How to Fly Safely within a Crowded Urban Airspace - Integrating Vertidrome Management Tasks into U-space

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Artistic impression of a vertidrome layout for Hamburg airport.

What is U-space?

U-space as defined by the European Commission is a set of new services relying on a high level of digitalization and automation of functions and specific procedures, designed to provide safe, efficient and secure access to airspace for large numbers of unmanned aircraft, operating automatically and beyond visual line of sight. Thus, U-space is the future of airspace integration for drones and air taxis in Europe, also called UTM (Unmanned aircraft system Traffic Management).

U-space services are under development but commercially not available yet. For demonstration in the project HorizonUAM a central U-space cloud service is simulated through a local messaging server using the protocol MQTT (Message Queuing Telemetry Transport).

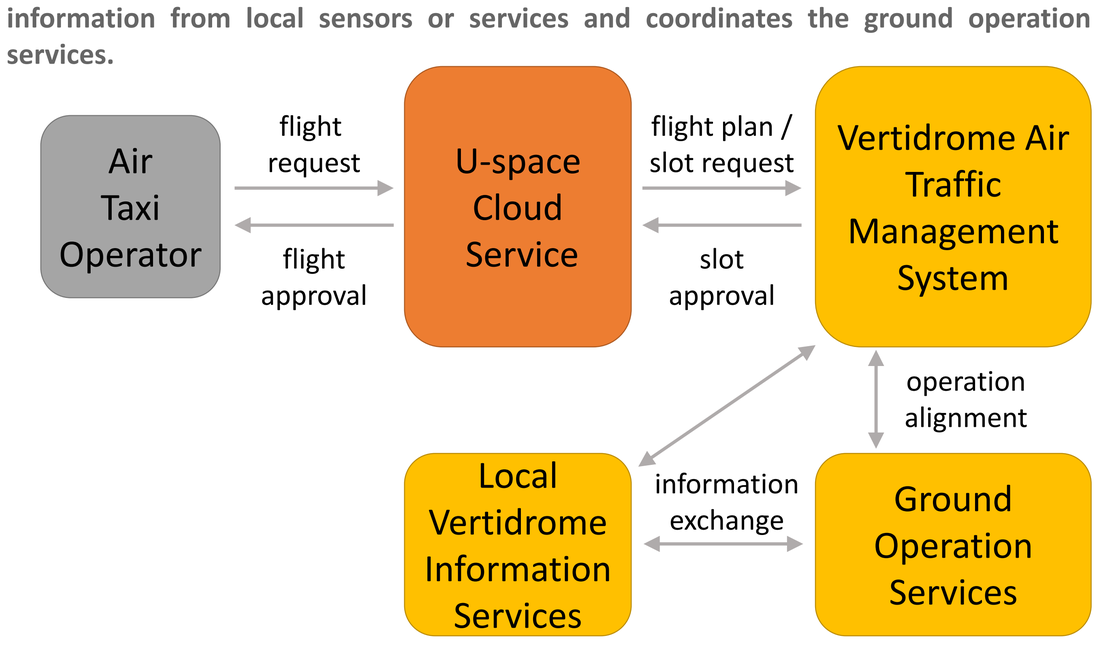
Vertidrome management

A prototypical vertidrome management tool was created to demonstrate the scheduling and sequencing of air taxis flights. The vertidrome manager is fully integrated within U-space and receives real-time information on flight plans, including requests for start and landing and emergency notifications. Additional information coming from other U-space services (e.g. weather information) can be accessed on request. The integration was demonstrated in a scaled flight test environment with multicopters (<15kg) representing passenger carrying air taxis.

The power of automation

The demonstrated vertidrome management tool relies on a human controller to manage incoming requests. Future developments envision a higher degree of automation on the vehicle side but also on the controller side. In future works also the integration at existing airports and the interface to conventional air traffic management will be investigated.

Integrating a vertidrome manager into U-space. The air taxi operator requests flight approval through the U-space cloud service. A slot request is generated for the vertidrome manager (air side). The vertidrome manager receives additional information from local sensors or services and coordinates the ground operation services.



Prototypical interface for a vertidrome manager. The vertidrome manager is connected over MQTT with U-space. The vertidrome manager receives flight planning requests from the U-space service and executes strategic deconfliction by sending clearances and time slots based on the weather, vertiport pad usability and already planned flight operations. Moreover, the vertidrome manager loads the specific vertidrome data involving sector headings around a vertidrome and tracks the position, altitude and heading of the arriving or departing flight for performing tactical deconfliction.

Acknowledgement: The authors acknowledge the contribution of Michael Rudolph and Cornelius Lehners in coding the software tools as well as the support of the HorizonUAM flight test team in the validation campaign.