringe horizontal NFZ with multirotors



Fixed wings infringe the NFZ and then realized an half turn

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SPHUNG



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2019
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European
Commission

First results



- *Conflict observed when a cage is created near a restricted area*



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SPHUR Mapping
Smart Urban & Suburban



AEROWAPPER
Aerial Mapping & Analysis

Attechsys

AIRMAP

2019
2020
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T A N D E M

Bucharest, 27-30 May 2019



European
Commission

VLD demonstration



24th September 2019
Atechsys, Pourrières, France



Final demonstration will show several drones from different types flying near restricted area in a UTM context. Scenario will be a search and rescue with the participation of firefighters



This final demonstration will have several purposes:

- Highlight the results obtained during the test period
- Show the technology readiness level of existing geofencing solution
- Show the link between active geofencing services and UTM services

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AEROMAPPER
AERONAUTICAL SOFTWARE FOR UTM

Atechsys
INTEGRATED SYSTEMS

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Thank you !



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AEROMAPPING & ANALYTICS

Atechsys
AEROMAPPING & ANALYTICS

AIRMAP

2019
2020
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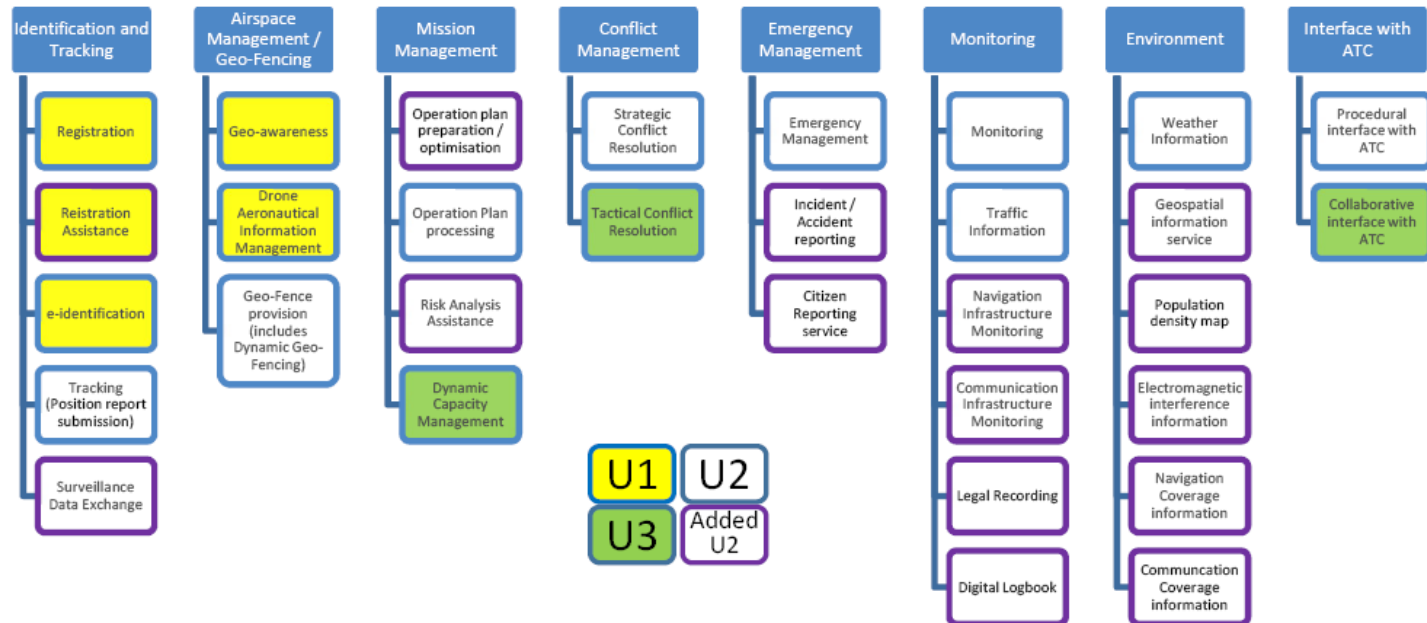
Micro-Service based Architecture for an U- space integrated Flight Planning Management

IMPETUS

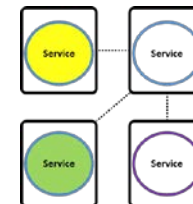
Hugo Eduardo

Technische Universität Darmstadt / Jeppesen GmbH

U-space services...



How to deploy a scalable and flexible system?

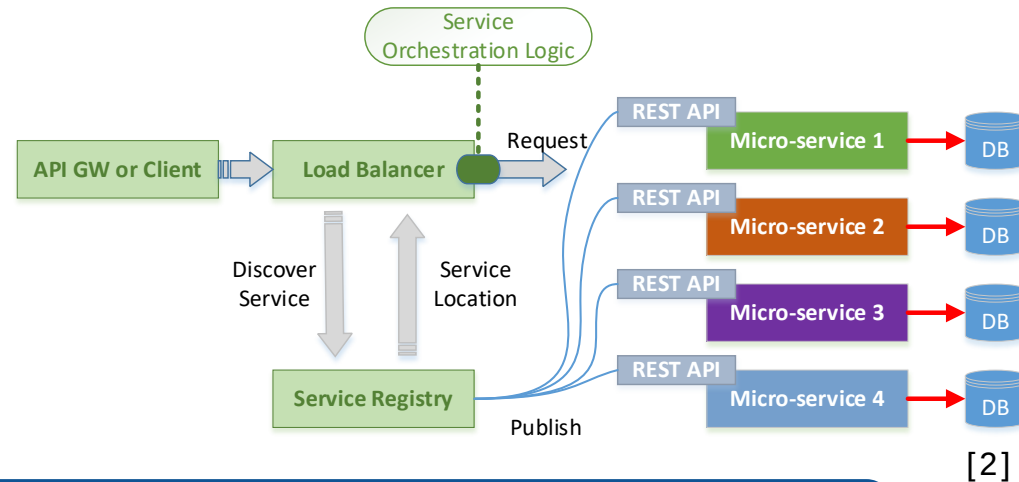


IMPETUS proposed solution – micro-service paradigm



Characteristics:

- Independently deployable
- Communicate using lightweight mechanisms (API)
- Micro-services run their own process
- Focused on business capabilities
- Additional services from external companies can be registered.

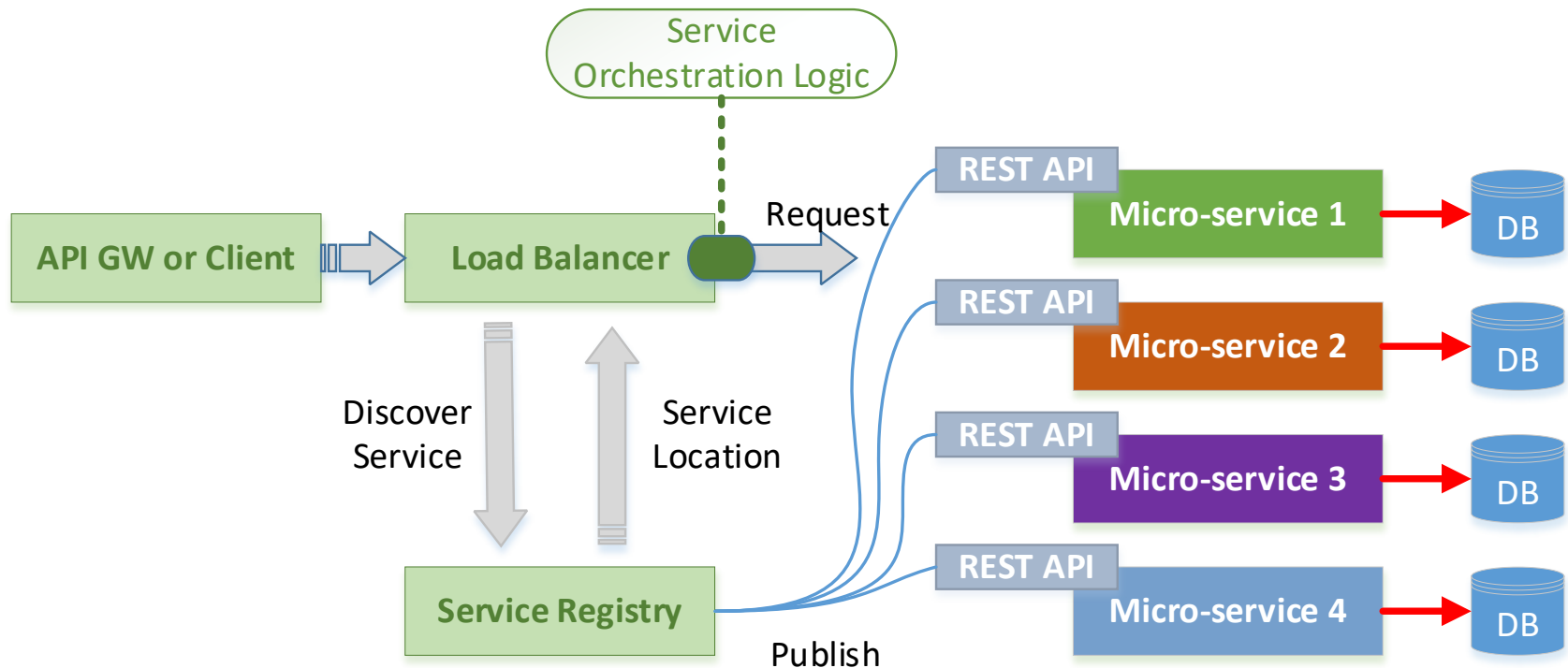


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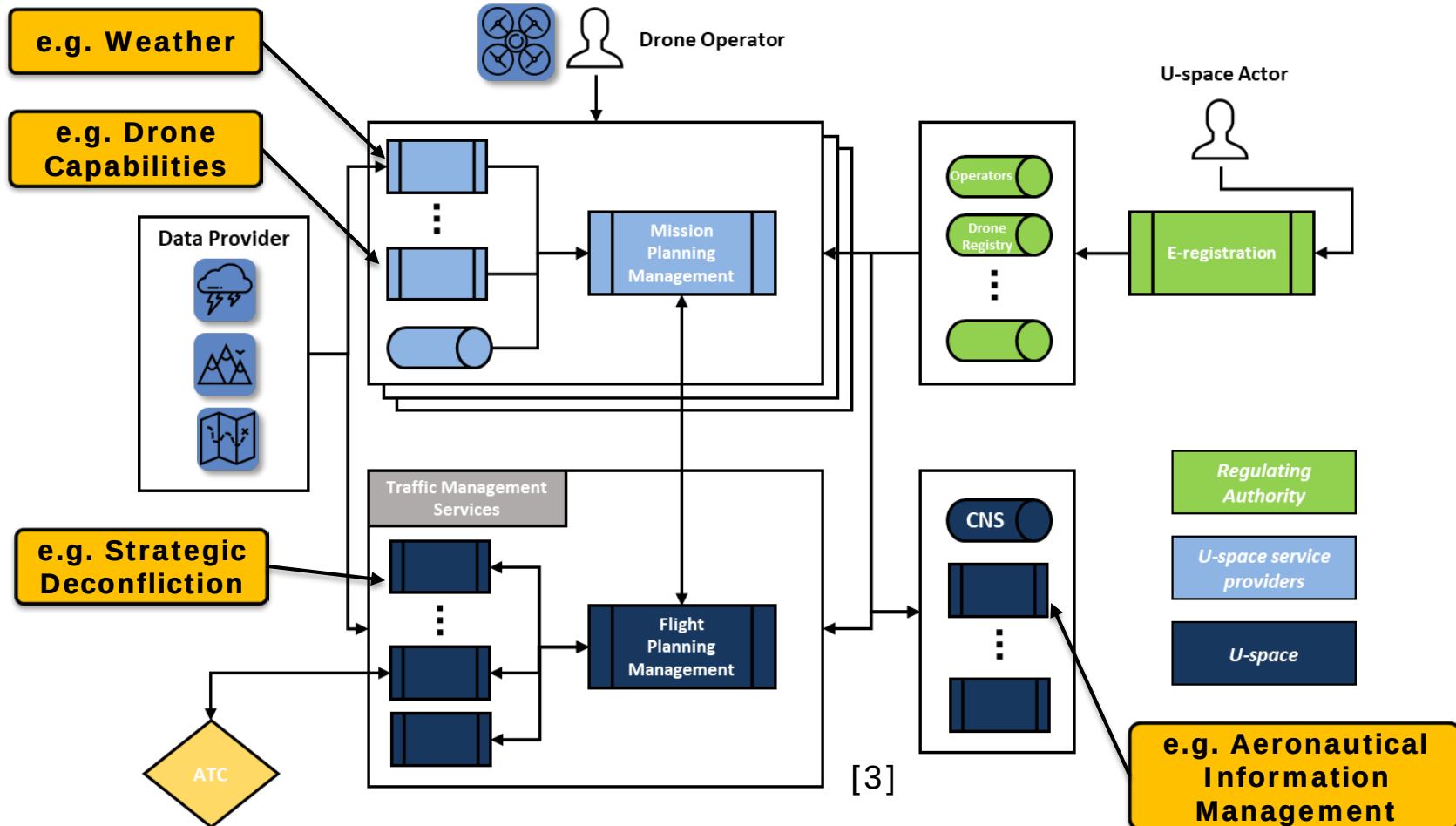
Benefits:

- ✓ Reduce complexity (**decompose** large applications into a set of functionalities)
- ✓ Enable each service to be **scaled** independently in demand and future evolutions
- ✓ Allows a **continuous** deployment independently from technologies
- ✓ Ensure **availability** of data (own database management) and service provision.
- ✓ Self-monitoring, self-management, based on metrics.

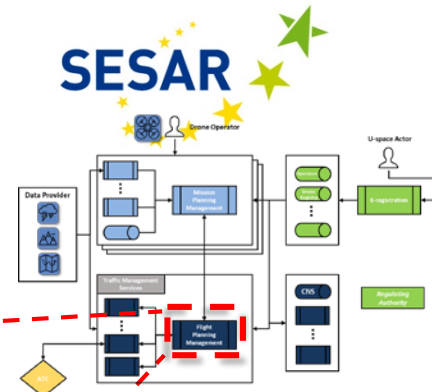
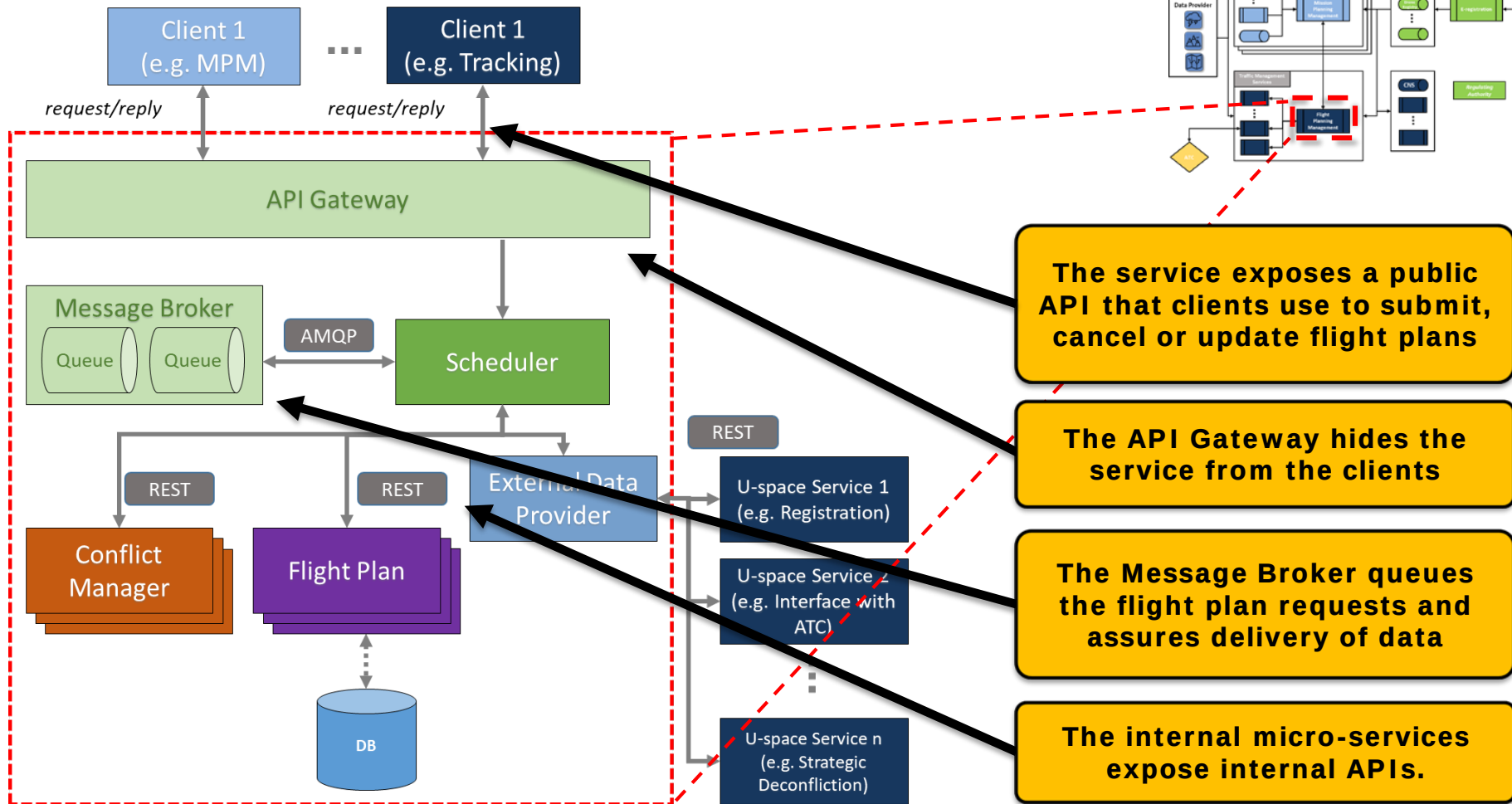
IMPETUS proposed solution – micro-service paradigm



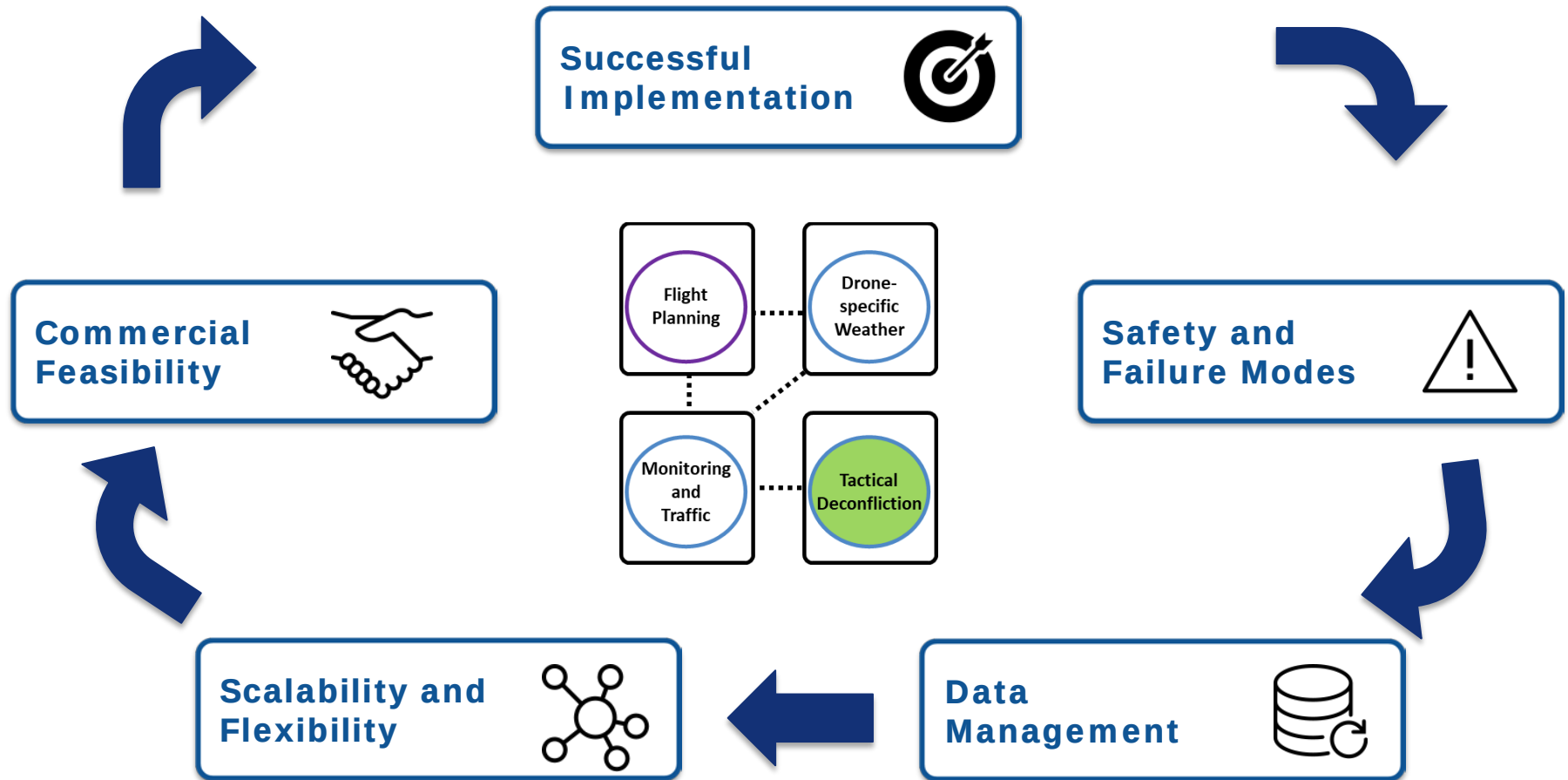
Showcase - integrated Flight Planning Management service



Showcase - integrated Flight Planning Management service



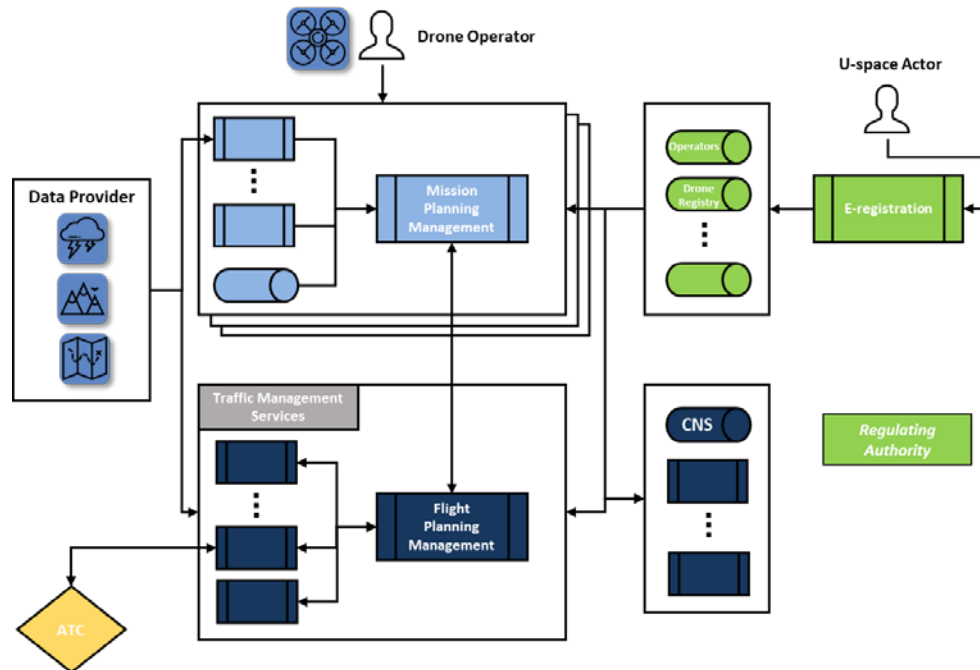
Experimental Plan – research areas



Potential gaps and challenges



Only a set of services examined so far



Evidence of performance

Useful info and acknowledgements



IMPETUS
<http://impetus-research.eu/>



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Bucharest, 27-30 May 2019



References



- [1] CORUS. Intermediate ConOps, H2020-SESAR, 2019
- [2] www.oodlestechnologies.com
- [3] IMPETUS. Architecture and Technical Requirements, H2020-SESAR, 2019.



Thank you !



GOF - Drones SWIM

GOF USPACE
Thomas Lutz
Frequentis
for the GOF USPACE Team

GOF - Overview



The GOF USPACE project at a glance

Flight Information Management System (FIMS), supports also cross-border drone operations

- ⇒ Integration of UTM and ATM systems
- ⇒ Cross-agency / country drone (UAV) information management system
- ⇒ Accessibility of a Common operational picture
- ⇒ Enable Joint Operations / authority collaboration

Large scale demonstration



Use-cases demonstrate integrating manned and unmanned aviation

 Urban drone fleet ops in Helsinki with <u>Police intervention</u>	 Model flyers, general aviation and drones sharing same airspace	 Est-Fin-Swe maritime SAR exercise in Gulf of Finland	 International parcel delivery between Helsinki and Tallinn	 Urban drone fleet ops in Tallinn in controlled airspace	 100km+ inspection flights in forestry and utility inspection	 Urban Air Mobility flight from Helsinki-Vantaa airport to downtown Helsinki
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All use cases demonstrate actual operational needs

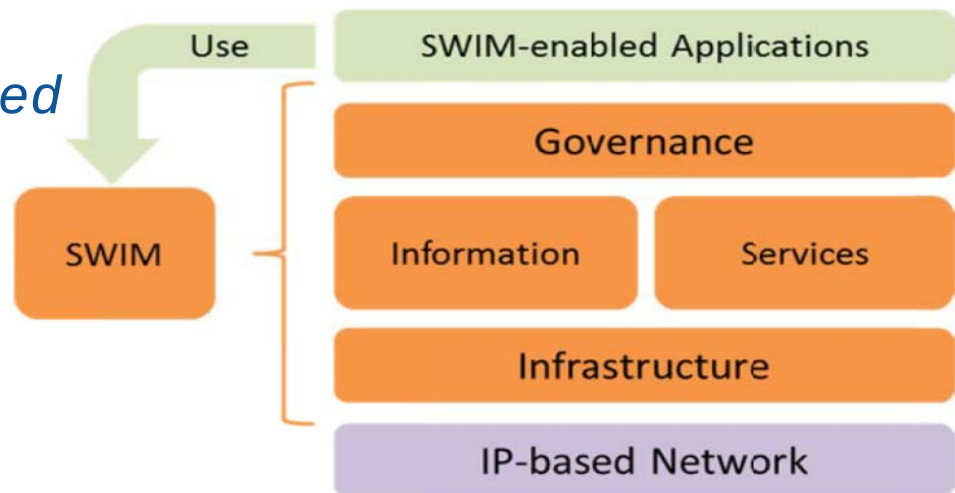
SWIM – ICAO 10039



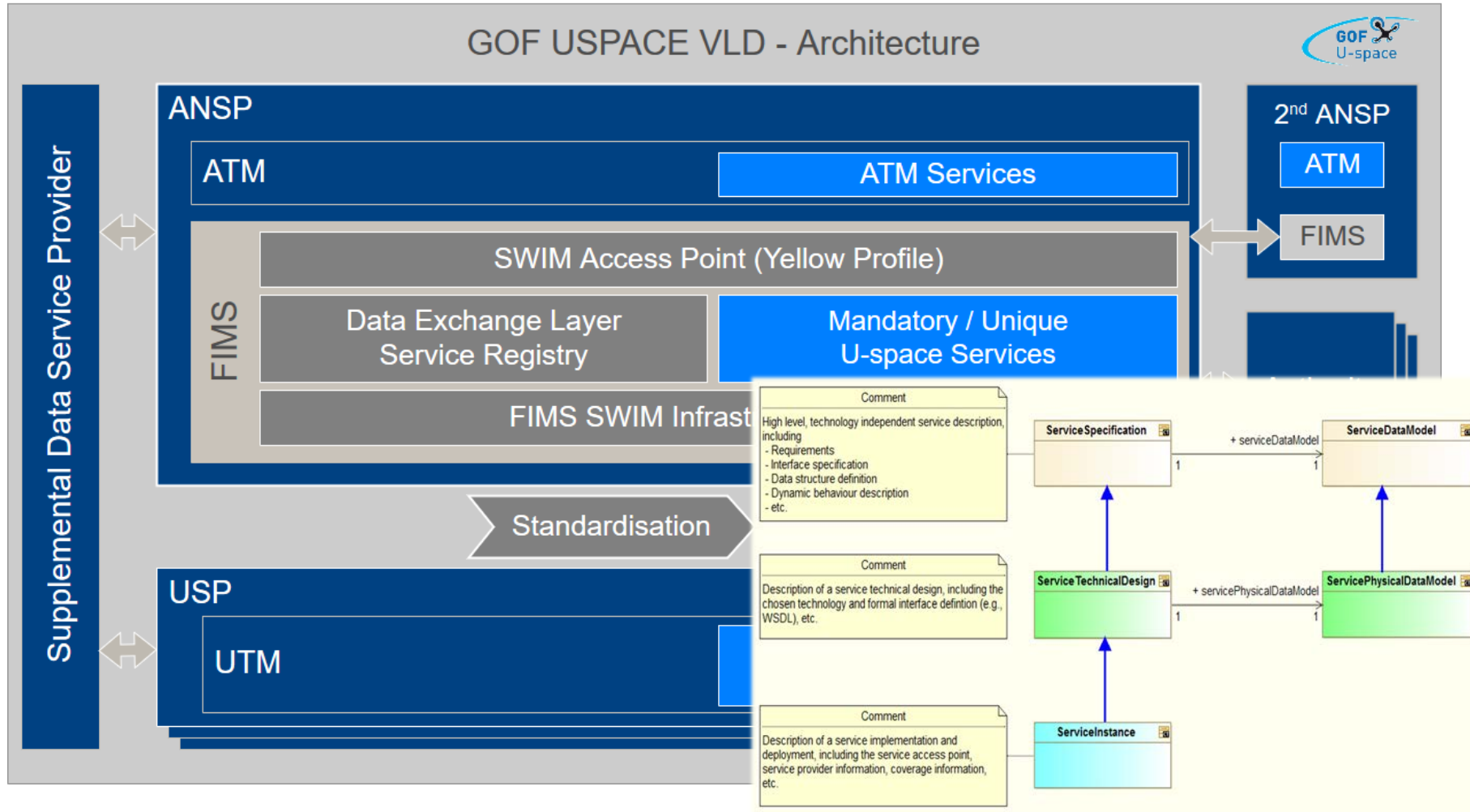
Covers a complete change in paradigm of how information is managed along its full lifecycle

Implementation of SWIM will enable direct business benefits to be generated by

- *assuring the provision of*
- *commonly understood*
- *quality information delivered*
- *to the right people*
- *at the right time.*



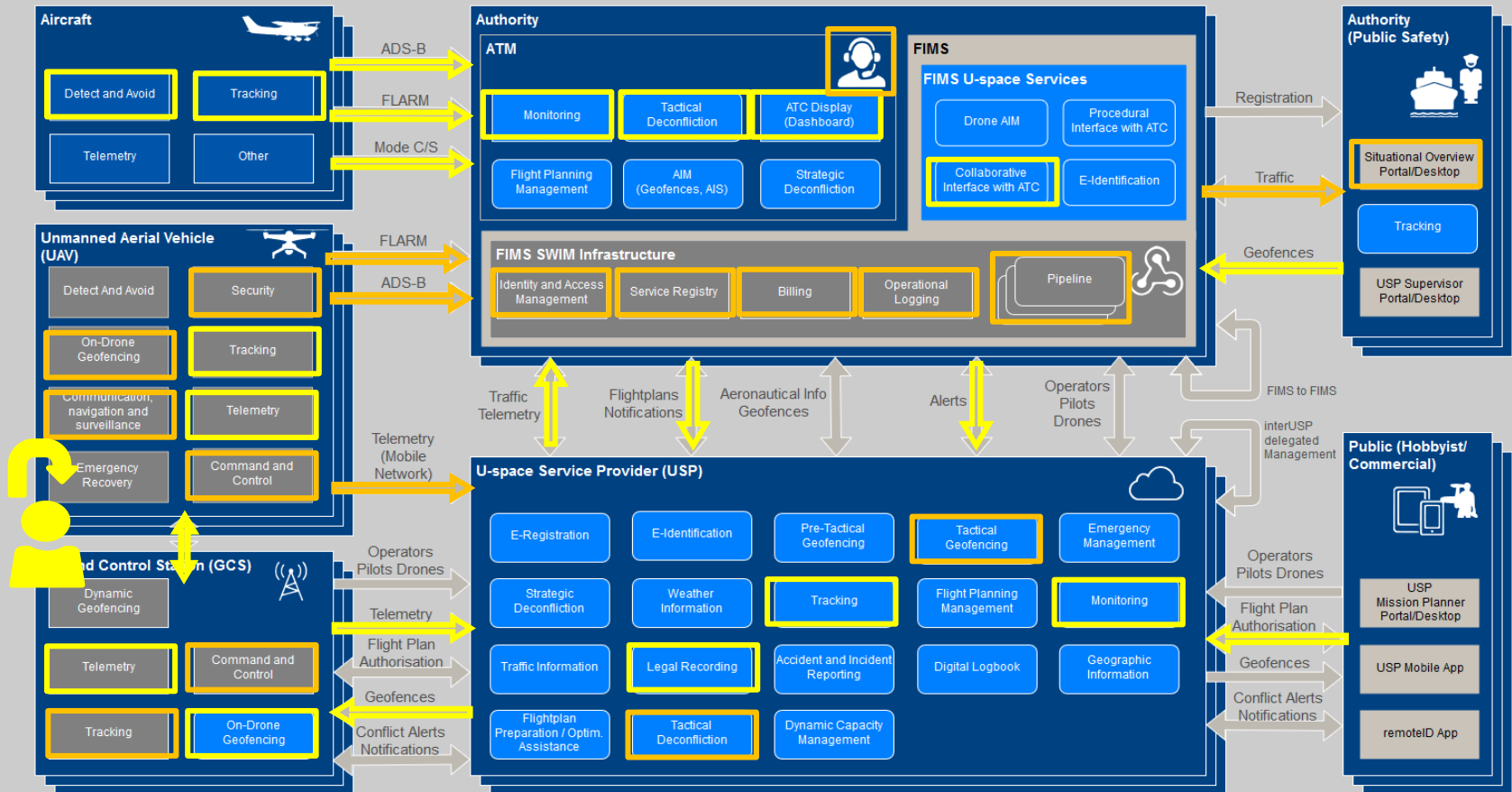
GOF Architecture – Logical View



GOF UAM Example: Airtaxi flight



GOF USPACE VLD - Design & Architecture



Useful info & acknowledgements



GOF USPACE

<https://www.sesarju.eu/index.php/node/3203>

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This U-Space project has received funding from the SESAR Joint Undertaking under the European Union's Connection Europe Facility (CEF) programme under grant agreement SJU/LC/343-CTR



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