

34th **C**entral **E**uropean **C**onference on  
Information and **I**ntelligent **S**ystems

# PROJECT SECTION PITCHES

**PROJECT NAME:**

**ORKAN - UNMANNED AERIAL VEHICLE  
CONTROL AND SURVEILLANCE  
FRAMEWORK**

**INSTITUTION:**

University of Zagreb, Faculty of  
Organization and Informatics

**PRESENTER:**

Neven Vrček

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and Informatics / Dubrovnik, Croatia*



# ORKAN project

## Objectives (1/2):

- Research business, legal and ethical trends and development of methodology for risk assessment related to drones in urban environment
- Research business models and use cases
- Energy efficient UAV communication
- Constellation UAV RF spectrum scanners
- UAV constellation control center (UCCC)

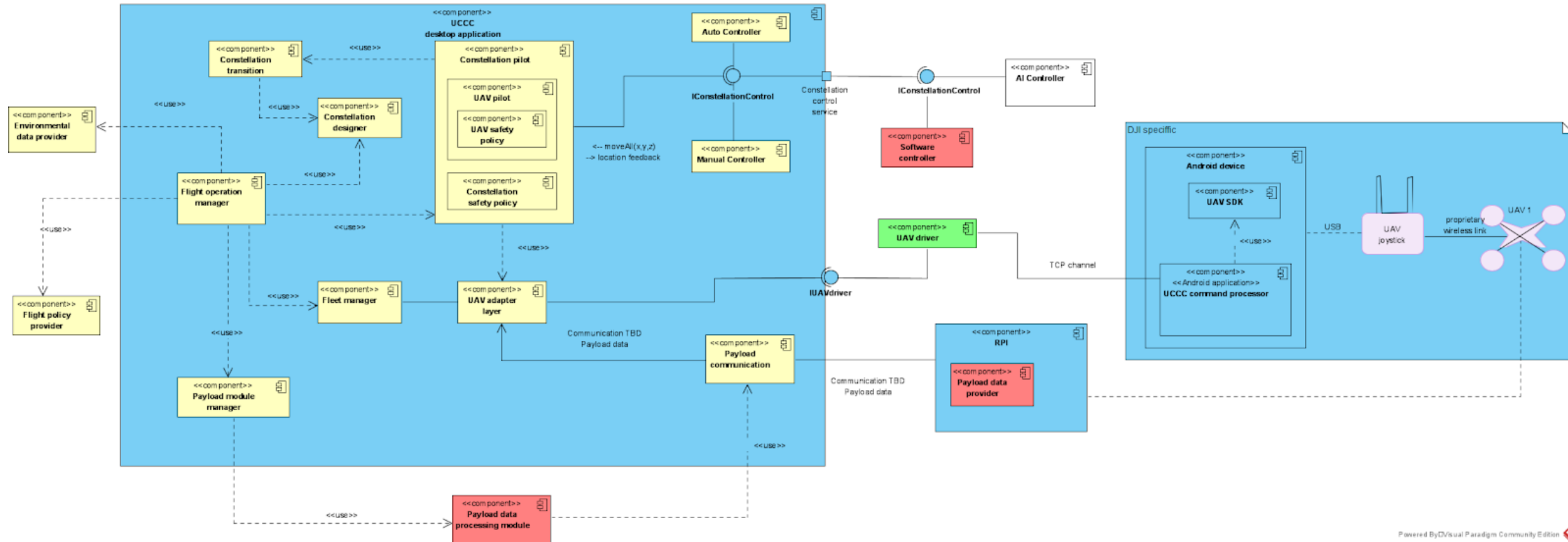
# ORKAN project

## Objectives (2/2):

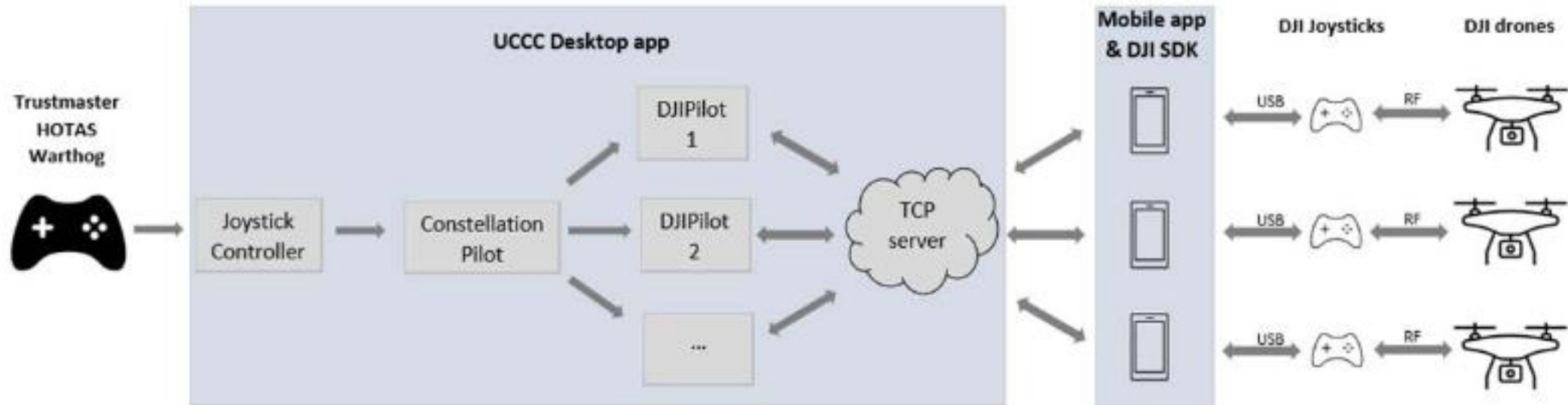
- Signal source localization
- Measuring the efficiency of intruder drone pilot localization using the final constellation model
- Development of mechanisms for autonomous, semi-autonomous or manual navigation by constellation of UAVs
- Testing various use cases and scenarios

## UAV constellation as a platform for scientific research

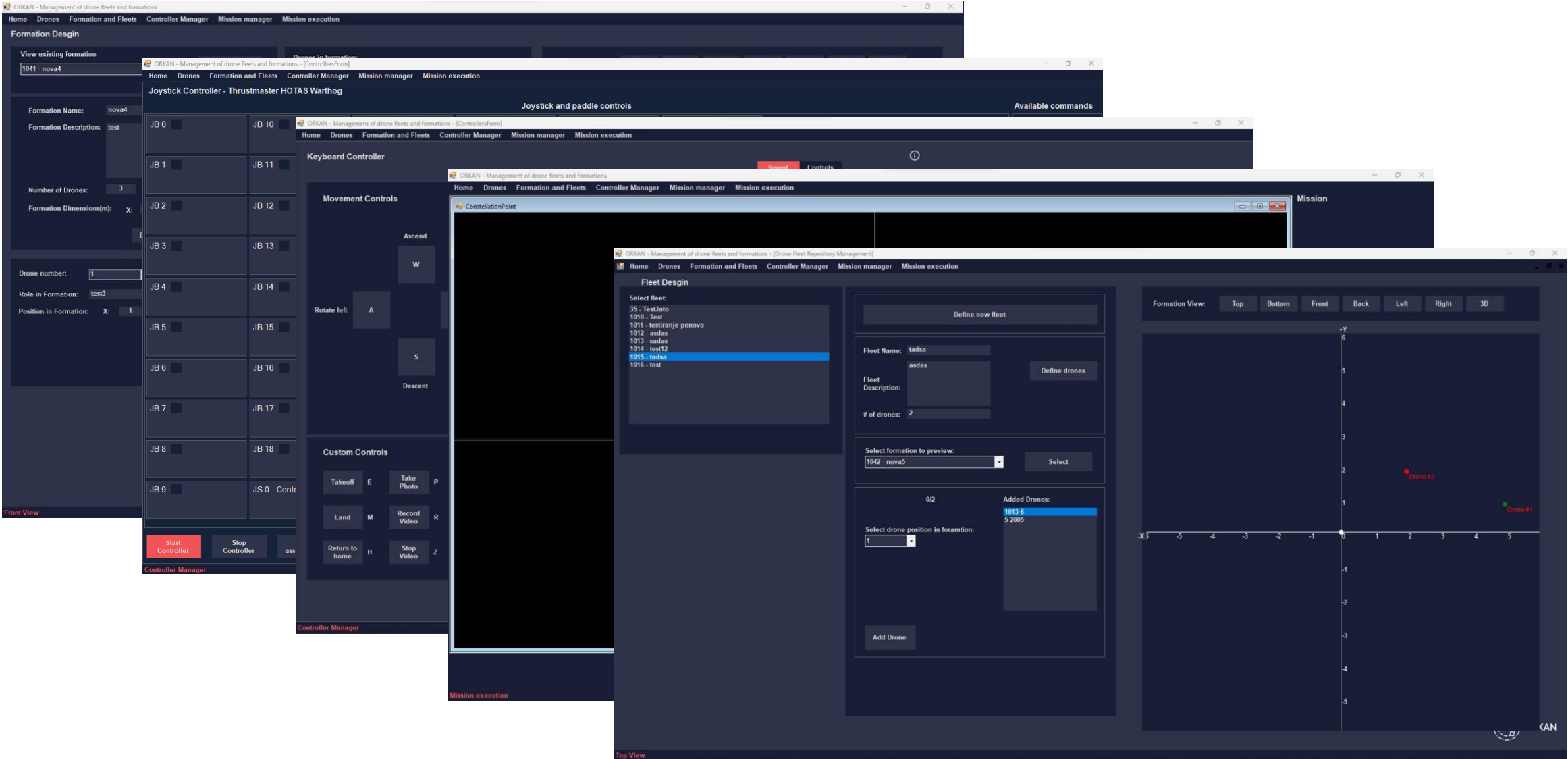
# Modular and extensible design



# PoC architecture



# UCCC's demo



The image displays several overlapping screenshots of the ORKAN software interface, which is used for managing drone fleets and formations. The screenshots show different views and control panels:

- Formation Design:** A panel for defining a formation, including fields for "Formation Name" (nova4), "Formation Description" (test), "Number of Drones" (3), and "Formation Dimensions(m)" (X:). It also includes a grid for assigning drone numbers (JB 0 to JB 18) and roles (e.g., test3).
- Joystick and paddle controls:** A panel for manual control using a joystick and paddle, labeled "Joystick Controller - Thrustmaster HOTAS Warthog".
- Keyboard Controller:** A panel for manual control using a keyboard, with sections for "Movement Controls" (Ascend: W, Descend: S, Rotate left: A) and "Custom Controls" (Takeoff: E, Land: M, Return to home: H, etc.).
- Fleet Design:** A panel for defining a new fleet, including fields for "Fleet Name" (tadsa), "Fleet Description" (adas), and "# of drones" (2). It also shows a list of selected drones (1013, 1016) and an "Add Drone" button.
- Mission execution:** A panel showing a "ConstellationPoint" view of the drone formation in a 2D coordinate system (X, Y).

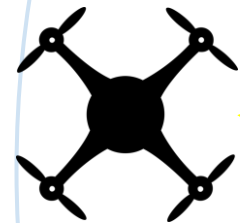
Mission fleet design

# RF localization application - Solution

UAV control signal



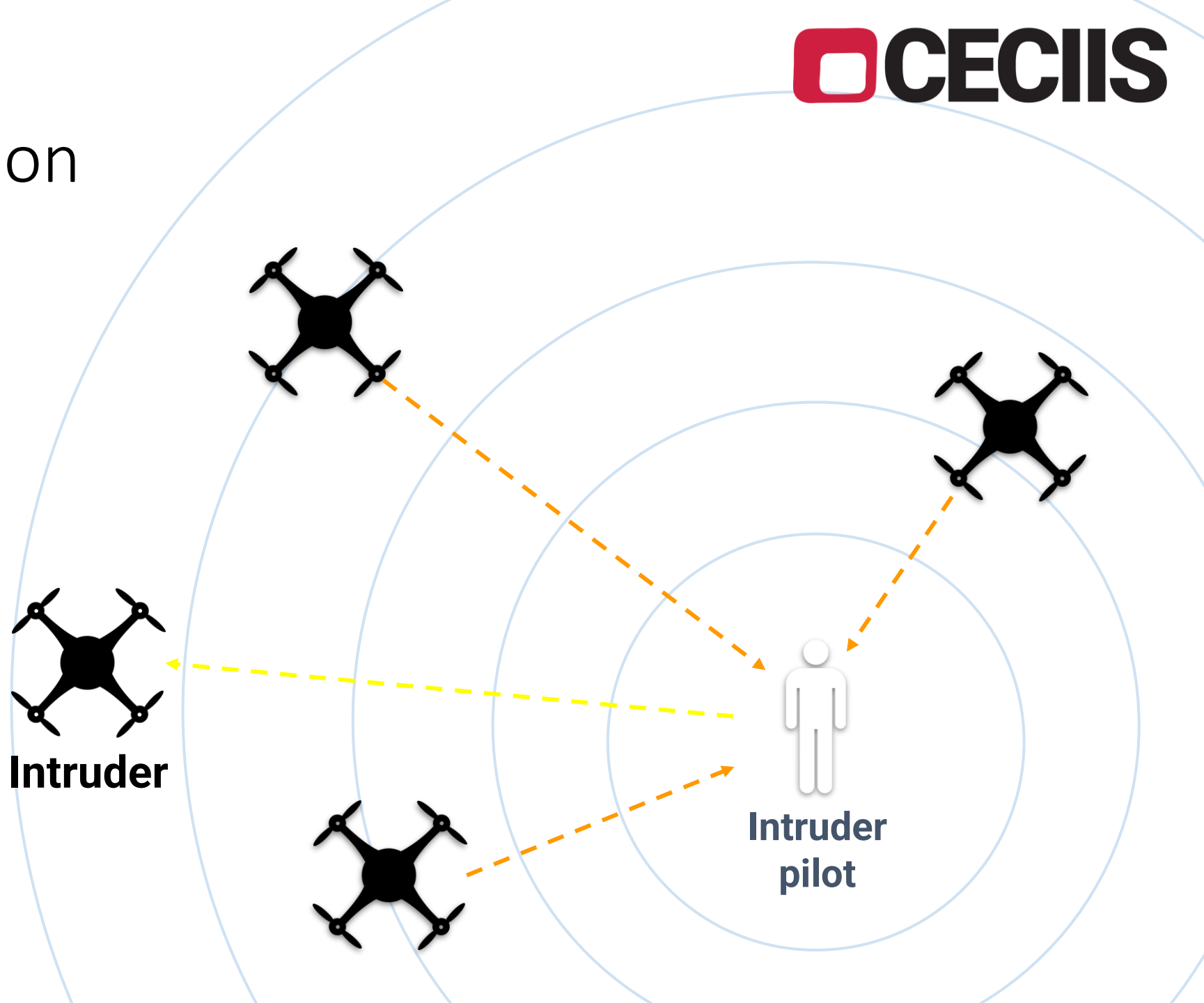
Signal strength  
analysis



**Intruder**

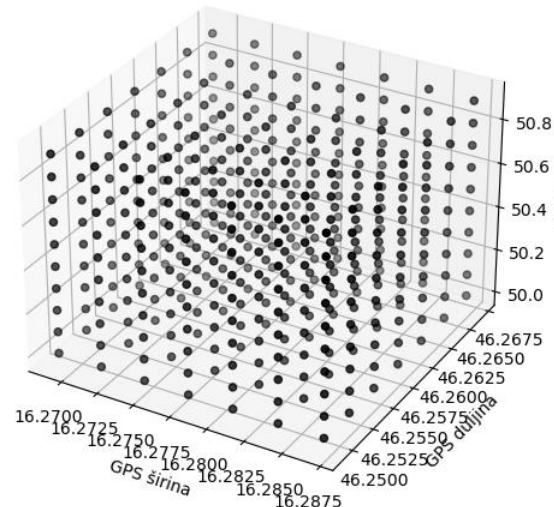


**Intruder  
pilot**



# RF localization application

- Algorithm:
  - goal - find the point in space where the probability of the source of signal is the highest
  - after first RSSI reading - adjustable point grid is constructed around the centroid of the constellation (akin to particle filtering)
    - each point assigned a 4-tuple (**X, Y, Z, probability**)
    - distance between each of the points can be adjusted depending on the required precision

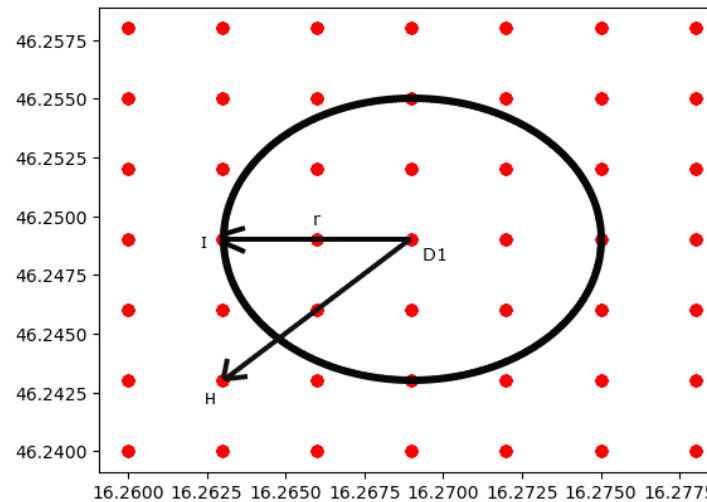


Example point grid



# RF localization application

- Algorithm:
  - signal propagation is considered omnidirectional
    - a **circle** can be formed around the source of the signal - *fuzzy sphere*
    - radius is calculated using appropriate path-loss models from received signal strength



2D visualization of the grid

D1 = location of RSSI reading

I = example point on the circle

H = example grid point outside of the signal range

r = radius of the circle