

Outcomes of 2nd ESA Galileo App Competition

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Background



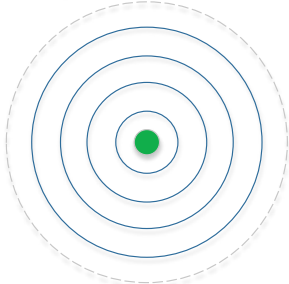
- In 2017, ESA in collaboration with EC and GSA launched the 1st Galileo App Competition
 - Use of single frequency (E1/L1) phones
 - Compute and visualize Galileo and GPS solutions separately
 - The winner app, **"GNSS Compare"**, received several international prizes
- In 2018, the first dual frequency phone was introduced giving access to the high performance Galileo E5 and GPS L5 signals



The **2nd Galileo App Competition** was launched 24th September 2018

- To showcase the use of Galileo E5 in **dual frequency phones**
- Organized by **ESA** in collaboration with **EC, GSA** and **Google**
- Open to all **students** in universities and **trainees** at R&D organisations located in **Europe**

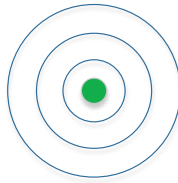
Typical Outdoor Open Sky Accuracy



METER-LEVEL



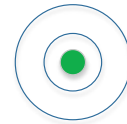
SINGLE
FREQUENCY
multi-GNSS



METER/SUB-METER



DUAL
FREQUENCY
multi-GNSS



DECIMETER



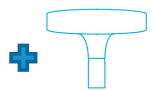
PPP/RTK



CENTIMETER



PPP/RTK



**Only commercial/professional apps for
real time solution**

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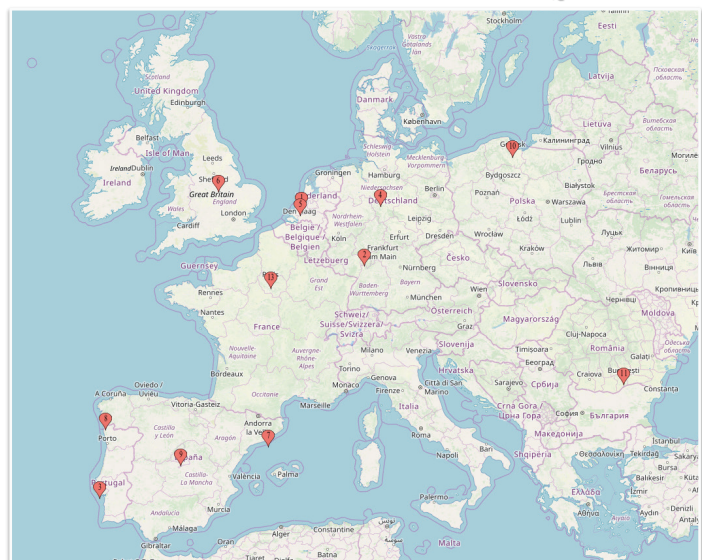
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Step 1: Applications



12 proposals
received on 12 November 2018

8 selected
to proceed to Step 2



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Step 2: App Development



- Each team provided with 1 dual frequency phone
- Progressive evaluation monitored by ESA Technical Advisory Team

M1	App look and feel	15 Jan. 2019
M2	50% functionality	28 Feb. 2019
M3	100% functionality	31 Mar. 2019

- ESA Technical Advisory Team provided training and supported development:
 - Technical feedback provided at each milestone
 - 2 training sessions webinars
 - Supported de-bugging following results of tests prior to Final

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Step 3: Final Competition



- Final event took place on 18th April 2019 at European Space Research and Technology Centre (ESA-ESTEC) in The Netherlands
- 5 teams selected for the Final:
 - GADIP3 by O ThiSaVRoS
 - Inari by Inari Team
 - NavGate by Team GNSS Tonic
 - Step with GNSS by Space Walkers Team
 - POINTapp by University of Nottingham
- Prior to the Final the apps were extensively tested by ESA at ESTEC
- The target was to match the results produced by processing of measurement logs of ESA reference app with Google tools and ESA PPP s/w.

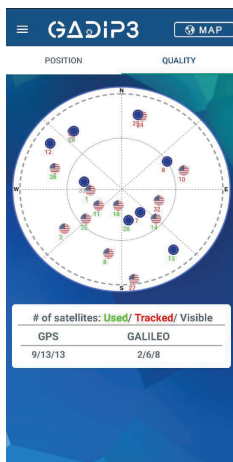
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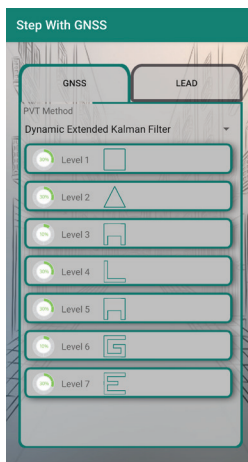
Competition Apps Outline



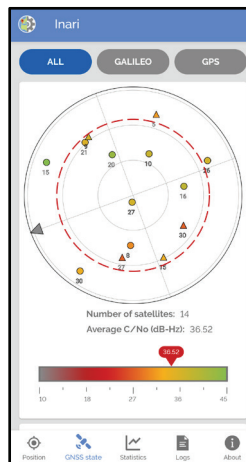
GADIP3



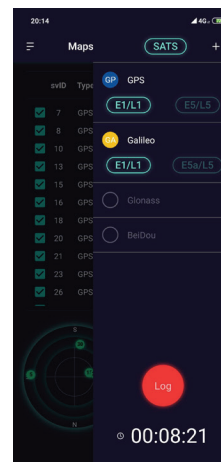
NavGate



Step with GNSS



Inari



PointApp

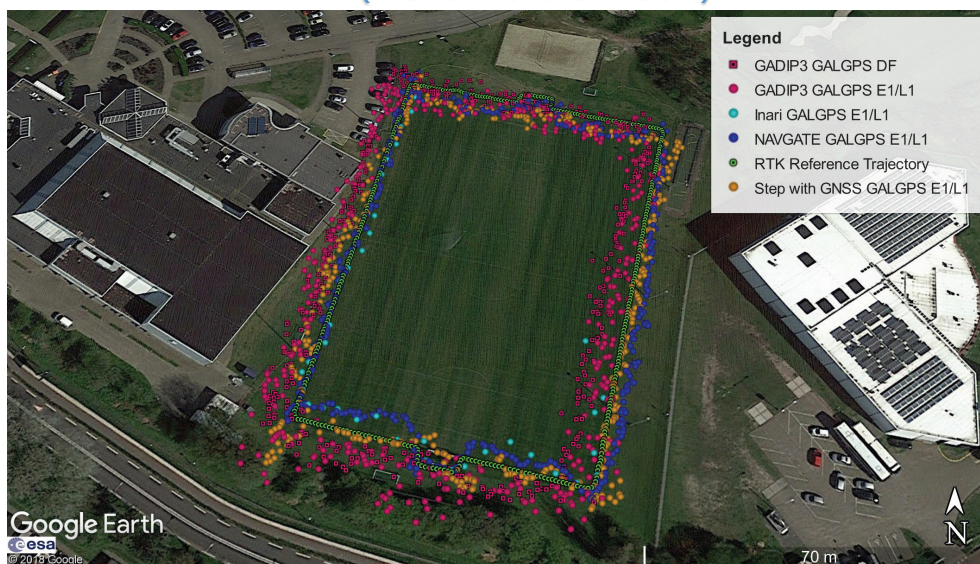
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Pedestrian Test @ ESTEC football pitch (7 GAL + 6 GPS > 20°)



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Vehicular Test @ ESTEC Campus (6 GAL + 8 GPS > 20°)



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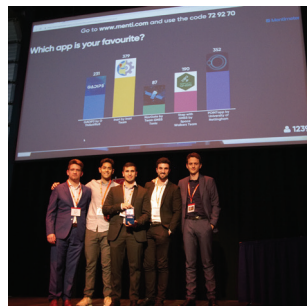


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... and the winners

1. GADIP3 by O ThiSaVRoS
2. NavGate by Team GNSS Tonic
3. Step with GNSS by Space Walkers Team

- Innovation prize of GSA and winner of public vote
Inari by Inari Team



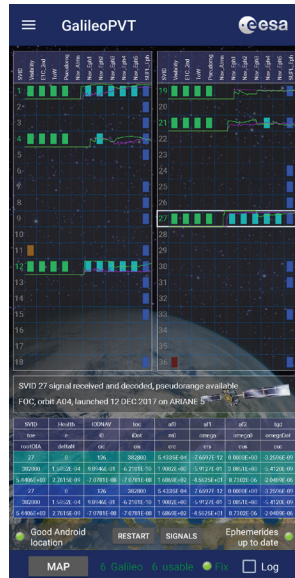
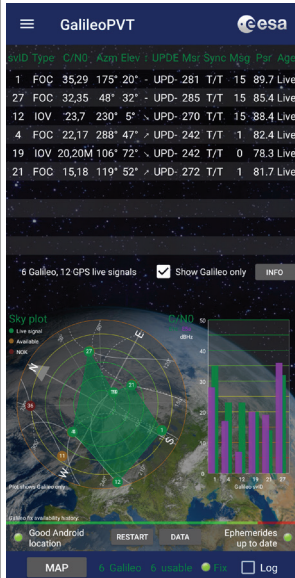
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ESA Reference App: GalileoPVT



GalileoPVT



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GAL + GPS 2F using Google Analysis Tools



Least Square PVT code only

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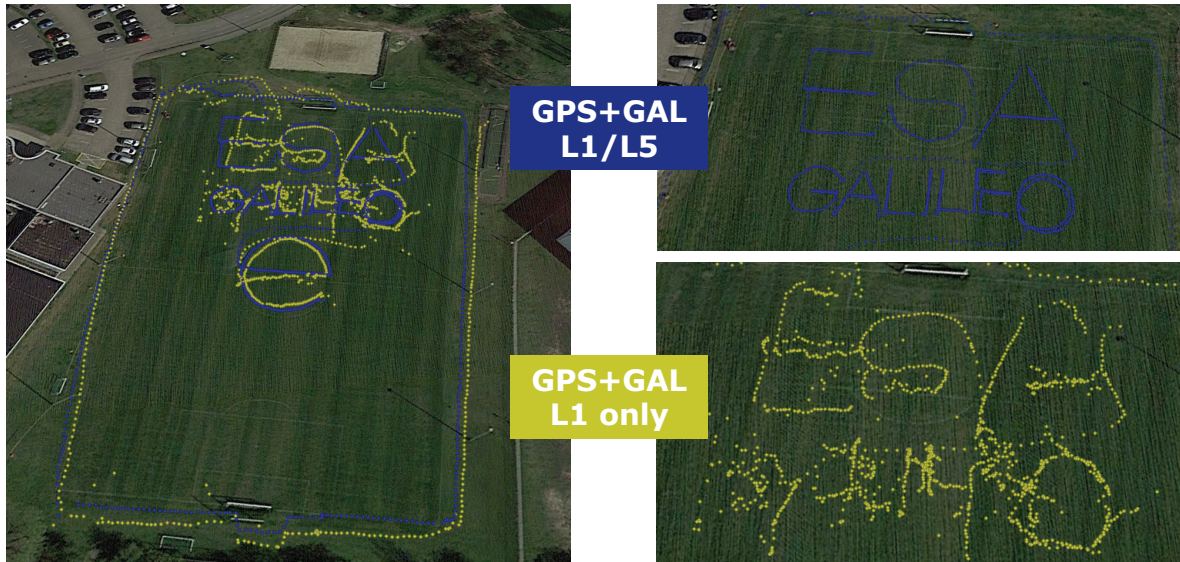
Code smoothed with carrier

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Results with MSP3 (PPP) + GalileoPVT logs



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Galileo App Competition Video

https://www.esa.int/ESA_Multimedia/Videos/2019/06/Galileo_smartphone_app_competition_2019

(video integrated in PowerPoint)

Conclusion



- App development competition is a good tool for **dissemination and capacity building**
- Offered valuable learning experience on GNSS and Android development with exposure to full product development lifecycle
- Competition was a success with apps available on Google Play Store
- 1st edition **internal to ESA** young professional & trainees across ESA sites
- 2nd edition **extended to European region** open to all students in universities and trainees at R&D organisations
- ESA reference app developed, used for testing and updated with new features



- Future **extension to other regions worldwide** with other Service Providers could be considered for the next edition

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