

Drone Human centered interfaces

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Multidrone Personnel and Roles



- **Director.** Person in charge of the media production. Specify the shots to be taken by the drone team. He will interface with the system through the Dashboard.
- **Supervisor Operator.** Person in charge of the security of the system. Throughout the Supervisor module, this person will validate plans as safe, and will give a green light to the Director.
- **Drone Pilots(?).** For security reasons, each drone will have a human pilot in charge to take over in case of emergency.
- **Cameramen (?).** There will be a cameraman in charge of each camera on board the drones to take manual control if required by Director.



Multiple drone operation modes



- **Manual operation**

- 1 pilot and 1 cameraman per drone.
- Scalability and operation cost issues, when multiple drones operate.

- **Automatic operation**

- 1 drone or multiple drones.
- 1 director (+ director dashboard).
- 1 Flight supervisor (+ supervisor station).
- 1 pilot per drone (due to regulations, redundant in the future?).



Drone Human centered interfaces



- **Director dashboard**
- Flight supervisor station



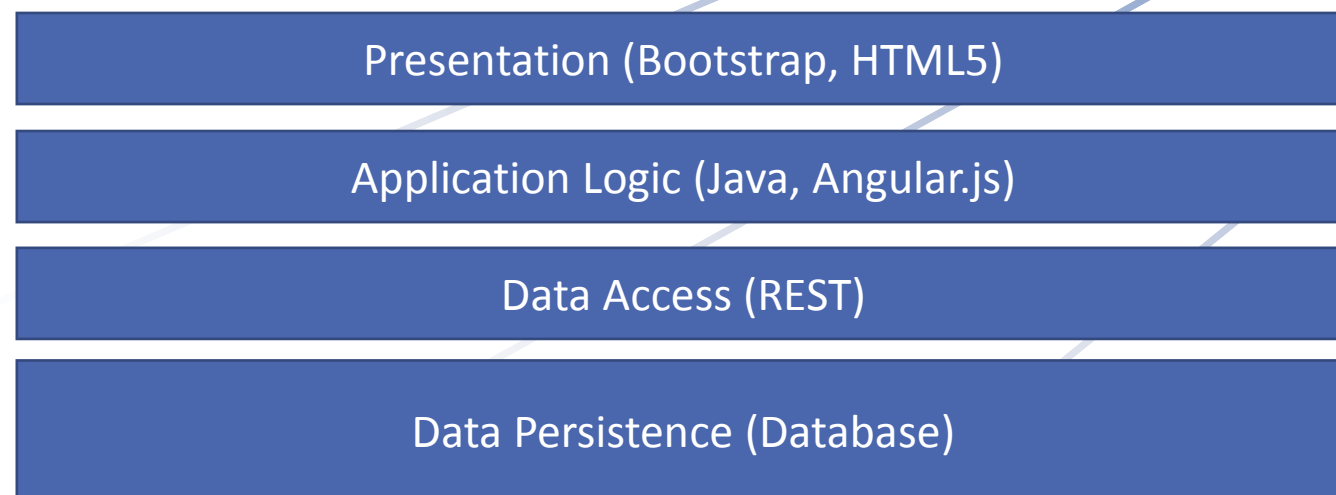


Design principles

- Classical web application.
- Based on state-of-the-art web development tools:
 - MySQL
 - Apache Tomcat
 - Angular.js, Bootstrap, HTML5.
- Layered architecture:
 - Database
 - REST API
 - Application/controller/services
 - HTML front-end.

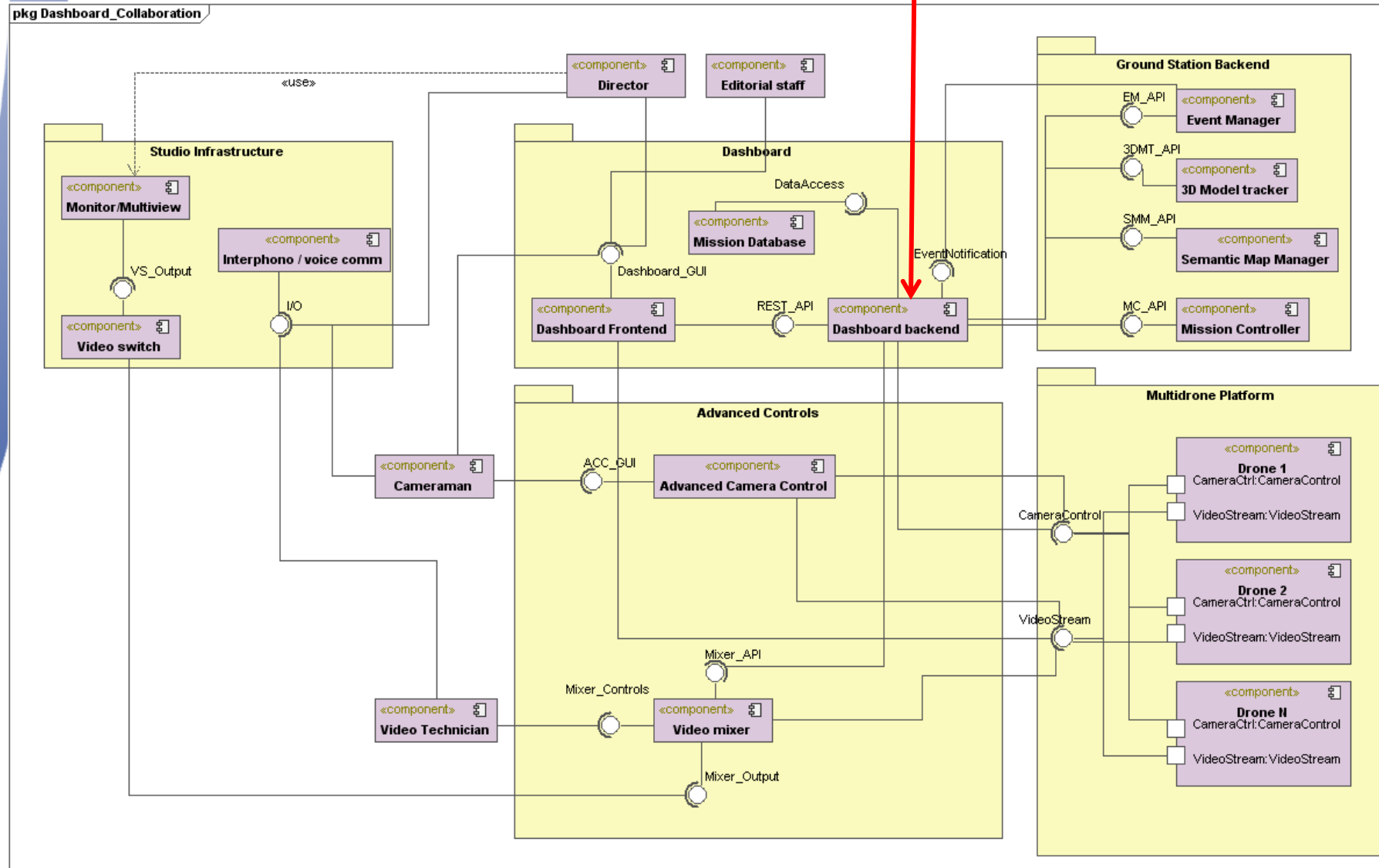


Dashboard Logical Architecture

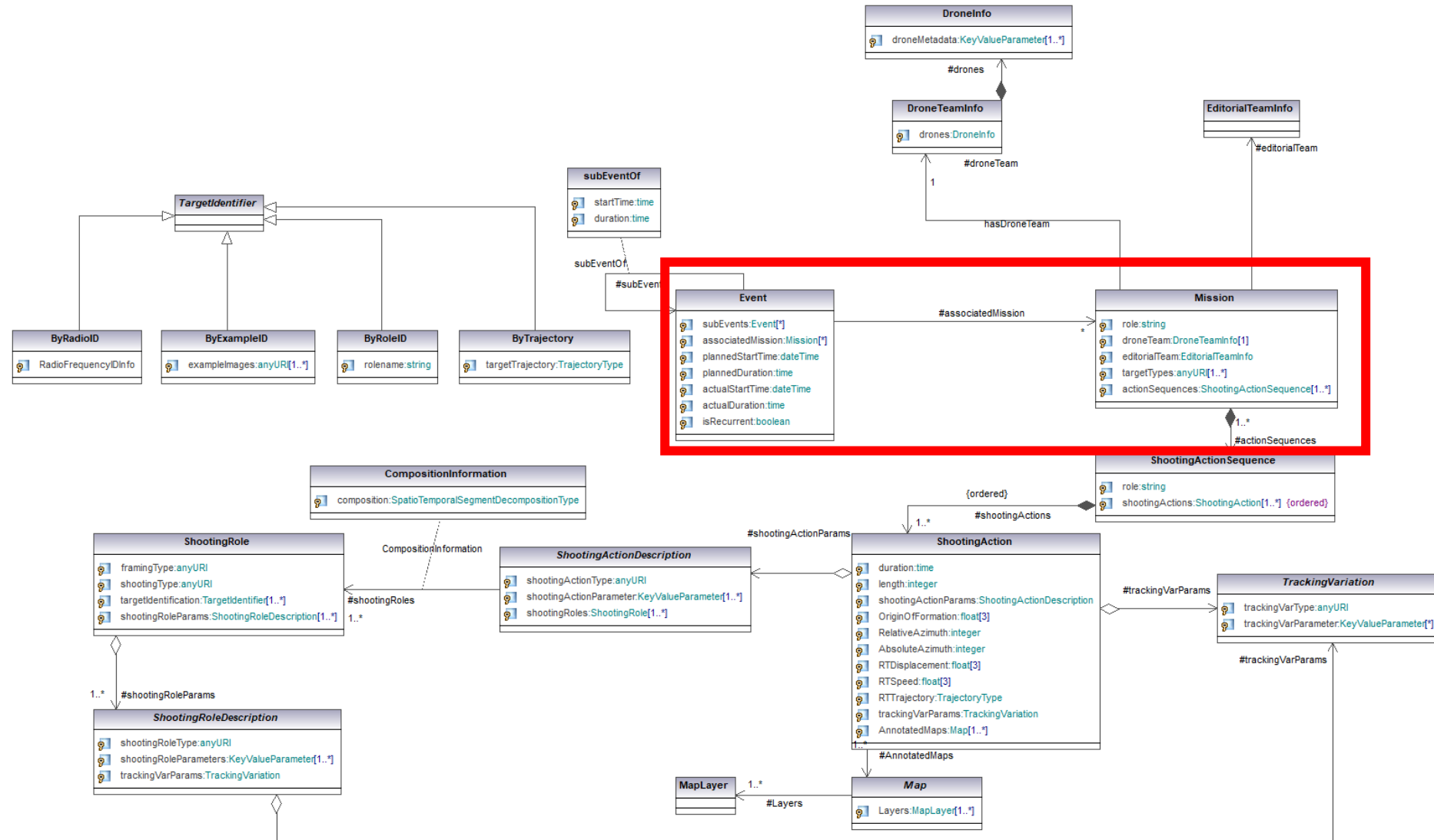


Dashboard Deployment

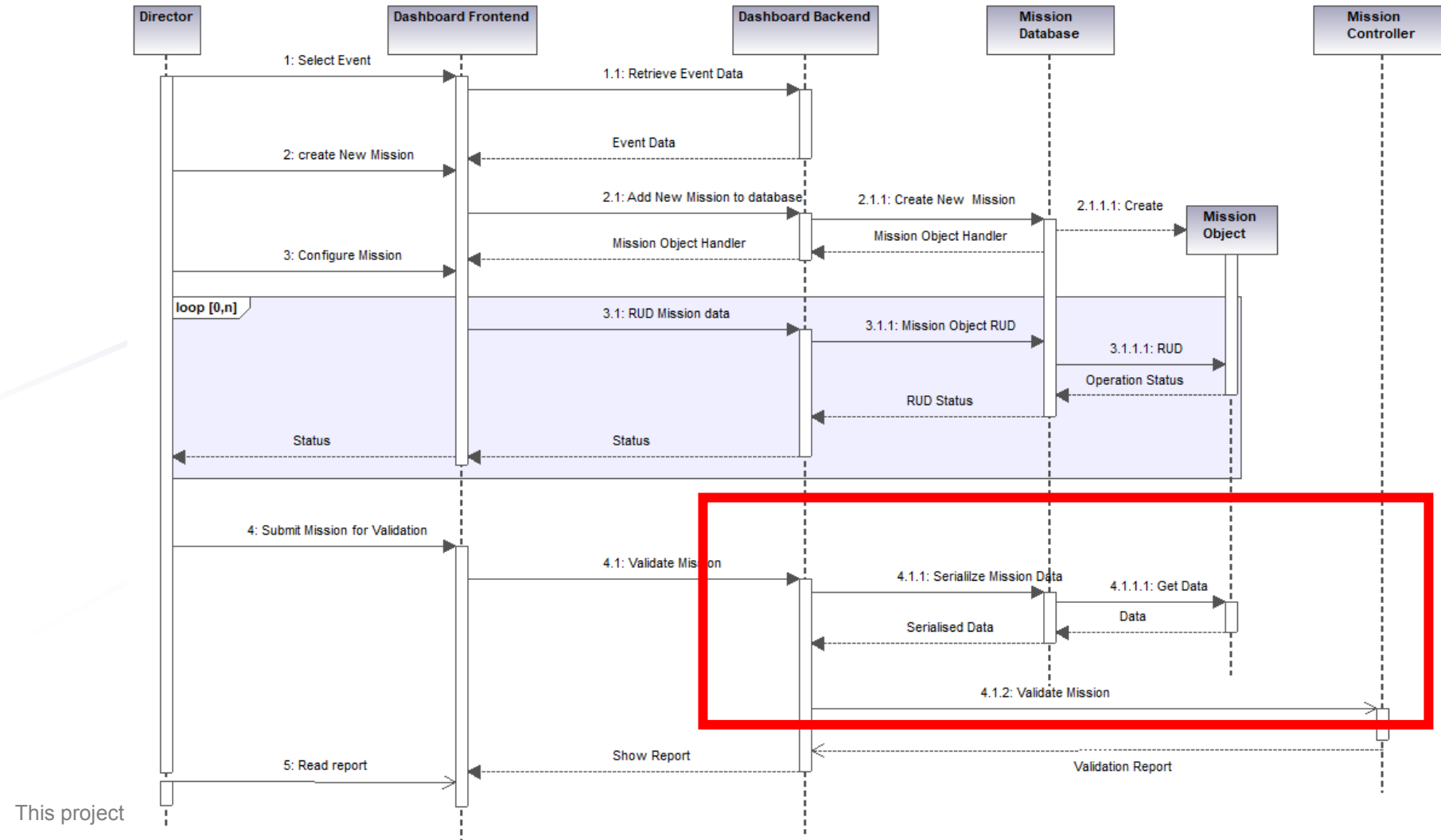
ROS Node



Dashboard Information model



Dashboard Interaction with Mission Planner



Dashboard mockup video



A browser window mockup titled "MULTIDRONE dashboard" with the address bar showing "http://multidrone.eu/dashboard". The page content includes the heading "MULTIDRONE editorial dashboard" and the MultiDrone logo. The login section contains a "Login as" label, a dropdown menu with "Select role", a "Username" label with an input field, a "Password" label with an input field, and a blue "Login" button.



Dashboard Implementation issues



- Database design:
 - mySQL.
- Serialised representation of the Shooting Mission:
 - XML Schema.



Drone Human centered interfaces

- Director dashboard
- **Flight supervisor station**



Supervision station



- Supervise several drones with one operator is challenging:
 - Operator needs a good situational awareness to take the good decision.
 - Operator have to simultaneously:
 - Handle the mission.
 - Ensure security.
 - Re-plan drone mission in real-time when necessary.
 - Monitor and manage the payload, e.g. gimbal and Cameras.



⇒ **Need for a well adapted cognitive system that allows the supervision of several UAVs by one/few operator(s).**

Supervision station



- Objectives:
 - Supervise the execution of the Mission in terms of safety and security.
 - Reduce the cognitive payload of the operator and help him to focus on its mission.
- Graphic User Interface (GUI):
 - Intuitive interactions based on touch screen system for contextual menu.
 - Dual screen approach: head-up and head-down displays.
 - Display:
 - Annotated map
 - Video streams from the drone's navigation cameras
 - Telemetry and status information from the drones.
- The GUI allows the operator to:
 - Check and validate the safety of the flight plan provided by the Shooting Mission.
 - Monitor the mission execution, including the overall state of the drones.
 - Abort the mission if needed for security reasons.
 - Insert manually safety- and logistics-related annotations in a semantic map.
- Can be use above the GCS.

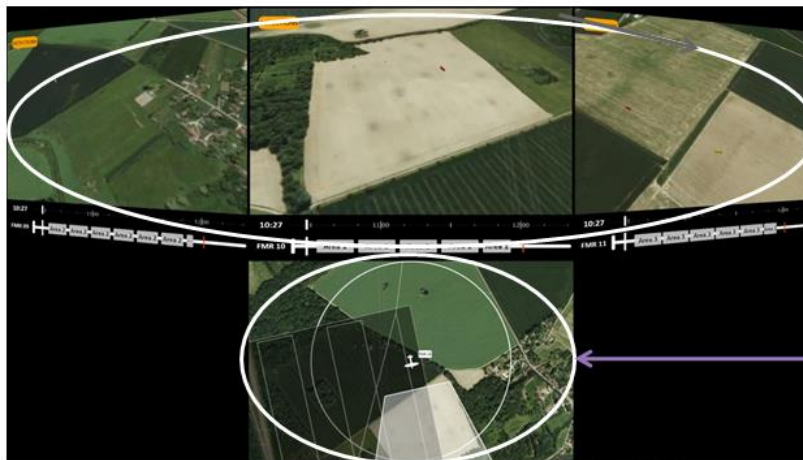


Supervision station

MultiDrone



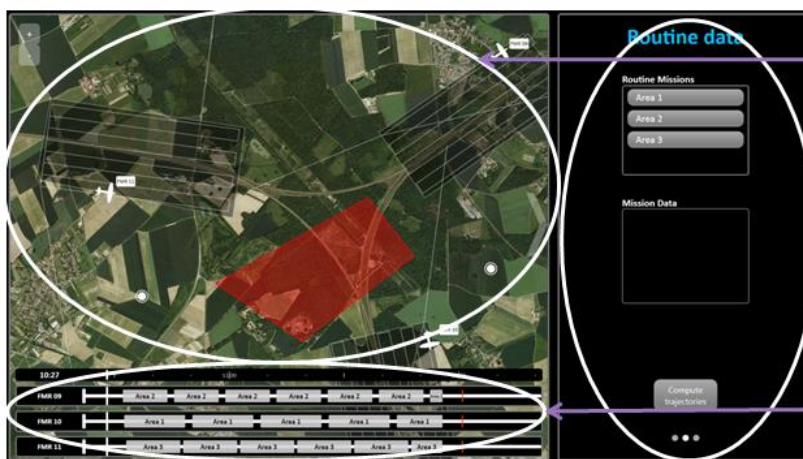
Head up display
for sensor
information



Display of sensor
data
and processing
results (for example
Object tracking)

Neighborhood situation
around a specific drone
(zoom of the map around
the drone)

Head down display
for mission
monitoring



Situation overview
(Map with planned
trajectories, forbidden areas...)

Mission data,
navigation data, ...

Mission status –
Timeline



Q & A



Thank you very much for your attention!

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