Indoor-Outdoor Positioning
for Emergency Staff

Grant Agreement No. 874391

D4.3: User operations manual

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List of acronyms

CPET	Civil Protection Emergency Teams
EMS	Emergency Management System
GIS	Geographic Information Systems
LTE	Long Term Evolution
RPAS	Remotely Piloted Aircraft System
UAV	Unnamed Aerial Vehicles
Project partners	
ATH	ATHONET SRL
CATUAV	CATUAV SL
CTTC	Catalan Tecnological Telecommunications Centre
FBBR	Frederiskborg Fire and Rescue Service
PCF	Pau Costa Foundation
SAReye	SAReye EHF
SCARABOT	Scarabot Technologies GmbH

1. Document target

A quick user guide needed to operate the system is the target of this document. The document do not include details about how piloting / be trained for piloting RPAS since flight training to end-users is foreseen as an activity to be done after the project ends

2. IOPES concept in brief

The IOPES project aims to increase the safety and efficiency of the CPETs (Civil Protection Emergency Teams) in the course of emergency operations resulting from human-made and natural disasters. To achieve that, the project develops and enhances operationally oriented technologies that are targeted to provide precise and detailed information about a hazardous environment that can drastically change where it becomes paramount to safeguard the lives and the physical integrity of the operatives in the field.

The IOPES technology relies on four pillars:

- RPAS-based fast mapping tool.
- Wearable positioning device.
- LTE/ 5G deployable communications.
- Mature EMS (Emergency Management System).

The combined use of these technologies will assist in better tracking the positions of the members of emergency teams, both in indoor and outdoor environments, which could help improve the CPETs situational awareness and facilitate their decision making during disaster-related operations.

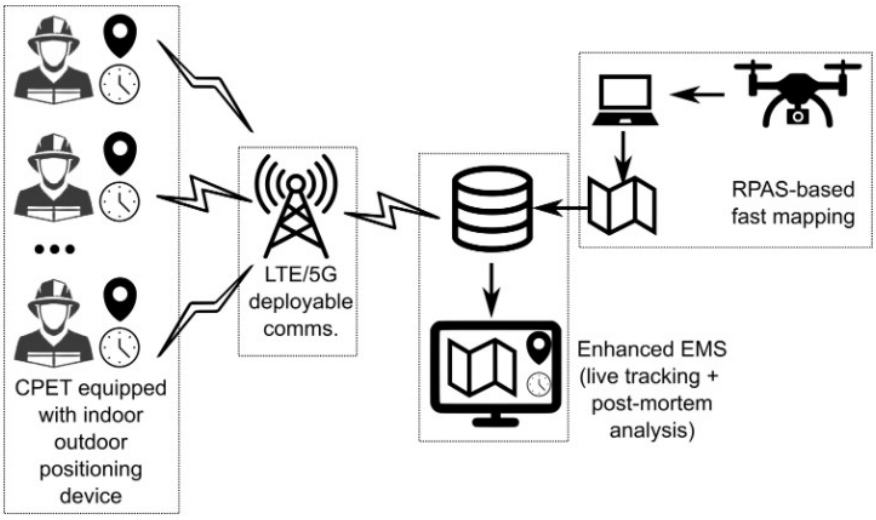

Figure 1. IOPES concept.

3. Technologies. User manual

As stated in previous section, IOPES technology relies on the combined used of four technologies. Since all the technologies has been designed to work alone but are also able to be used in a coordinated way within this project, we will explain how to use them one by one.

Since one of the main requirements of emergency staff was that the systems had to be easy to use, big efforts were done on that sense and the use of the IOPES technologies is really simple and with just a few very easy steps anyone can use it.

3.1. Seamless indoor outdoor positioning system

Use

1) Preparation
    a. Insert Communications SIM card (generic one) to the communications dongle.
    b. Charge battery pack
    c. If long time since last use or more than 100km away from last use: switch on for 10 minutes at open space.

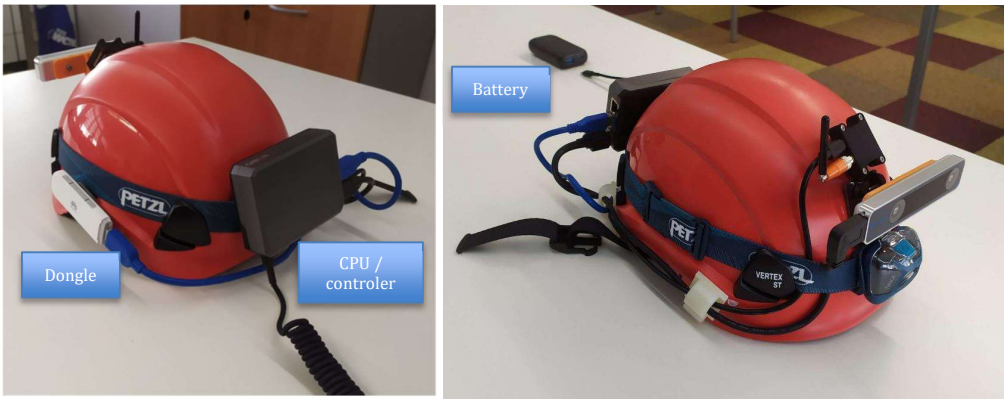

Figure 2: Seamless indoor outdoor positioning system

2) Tracking
    a. Put the helmet on, on an open space.
    b. Connect the system to battery pack.
    c. Stay at least 2 to 4 minutes on an open space.
    d. Operate normally indoor/outdoor.
    e. To see the track solution, check the EMS (section 3.3)
    f. When finished, switch off. Take the helmet off.

3) A posteriori data recovery
    a. Use the CPU/controller (Raspberry Pi) as a normal computer. Connect a keyboard, a mouse and a screen.
    b. Power on the computer.
    c. Go to data folder (pre-defined with the user). There the files of the day will be found under the name including the targeted date.

Integration with an EMS or any other track viewer

1) Use the CPU/controller (Raspberry Pi) as a normal computer. Connect a keyboard, a mouse and a screen.
2) Power on the computer.
3) Go to source code data folder (pre-defined with the user). Define the new address where the data need to be sent in the options file. Save.
4) When restarting the system, the data will be send to the new EMS system using the IOPES EMS exchange protocol [2].

3.2. LTE/5G communications system

Use

1) Charge rucksack battery using the provided charger.
2) Ensure all devices to be used (smartphones or positioning system) include one of the Sim cards provided with the system.
3) Place the rucksack more or less in the middle of the area of where the team will need to work.
4) Mount the two antennas in their places.
5) Switch on the rucksack using the proper button (different places depending on the rucksack model)
6) Test the devices (mobile phones or positioning devices)
7) Start using as common devices.

Figure 3: Portable network rucksack solution

3.3. Enhanced EMS

Installation

1) This procedure will be made by SAReye staff in coordination with IT managers of the emergency team.

Use

1) Access to the EMS trough the http direction provided by SAReye
2) Log in
3) Use track functionalities
    a. Go to TRACKER label in the left menu

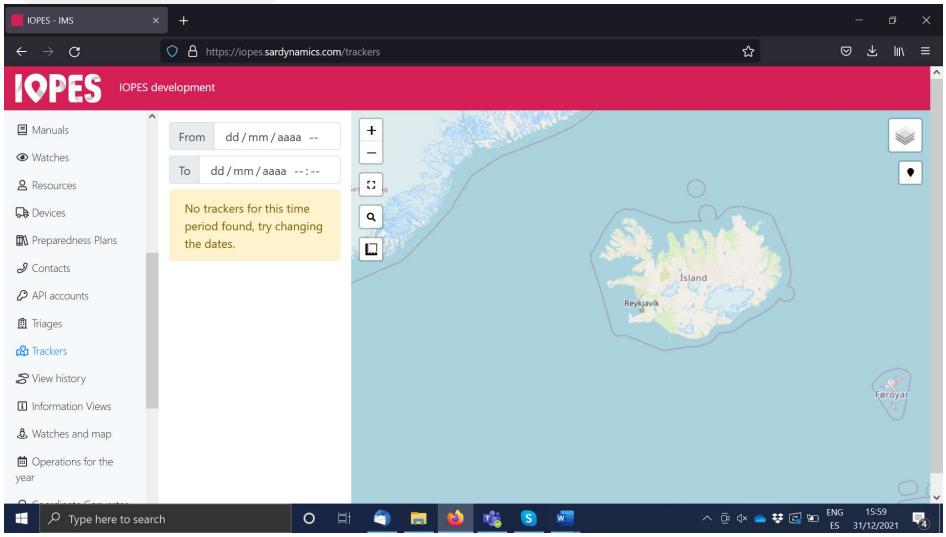

Figure 4: Enhanced EMS main menu

    b. Select slots to see (From – To). Both in RT and in Post Mortem analysis do it in the same way.

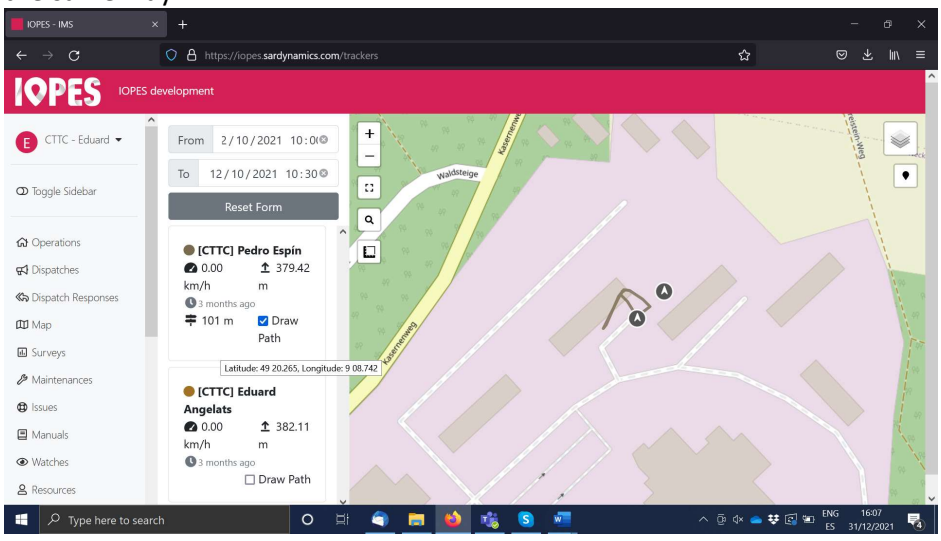

Figure 5: Enhanced EMS track screen

c. Select overlay (if any)

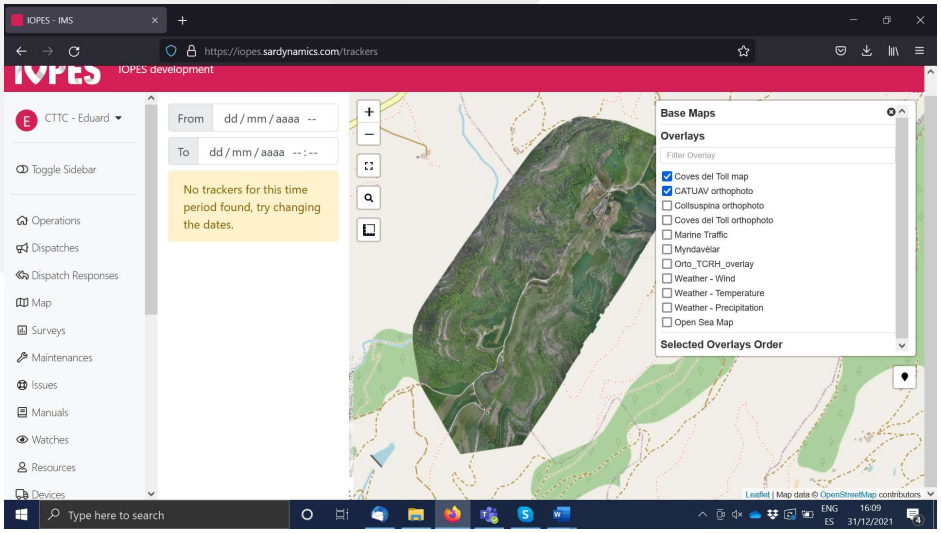

Figure 6: Enhanced EMS overlays

d. To track altitude. Click right bottom on the trajectory and select altitude chart.

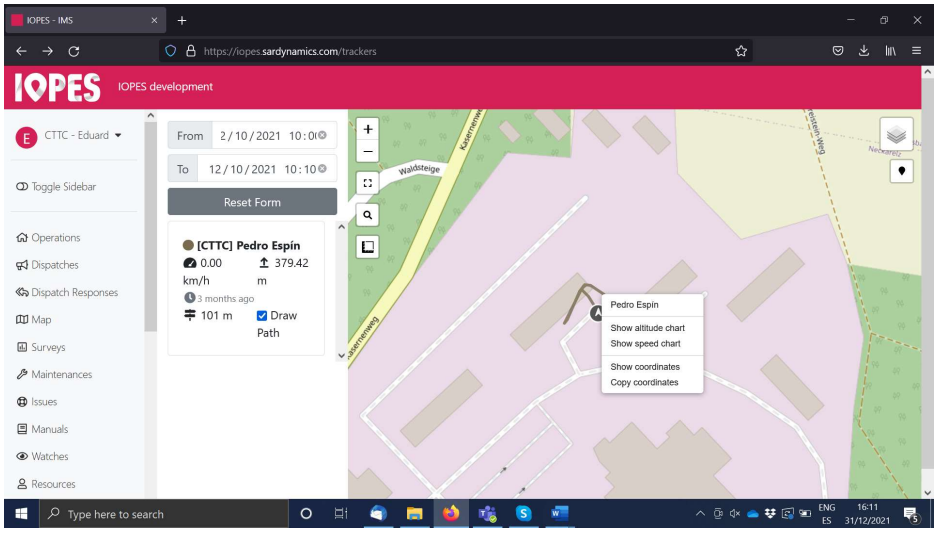

Figure 7: Enhanced EMS track screen

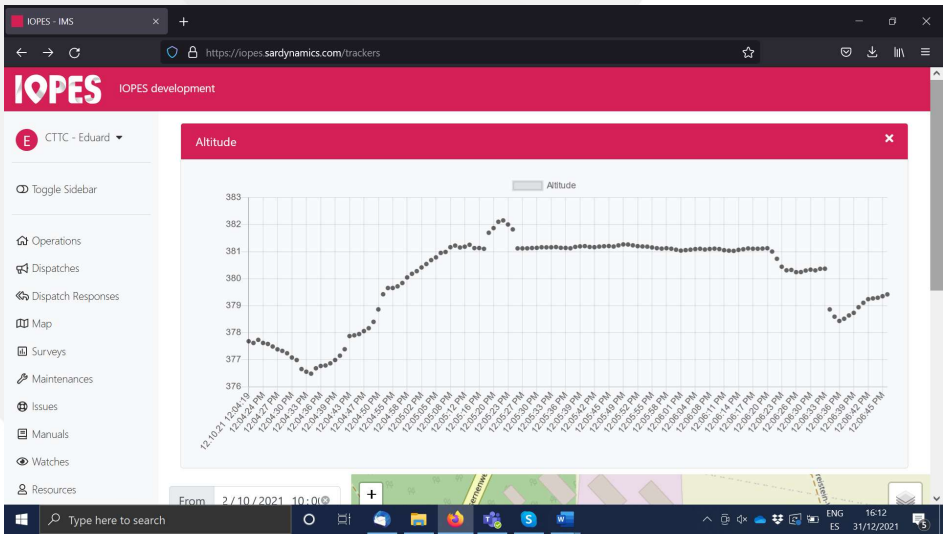

Figure 8: Enhanced EMS height profile

e. When finish, log out.

3.4. UAV products

Orthophoto

The fast mapping main output is an orthophoto that can be generated in .tiff or in .png formats. The images can be generated with several resolutions. The IOPES processing is done using CATUAV photogrammetric processing chain. This processing, done in CATUAV's chain or a similar one, should be done by a trained operator. Several tutorials on the topic can be found or the web, or specific courses can be done at CATUAV facilities.

RGB and thermal images

The images of the multirotor drone are send to the computer associated with the drone. Using the SCARABOT Visualizer, the user will be able to see, in real time, the images of the drone. The app is very simple and only requires to start the vision. The images are also stored in the hard drive (in a predefined path) and the team will be able to recover it at any time in the future.

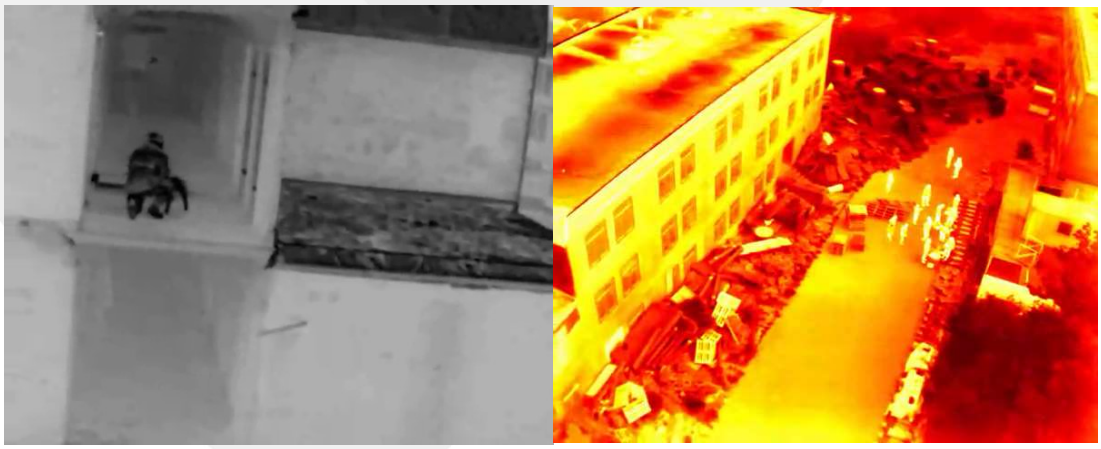

Figure 9: RT images viewer screenshot

4. Reference documents

[1] IOPES (2020). *D4.1 System architecture definition*.

[2] IOPES (2021). *D4.2 Wearable device/EMS data exchange protocol*.

IOPES

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