IMPACTS

- Facilitate integration of U-space and ATM data
- Increase data quality and integrity
- Enable safe and efficient operations
- Ensure technological feasibility of the U-space Information Management
- Ensure data management scalability
- Ensure commercial feasibility of the U-space Information Management

We are key stakeholders providing complementary views on the current and envisioned Drone information management processes

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WORKSHOP ON IMPETUS RESULTS

CRIDA Premises
Madrid (Spain)
www.crida.es

12th November 2019

linkedin.com/groups/13574098
info@impetus-research.eu
impetus-research.eu

U-space

SESAR JOINT UNDERTAKING

IMPETUS

U-space Information Management for drone operations in Very Low-Level airspace

IMPETUS main aim is testing technologically and commercially feasible solutions for the delivery of information services to drone operators, following a step-wise process.

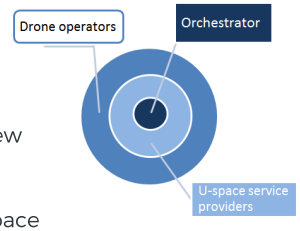
Coherent operating picture of U-space information services

Identification of information needs of drone users is done by reviewing the entire drone operational lifecycle, starting with mission and individual flight planning, continuing via traffic planning, mission and flight execution, and ending with the end customer who receives the service:

- Up to 35 U-space service concepts identified.
- Agnostic approach, independent from the implementation.

Architecture, dependencies and requirements of services

The framework of IMPETUS solution is based on a federated architecture with a layered distribution of responsibilities: a central actor, the "Orchestrator", which has a global view and is the single point of truth of the airspace situation, an intermediate interface composed of multiple U-space Service Providers, and an external layer for the end-users (the drone operators).



Development of U-space services prototypes and integration

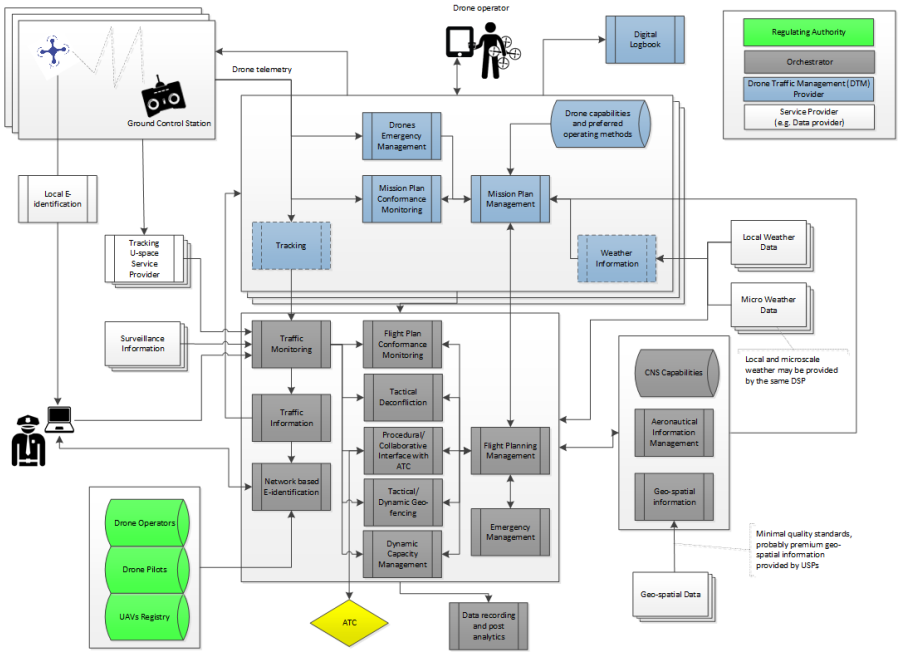
IMPETUS platform enables the execution of experiments by implementing micro-services models for testing the addressed U-space information services.

Execution of experiments and evidence of performance

The architectural solution

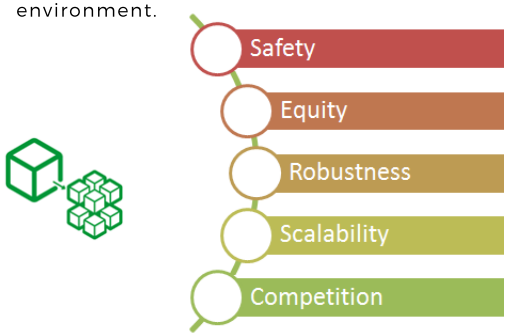
In the federated architecture, end-users – specifically Drone Operators - are serviced by DTM Providers. The "Orchestrator" acts as a proxy for both the rest of the network (i.e. federated peers) and the ATM system, freeing DTM Providers from the complexity of having to interact with a large number of peers and protocols and supporting them in their computational needs. The "Orchestrator" also acts as firewall between highly critical ATM system and the network of DTMs.

Federated Scheme



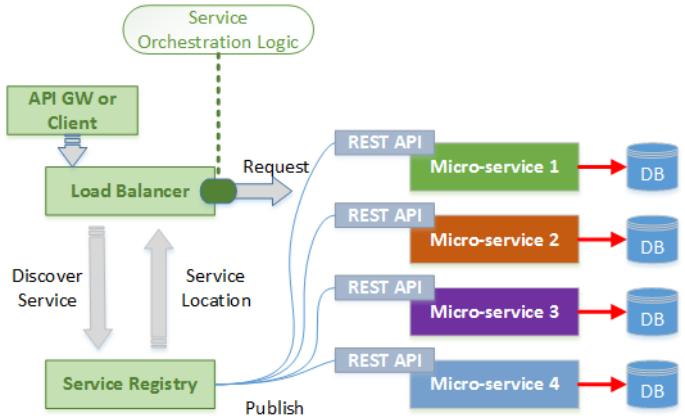
Benefits of the layered distribution of responsibilities are:

- Maintain and improve **safety**, building upon existing safety management.
- Ensure equal and **fair access to airspace**.
- Robustness and solvency.
- **Scalability** thanks to the easy addition of new providers to the system. Reduction of the complexity to interact with the rest of U-space service providers.
- **Maximized competition** in a secured, neutrally governed and standardised environment.



Microservice Paradigm

Microservice architectural style is an approach to develop a single application as a suite of small functionalities, each one running in its own process and communicating with lightweight mechanisms.



Benefits

The ability for services to be independently deployed provides the **flexibility required for rapid and agile increments** of the overall U-Space capability.

- Diverse technologies according to the service requirements.
- No need of common standards for design and development.
- Continuous deployment of the service is made possible.

Challenges

- Maintaining **data consistency** across multiple services as microservice architecture is characterised by the decentralised data management.
- Management of **failure modes** and mechanisms for the real-time monitoring.

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THE EXPERIMENTS

DRONE-SPECIFIC WEATHER SERVICE

How a **better knowledge of the uncertainty in the meteorological prediction** – as this is the most important novelty with respect to the state of the art, will improve the robustness of trajectory-based decision making processes underlying Mission Plan, Flight Planning and Traffic Management services.

FLIGHT PLANNING MANAGEMENT

How the Flight Planning Management Service can be used as controlling entity for flight plan submission and strategic deconfliction. How to guarantee **successful and safe adaptation of initial submitted flight plan** when Flight Planning Management Service interacts with the Local Weather, the Aeronautical Information Management and the Mission Plan Management services.

MONITORING AND TRAFFIC INFORMATION

How dynamic information, especially surveillance data and the positions of obstacles, is gathered, integrated and provided to all actors involved in the operation. How to develop **automated services to process traffic information from multiple users and sources**, offering situational awareness (including live updates of geo-spatial information) and alert messages in case of non-conformances.

TACTICAL CONFLICT RESOLUTION

Which services are needed to **dynamically manage the airspace** in the execution phase, considering both the standard separation criteria proposed by CORUS and new separation criteria that take diverse drone capabilities into account. The exercise also assesses how to deal with dynamic changes in airspace restrictions by determining the safest path for the affected drones to take.

OUTCOMES

Coherent operating picture of U-space information services

Architecture, dependencies and requirements of services

Evidence of performances and technical feasibility