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World ATM Congress

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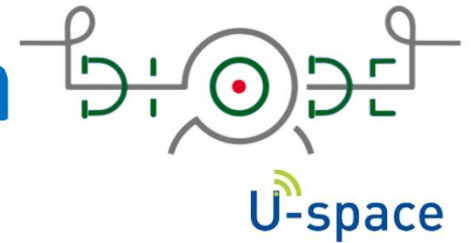


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Stand 849



Project and Consortium



DIODE [D-Flight Internet of Drones Environment] project born in response to the European Commission's "Connecting Europe Facility (CEF)" funding program.



Objective: contribute to the definition of the regulation to exploit the airspace up to 150 meters (AGL)



Distinguished factors:

SIMULTANEITY

REAL LIFE MISSIONS

SERVICES FRONT RUNNER

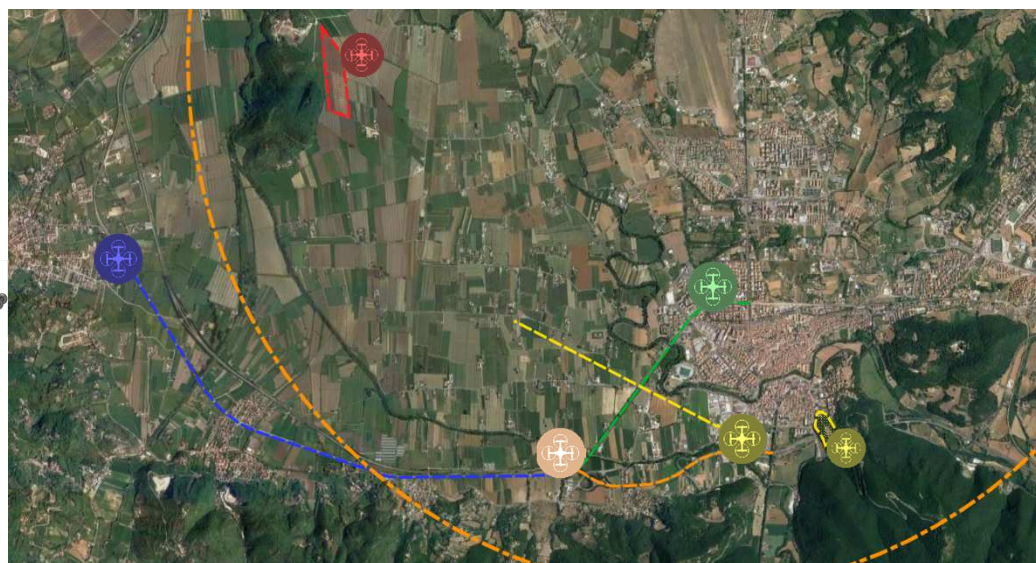


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Project Overview



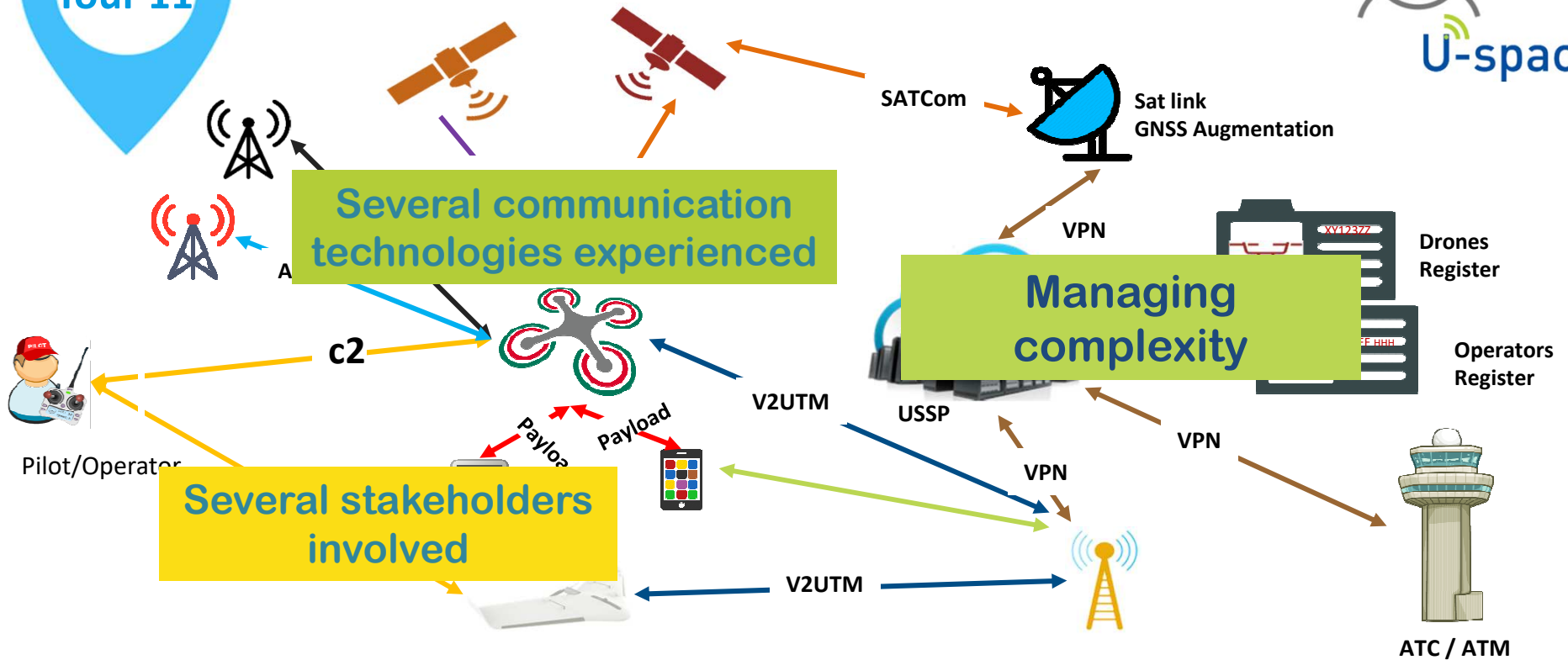
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Tour 11

Technologies @work in operational missions



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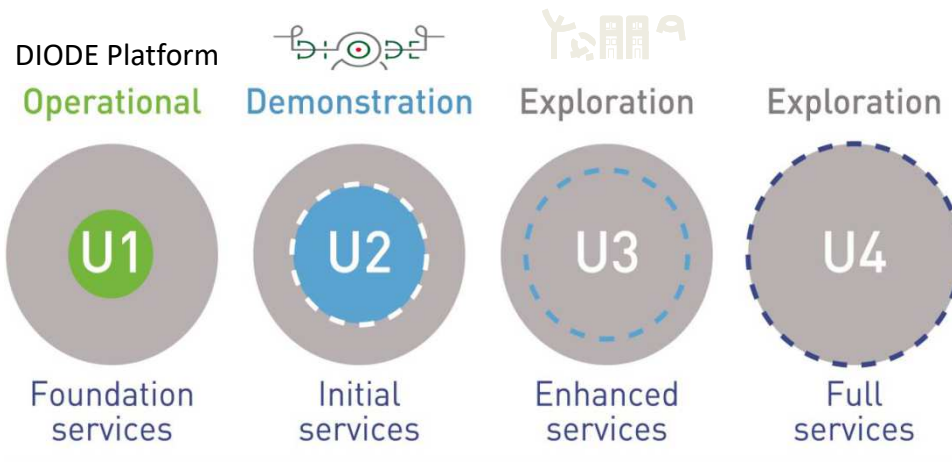
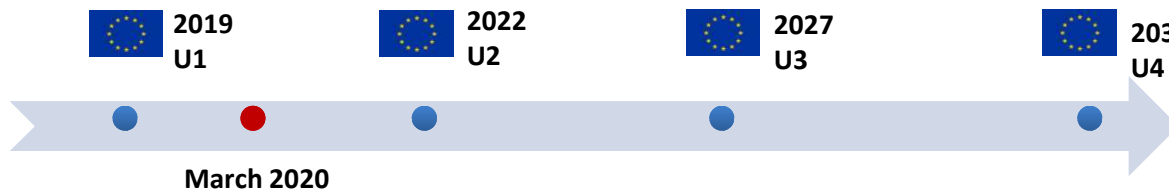




U-space roll-out by



U-Space
Roadmap



- Tactical Geo-fencing
- Collaborative Interfaces ATC
- Emergency management
- Strategic de-confliction
- Weather information
- Tracking
- Registration
- Flight planning management
- E-identification
- Monitoring
- Pre-tactical Geo-fencing
- Traffic information
- Drone Aeronautical Information Management
- Procedural interfaces ATC



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Conclusions



DIODE will **demonstrate** examples of real and practical exploitation of the U-Space services, in **highly complex environment**

DIODE is a **front runner** in the effort of the development of the **U-Space regulations**

DIODE distinguished factors: **strong interaction** between drones, demonstration activities will be executed in a **real-life environment**, **evolution** of the Italian roadmap for the **U-Space services**

Thank you for your attention

for more information:

visit us at

follow us on

contact us



diodeproject.eu

[@diodeproject\\$JU](https://twitter.com/diodeproject$JU)

info@diodeproject.eu



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DOMUS Consortium



ENAIRe 

gmv
INNOVATING SOLUTIONS

SRS
SOTICCL Robotics Systems S.L.

FuVeX

CRIDA
I+D+i - ATM

Isdefe

PildoLabs
move smart

FADA
FUNDACIÓN ANDALUZA PARA EL
DESARROLLO AEROSPAIAL

CATEC
CENTRO AVANZADO
de TECNOLOGÍAS
AEROSPAIALES

indra

EARTH
NETWORKS

AIRMAP

everis

vodafone

Correos

ineco

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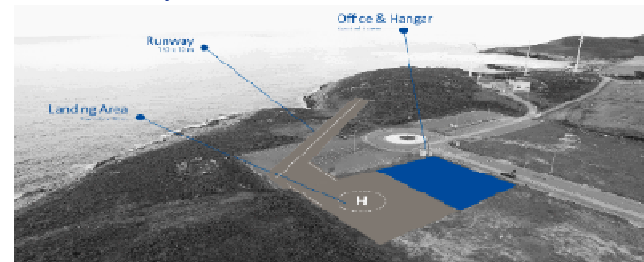
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Demonstration sites



- Where:
 - ATLAS airdrome, Andalucía, Spain.
 - ANCORA airdrome, Galicia, Spain.
- Demonstration in both locations will take place simultaneously.

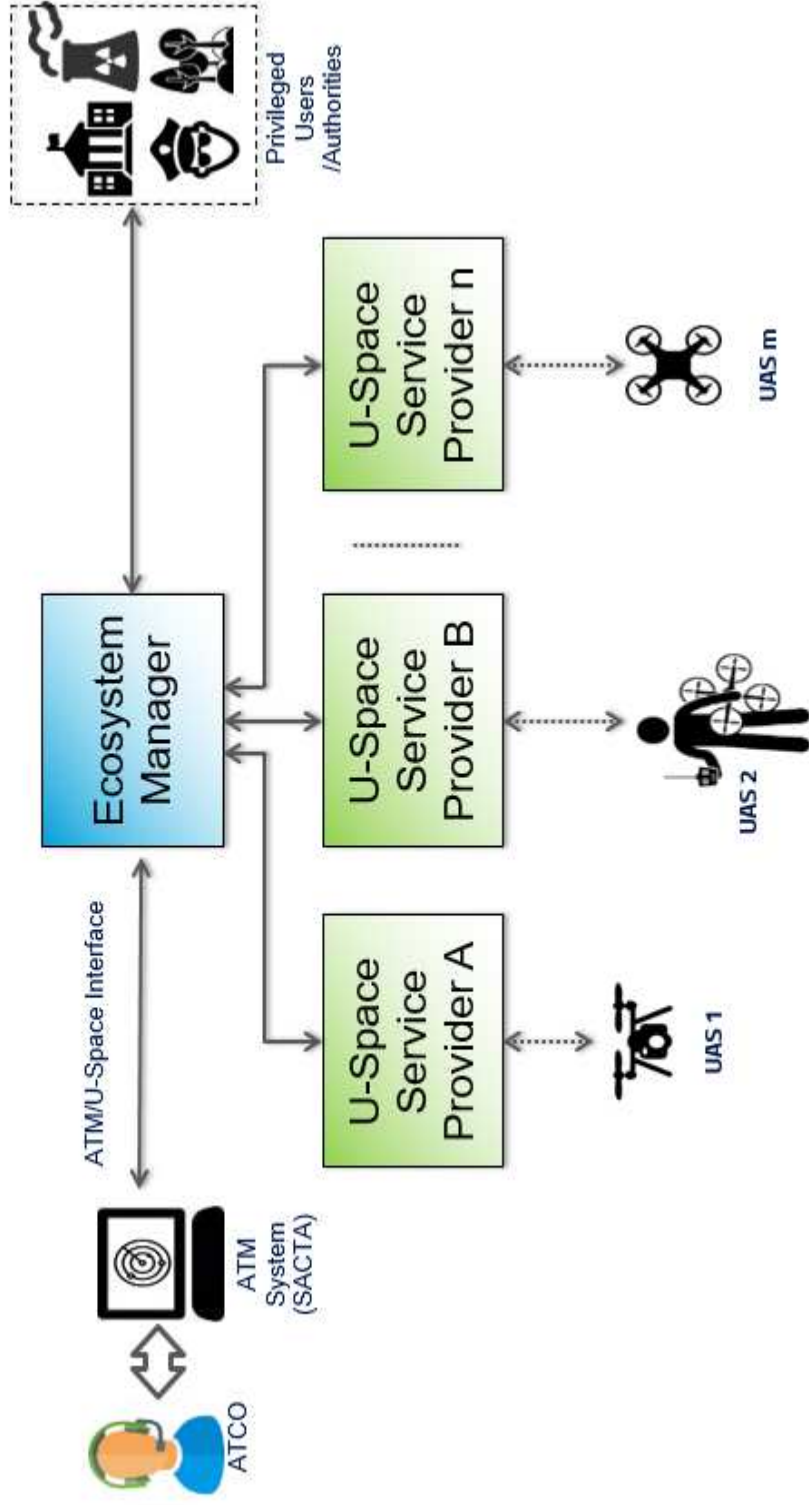


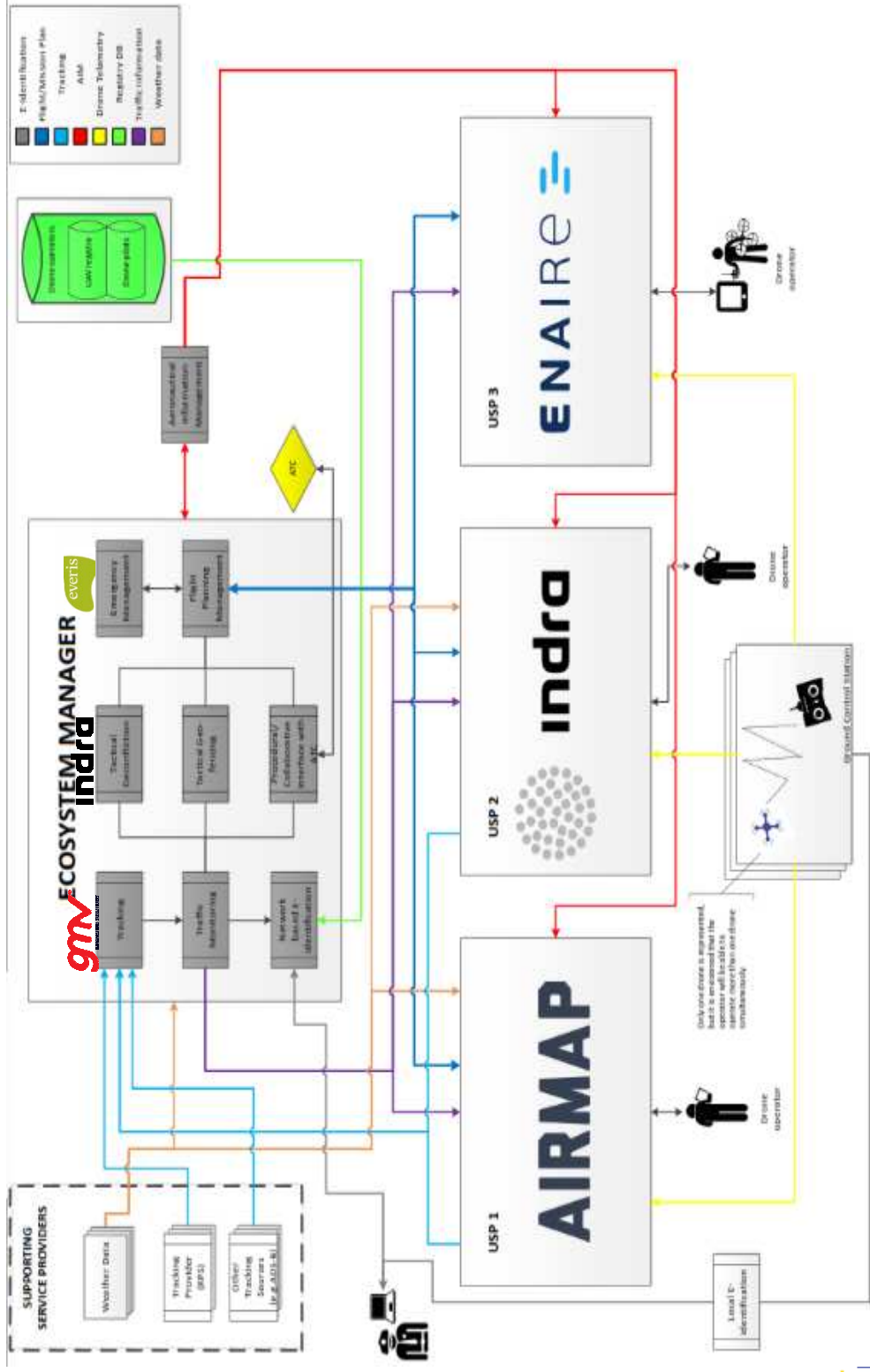
- When:
 - End of July internal DEMO
 - **Mid September External DEMO**



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Trials of



OPERATION CHARACTERISTICS

Mapping UAS
Surveillance UAS
Leisure UAV without flight plan
Emergency assistance
Emergency assistance
Emergency manned aircraft

OPERATION CHARACTERISTICS

Inspection of building facades
Crowd monitoring (Smart-city)
Mapping task
Emergency task
Normal and urgent deliveries
Mapping task
Leisure UAV with Flight Plan



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Pushing the U-space envelope!

Peter Alty – Project Coordinator
13MARCH2019





ODENSE -- enhancing drone interface with aviation environment

- 5 scenarios
- 45 flights
- Restricted airspace
- Class G, TIZ, AFIS
- VLOS, BVLOS



EELDE -- "unexpected" scenarios

- 3 scenarios
- 30 flights
- Class C CTR
- VLOS, BVLOS
- Priority, diversion..



BRETAGNY -- enhancing business operations

- 5 scenarios
- 100+ flights
- Reserved Zone
- CTR vicinity
- VLOS, BVLOS



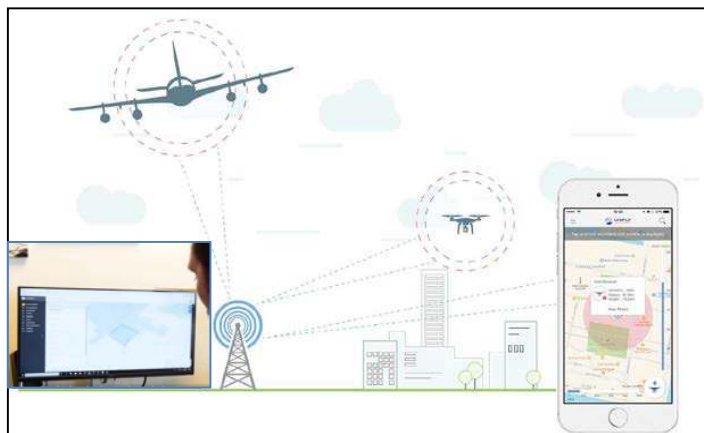
Rodez - entering/exiting CTR, ATCO interactions

- 5 scenarios
- 10 flights
- Class D CTR
- BVLOS
- C2 loss....

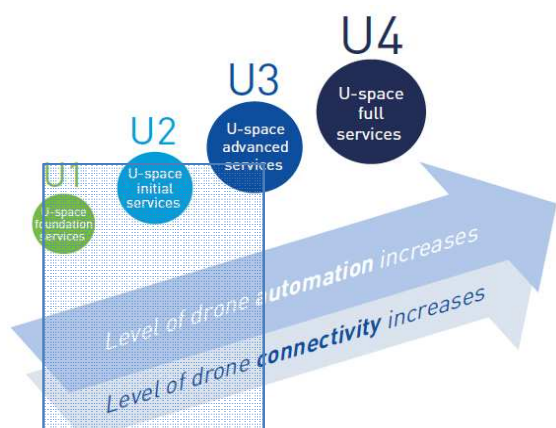


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- Operator, supervisor...roles
- registration & identification
- No-fly zones generation
- automatic flight plan validation
- automatic & manual flight permission
- drone location & tracking
- conflict detection/alerting



- Airspace, legislation data
- Automated, web-based core..
- Fusion, air picture, CWP
- Secure gateway, Access Point Network
- Tracking: GSM, ADS-B/1090 MHz, UNB/L-band



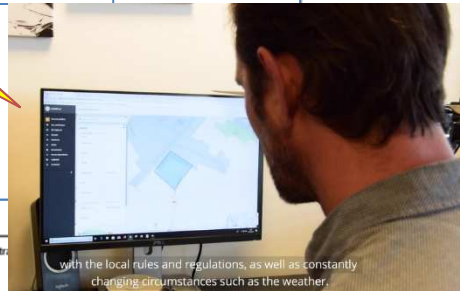
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Data collection & analysis

2. Feasibility of the tasks using UTM system					
2.1. How would you rate the easiness of the performing the flight preparation tasks:	Very Difficult	Difficult	Medium	Easy	Very Easy
a) Perform E-identification	☐	☐	☐	☐	☐
b) Consult/access data (Maps, NOTAM, weather, ATC procedures....)	☐	☐	☐	☐	☐
c) Prepare flight/mission plan	☐	☐	☐	☐	☐
d) Obtain authorisations	☐	☐	☐	☐	☐
Comments :					

Easy to use?



	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. I think that I would like to use this system frequently	☐	☐	☐	☐	☐
2. I found the system unnecessarily complex	☐	☐	☐	☐	☐
I would use	☐	☐	☐	☐	☐
Sort of a technical person to be	☐	☐	☐	☐	☐
in system were well	☐	☐	☐	☐	☐
consistency in this system	☐	☐	☐	☐	☐
would learn to use this	☐	☐	☐	☐	☐
come to use	☐	☐	☐	☐	☐
eam	☐	☐	☐	☐	☐
before I could get going with	☐	☐	☐	☐	☐

3. Impact of UTM system on your tasks				
3.1. How would you rate the impact of the UTM system on the following flight preparation tasks:	Very Negative	Negative	Neutral	Positive
a) Perform E-identification	☐	☐	☐	☐
b) Consult/access data (Maps, NOTAM, weather, ATC procedures....)	☐	☐	☐	☐
c) Prepare flight/mission plan	☐	☐	☐	☐
d) Obtain authorisations	☐	☐	☐	☐
Comments :				

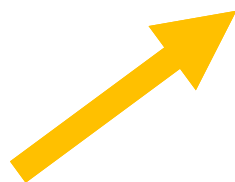
Benefits?



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Pushing the U-space envelope?



Fixing tracker
performance
including
robustness



Obtaining BVLOS
approvals/waivers
including for CTR



Configuring
“trusted”
airspace data
and legislation
in a single HMI



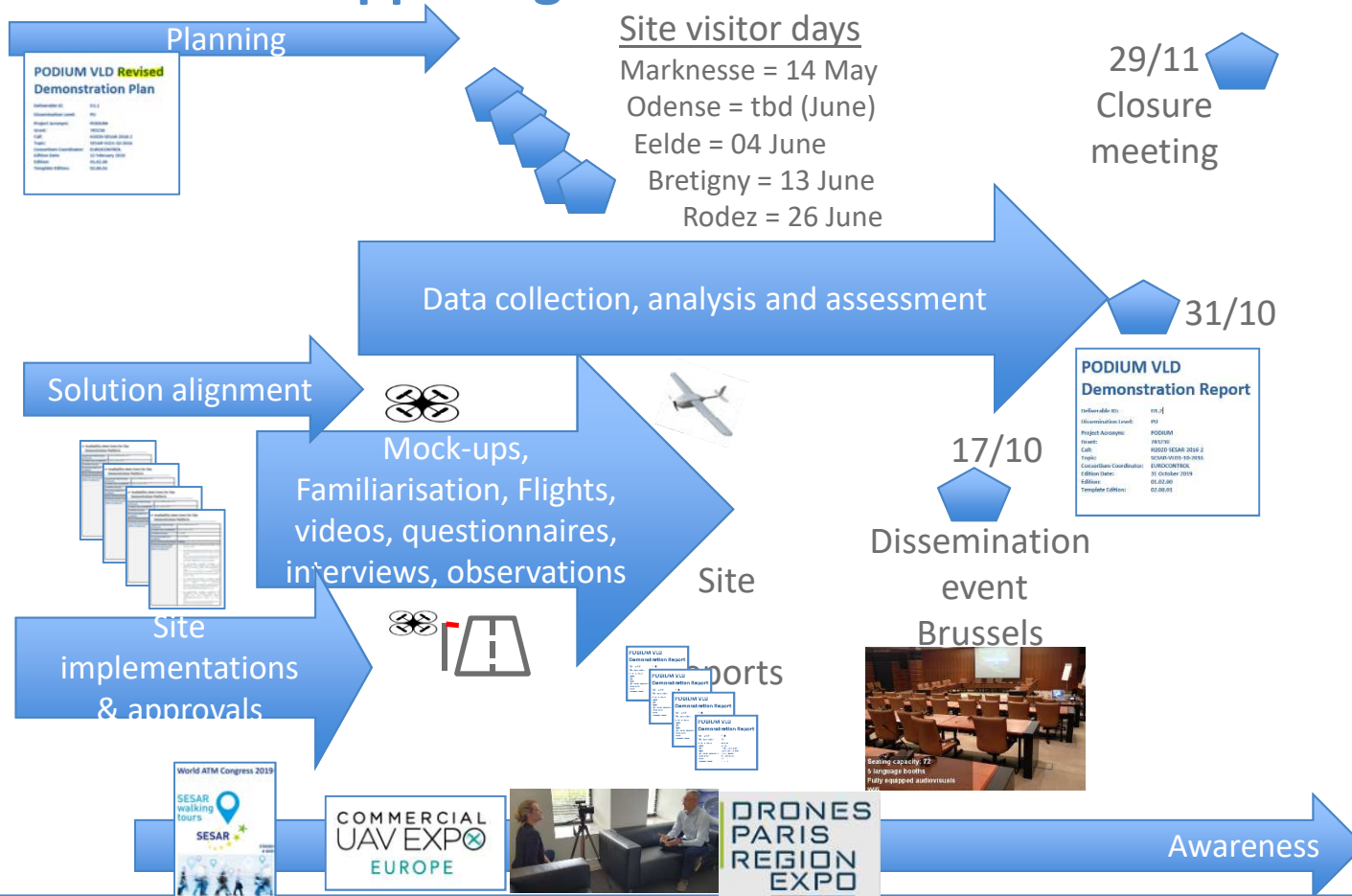
Delivering “live”
unmanned/man
ned scenarios



**Demonstrate, assess maturity, make
recommendations**



What is happening in 2019!



Engage!



U-space PODIUM

171 followers
2w • Edited

What will happen in 2019! Lively **U-space PODIUM** consortium meeting today planning the flights, videos, interviews, questionnaires and observations leading up to the visitor days at Odense, Bretigny, Eelde and Rodez before end June ...see more



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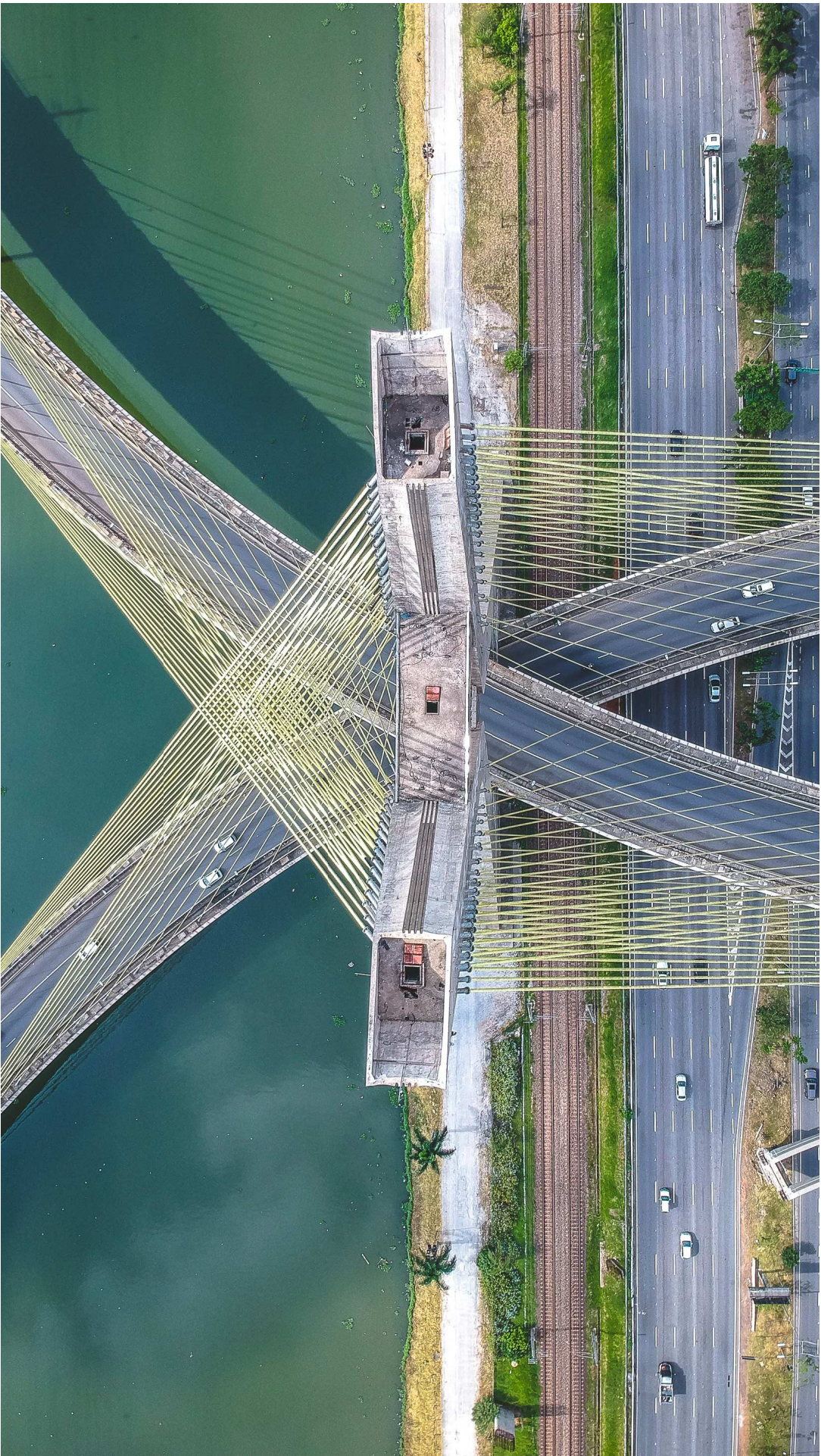


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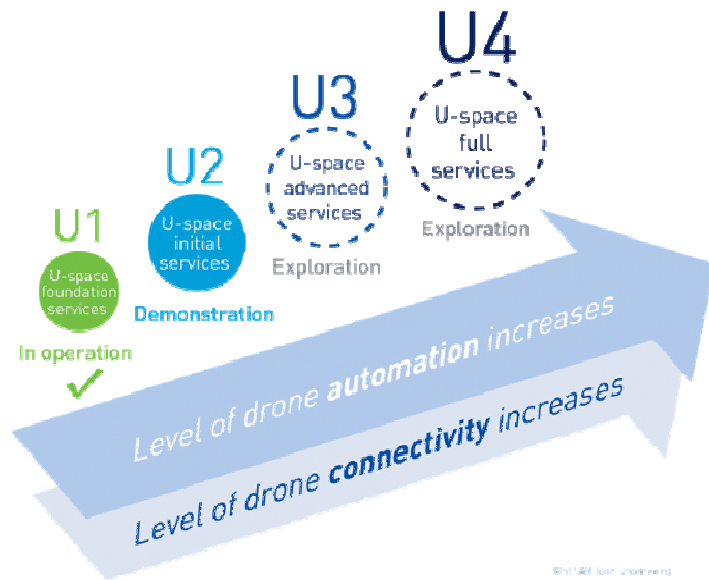
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U-space



SAFEDRONE

USIS



These projects have received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement numbers 763551, 763719, 763599 and 783230.



These SESAR Deployment projects are co-funded by INEA/CEF under grant agreement numbers SJU/LC/344-CTR and SJU/LC/345-CTR.



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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



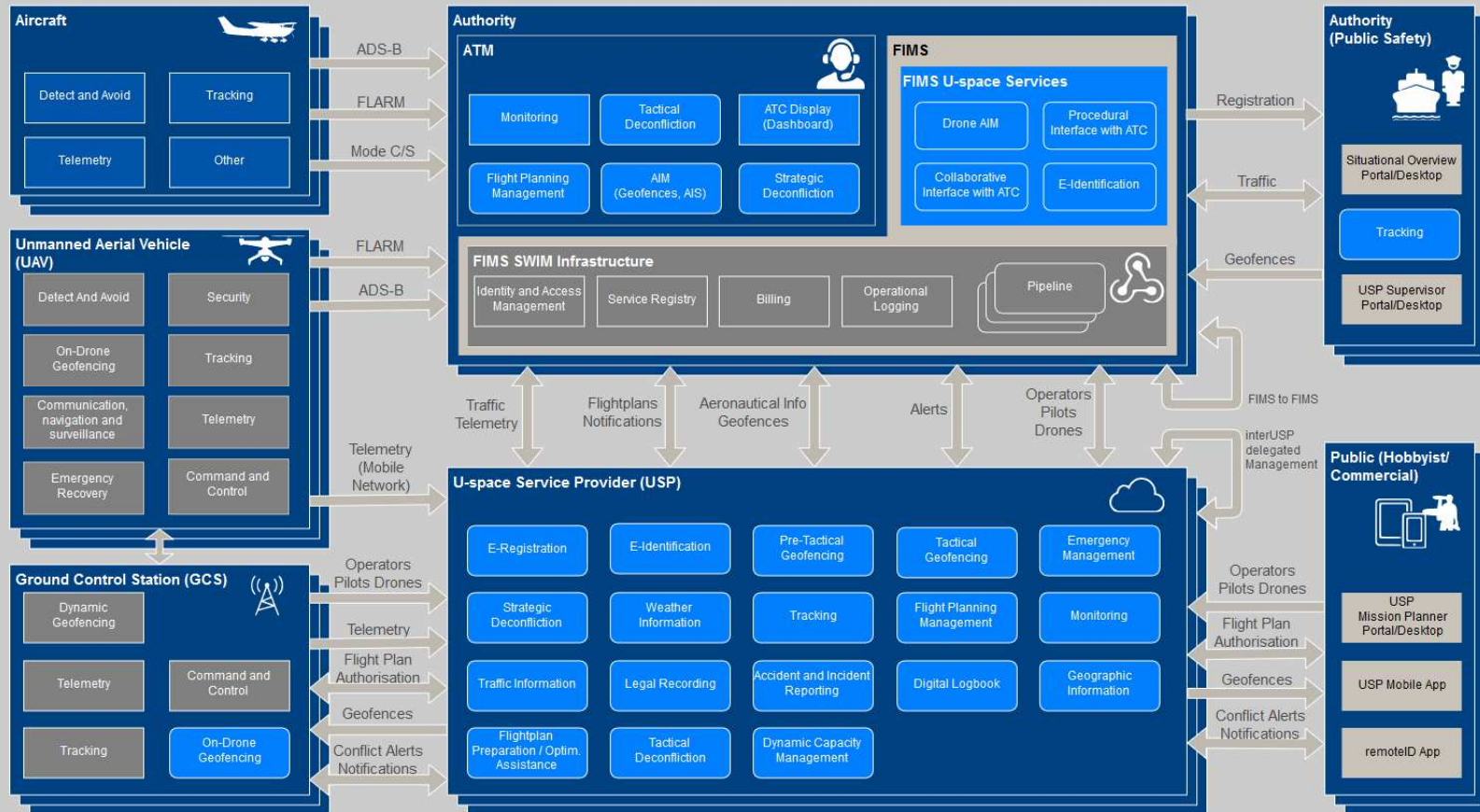
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GOF USPACE VLD - Design & Architecture



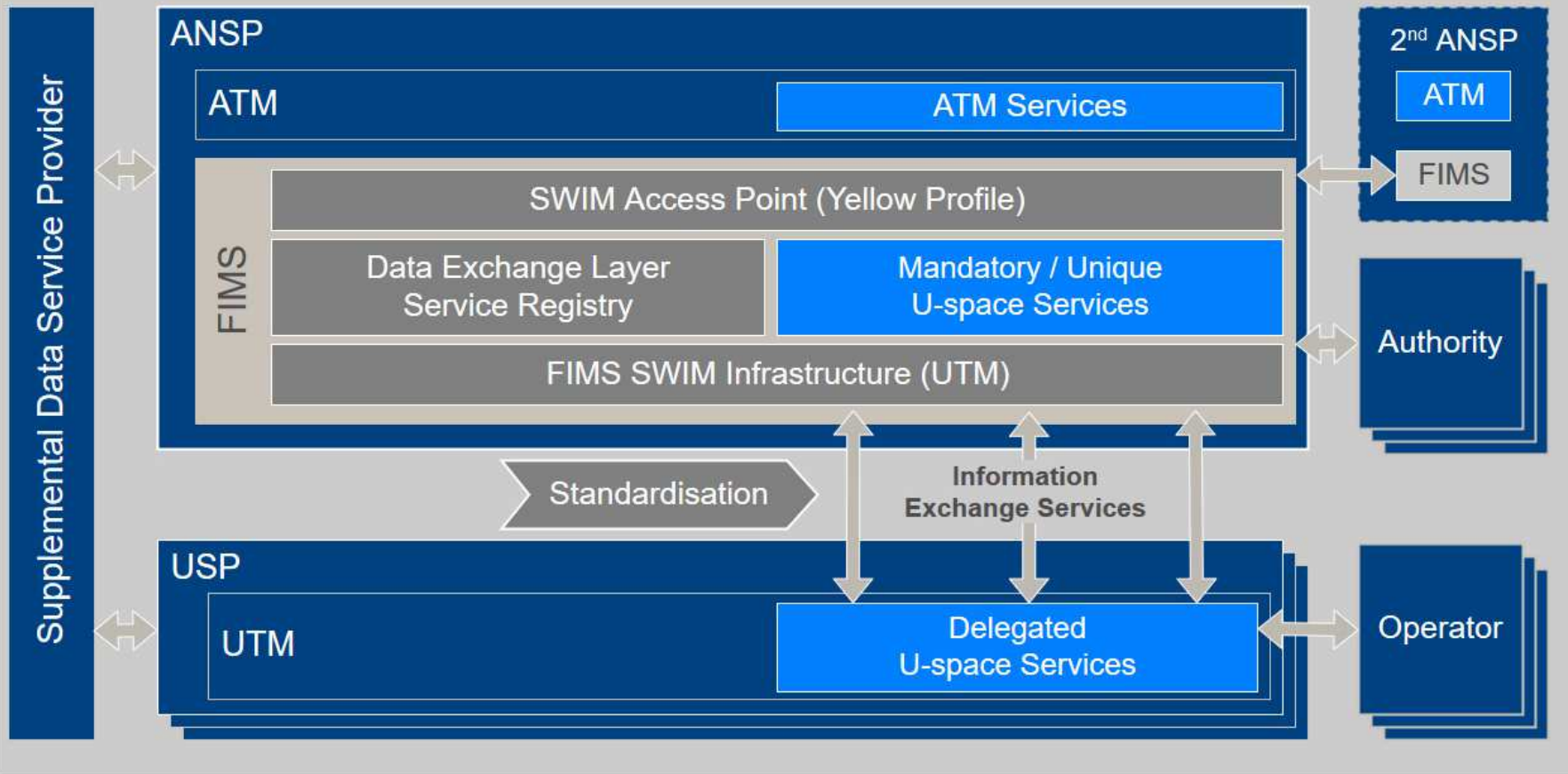
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GOF USPACE VLD - Architecture



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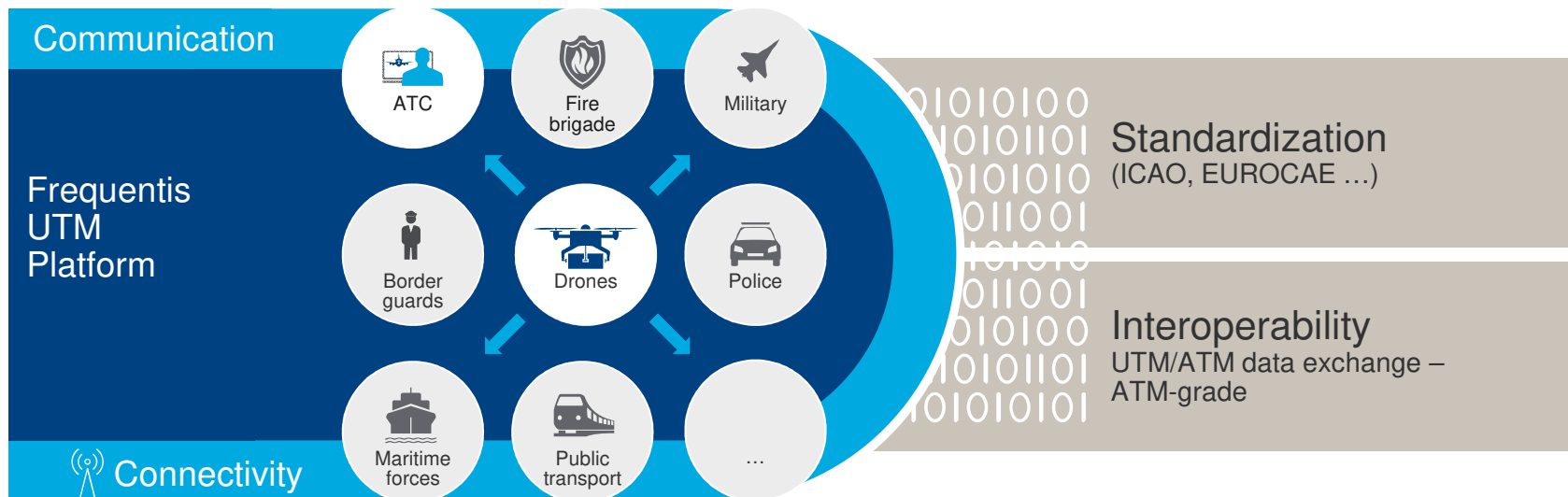
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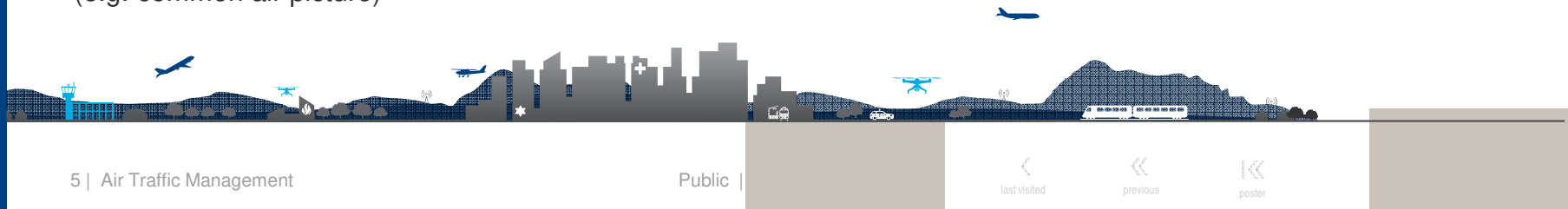
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Bridging UTM and ATM with MosaiX SWIM

Interoperability and standardization are key enabler



Cross-divisional collaboration between all UTM stakeholders
(e.g. common air picture)





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DOMUS scope



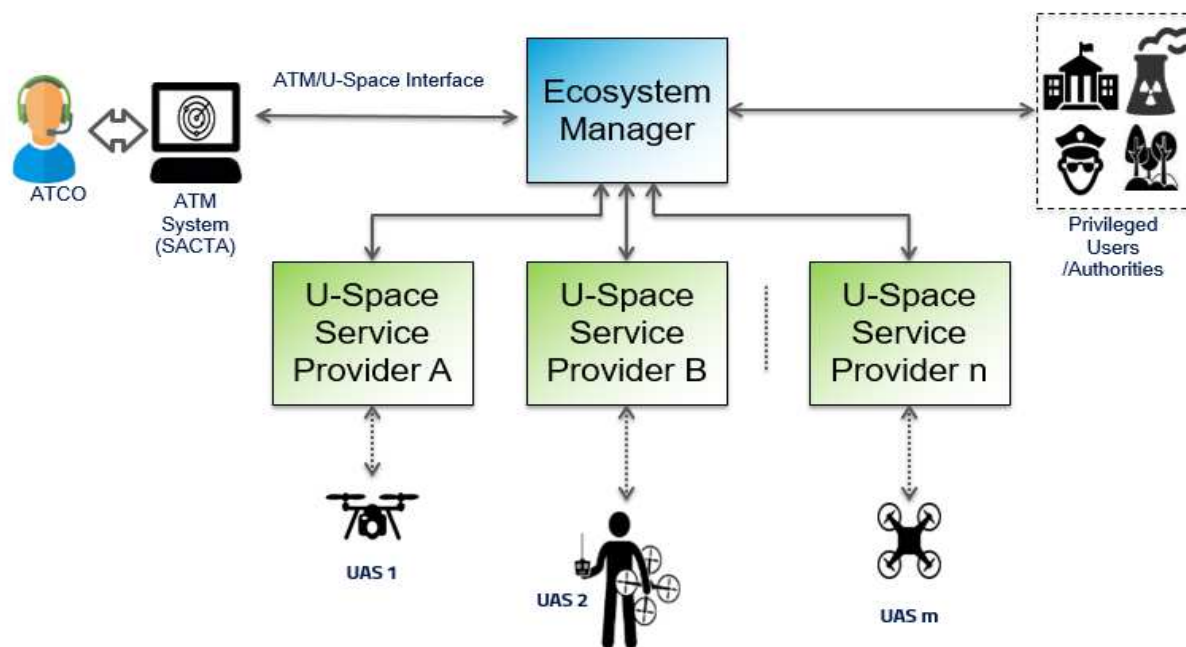
- U-space initial services (U1 and U2)
- Some specific U3 services:
 - Tactical Deconfliction
 - Collaborative ATM
- Smart City use cases



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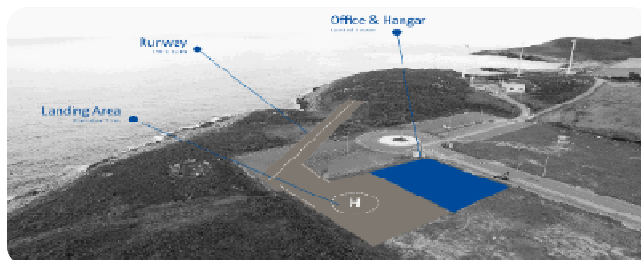


U-space Architecture



Demonstration sites

- Where:
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Trials of DUMUS



OPERATION CHARACTERISTICS

Mapping UAS
Surveillance UAS
Leisure UAV without flight plan
Emergency assistance
Emergency assistance
Emergency manned aircraft

OPERATION CHARACTERISTICS

Inspection of building facades
Crowd monitoring (Smart-city)
Mapping task
Emergency task
Normal and urgent deliveries
Mapping task
Leisure UAV with Flight Plan



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DOMUS main ideas



- Real business model scenarios under U-space operation.
- The architecture will have a federated approach.
- Ecosystem Manager responsible for critical services related to safety, security and privacy.
- The drone operators connect to U-space through the U-space service providers.



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GEOSAFE PROJECT ATM CONGRESS PRESENTATION

13th of March 2019



THE ISSUES OF THE CIVILIAN DRONES MARKET



Extend the use of
civilian drones to
professionals



Automated drone flight
in rural & urban
airspace



Guarantee a safety &
security rate

U-SPACE SERVICES

U-space is defined in the U-space blueprint document as a set of services designed to support safe, efficient and secure access to airspace for large numbers of drones. The deployment of U-space is foreseen in an incremental manner:

- U1 : U-space fondation services
- U2 : U-space initial services
- U3 : U-space advanced services
- U4 : U-space full services

FUNCTIONS

These services will be based on these functions:

- E-identification
- **Geofencing**
- Security
- Telemetry
- Tracking
- V2V (Vehicule to Vehicule Communication)
- V2I (Vehicule to Infrastructure Communication)
- Communication, Navigation and Surveillance
- Detect And Avoid
- Emergency Recovery
- Command and control
- Operations management

GEOFENCING SOLUTION



DESCRIPTION OF THE GEOFENCING SERVICES 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 connectivity to a geofencing system that allows the data to be **updated during the flight**

U4 LEVEL

Full services

Extract from European ATM Masterplan

DESCRIPTION OF THE GEOSAFE PROJECT



WHAT ?

To establish state-of-the-art geofencing solutions regarding U-space regulation

HOW ?

One-year long flight-test campaign

WHY ?

Propose recommendations for future geofencing system definition (CORUS), Sustain technological improvements for enhanced geofencing system.

CORUS : Concept of Operations for U Space

GEOSAFE TEST OBJECTIVES



Objectives

Assessment of available flight planning solution available
Drone operation near a Restricted Area / within a geofenced volume / in degraded environment
Assessment of restricted area data update during the flight / UTM tracking
Assessment of navigation system performance



Functional test

Assessment of geofencing
feature available on the market



Technical test

UTM services, in flight data
update, assessment of
navigation system performance



Real test

Evaluate the Geofencing
solutions on operational drone
mission

Schedule & VLD (Very Large Demonstration)



Jan 2019

July 2019

Tests realization

Results and Recommendations

VLD preparation

VLD



VLD : September 2019
Atechsys, Pourrières, France



Final demonstration will show
several drones from different
types flying near restricted area
in a UTM context



Final demonstration focus:

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

GEOSAFE
GEOFENCING
FOR SAFE
AUTONOMOUS
FLIGHT IN EUROPE



ATM Master Plan & CORUS



U1 – U-space foundation services

Pre-tactical geofencing

The service provides the operator with geo-information about predefined restricted areas (prisons, etc.) and available aeronautical information (NOTAM, AIRAC cycle) used during the flight preparation.

This service requires the identification of accredited sources and the availability of qualified geo-information related to restricted areas.

This service provides information that allows the drone operator to make use of the geofencing capability of the drone.

U2 – U-space initial services

Tactical geofencing

Compared to U1 pre-tactical geofencing, tactical geofencing brings the possibility to update the operator with geofencing information even during the flight.

U3 – U-space advanced services

Dynamic geofencing

Compared to tactical geofencing in U2, the dynamic geofencing 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.

[SESAR JU]: European ATM Master Plan: Roadmap for the safe integration of drones into all classes of airspace

Service or Capability	level	Features
Pre-Tactical Geo-Fencing	U1	Information provided before flight. The user should have access to AIP and NOTAM defined geo-fences in a form that can be used when planning and that can be loaded onto the drone if it has geo-fence fence features in its navigation system
On-drone Geo-Fencing	U1	The ability of the drone to keep itself on the correct side of a geo-fence by having geo-fence definitions (location, time, height) within its navigation system
Tactical Geo-Fencing	U2	This service delivers to the pilot and /or drone operator updates to and new definitions of Geo-Fences occurring at any time, including during flight. The creation of geo-fences with immediate effect <i>may</i> (tbd) require that they are defined outside the AIP. (See below)
Drone Aeronautical Information Management	U2	U2 <i>may</i> (tbd) include a non-AIP repository of Geo-Fences. The Drone Aeronautical Information Management service includes all information coming from such a source, combined with information from the AIP and NOTAMS together with any other drone relevant sources.
Dynamic Geo-Fencing	U3	This service delivers updates and new definitions of geo-fences directly into the drone, even in flight. This service relies on capabilities of the drone in U3 to receive communications from U-space and to deal with geo-fence updates.

Table 8 Geo-fencing in U-space

CORUS

