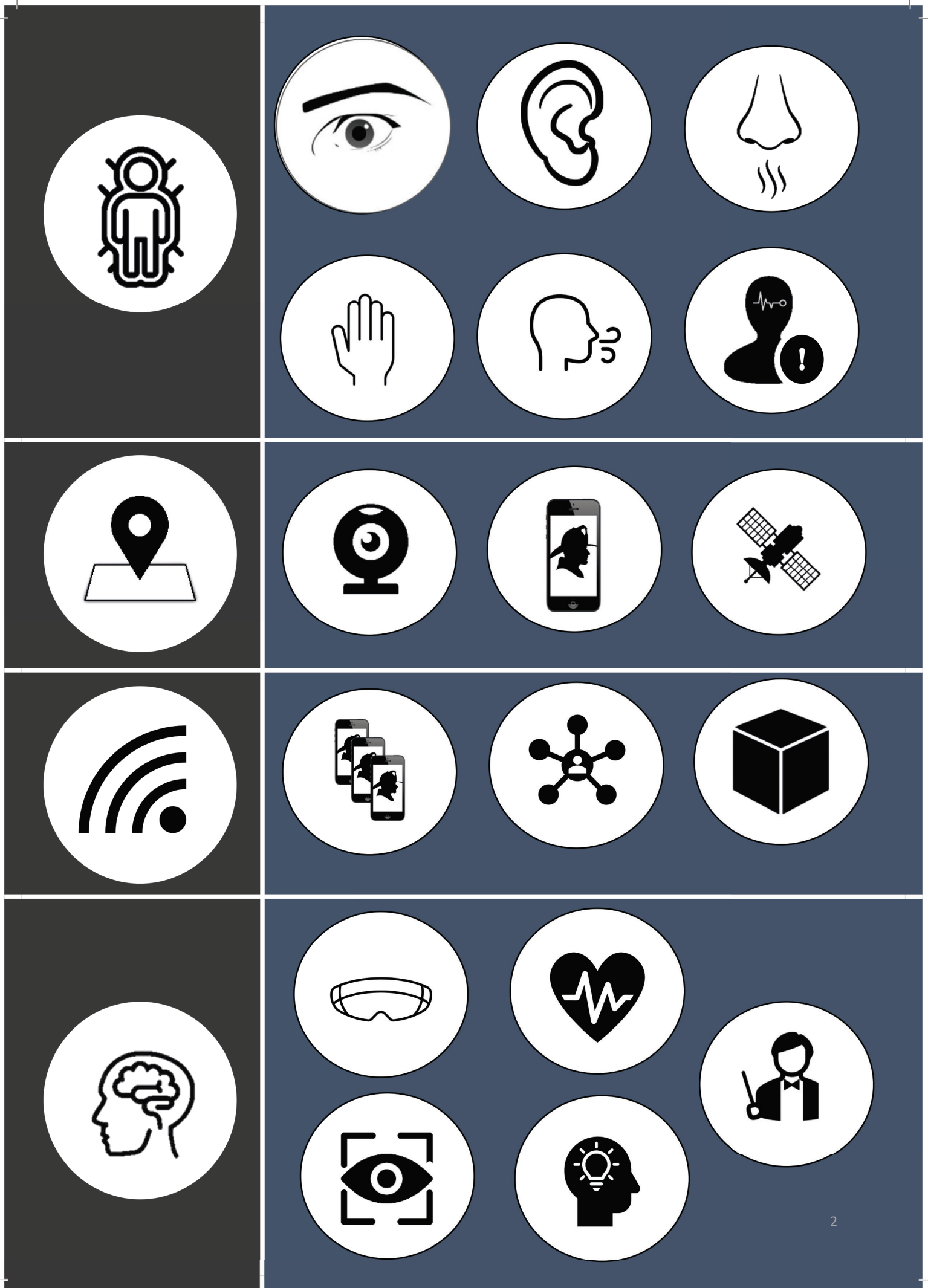
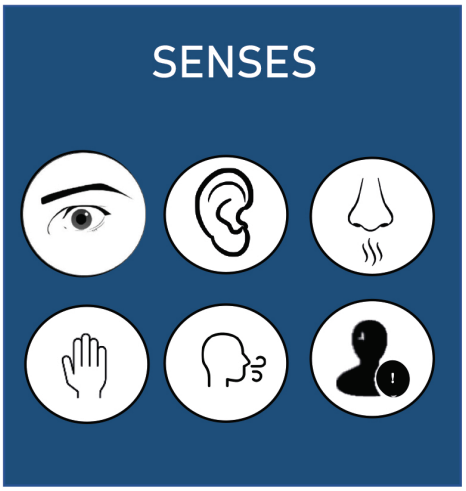
RESCUER

USER MANUAL



USER MANUAL – HERO CONCEPT

Here are all the RESCUER Modules, grouped by the 4 HERO pillars: SENSES, LOCALISATION, COMMUNICATION, COGNITIVE SUPPORT



ROBUST VISION : Live camera capture and processing to remove certain weather effects such as rain and fog, light smoke and low light to provide first responders with detection of objects of interest.

ENHANCED HEARING: Capture and treatment of surrounding audio environment to foster certain sounds (voices) and cancel others (annoying sounds), and audio feedback for other modules (warnings).

AUGMENTED OLFACTION: Detection and monitoring of hazardous gases in the operational environment through a set of sensors, with an alert triggered if the tolerated health limits are exceeded.

RADAR SENSING AND REMOTE TOUCHING: Detection of obstacle through radar that can detect walls and moving objects with tactile feedback to warn the first responders

SIGNS OF LIFE DETECTION: Detection of signs of life such as slight movement, breathing through thin walls (plaster or brick).

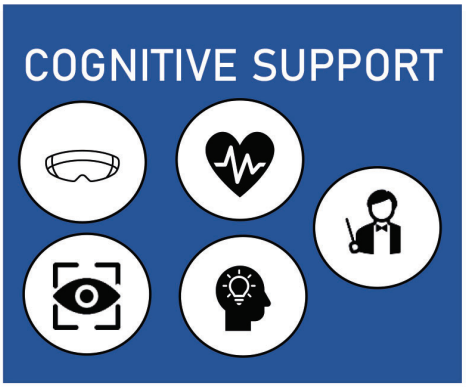
WIRELESS FINDER: Detection of personal electronic objects (cell phones, connected watches).

SEAMLESS LOCALISATION : Better indoor and outdoor localization of the first responder thanks to a combination of positioning/orientation techniques (visual, inertial, satellite), to be visualized on augmented reality displays (minimap) and on the C2 Interface.

COMMUNICATION GATEWAY: Ensure voice and data communications in environments without communications infrastructure, with ad hoc creation of private local area networks and direct networking of first responder devices.

C2 INTERFACE / COMMUNICATION WITH C2: Communication and Visualisation of all the data collected on a dedicated C2 Interface, including a mission recorder feature.

BLACK BOX : Device allowing to consult pre-recorded information concerning the invested building (map, points of interest such as gas depots) and to receive real time information from sensors possibly present in the building (number of people in the building, etc.).



AR INTERFACES: Provides AR representations of the RESCUER modules' outputs and interactions to first responders on 2 displays: HoloLens2 and Smart Helmet.

BIOSIGNALS MONITORING: Measurement of heart rate, skin conductivity, skin temperature, pupillary response.

COGNITIVE LOAD BALANCING: Prevents excessive cognitive load by selecting which information can be displayed.

INFO PRIORITISATION & DATA ORCHESTRATOR: Collection, processing and prioritization of information sent to FRs.

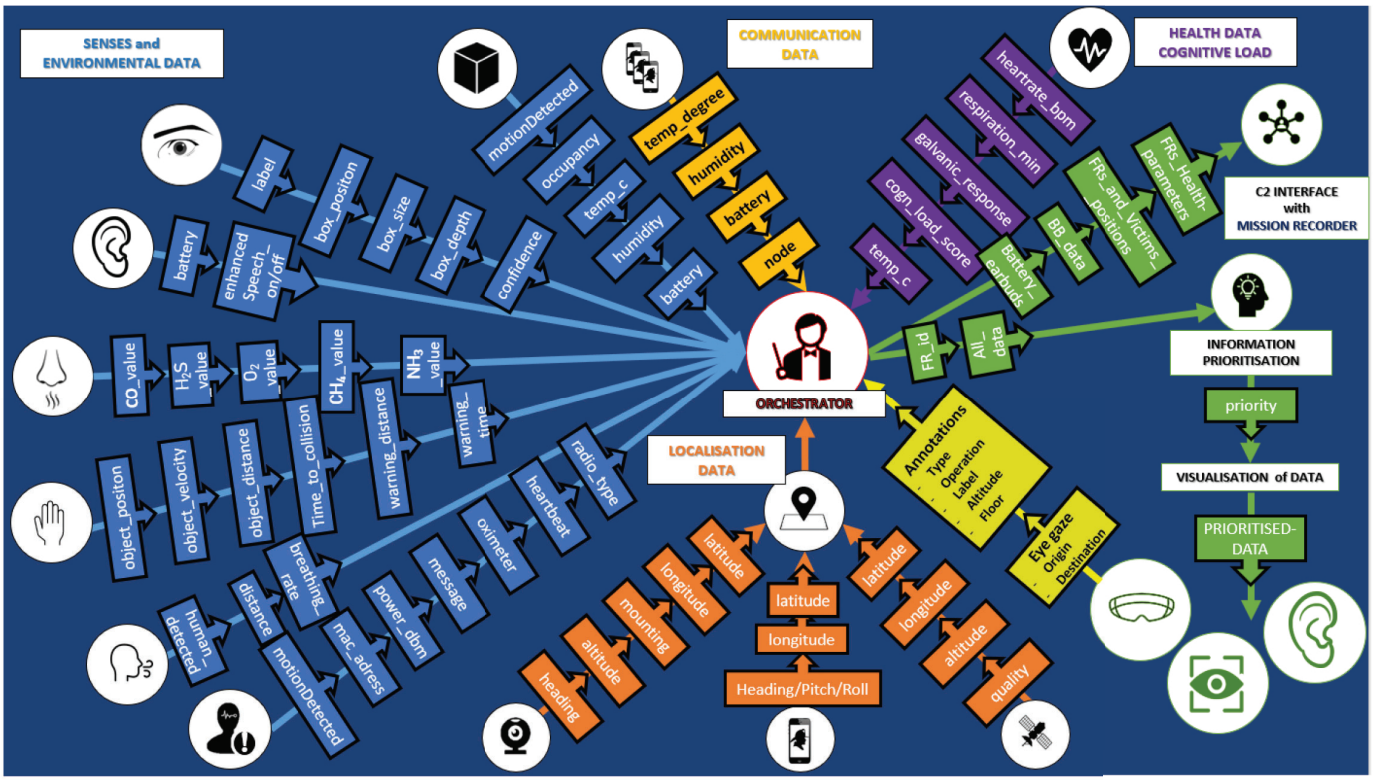
RESCUER SYSTEM ARCHITECTURE

The information collected by the different sensors and devices are sent to the BROKER, which acts as a orchestra conductor by orchestrating the sharing of data between the RESCUER Modules.

The INFORMATION PRIORITISATION Module will determine the information to be visualized through the AR displays based on:

1) the preferences expressed by first responders,
2) the biosignals monitoring values,
3) the related cognitive balance index experienced by the FR.

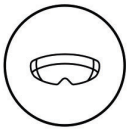
DATA produced, consumed and shared



USER MANUAL – H2 SUBSYSTEM

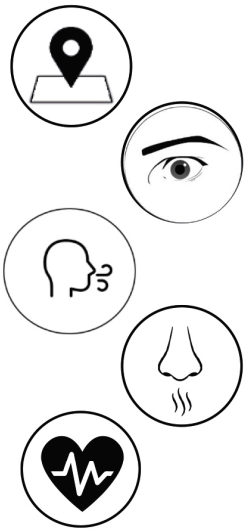
SUBSYSTEM 1 – HOLOLENS2 AR INTERFACE
Functionalities

INTEGRATED FUNCTIONALITIES



HoloLens2 AR Interface

- Shared AR Annotations
- Locations on Minimap
- Reverse Path
- Robust vision
- Signs of life alerts
- Dangerous Gas Alerts
- Biosignals values
- Earbuds Battery Status



Enhanced Hearing

- Audio messages
  - « Dangerous gas detected »
  - « High heart rate »
  - « Victim detected »

STANDALONE FUNCTIONALITIES

Radar sensing

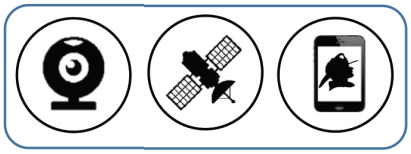
Detection of obstacles or moving objects

Wireless Finder

Detection of smart devices

Black Box

Downloadable information on investigated building



LOCALISATION

Seamless Localisation Indoor/Outdoor

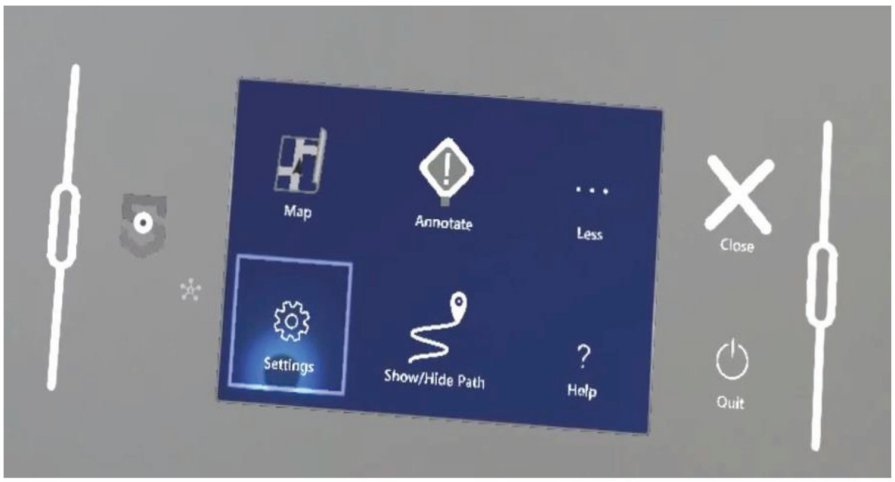
Network Gateway

Intra-team Communication
Communication with C2

C2 interface

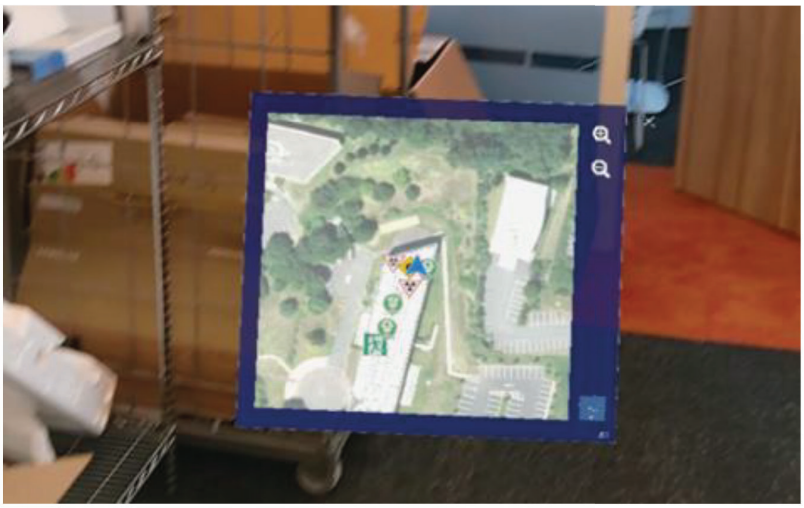
- FRs locations
- Biosignals
- Earbuds battery status
- Mission Recorder

SUBSYSTEM 1 – HOLOLENS2 AR INTERFACE FEEDBACKS



HAND MENU

MINIMAP



EXAMPLES OF ANNOTATIONS

SUBSYSTEM 1 – HOLOLENS2 AR INTERFACE FEEDBACKS

Displays alerts - visual + sound - provided by the following tools :

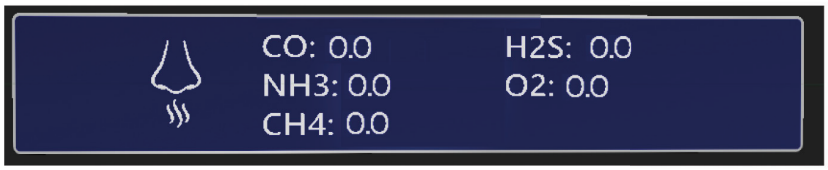
- **Signs of life**: first responders will be notified with an alert message pop on HoloLens when a sign of life is detected. If the hand menu is opened, the distance of the detection is indicated.

Alert shown to the FR upon detection

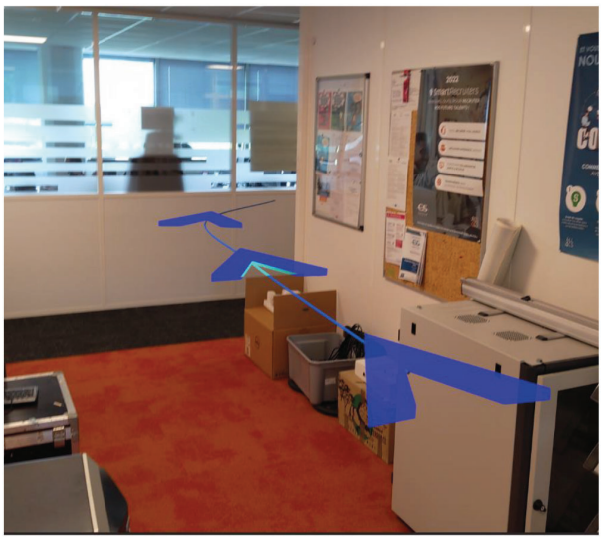
Information shown in hand menu

- **Augmented olfaction**: first responders will see an alert shown upon detection of a dangerous gas. Depending on the concentration level the alert colour can be:
  - Orange : Warning
  - Red : Danger
  - Blue : Information

Augmented olfaction gas concentration values will be display as below.



- **Firefighter lifeline**: first responders will visualize the way to go back to the starting point depending on the previously travelled path.



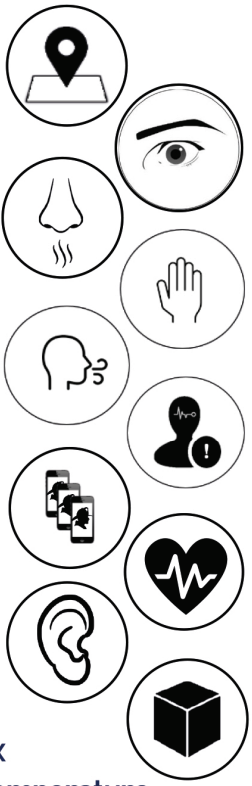
- **Robust vision**: first responders will visualize a label based on the message containing the nature of the detected object (e.g. Victim, Person, Chair…).


Smart Helmet
AR Interface
Robust
Vision
Enhanced
Hearing
Augmented
olfaction
Radar
sensing
Wireless
finder
LOCALISATION
Network Gateway
ORCHESTRATOR
INFO PRIORITISATION
Signs of life
EMG
THERMOCOUPLE
CHEST BAND
WRISTBAND
Biosignals
Monitoring
Black Box
C2 interface

SUBSYSTEM 2 – SMART HELMET AR INTERFACE
Functionalities

Smart Helmet AR Interface

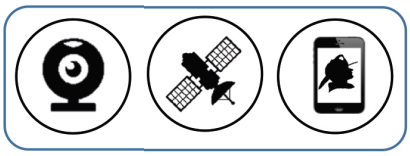
INTEGRATED FUNCTIONALITIES



- Self-localisation
- Victim localisation
- Robust vision
- Dangerous Gas alerts
- Radar sensing status
- Signs of life status
- Wireless finder status
- Gateway info
- Biosignals values
- Earbuds Battery Status
- Black Box info
  - Location of Black Box
  - Data from sensors: temperature, humidity, number of people inside building

Enhanced Hearing

- Audio messages:
  - « Dangerous gas detected »
  - « High heart rate »
  - « Victim detected »

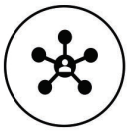


LOCALISATION

Seamless Localisation Indoor/Outdoor

Network Gateway

Intra-team Communication



C2 interface

- FRs locations
- Biosignals
- Earbuds battery status
- Mission Recorder

SUBSYSTEM 2 – SMART HELMET AR INTERFACE FEEDBACKS

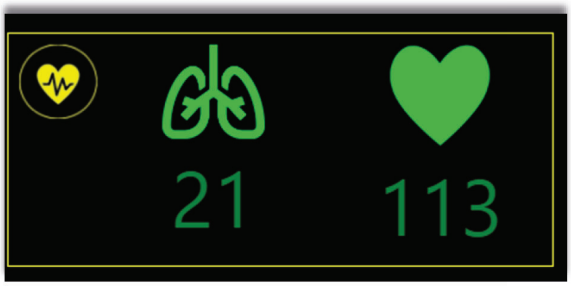
This device displays most of the information collected through the other RESCUER modules

- **Victim/Object location:** information about the location of current targets, such as victims for example, is displayed in the AR interface.

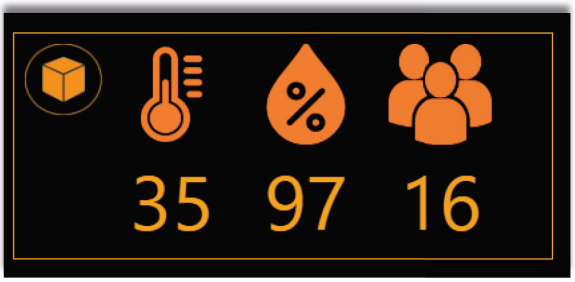
  As the FR turns around, the victims' position will change and the radar will be updated. The easiest way to go toward a victim is to keep the objective you want to go to in the top of the circle.

- **Own information:** information about the ID and coordinates of the FR is shown in the screen at all times.

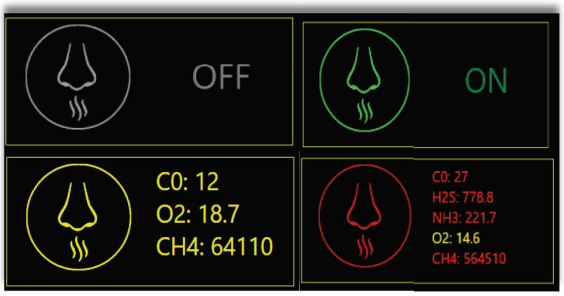
- **Biosignals:** the values of heart rate and breath rate are shown constantly. The colour changes depending on the values received.

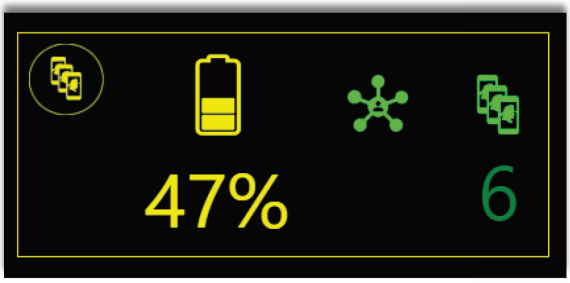


- **Black box:** information about temperature, humidity and amount of people surrounding the Black box are shown on the screen.



- **Augmented olfaction:** information upon detection of a dangerous gas has 4 status depending on the concentration level :
  - Grey : Off
  - Green : Information
  - Yellow : Moderate warning
  - Red (blinking) : Danger



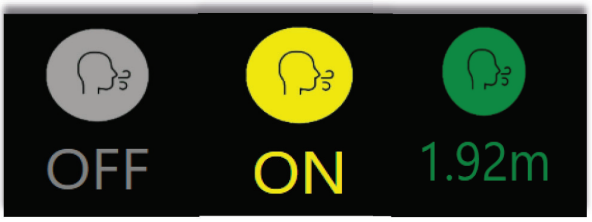


- **Gateway connection:** battery level remaining on the gateway; A icon green when the C2 gateway is on reach, grey when is not; number of other gateways are on reach

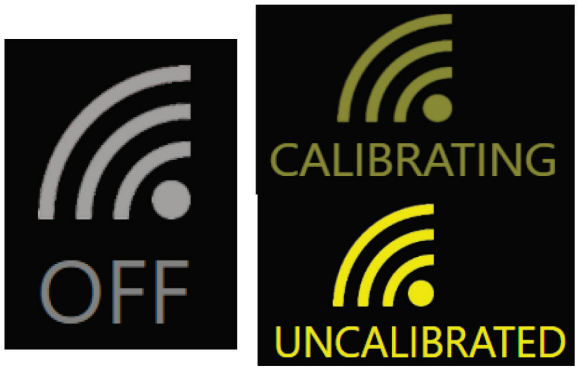
SUBSYSTEM 2 – SMART HELMET AR INTERFACE FEEDBACKS

- **Radar information** with 3 status
  - Grey : Off
  - Green : On but no imminent collision detected
  - Red (blinking) : imminent collision with the number of approaching objects detected

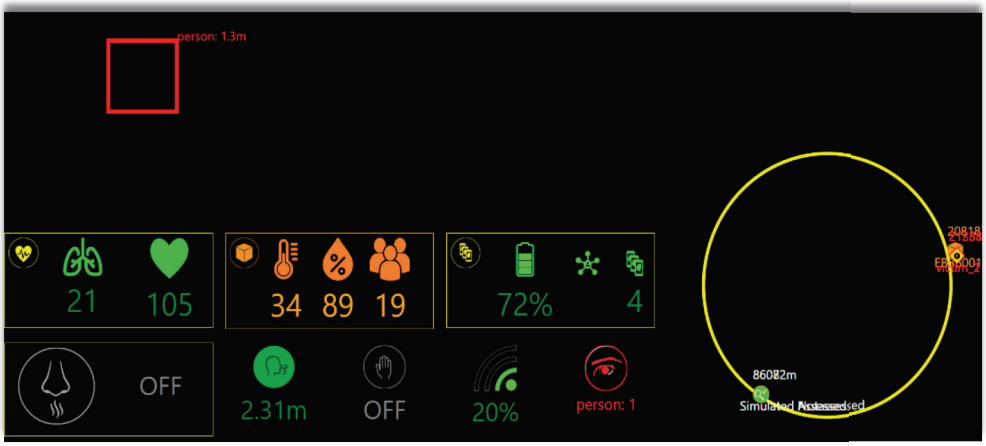
- **Signs of life information**
  - Grey : Off
  - Yellow : On but nothing found
  - Green (blinking) : something found with distance



- **Wireless finder:** shows the current status of the wireless finder device. It has several statuses:



- **Robust vision:** objects detection (e.g. Victim, Person, Chair…)
  - Green : nothing detected
  - Red : something detected. If there are too many types of objects to list them (3 or more), the ones with most repetitions are shown.



USER MANUAL – SCENARIO

SCENARIO

A fire has started in a building which hosts an hotel, a laundry and a laboratory. Electricity has been cut off in the building and smoke is filling both the laundry and the laboratory, where dangerous goods are stored. No smoke nor darkness in the hotel, but cases of people feeling ill have been reported.

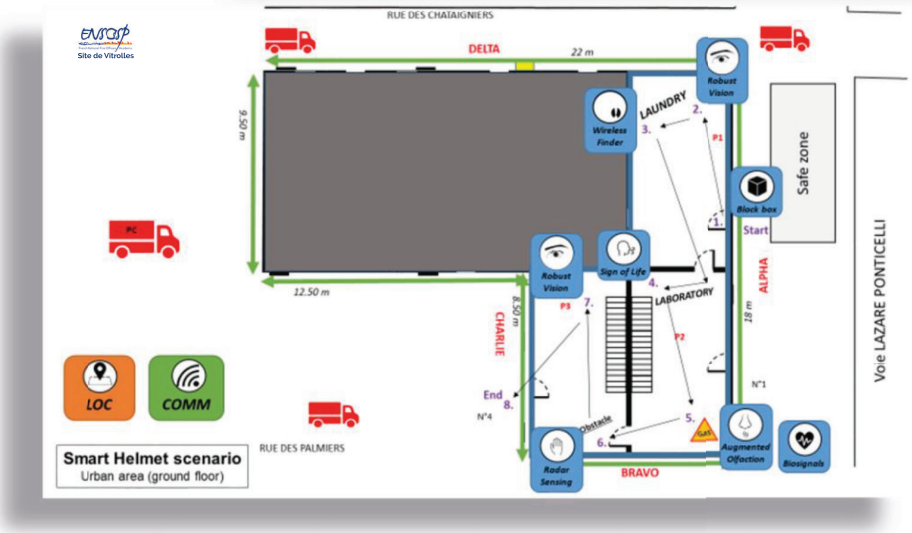
Two teams are sent to carry out reconnaissance inside the building after the fire has been extinguished:

- one team equipped with **RESCUER HoloLens2 Subsystem**
- one team equipped with the **RESCUER Smart Helmet Subsystem**

For both subsystems, the incident commander observes the status of the team via **the C2 interface**

HoloLens 2 scenario

SMART HELMET scenario



This document has been produced by ENSOSP, the French National Academy for Firefighters' Officers.
It is part of the Training Materials developed in the framework of the project RESCUER.
Find more about the project by scanning the QR Code below.

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French National Fire Officers Academy