RTK, YOU ARE NOT LOST !

- Final project review
- 5ISS, 2021/2022

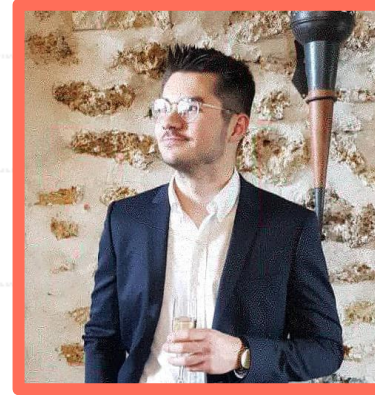INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

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1. TEAM MEMBERS

| Yacine, IR | Agathe, AE | Assia, AE | Hugo, IR | Leila, AE |

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2. PROJECT PRESENTATION

- **Context :** to retrieve data, we must send helium balloons up to 30km

- **Problem :** when the balloons deflate and land on the ground

- **Objective :** to locate the balloons with precision

- **Technology :** a low-cost solution of RTK modules

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3. PAUL SABATIER PROJECT

(a) Structure closed view
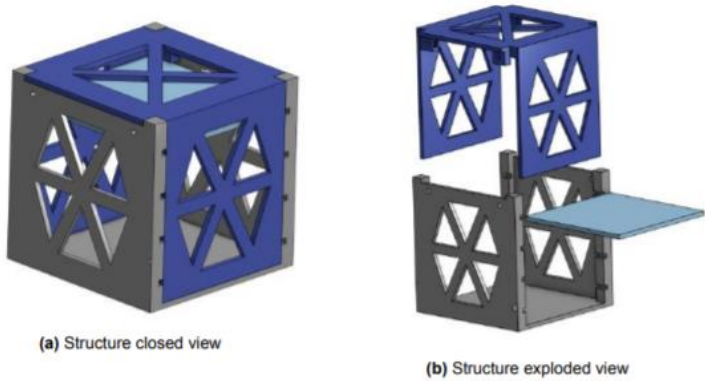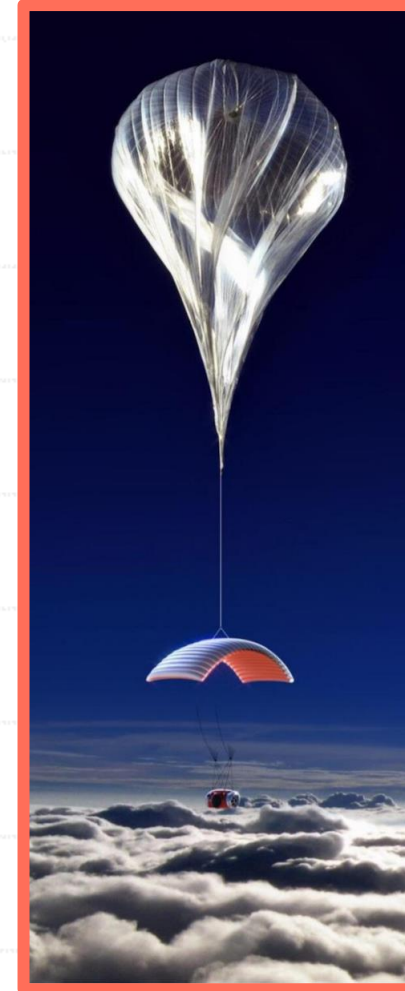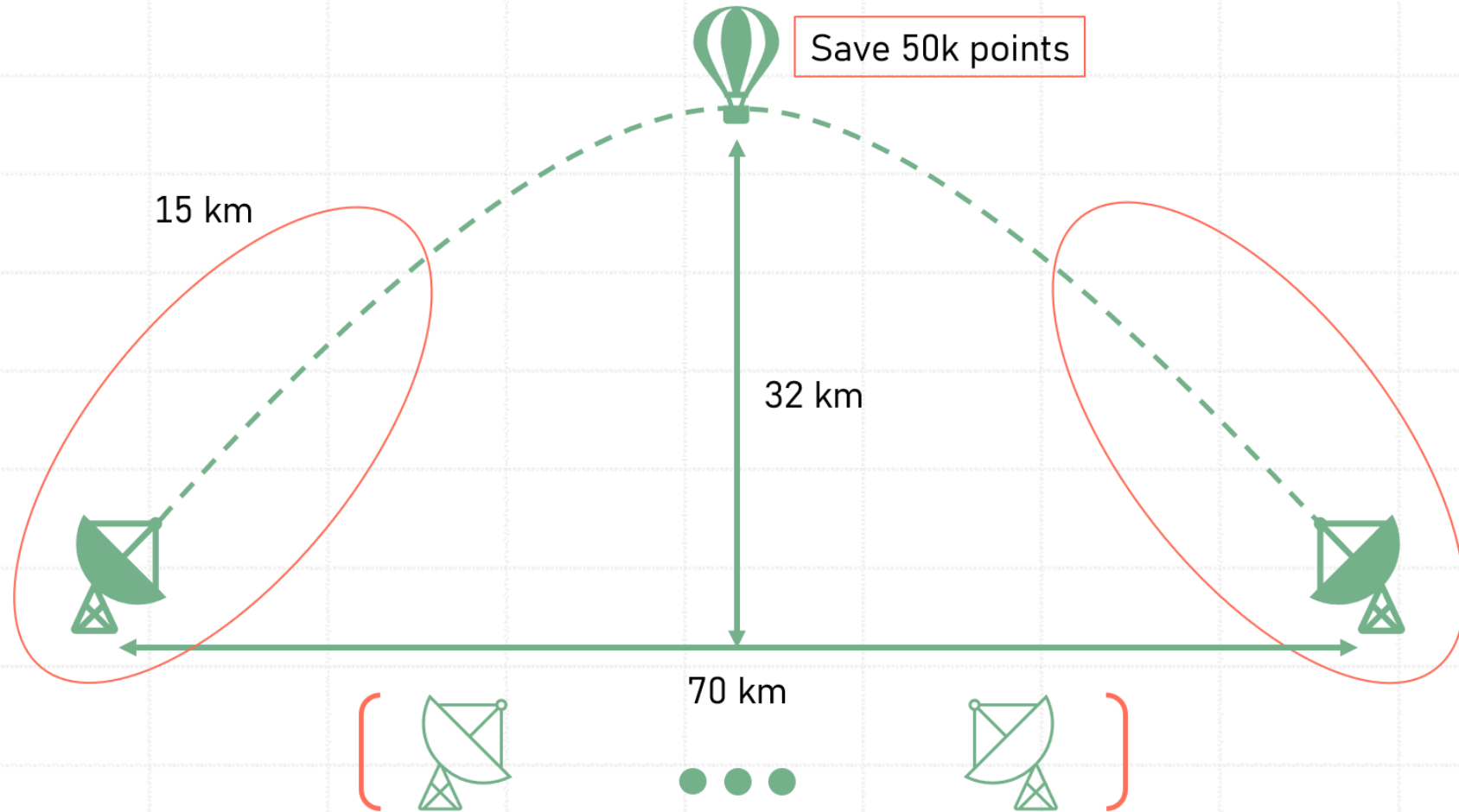
(b) Structure exploded view

Figure 6.1: Structure of the cubesat

Cubesat containing motors, sensors, boards, antennas, etc.

3. PAUL SABATIER PROJECT

Save 50k points

15 km
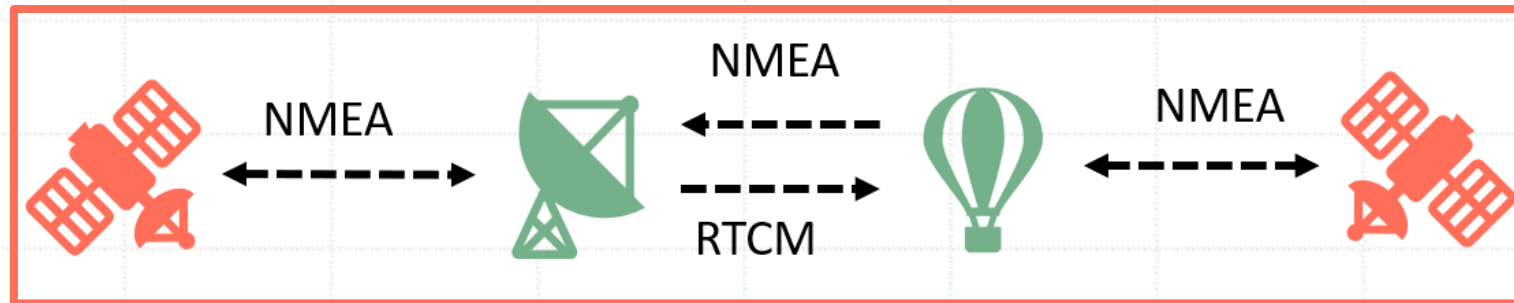
32 km

70 km

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4. THE TECHNOLOGY

GPS vs DGPS vs RTK

	GPS	DGPS	RTK
Accuracy	~ ten m	+/- 1 m	+/- 2 cm
Constellation	GPS (4 satellites min)	GPS (4 satellites min)	GPS, Galileo, Glonass, Beidou (5 satellites min)
System	Receiver	Base + Rover	Base + Rover
Measurement method	Multilateration	Code phase/Corrected Pseudorange	Carrier phase
Positioning mode	Absolute	Differential (code)	Differential (phase)
Radio link		Less information Slow transmission Real-time or post-processed results	More information Fast transmission Real-time results
Range		100 to 200 km	10 to 20 km

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4. THE TECHNOLOGY

Types of frames

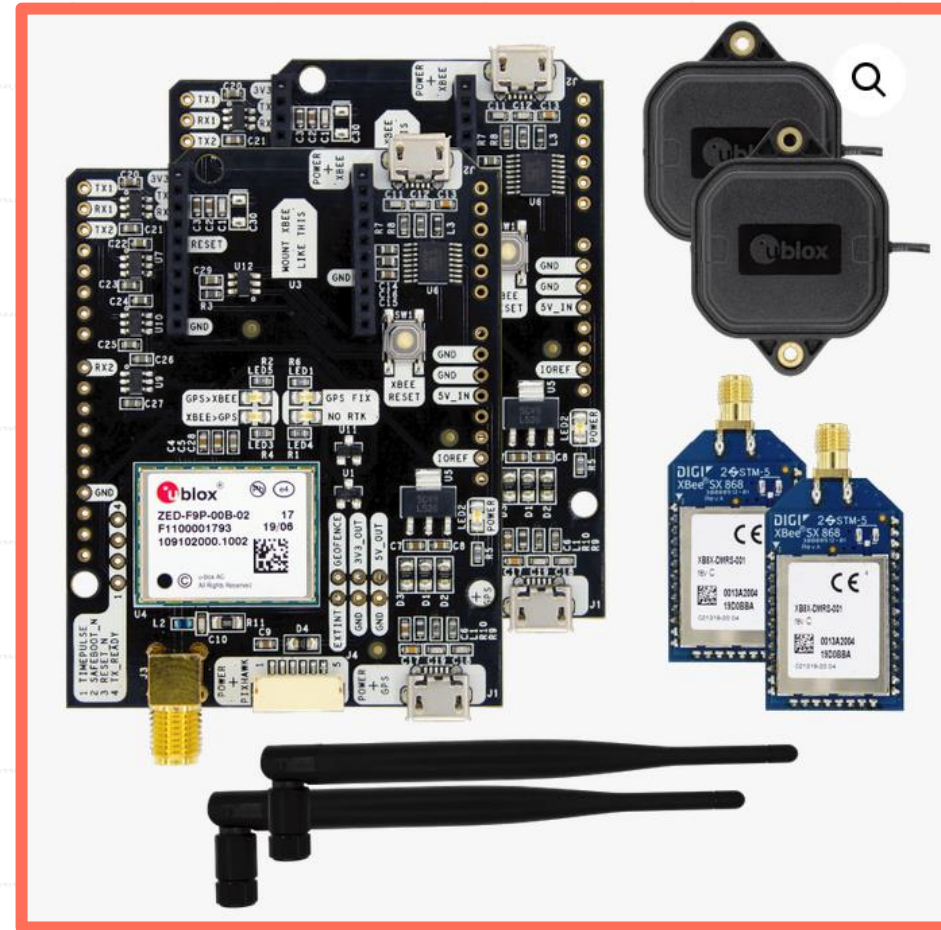BENCHEHIDA Yacine, LE BELGUET Hugo, LIEVRE Agathe, MENECEUR Leila, NGUYEN Assia

5. OUR RESOURCES

We possess a simple RTK2B kit by ArduSimple with :

- 2 simple RTK2B boards (rover and base)

- 2 Radio Modules LR (Long Range) with Xbee+ 2 x radio antennas

- 2 u-blox ANN-MB-00 Antenna for GNSS Dual Band with cable (IP67)
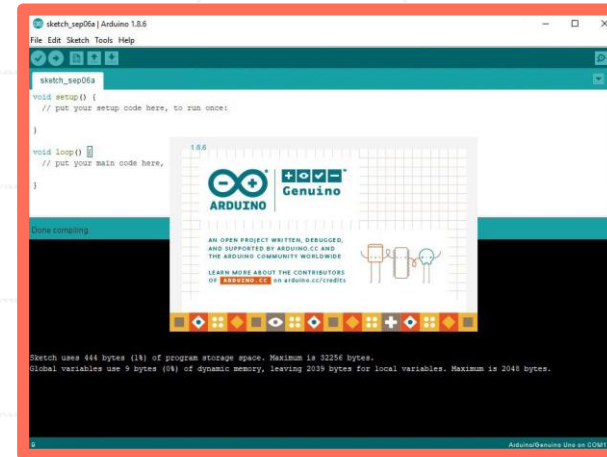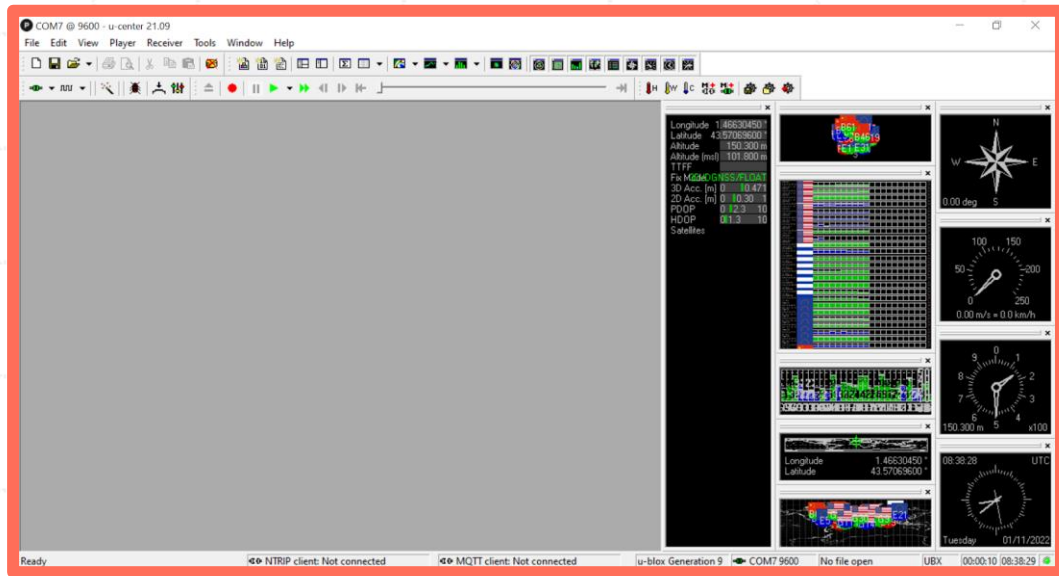
- Base and Rover pre-configuration

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5. OUR RESOURCES

Xbee sniffer +

ESP32 +

  +   +

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5. OUR RESOURCES

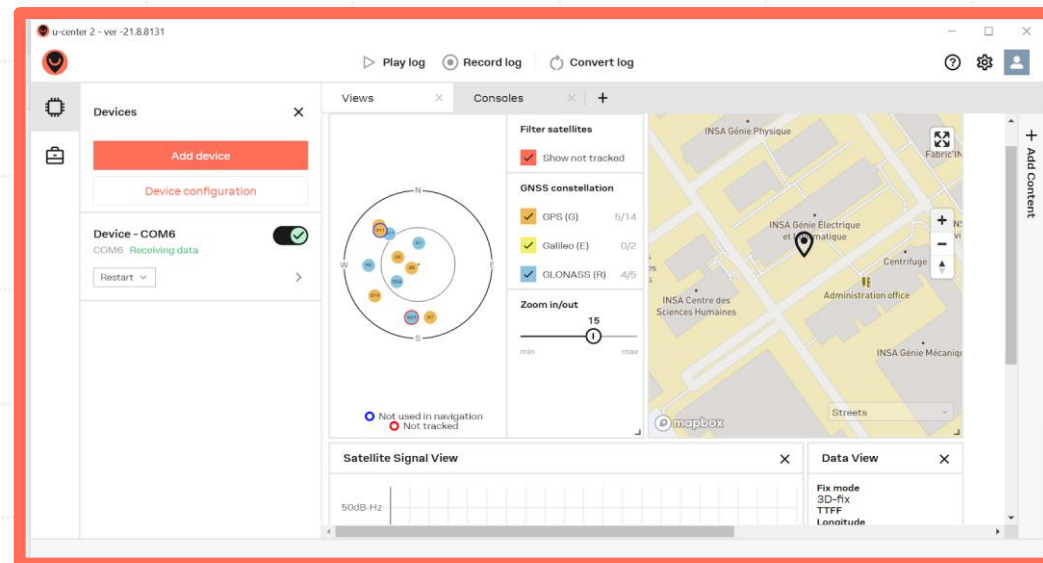u-center

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6. OUR OBJECTIVES

- Our objectives and tasks were :

State of the art comparing the different GNSS technologies

To measure the performance and range of this kit

To obtain a RTK accuracy of a few centimeters

To retrieve the rover's position

To display both the base and rover's position

7. TESTS, RANGE

We had communication up to 3km

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7. TESTS, SNIFFING

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7. TESTS, ACCURACY

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2. OUR SOLUTION

Website
mapbox

GET Requests

Firebase

WiFi

ESP32

Base station

uCenter
ublox

Xbee
Up to 15 km

Rover

Cubesat

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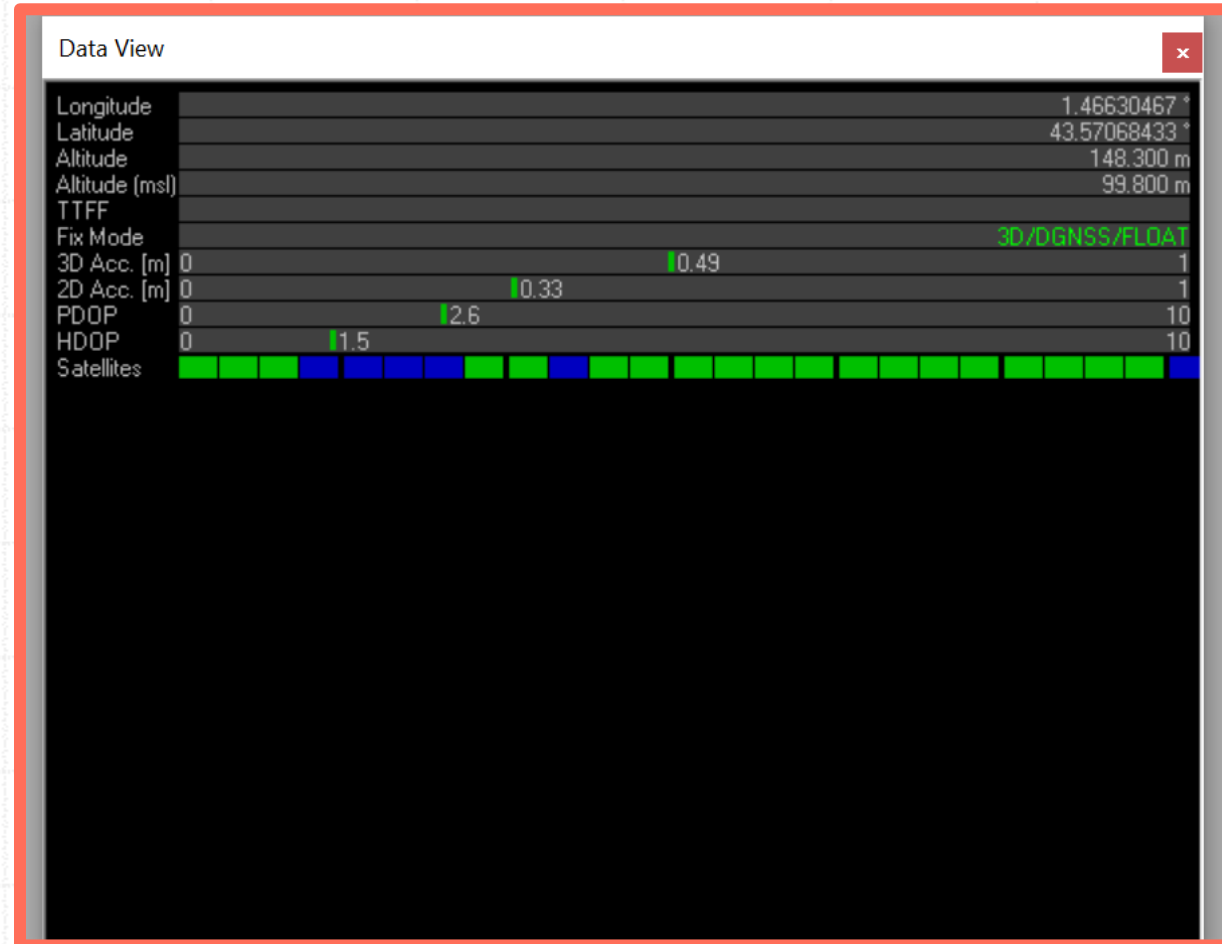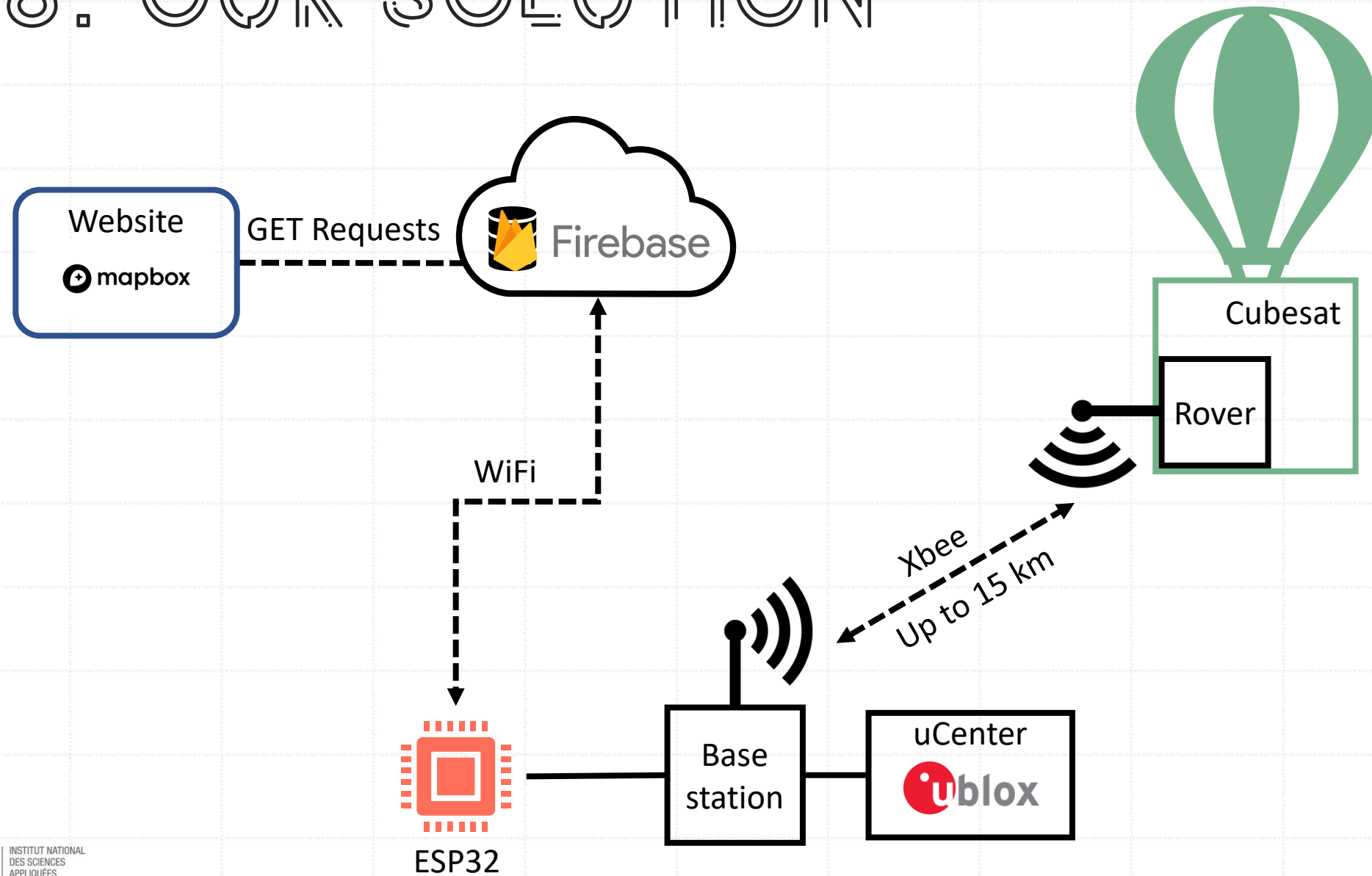
8. OUR SOLUTION

Parsing the frames sent by the base to the rover

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8. OUR SOLUTION

Send the frames to a database

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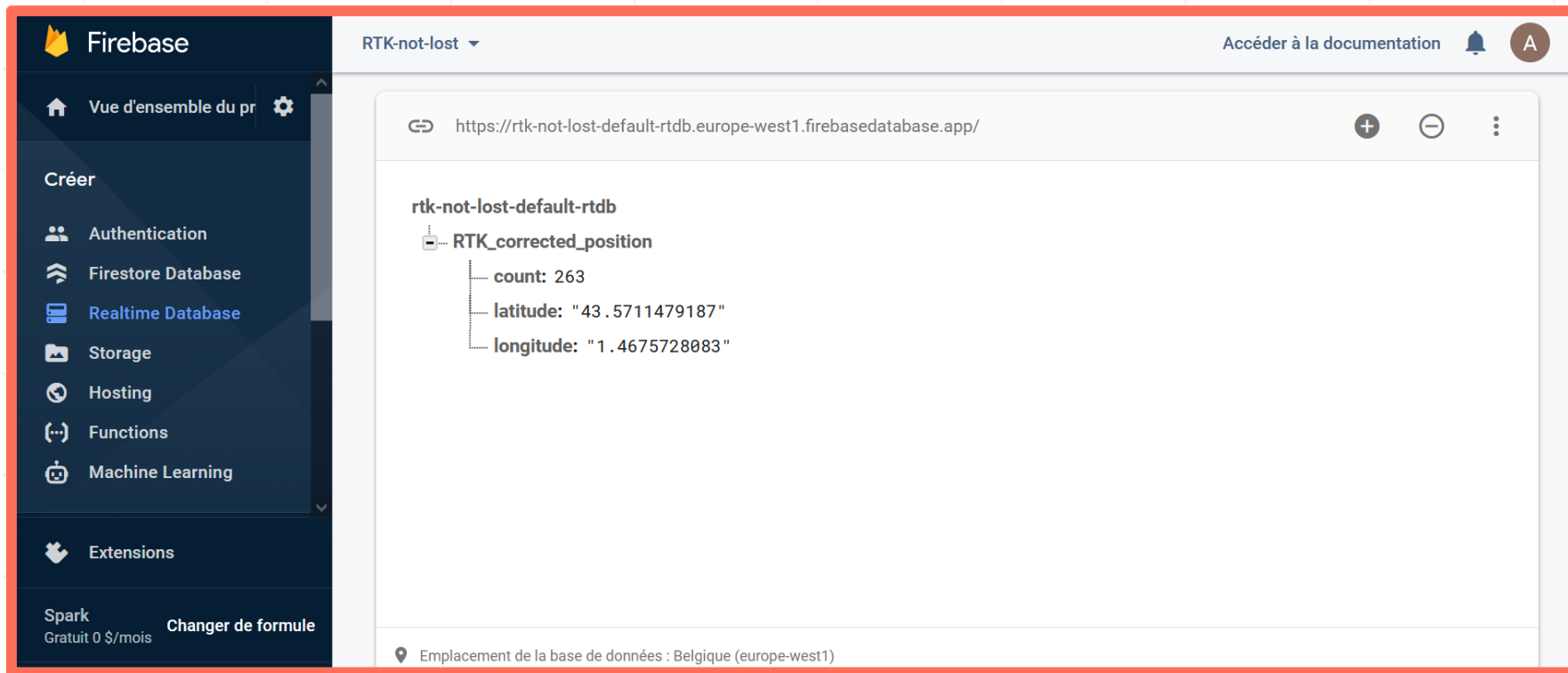
8. OUR SOLUTION

Display the location on a website:
https://rtk-not-lost.web.app/

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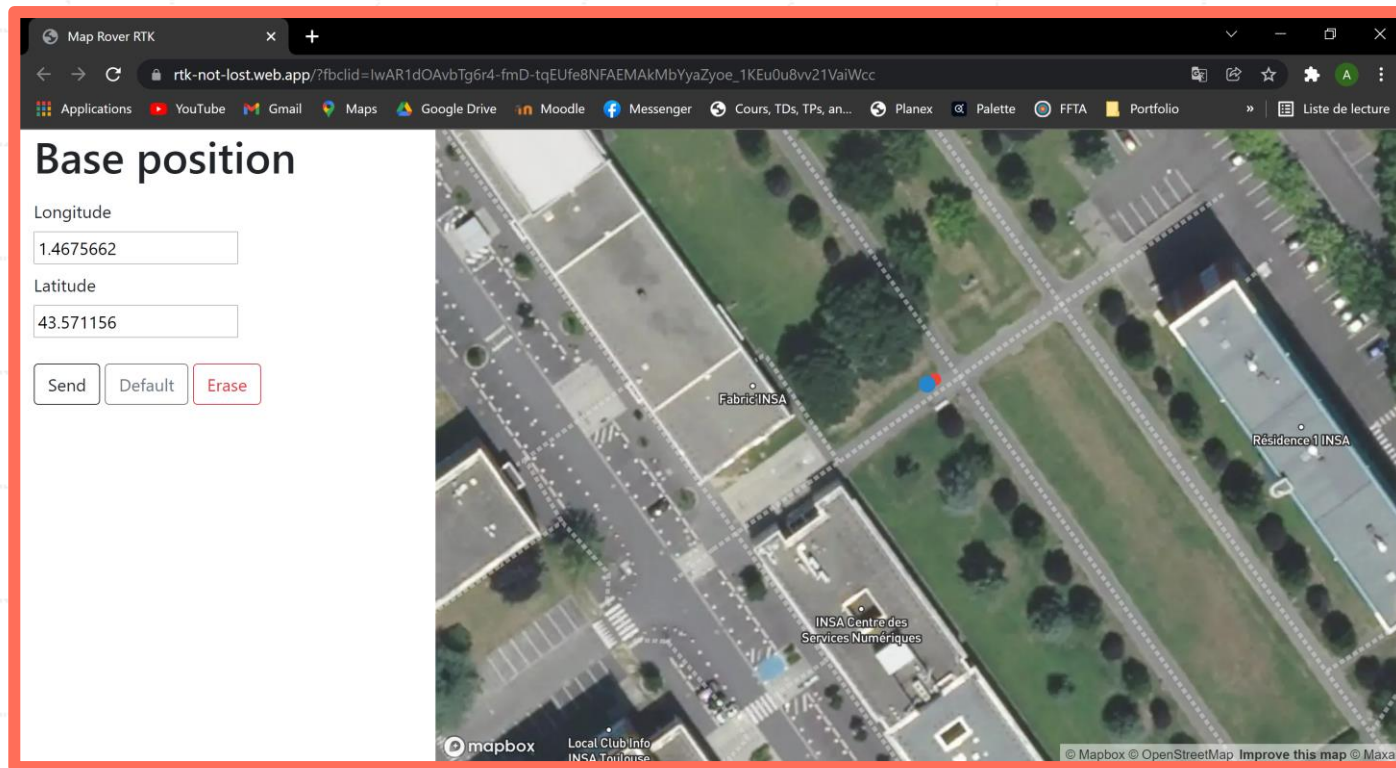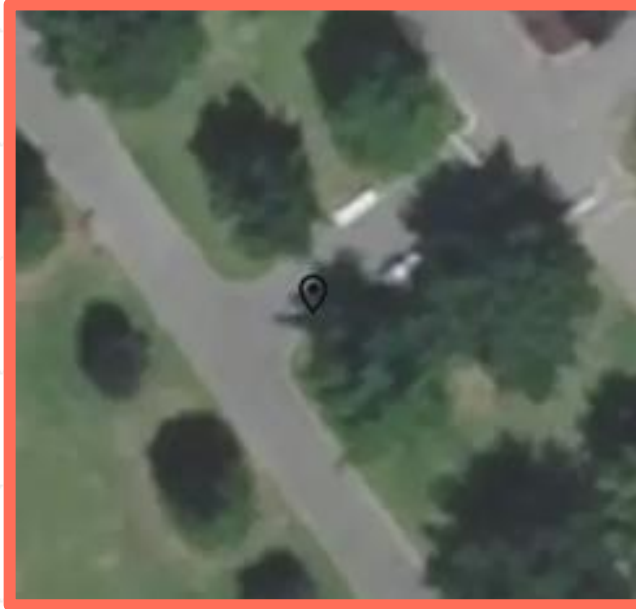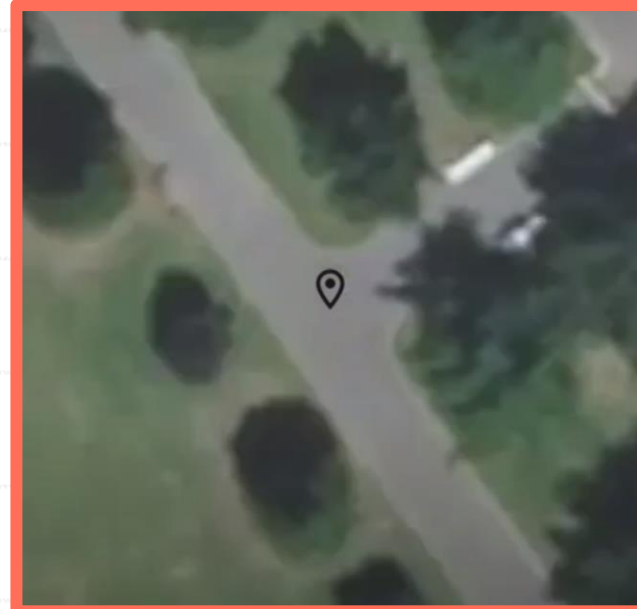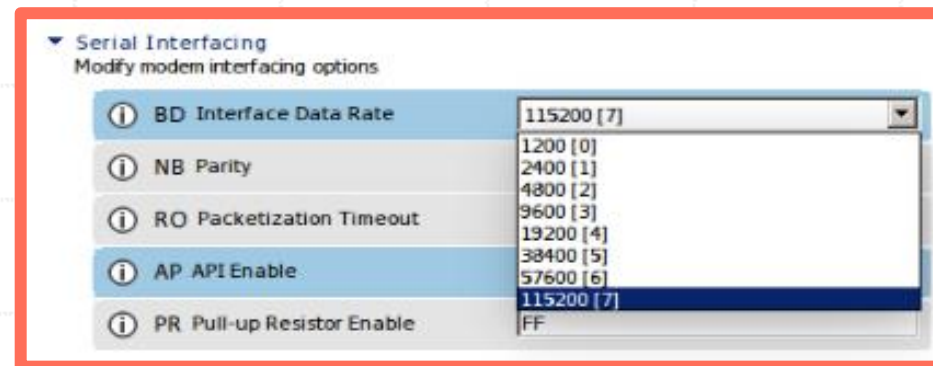
8. OUR SOLUTION

GPS

DGPS

RTK

9. CHALLENGES

Finding the right configuration to have RTK

- We linked the base and rover through UART

- We reconfigured the baud rate of the Xbee module

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9. CHALLENGES

Finding the right setting: open-sky view, temperature (for the pc)

Assimilating new notions (RTK, database, mapbox, etc.)

Interpreting the raw frames obtained with XCTU

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10. MANAGEMENT

Agile method ▶ 2-weeks sprints ▶ Meeting at every end of sprint

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10. MANAGEMENT

1st meeting 11/10/21	• Explanations about the project • Goals setting	
Sprint #1 11/10/21 - 25/10/21	• Research about the technologies (GPS, DGPS, RTK…) • Testing the RTK kit	**2nd meeting** 28/10/21
Sprint #2 25/10/21 - 08/11/21	• Research about the RTK architecture • Research bout the types of frames • Preparing the first project review	**3rd meeting** 04/11/21
Sprint #3 08/11/21 - 22/11/21	• Writing the report's theorical sections • Studying the different existing configurations for the base/rover • Sniffing the communication	**4th meeting** 23/11/21
Sprint #4 22/11/21 - 06/12/21	• Meeting with the Paul Sabatier team • Testing the Xbee modules' range • Writing the report	**5th meeting** 02/12/21
Sprint #5 06/12/21 - 20/12/21	• Preparing the second project review • Attending the Paul Sabatier team's presentation • Trying to get the best possible accuracy • Retrieving the position frames with an ESP32 • Writing the report	**6th meeting** 06/01/22
Sprint #6 03/01/22 - 17/01/21	• Parsing the frames via an ESP32 • Collecting them in a database • Displaying the position on a website • Writing the report • Preparing the last project review	
Final meeting 17/01/21	• Demonstration • Feedbacks	

THANK YOU !

GET READY FOR THE DEMO

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