



B A S H E E

Hybridization of E-GNSS and Wi-Fi ranging for LBS and automotive Accurate Navigation in Smart city

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Outline

- Concept
- Key figures and Goals
- Preliminary results and market expectations
- Project Management hints



Concept



Problem

Mass-market verticals



LBS



Autonomous vehicles



Geolocation solutions needs



Accurate



Robust



Ubiquitous



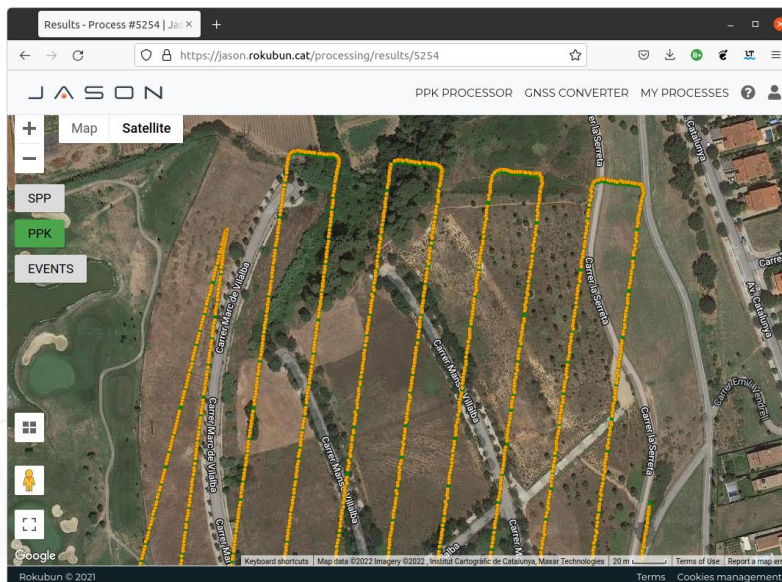
Affordable



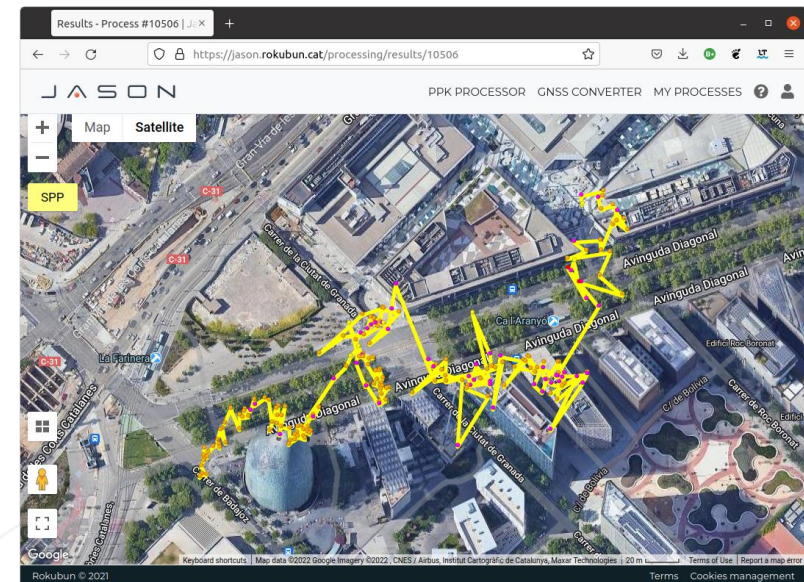
Scalable



urban environments,
most of the users



GNSS excels at accuracy in benign conditions (open sky)



but suffers in not-so-benign conditions (e.g. urban → multipath, obstructions...)

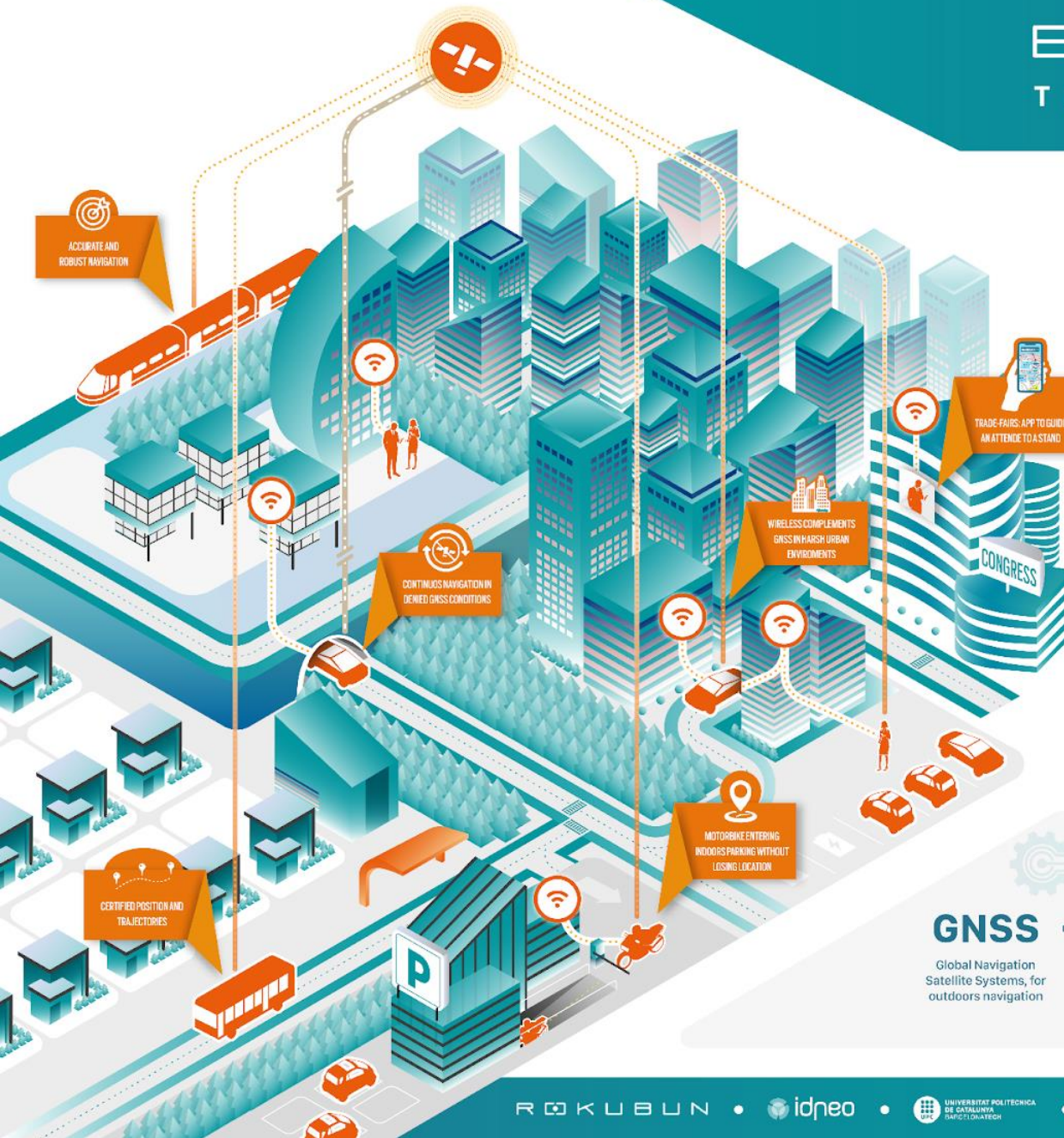


Solution: BANSHEE

BANSHEE proposes a new technology hybridizing **GNSS** and **Wi-Fi RTT** to fill the gaps of GNSS in urban harsh environments and in indoor scenarios.



BANSHEE will use Wi-Fi ranging based on Time-of-arrival (the new 802.11mc protocol), not the less accurate Received Signal Strength or Fingerprinting, being used nowadays



What is BANSHEE?

- ★ Is an indoor-outdoor accurate positioning technology for mass-market and IoT applications
- ★ Combines GNSS and wireless ranging in a new positioning engine
- ★ Is demonstrated for Location Based Services (LBS) and automotive
- ★ Specially targeted for Smartcity environments
- ★ Leverages Galileo differentiators (E5, OS-NMA)

BENEFITS

- Ubiquity: seamless location outdoor-indoor
- Accuracy: meter level
- Scalability and portability
- Affordability
- Alternate PNT

PRODUCT

- User side: Software library for GNSS + Wireless navigation running in smartphones and COTS navigation devices.
- Service side: API automatically computes precise location of wireless nodes and provides them to the SDK for wireless accurate navigation.

TECHNOLOGY

GNSS + WIRELESS

Global Navigation Satellite Systems, for outdoors navigation

Wireless Access Point, for indoor navigation:
Wi-Fi, UWB (ultrawideband), Bluetooth, 5G, etc.

TARGET DEVICES

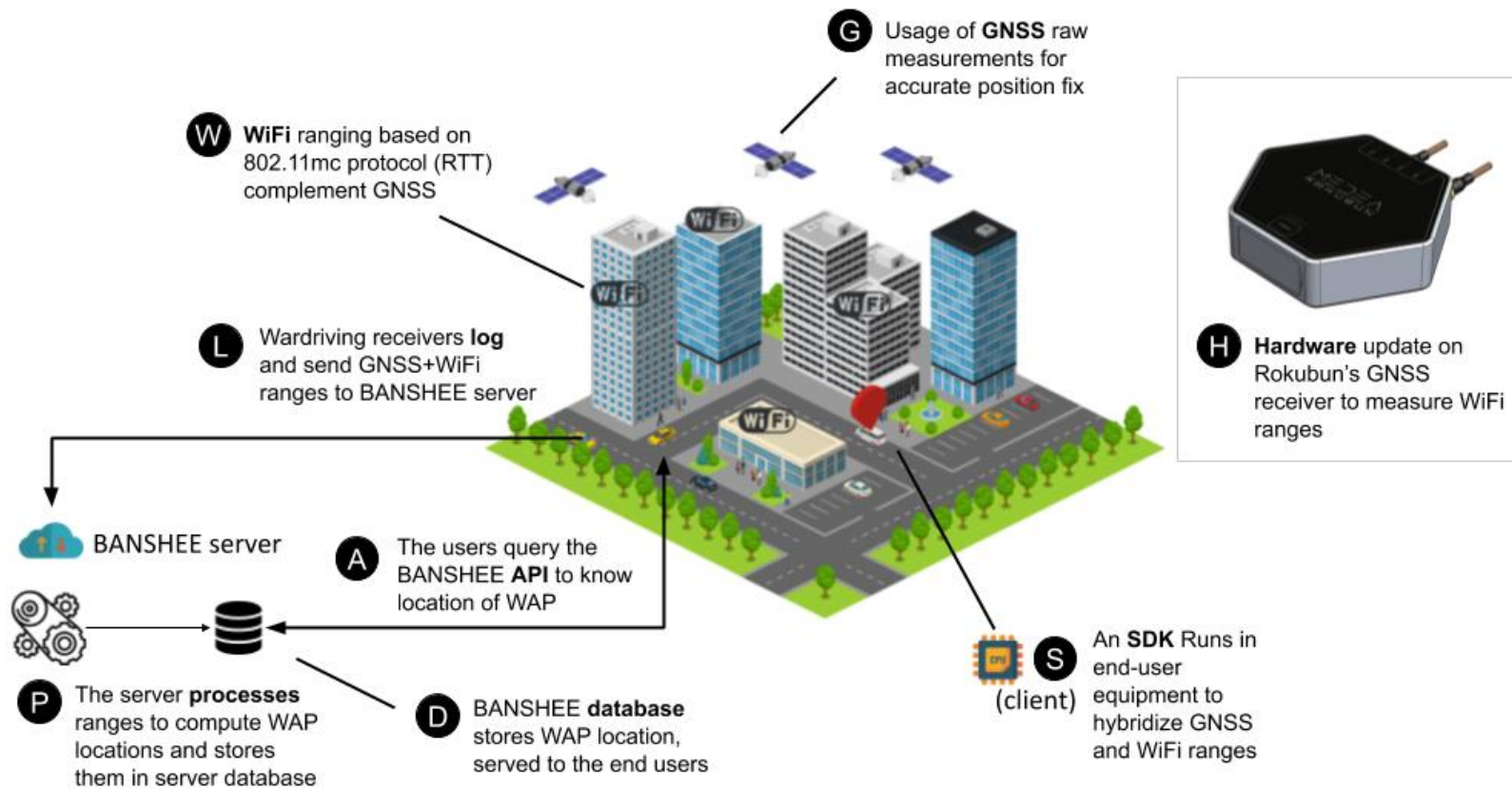


High-end smartphones



COTS (Commercial of The Shelf) navigation technologies

High Level Architecture



Key figures and Goals



The Project in numbers



KO: Jan 2021



24 months



4 partners: ROKUBUN, IDNEO, MOCA, UPC



Budget: 1,4 M€



Grant: 0,99 M€



The Project in numbers

2 

Papers

6 

Milestones

14 

Meetings

5 

Events

14 

Deliverables

9 

Articles

[banshee-navigation.eu](https://www.banshee-navigation.eu)



[Accurate
Navigation for
Mass-Market](#)



>100 Posts

[@BansheeGSA](https://twitter.com/BansheeGSA)

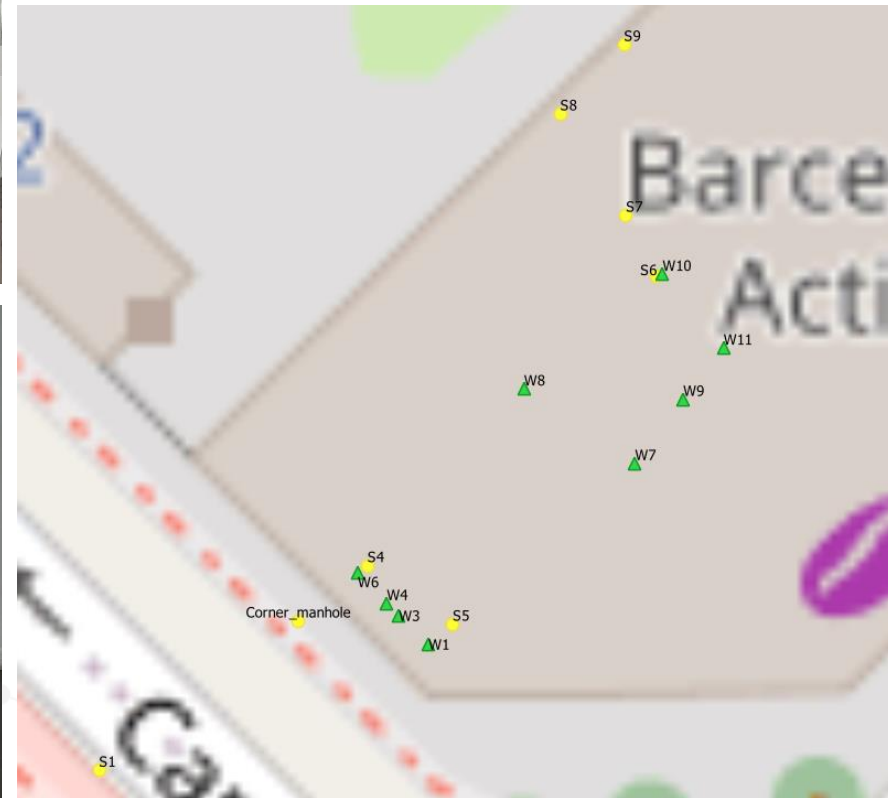
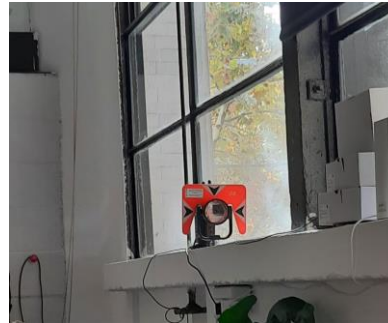


Preliminary results and market expectations



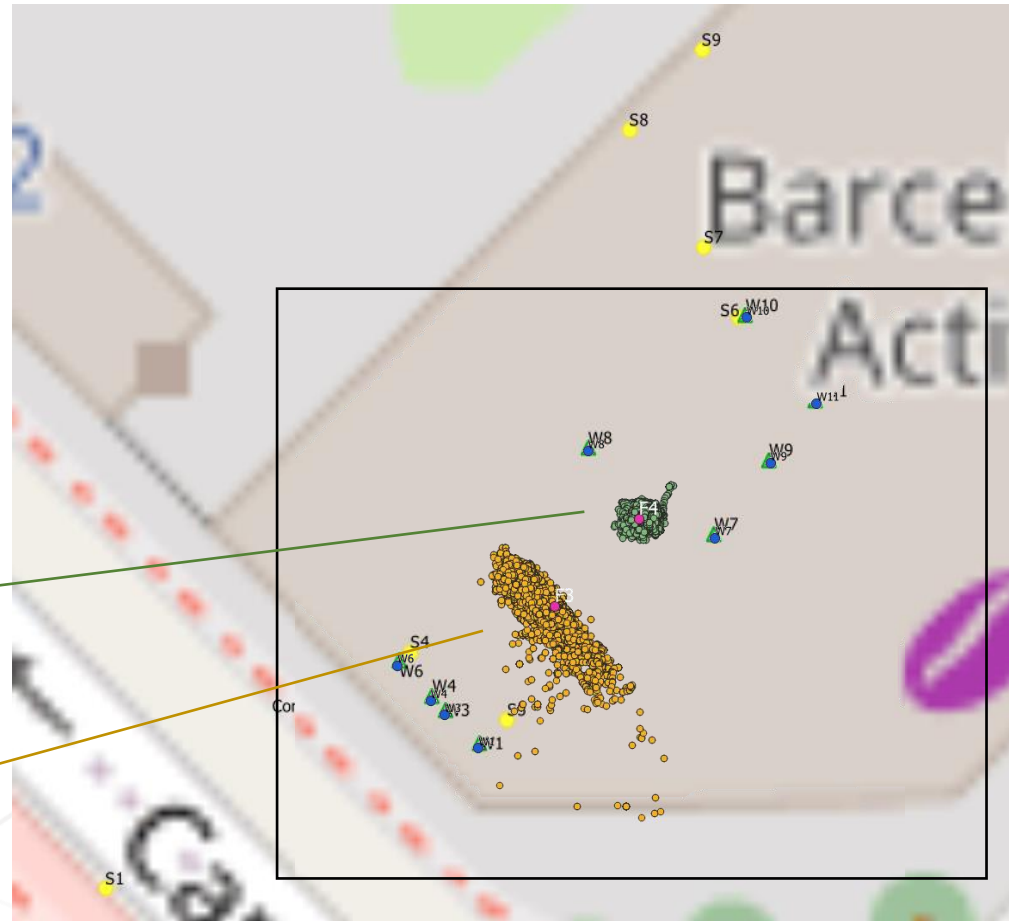
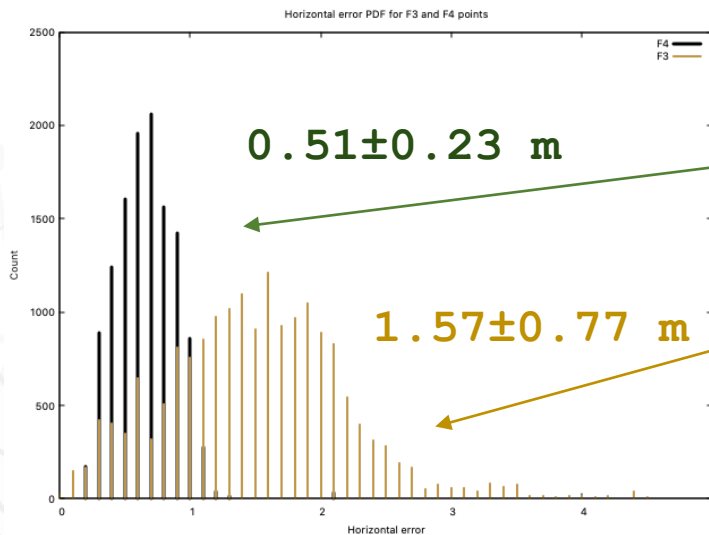
WAP survey campaign

- Geodetic survey campaign was taken over the closed traverse in the ROK office neighborhood in order to have centimeter error in WAP positions.
- Used equipment: Trimble M3 2" total station, mirror.
- Yellow dots represent highly accurate surveyed points and green triangles - reproduced coordinates of the WAPs.



First results on Wi-Fi indoor positioning

- **Google Pixel 4** used to collect measurements and perform indoor Wi-Fi positioning
- **True positions of WAPs** obtained from the survey (along with calibrated biases)



First results on Wi-Fi indoor positioning

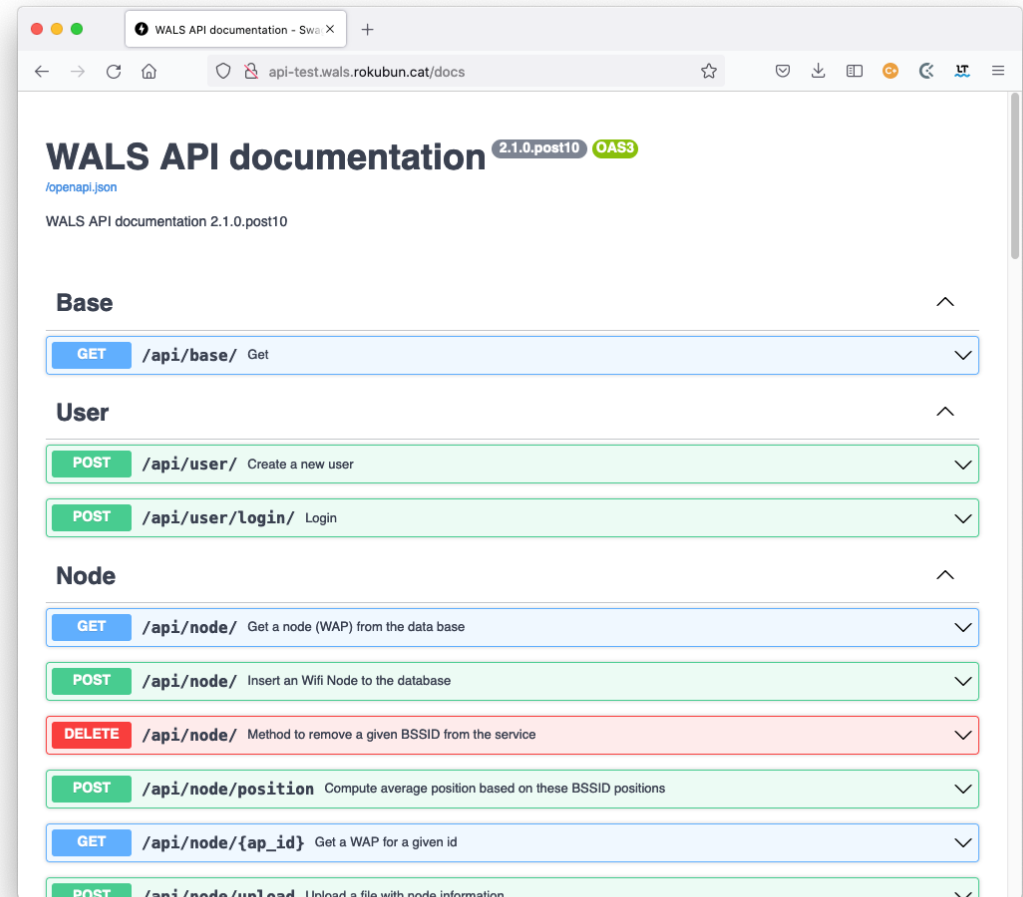


The video shows the comparison of Android Location and BANSHEE location in our office premises running in a static **Pixel4 smartphone**.



WALS API

- WALS API deployed
- Fully working online documentation (via Swagger, link below)
- Work on API mostly completed (authentication also implemented), ready for testing phase



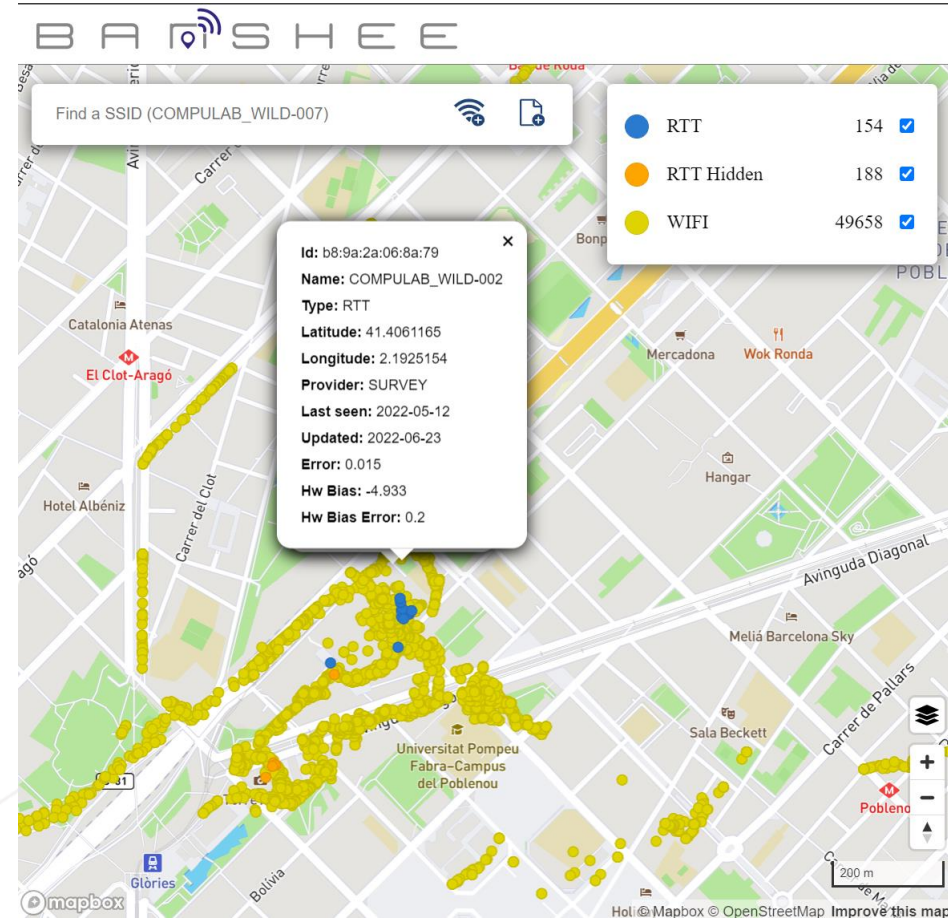
<http://api-test.wals.rokubun.cat/docs>



WALS web service

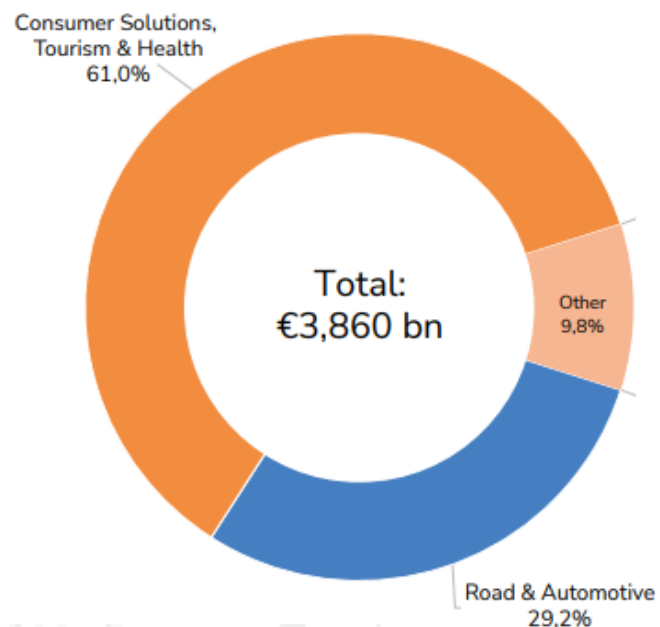
- Demonstration front-end (not initially covered in the project, but implemented for convenience)
- Currently up & running, leverages WALS API shown before
- Next steps: Authentication (using WALS API) to be added.

<https://banshee.rokubun.cat/>

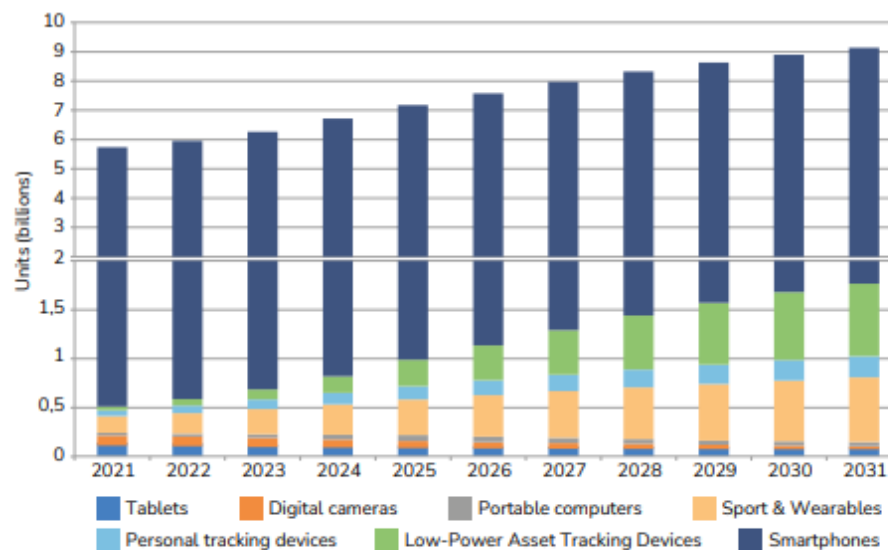


Market expectations

Cumulative revenue by segment 2021–2031



Installed base of GNSS devices by type



Source: EUSPA EO and GNSS Market Report 2022

Project Management hints



Hints & lessons learnt



The **reporting and payment** process can take a while



Use **timesheets!**



Keep all your **invoices** and **proof of expenditures** (and track them properly!)



Market-oriented technology in the proposal

Choose **good partners:**



- The consortium must be **balanced**
- the dynamics between the partners during **the proposal** are a **preview** of how smooth the project will develop



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THANK YOU FOR ATTENDING!

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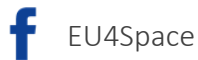




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