EOSystem

Energy Optimized drone-based healthcare delivery System

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Co-funded by the Horizon 2020 programme of the European Union

DT-ICT-01-2019
Smart Anything Everywhere Area 2

www.smart4all-project.eu
Grant Agreement: 872614

Focused Technology Transfer Experiments (FTTE) 2nd Call
Financial Support to Third Parties

Saves lives

Daily needs

Easily perishable

donor unevenly distributed

Unpredictable needs

Emergencies difficult to plan

Long awaiting times

Means not always available

High costs

Staff active 24/7

Transport not compliant

SLA unrespected

SOLUTION

The Smart Capsule

Approved Patents

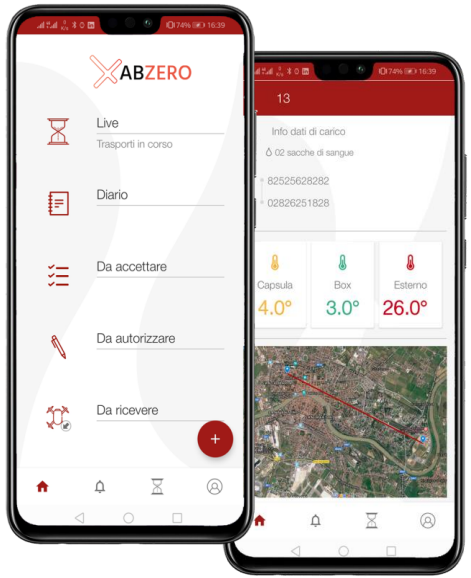
IoT Innovative sensor (pH & hemolyisis)

Artificial intelligence

Quality guaranteed & preserved

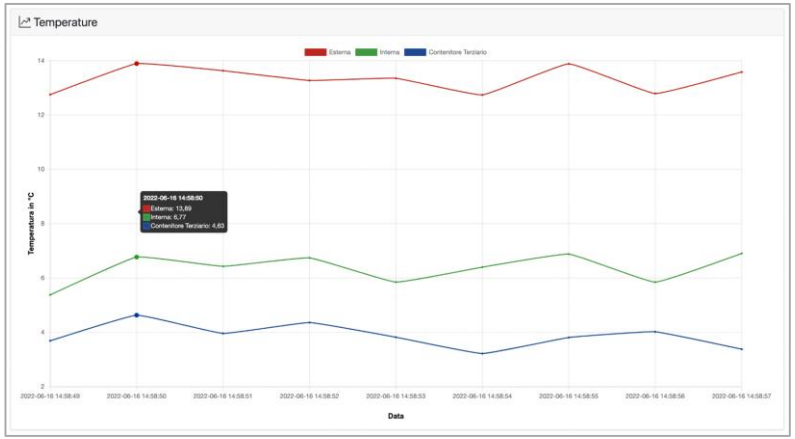
Spoke platform

App



Delivery management

Back-end



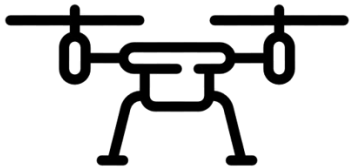
Real-time monitoring

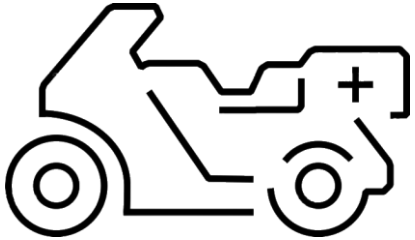
Artificial Intelligence

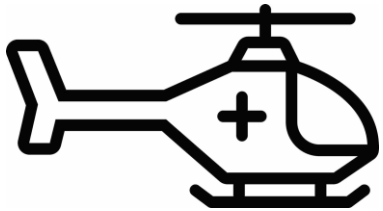
Autonomous vehicle control & supervision

Competitive advantages

Multimodality







80% Delivery time reduction

40% Direct cost reduction

CO_2 Emissions reduction

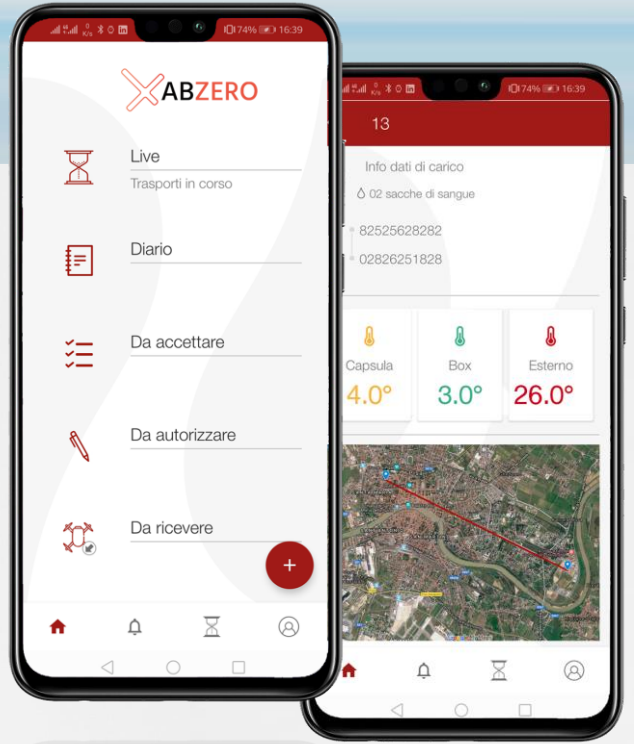
BUSINESS MODEL

ABZERO → LEASING

B2B

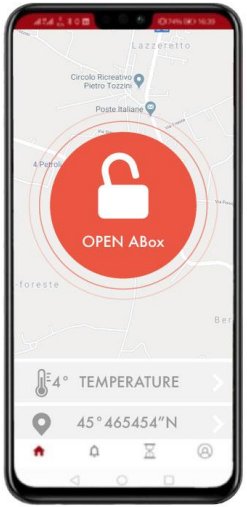
Public & private medical facilities

Traditional delivery & drone operators


ABZERO
Live
Trasporti in corso
Diario
Da accettare
Da autorizzare
Da ricevere
13
Info dati di carico
02 sacche di sangue
82525628282
02826251828
Capsula
4.0°
Box
3.0°
Esterno
26.0°

ABZERO

The Smart Capsule and Spoke platform



APP.

Temperature management

Door lock release

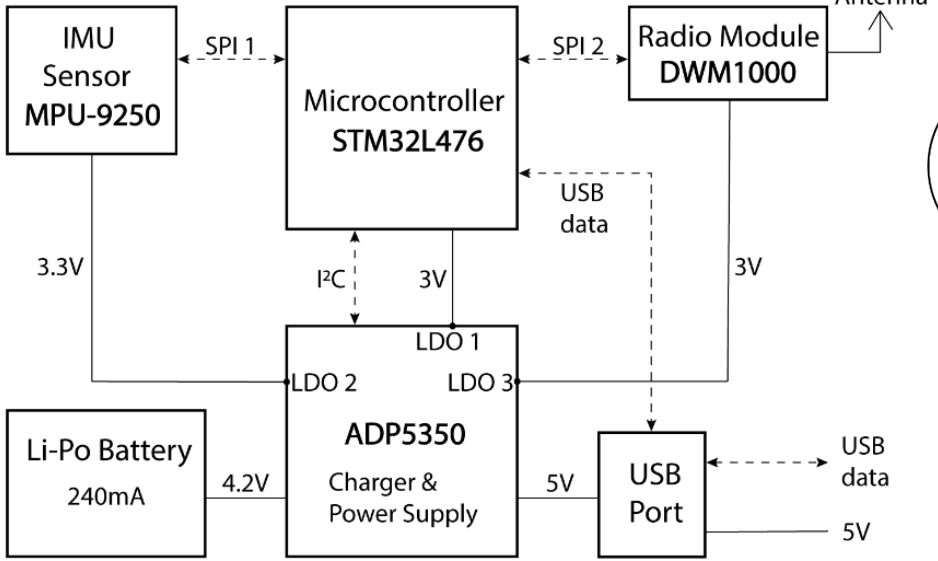
Flight monitoring

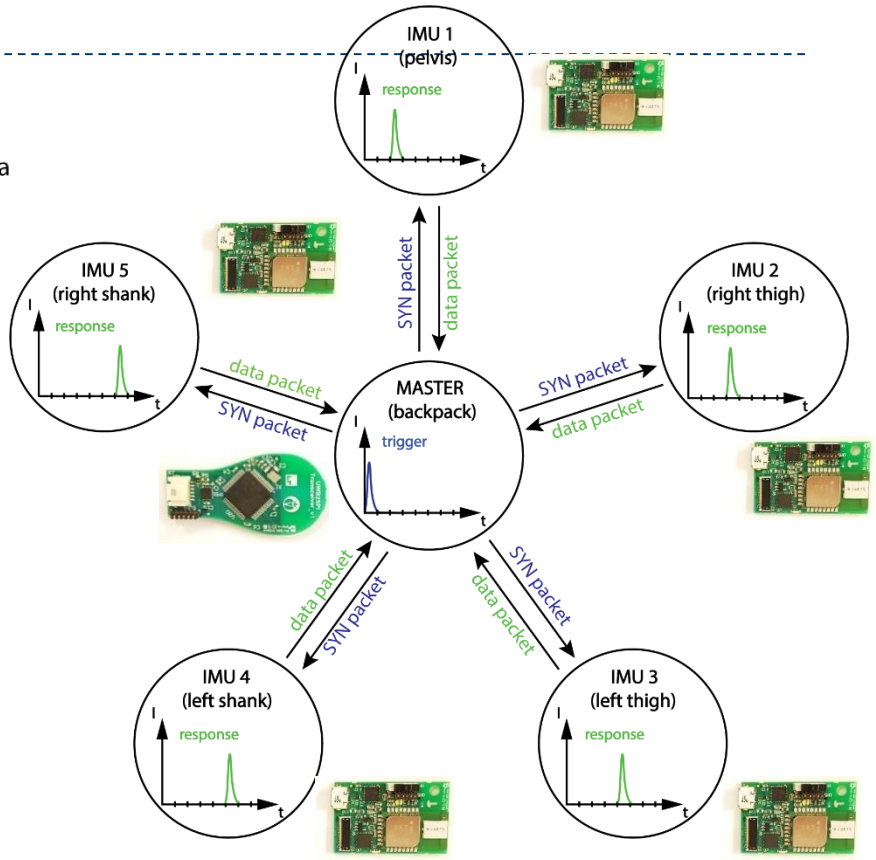
The blood and blood components UN3373 box

Current sensors onboard

Bluetooth 5.0 Temperature and Humidity Beacon

Inertial Measurement Units (IMU)

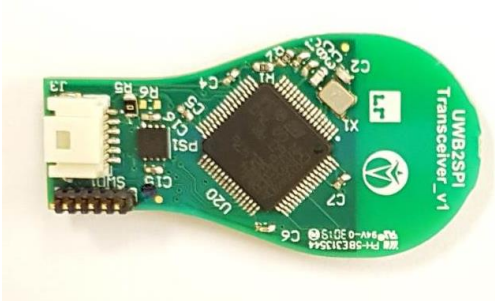


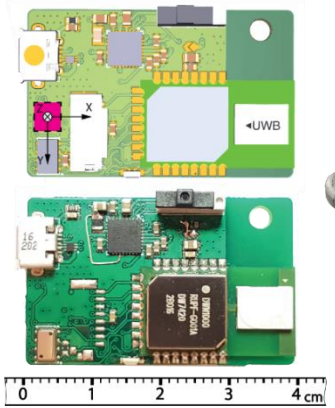


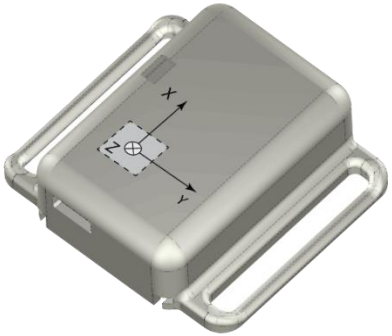
CYBERLEGs Plus Plus Project has received funding from the European Community's H2020 Research and Innovation Programme (H2020/2014-2020) under grant agreement n. 731931

IMU rev. E

- Produced 60 UWB IMU devices (rev. E – last version)
- Produced CTRBv2 and UWB2SPI
- Custom synchronization interval
- Optimized battery consumption: autonomy from 2,5 h to around 6 h
- Configuration software tool







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IMU fw&hw development

- functions and USB instructions to set digital low pass filter (DLPF) for accelerometer and gyroscope.
- functions and USB instructions to set avalible full **scale ranges** for accelerometer and gyroscope
- functions to set internal IMU output rate **divider** (fs = 1 kHz, DLPF: on)
- functions to set predefined MCU's timer **sampling** frequency:
- {1, 10, 20, 50, 100, 200, 250, 400, 500, 800, 1000} Hz

- UWB IMU rev. E devices **produced**
- straps for wearing devices
- plastic IMU cases 3D-printed

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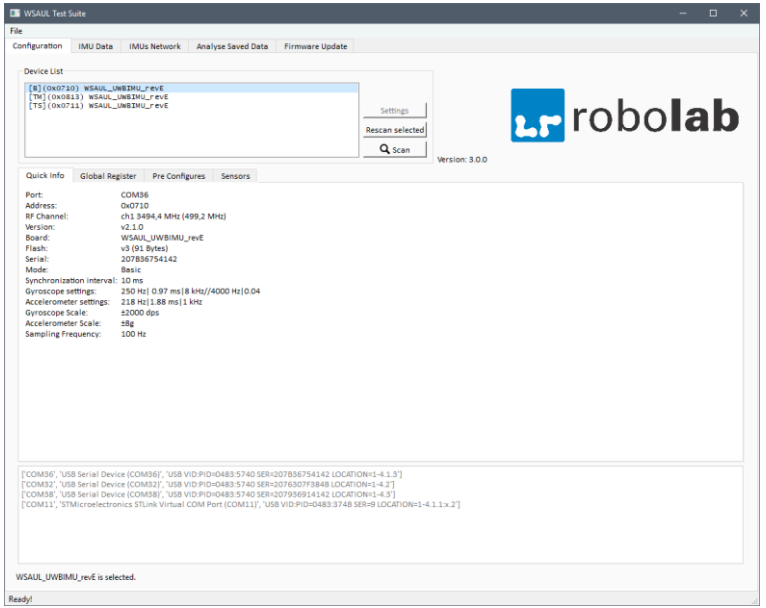
Software Application - WSA Test Suite

WSA Test Suite: *configure, test, measure:*

- device configuration
- reading IMU data from single device over USB
- network of IMUs
  - master device in network with 6 remote devices
  - 9-DOF IMU (MPU-9250) and temperature data
  - pressure sensor (MS5611-01BA03) + temperature data
  - radio (DWM1000) received signal strength data
  - packet counters (master + remote devices)
  - packet loss calculation
  - battery level indicator
  - raw ADC or SI units display of output data
- option to save data to file for later inspection (up to 30 min)
- upgrade firmware over USB
- Mount SD Card, File open, Data display



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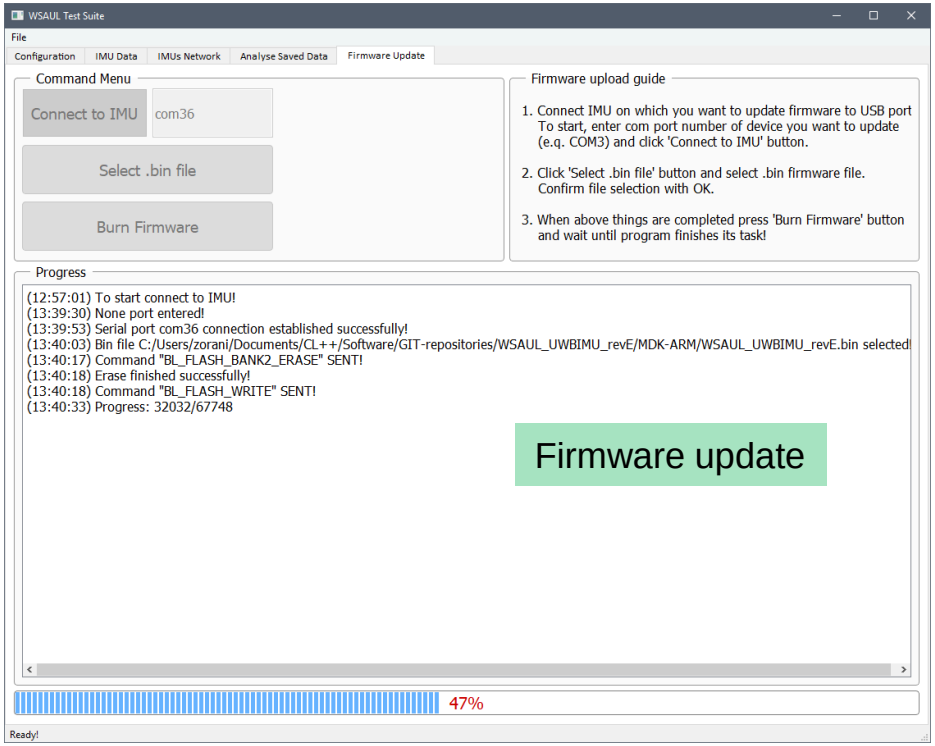
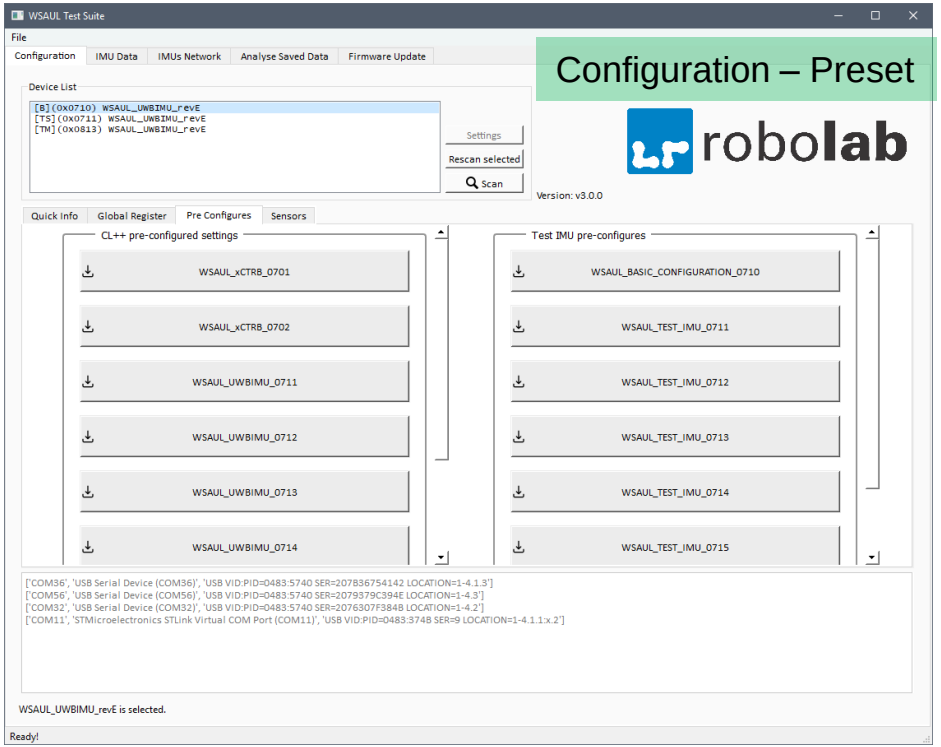
Software Application - WSA Test Suite



Firmware update



Configuration – Preset

robolab

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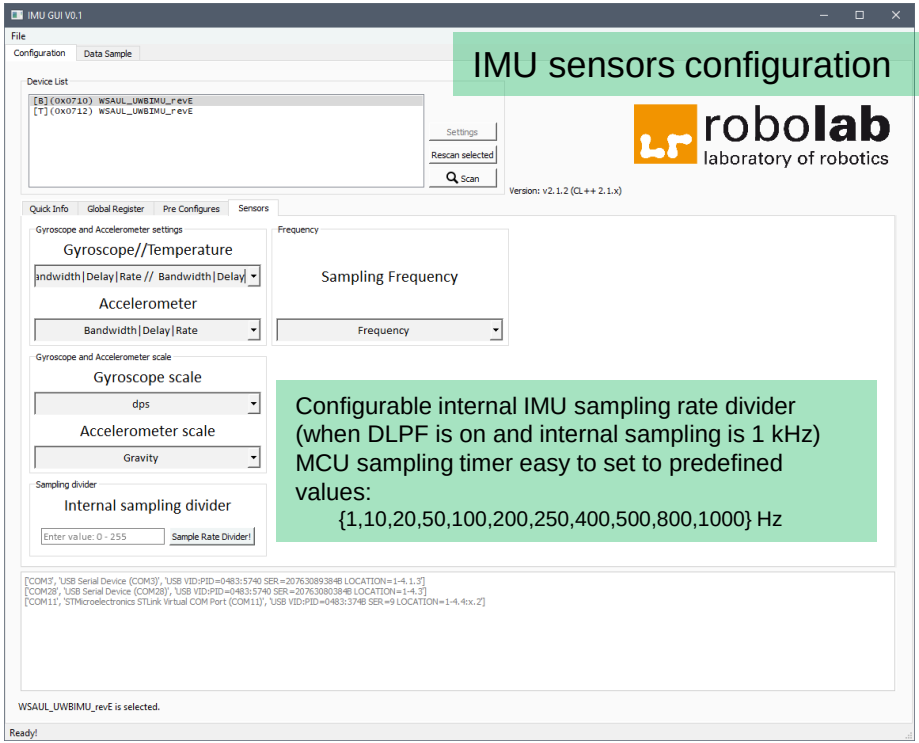
HORIZON 2020

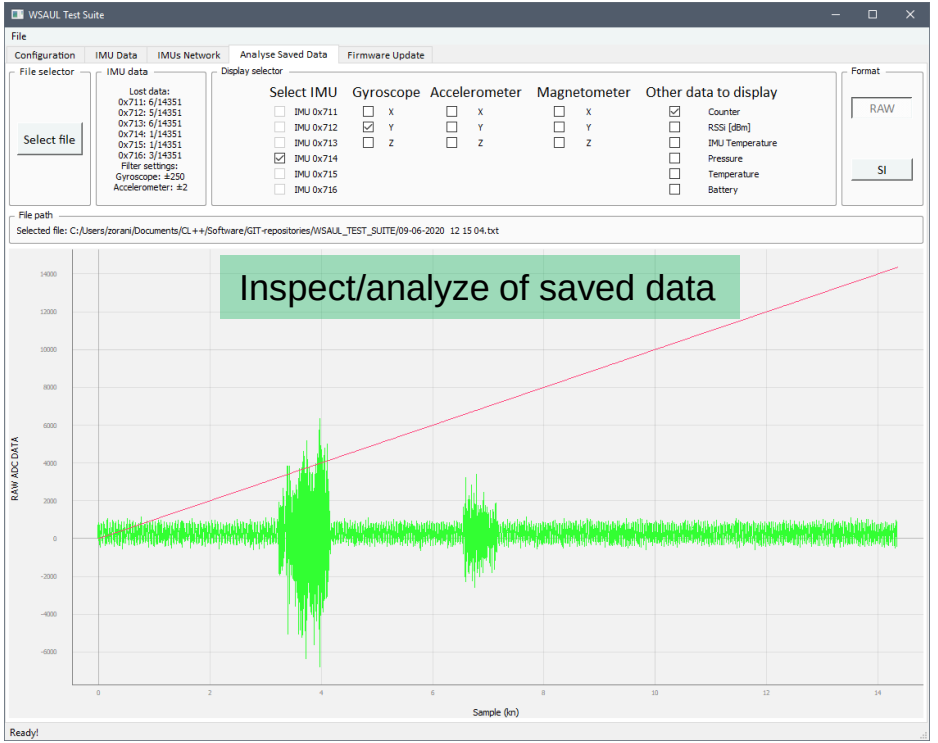
Software Application - WSA Test Suite



IMU sensors configuration

robolab
laboratory of robotics

Configurable internal IMU sampling rate divider (when DLPF is on and internal sampling is 1 kHz)
MCU sampling timer easy to set to predefined values:
{1,10,20,50,100,200,250,400,500,800,1000} Hz



Inspect/analyze of saved data

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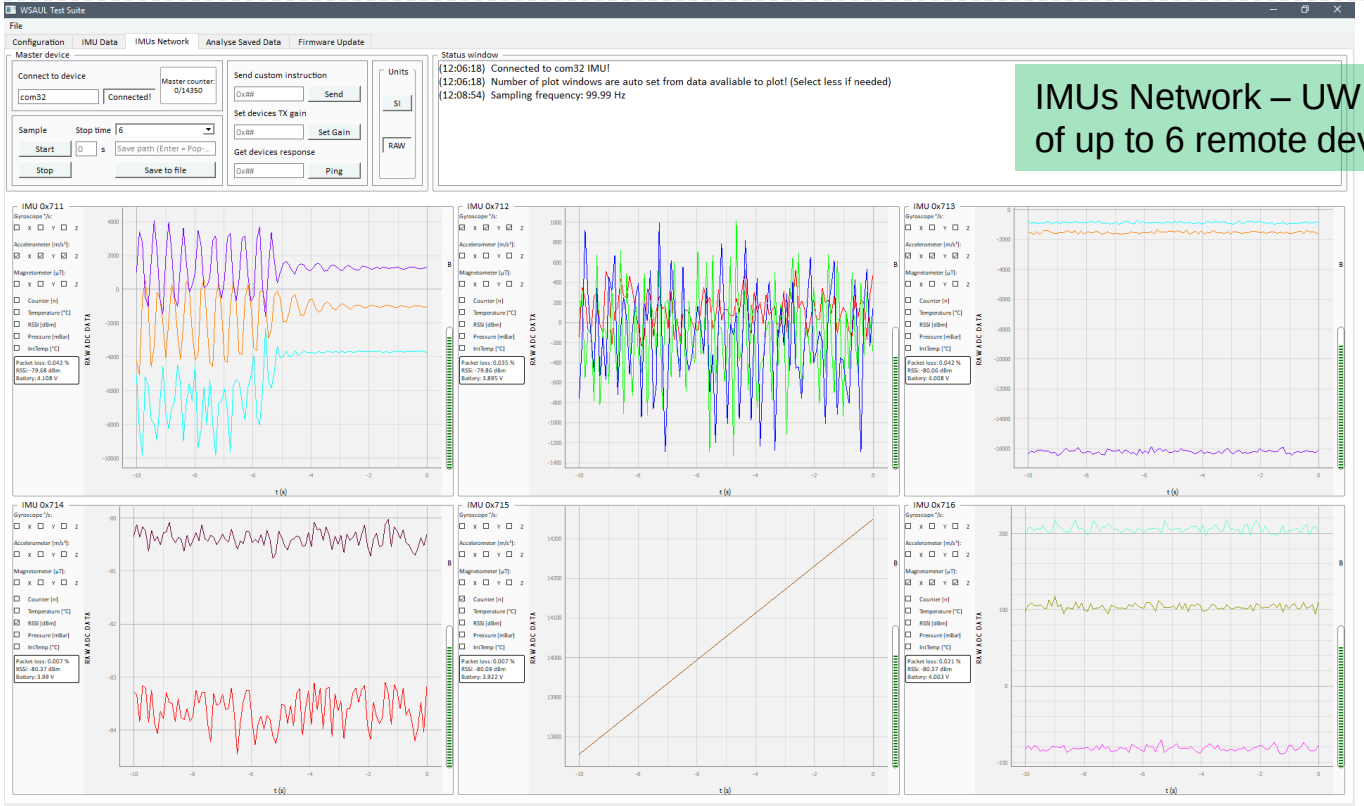
Software Application - WSA Test Suite



IMUs Network – UWB radio network of up to 6 remote devices (via USB)

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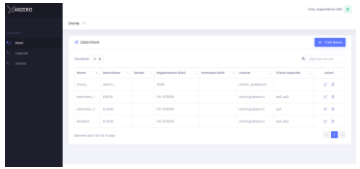
System architecture detail



SPOKE

robolab

Electric lock

Internal Battery

Simcom 4G module

Raspberry Pi3

Live monitoring

AI algorithm

Display

UAV

Mavros/mavlink

Sensorizing the Smart Capsule

Sensorizing the Smart Capsule

Field tests

Timeline (December 1st – October 1st)

WP1: Technology transfer
• Task 1.1: Analysis of ABZ's sub-systems monitoring requirements [Month1 to M1]
• Task 1.2: Adaption/Implementation of new sensors on the IMU device [M2 to M7]
• Task 1.3: Firmware and hardware integration of the IMU device in the flAIX system and lab testing [M4 to M7].
Milestone #1: 2.0 version of the ABZ's system integrated

WP2: Test and demonstration
• Task 2.1: Obtainment of flight authorization [M7 to M7]
• Task 2.2: Field tests and demonstration in operating conditions (5 delivery missions) with KPI check [M7 to M9]
• Task 2.3: Fine-tuning and final modifications [M8 to M9]
Milestone #2: 2.1 (final) version of the system integrated (after fine-tuning)

WP3: PM, IPR agreement design & Dissemination [M1 to M9]
• Task 3.1: IPR licensing agreement design and signature [M1 to M1]
• Task 3.2: Preparation and publication of abstracts and presentations (R, PU). [M3 to M9]
• Task 3.3: Elaboration of MP (Mentoring Plan) Initial plan, Intermediate report [M9 to M9]

Current and past projects

IUPITER project

UNIVERSIDAD DE MÁLAGA

Junta de Andalucía
Consejería de Salud y Familias
SERVICIO ANDALUZ DE SALUD

E-FLIGHT project

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