The FLAMINGO Experience: Developing a 50 cm positioning service for Smartphones

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NSL

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Web Seminar

Fourth Annual GNSS Raw Measurements Taskforce Workshop

What is FLAMINGO?

European Global Navigation Satellite Systems Agency

- FLAMINGO *(Fulfilling enhanced Location Accuracy in the Mass-market through Initial GalileO services)* will be a **high accuracy positioning service to be used by mass market devices**
- Comprises **positioning services, high-capacity architecture and interfaces** for easy integration
- 9*-organisation collaborative venture, led by NSL, with the best of European GNSS capabilities
  - **PPP and RTK infrastructure**, products, service provision and user solution
  - The target is accuracies of **50 cm or better**
- We will demonstrate its use and facilitate uptake
  - **3x city-wide, long-duration demonstration events**
  - **Dedicated hackathon and participation in other hackathons**
  - Supporting other initiatives, eg Task Force – EU GNSS Task group

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You may recall, we have been here before… This is what is new

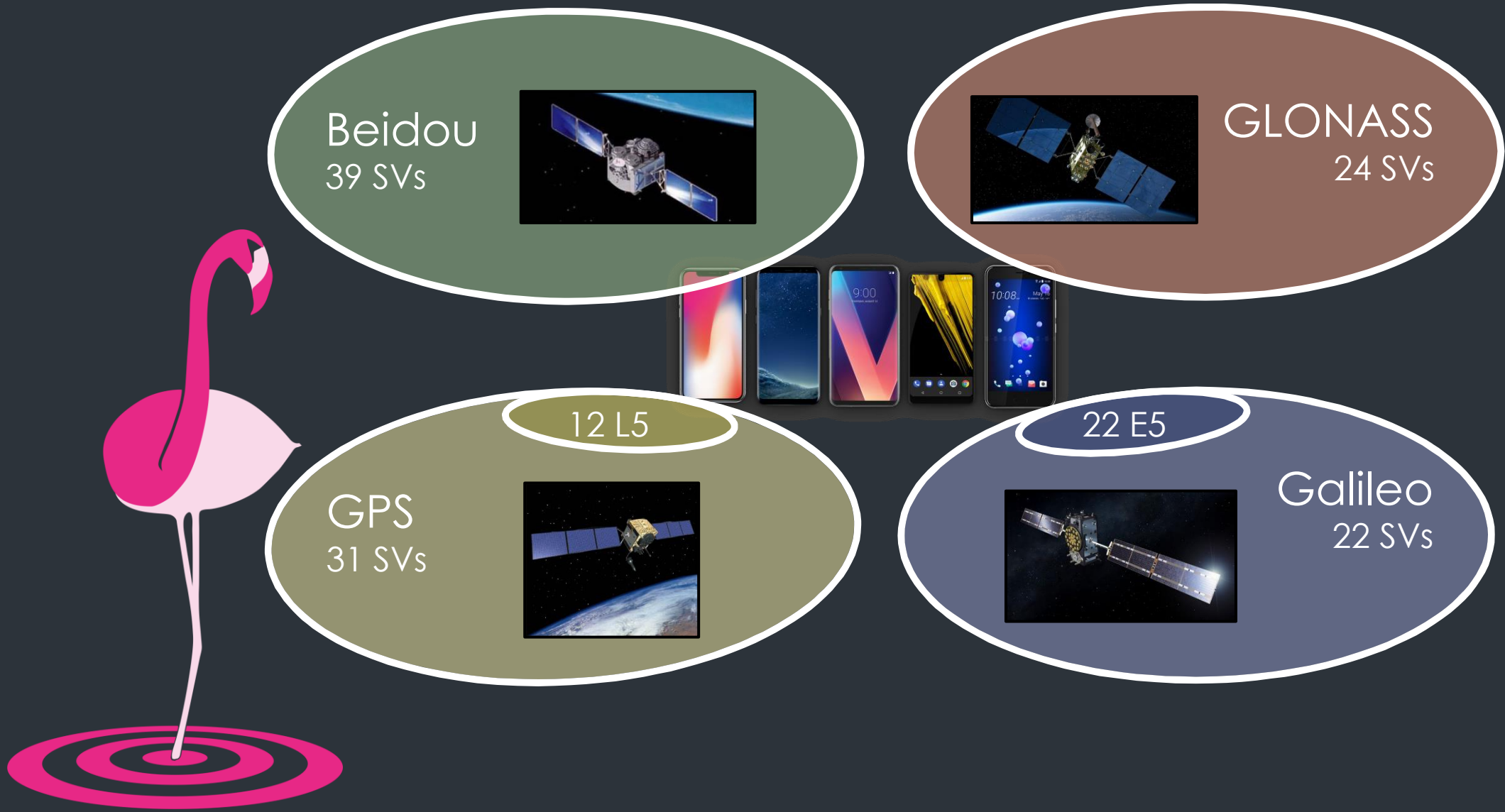
- Last year, we also gave a talk on FLAMINGO. Here we wish to showcase the latest of the FLAMINGO initiative.
- Firstly,

FLAMINGO is now LIVE and ready for your applications.

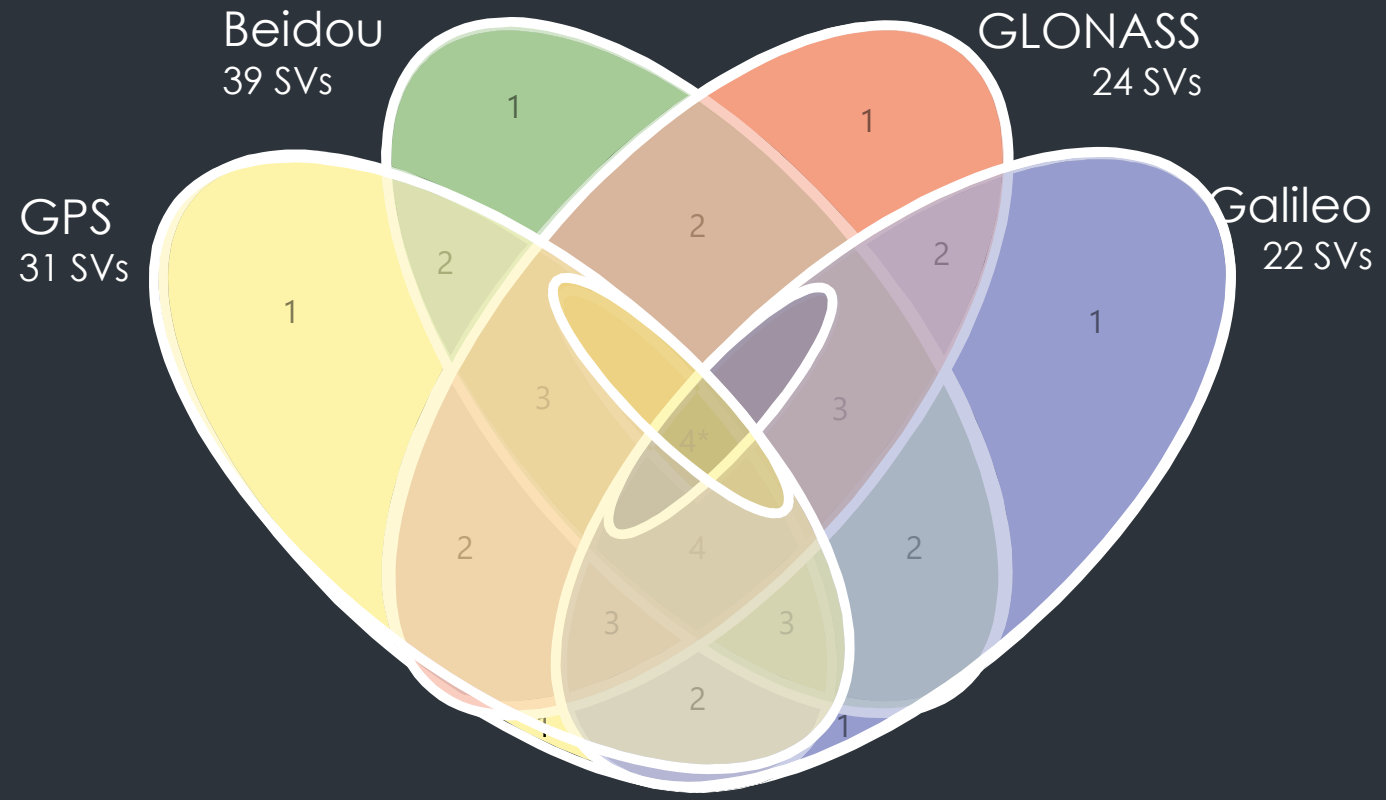
- We have been busy demonstrating FLAMINGO to user groups, hosting a hackathon and showcasing the service. I will introduce this.
- I will also provide some useful feedback and lessons learnt from the project. We hope this may be useful in your own endeavours.

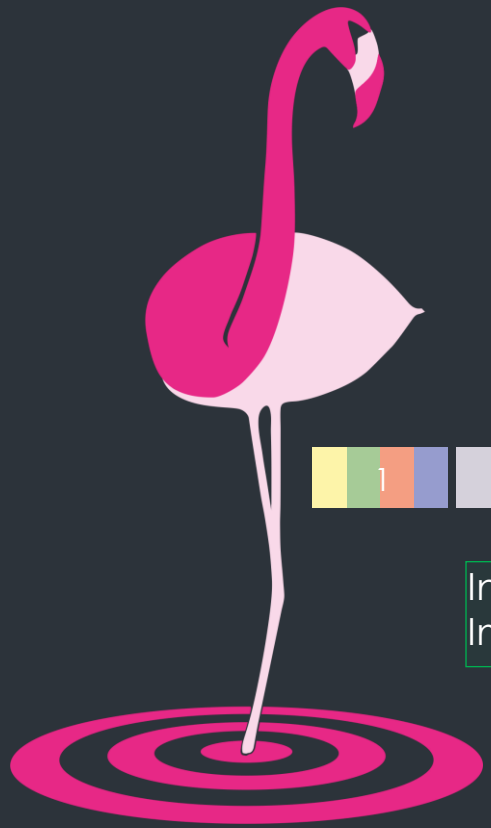
To start, a brief video

GNSS Raw Measurements within Smartphones



GNSS Raw Measurements within Smartphones





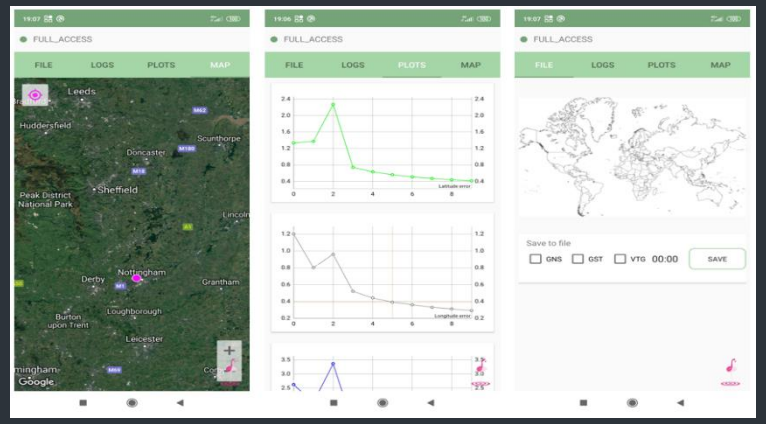
Increased Availability
Improved Accuracy

Highest Accuracy

Huawei Mate 20xx
Xiaomi Mi 8

This is what we look for in devices – these are considered to be **FLAMINGO-ready**

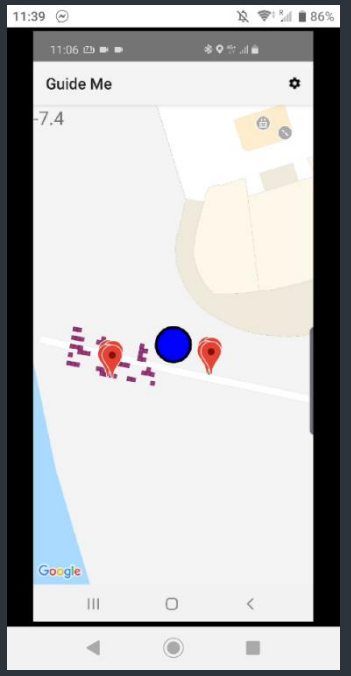
Who will use this?



For the surveyor

For the gamer

For the navigator



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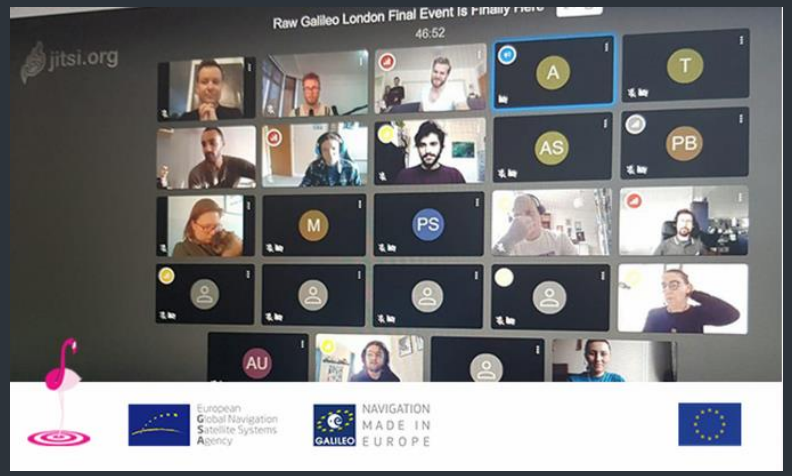
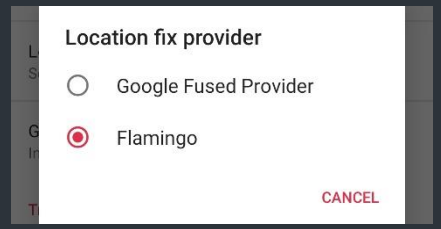
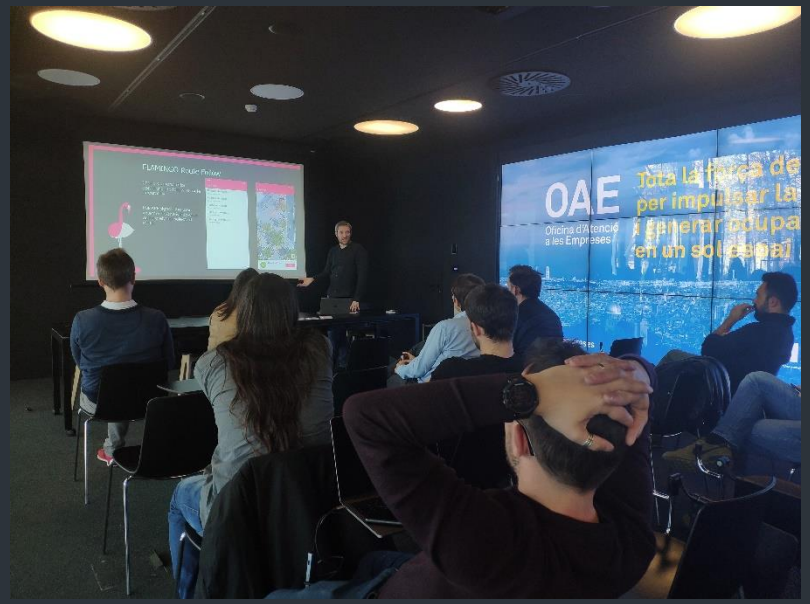


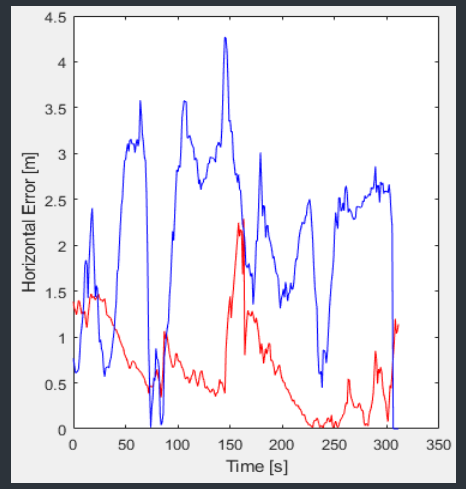
FLAMINGO co-hosted Hackathon:
Raw Galileo London



Stakeholder trials

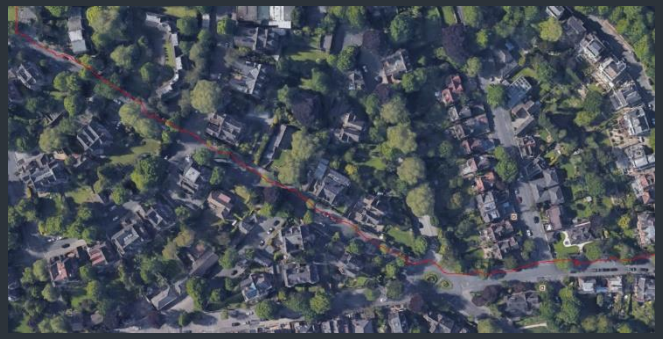
Barcelona Demonstration – originally part of the MWC 2020

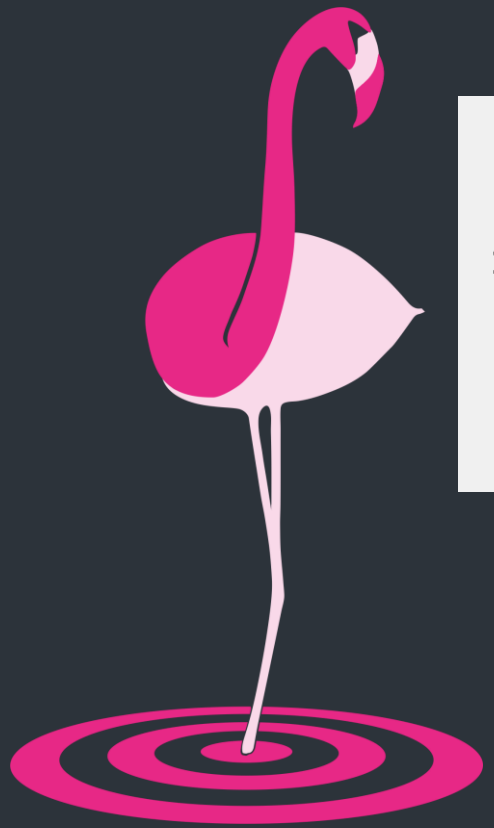


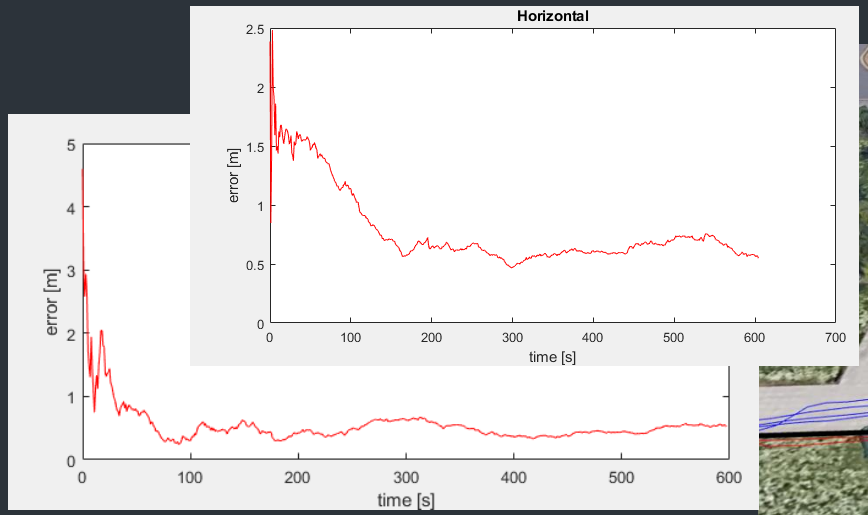


And can we meet the accuracy?

FLAMINGO targets sub-metre – we have done it!







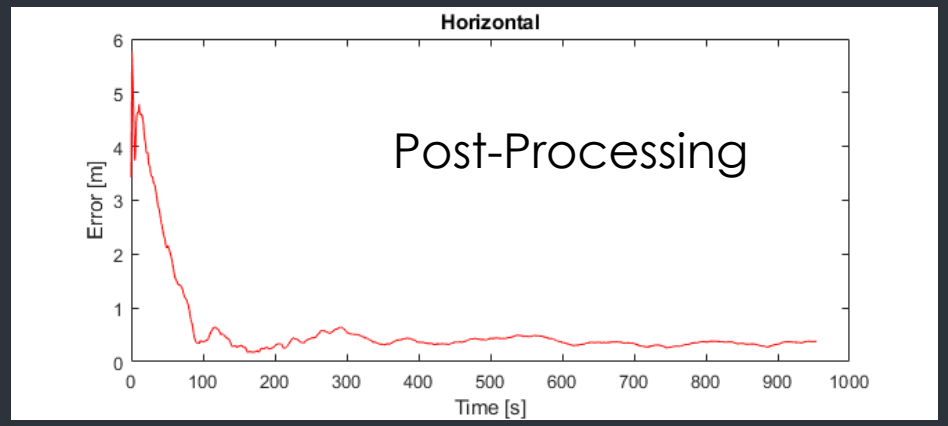
FLAMINGO is red.
Android is blue.
Can we meet 50 cm.
Yes we do.

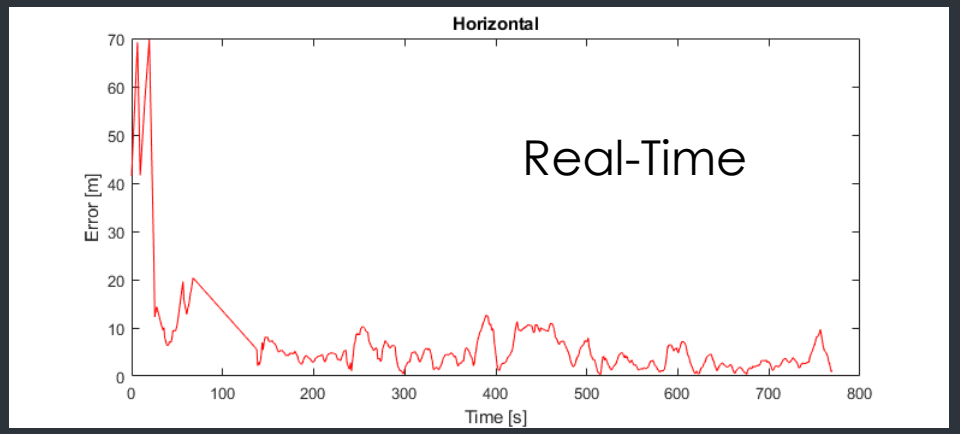
Lesson 1: Hybridisation and Filtering

- The city presents a lot of challenges to positioning.
  - Lack of satellites.
  - Multipath
- We can meet the higher accuracy, but precision is another challenge.
- Android uses a combination of sensors and Doppler measurements, in addition to code and carrier phase measurements.
- Important to add for the user experience.

Lesson 2: PPP is not ready for a real-time smartphone

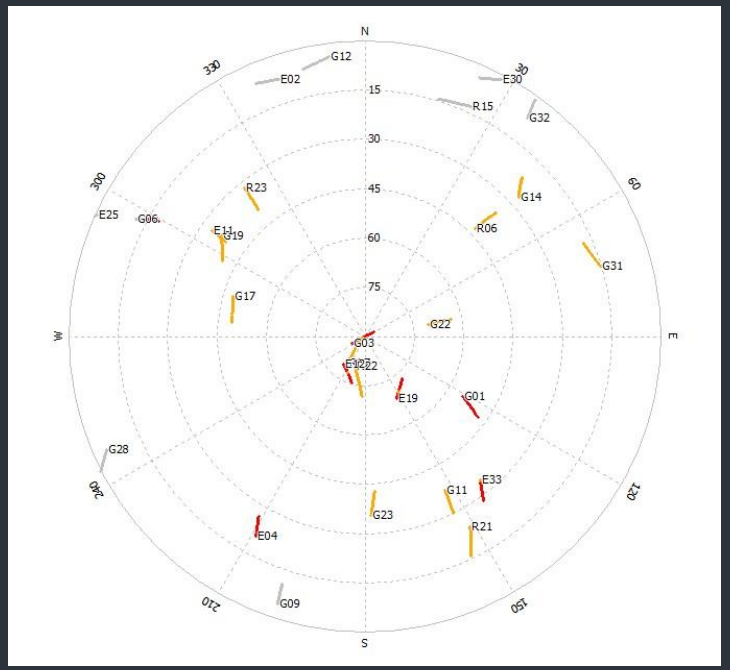
- PPP is highly challenging for smartphone implementations.
- With all the noise present in the receiver, its challenging to overcome.
- With a bit of post-processing magic though, we can achieve FLAMINGO targets.





Lesson 3: Number of dual-frequency satellites is limited

- Only some satellites are available with dual-frequency observations in a smartphone.
- Uses are limited – we do not have enough satellites available for an accurate ionospheric free combination.



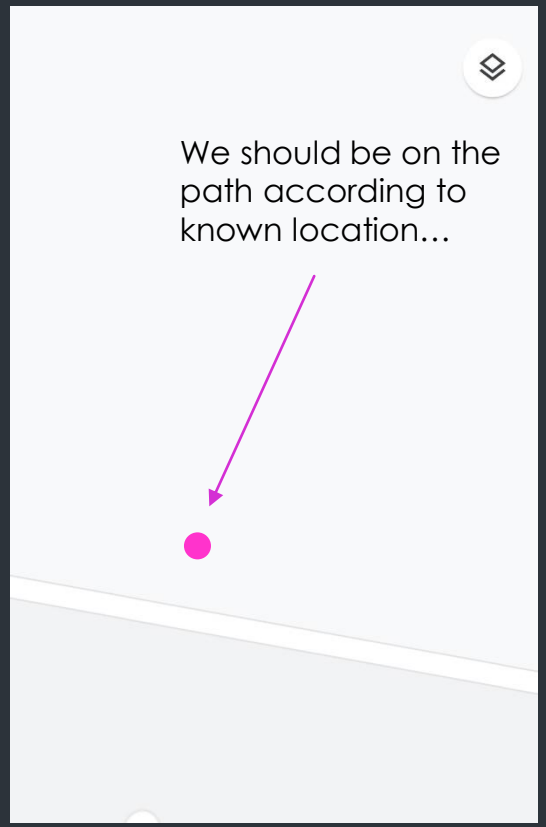
Red – L1 + L5

Yellow – L1

We only have up to 6 satellites, and I doubt the E04 and E33 at the fringes have enough power to be reliable…

Lesson 4: Smartphone map apps are not yet ready for high-accuracy

- We can meet 50 cm target accuracies.
- However, sometimes when the user zooms in, the dot does not match the feature.
- Sometimes, the satellite image provides a much better view on where we are located.

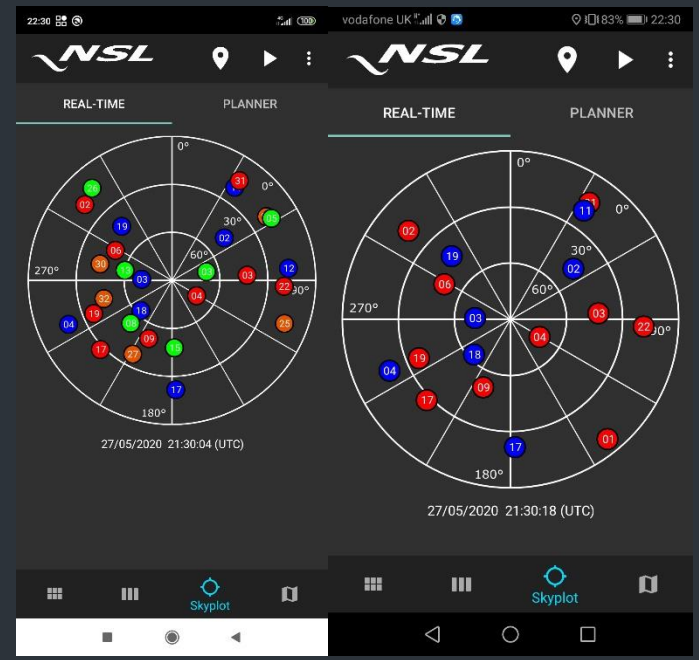


Lesson 5: We cannot locate in the background

- A change in the Android lifecycle resets the clock.
- This is due to battery conservation. Occurs when:
  - When the smartphone is stationary for a period.
  - When moving an app to the background.
- The chipset resets.
- Whenever running the smartphone, keep the screen active.
- Otherwise…

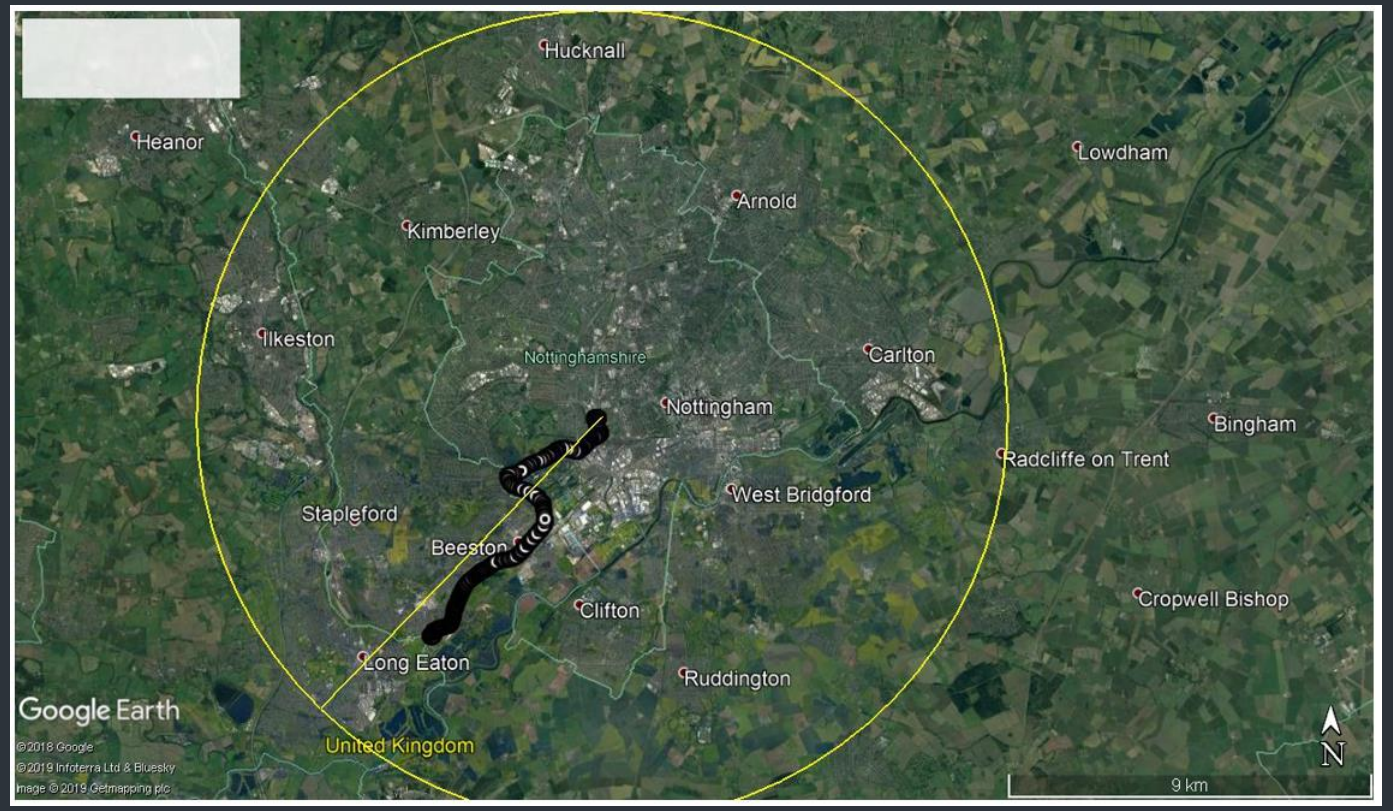
Lesson 6: The chipsets prioritise certain constellations and satellites

- Some smartphones prioritise certain satellites, constellations and signals.
- This is based on many reasons:
  - Dual-frequency satellites have higher preference in logic
  - Availability of aiding
  - Resource constraints – limited channel capacity
  - Stronger signals
  - Country regulations



Lesson 7: FLAMINGO requires Base Stations

- 10 km radius coverage area set in FLAMINGO.
- Nottingham city centre and countryside covered (>500,000 people)
- Path >7 km



Thank you

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Get in touch with us >
https://www.flamingognss.com/

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