Unmanned Aerial Vehicle Vertical Applications' Trials Leveraging Advanced 5G Facilities

" 5G!Drones: Unmanned Aerial Vehicle Vertical Applications' Trials Leveraging Advanced 5G Facilities"

Infocom World 2019 Conference, Athens, November 26th, 2019

Dr. Konstantinos Filis, Mrs. Fofy Setaki, COSMOTE

5G!DRONES in brief

Call: H2020-ICT-2018-2020

Topic: ICT-19-2019

Type of action: R&I

Duration: 36 Months

Start date: 1/6/2019

Verticals:
1. Alerion, France
2. INVOLI, Switzerland
3. Hepta Airborne, Estonia
4. CafaTech, Estonia
5. Unmanned systems, UK
6. Thales, France
7. Airbus, France
8. Frequentis, Austria

Large industries:
1. COSMOTE, Greece
2. Orange, France
3. Orange, Poland
4. Nokia, Finland

SMEs:
1. DroneRadar, Poland
2. INFOLYSIS, Greece
3. Robots.Expert, Finland

Institution:
1. Municipality of Egaleo, Greece

Academics:
1. EURECOM, France
2. DEMOKRITOS, Greece
3. Aalto, Finland
4. Oulu, Finland

5G!DRONES Aim

- 5G!Drones aim is to trial several UAV use-cases covering eMBB, URLLC, and mMTC 5G services, and to validate 5G KPIs for supporting such challenging use-cases.

- The project will drive the UAV verticals and 5G networks to a win-win position, on one hand by showing that 5G is able to guarantee UAV vertical KPIs, and on the other hand by demonstrating that 5G can support challenging use-cases that put pressure on network resources, such as low-latency and reliable communication, massive number of connections and high bandwidth requirements, simultaneously.

Objectives

- Analysis of the performance requirements of UAV verticals' applications and business models in 5G.

- Design and implementation of the 5G!Drones software layer (or system) to execute UAV trials.

- Design a high-level scenario descriptor language to run and analyse the results of the UAV trials.

- Design and implementation of 5G!Drones enablers for UAV trials and operations.

Objectives

- Validate 5G KPIs that demonstrate execution of UAV use cases.

- Validate UAV KPIs using 5G.

- Develop advanced data analytics tools to visualise and deeply analyse the trial results, and provide feedback to the 5G and UAV ecosystem.

- Dissemination, standardisation and exploitation of 5G!Drones

5G!Drones Use Cases

- **UAV traffic management** – UTM application, 3D Map and supporting visualization/analysis software for UTM, UAV logistics

- **Public safety/saving lives** – Monitoring a wildfire, Disaster recovery, Police

- **Situation awareness** – Infrastructure inspection, UAV-enhanced IoT data collection, Location of UE in non-GPS environments, Media

- **Connectivity during crowded events** – Connectivity extension and offloading

UC1: UAV Traffic Management

- The need for UTM systems has been driven by a number of factors such as the recent increase in the number of drones in the airspace.

- In the European Union, UTM systems (level U1: E-registration, E-Identification and Geo-awareness) will be mandatory in every EU country by 2019 and the next level U2 is expected to be enforced in two years timespan.

- It should be noted that drone applications will require extremely low end-to-end latency, in the order of milliseconds, in order to operate in a safe and secure way.

UC1: UAV Traffic Management
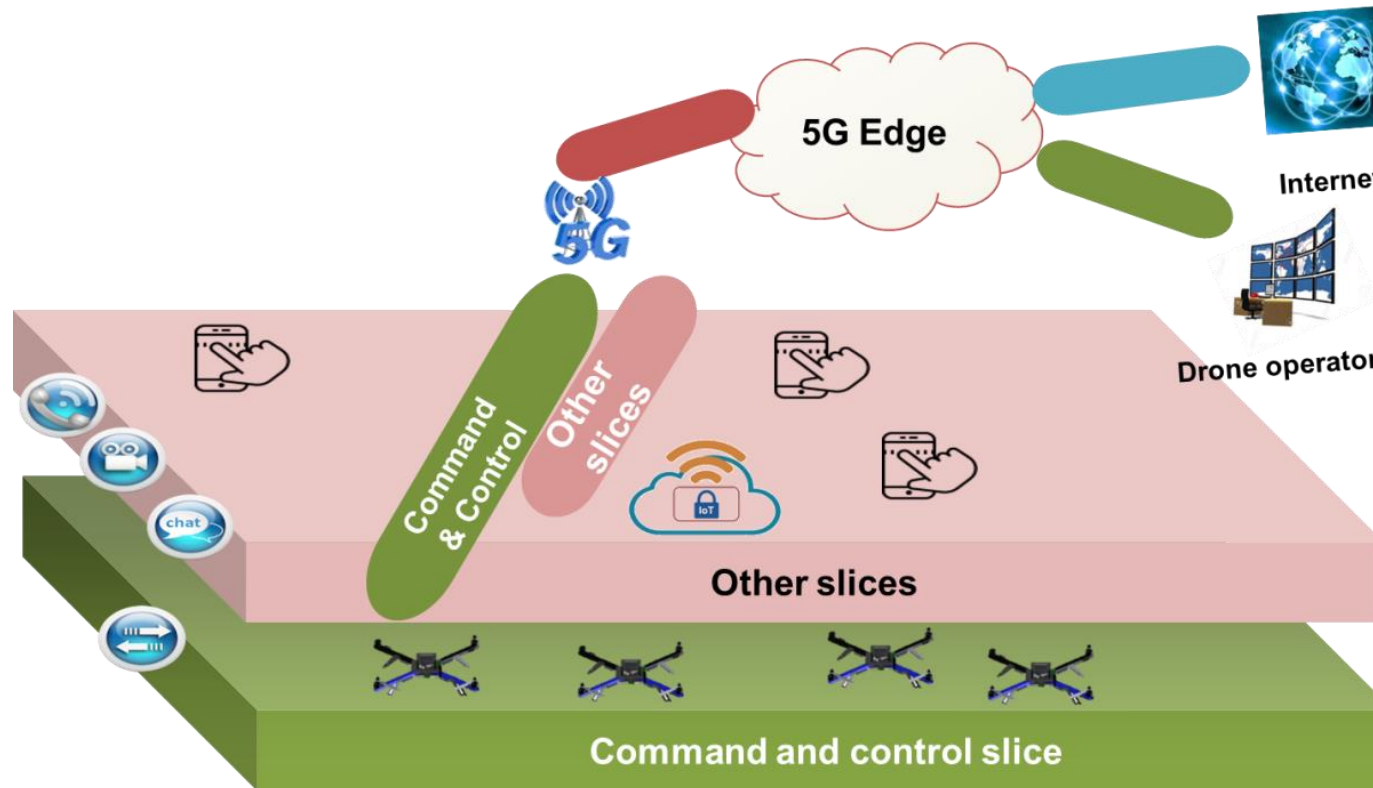
UC2: Public safety/saving lives

- UAVs equipped with thermal cameras can be used to quickly locate victims of natural disasters regardless of the time of the day (especially during night time operations).

- A swarm of UAVs can cover more ground quickly and efficiently. In addition, HD live stream can be transmitted to a larger monitor for easier spotting of subjects in real-time.

- This allows pilots or command crews to guide rescue teams to the precise location of their subjects, and the aerial view aids in steering those crews around any obstacles or hazards that may be in their path.
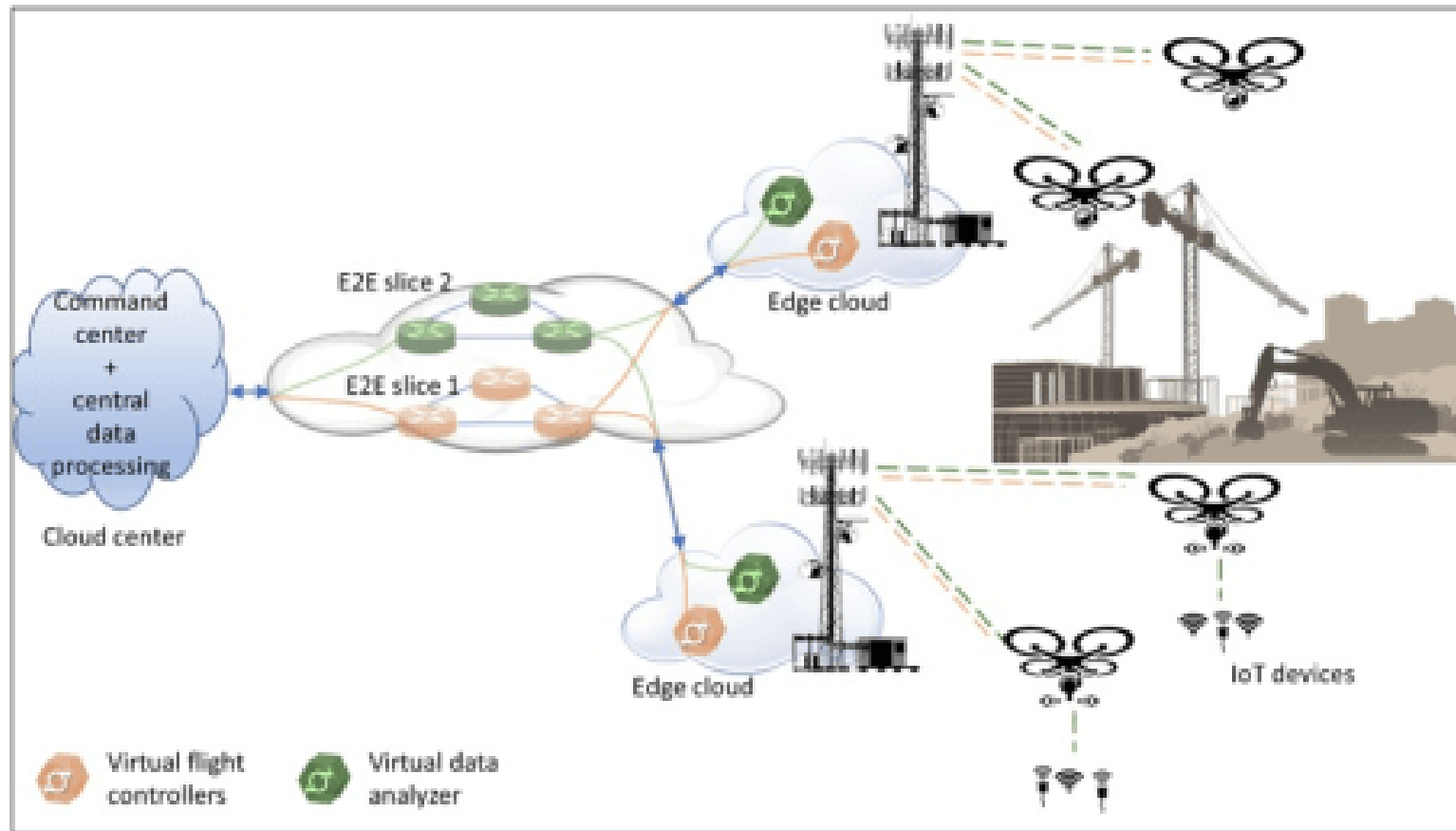
UC2: Public safety/saving lives
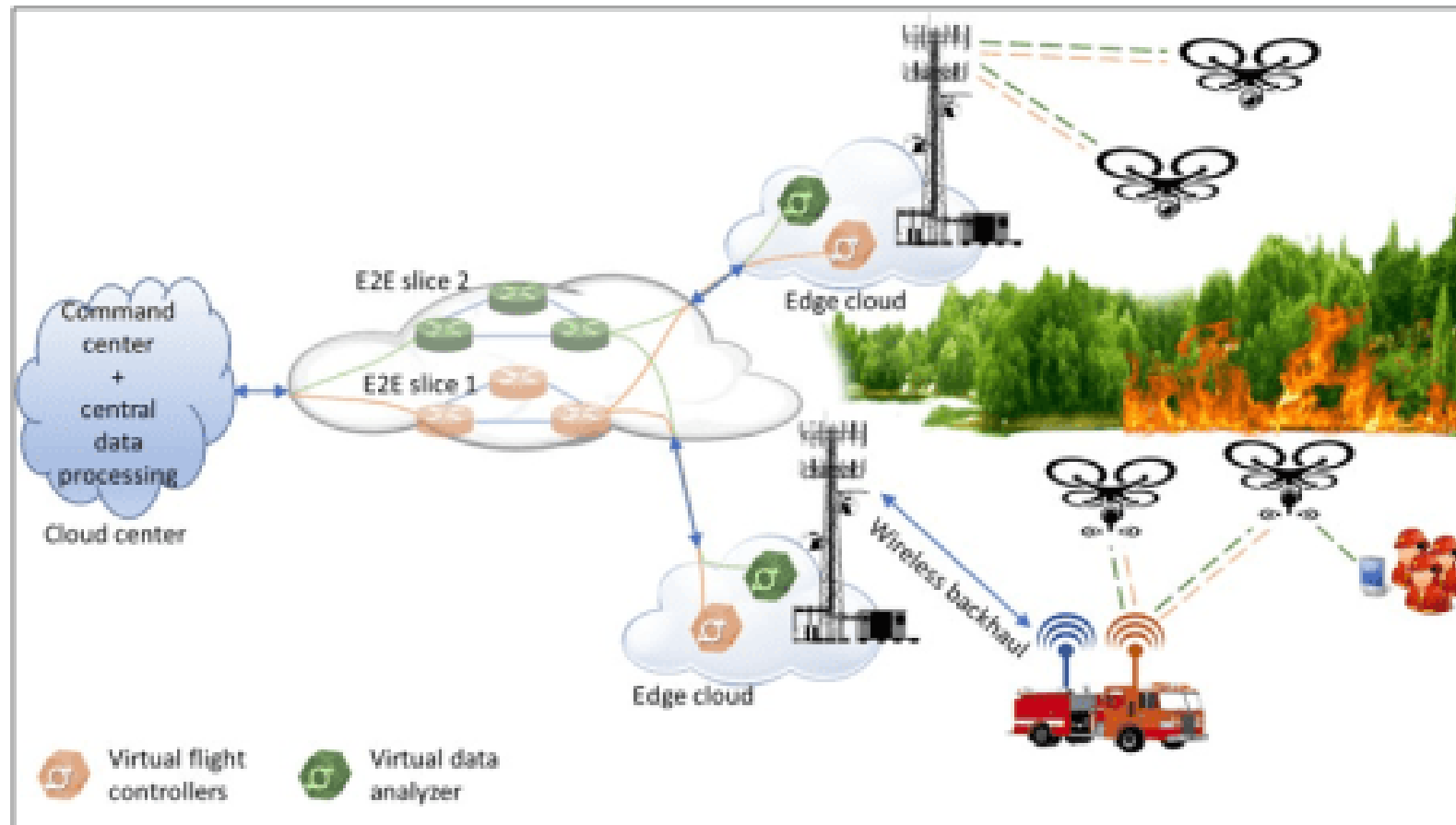
UC3: Situation awareness

- Equipping drones with IoT devices allows for offering new types of services that can be delivered only from the sky.

- Depending on the target objectives, different IoT devices could be considered onboard the drones. This includes HD camera, gas sensor, humidity/temperature sensor, etc.

- Moreover, while UAVs could be deployed for a specific mission (e.g., mail delivery), the on-board IoT devices would allow providing added value services, simultaneously to the drones' original tasks. This creates a novel ecosystem that supports IoT in the sky.

UC3: Situation awareness

Command center + central data processing

Cloud center

E2E slice 2

E2E slice 1

Edge cloud

Edge cloud

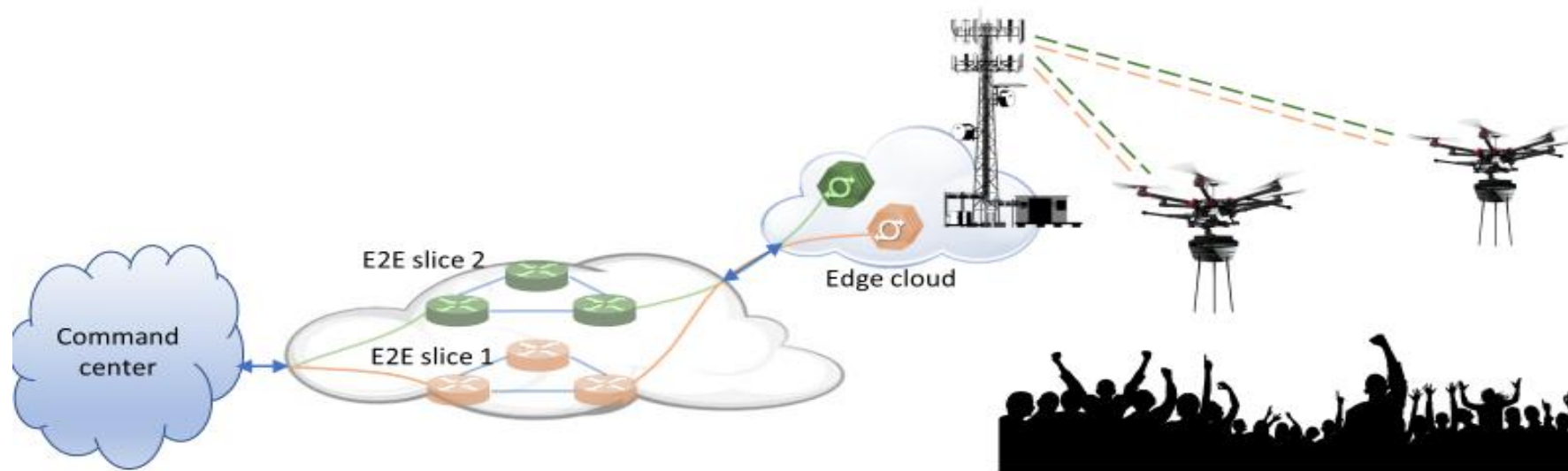Virtual flight controllers

Virtual data analyzer

IoT devices

UC4: Connectivity during crowded events

- Using an on-demand swarm of UAVs equipped with 5G small cells can solve this challenge by providing better coverage resulting in fewer dropped calls and better Internet connectivity to people attending the events.

- Since in this use case drones are flying over a crowded area, reliable control of drones (i.e., flying capabilities and residual battery life) is needed.

UC4: Connectivity during crowded events

Thank you!