spaceopal

a DLR GfR and Telespazio company

2021 EUREF symposium

Spaceopal’s services for Galileo and the exploration of GNSS applications

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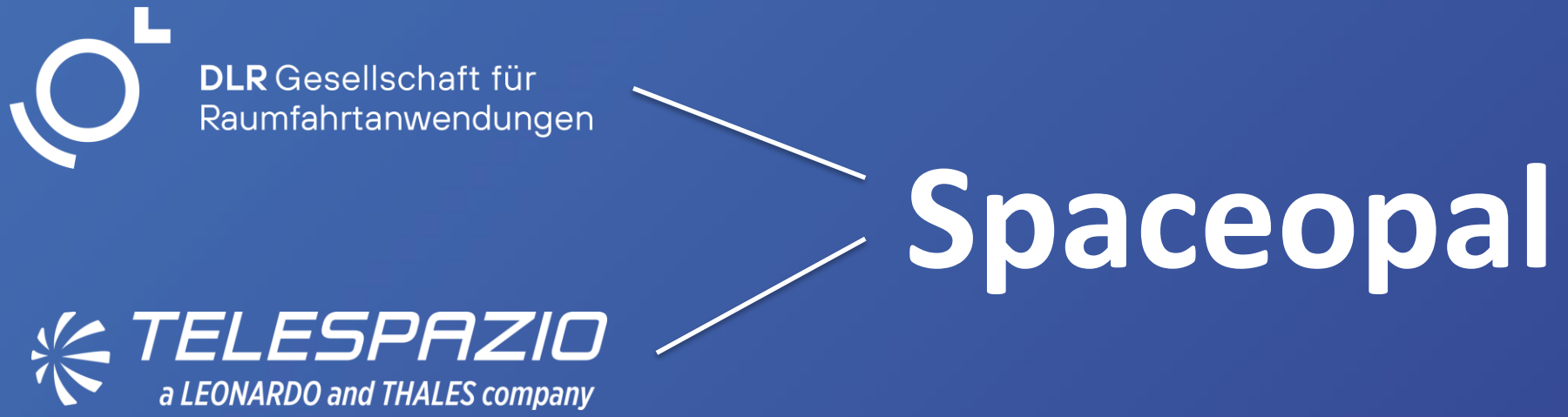
a joint venture



Spaceopal, a joint venture by **DLR Gesellschaft für Raumfahrtanwendungen (GfR) mbH** and **Telespazio**, a Leonardo and Thales Company, is the **prime contractor** for the **operational services of Galileo**, the satellite navigation program of the European Union, and is the **world's largest navigation satellite service operator**.

Spaceopal at a glance

Since 11 years the **Galileo Service Operator**

Satellite based navigation service **<1,5m** accuracy and **< 8ns** world wide

Operates **26** Satellites **2** Control Centres **1** Service Centre **13** Remote Sites

NAVCAST GNSS augmentation service world wide <20cm and applications

Spaceopal for Galileo

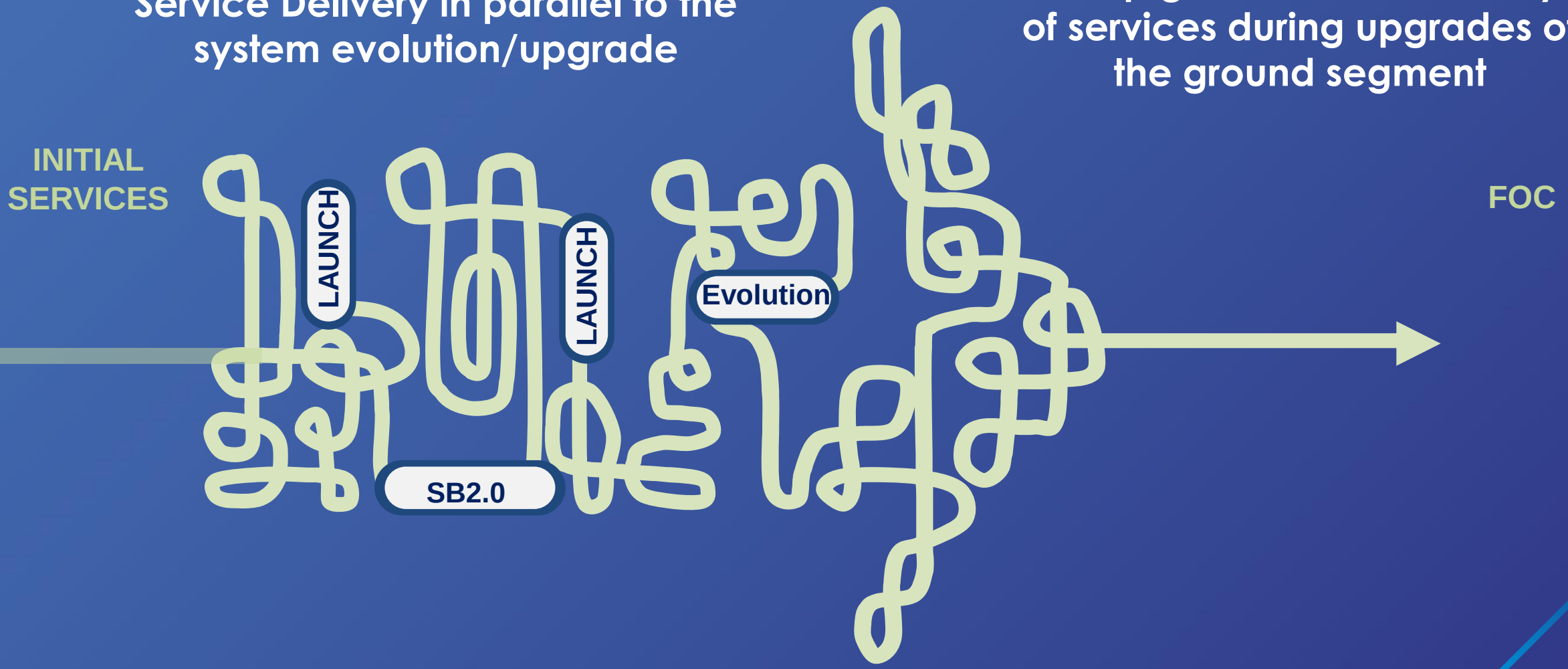
Operating a distributed worldwide system

- **Control Centres GCC-I Fucino (GMS) and GCC-D Oberpfaffenhofen (GCS)**
- **European GNSS Service Centre (GSC)** *Torrejón, Spain*
- **ILS Centre (GILSC)** *Transinne, Belgio*
- **Galileo Reference Centre GRC** *Noordwijk, The Netherlands*
- **Time Service Provider (TSP)** *Fucino*
- **Geodetic Reference Service Provider (GRSP)**
- **Galileo Security Monitoring Centre (GSMC)** *St. Germain-en-Laye*
  GSMC back-up *Marañosa, Spagna*

Spaceopal for Galileo

Continuity of System Operations and Service Delivery in parallel to the system evolution/upgrade

GSOp guarantees continuity of services during upgrades of the ground segment



GSOp - Service Status

Integrated Operations

GMS

GCS

GSC

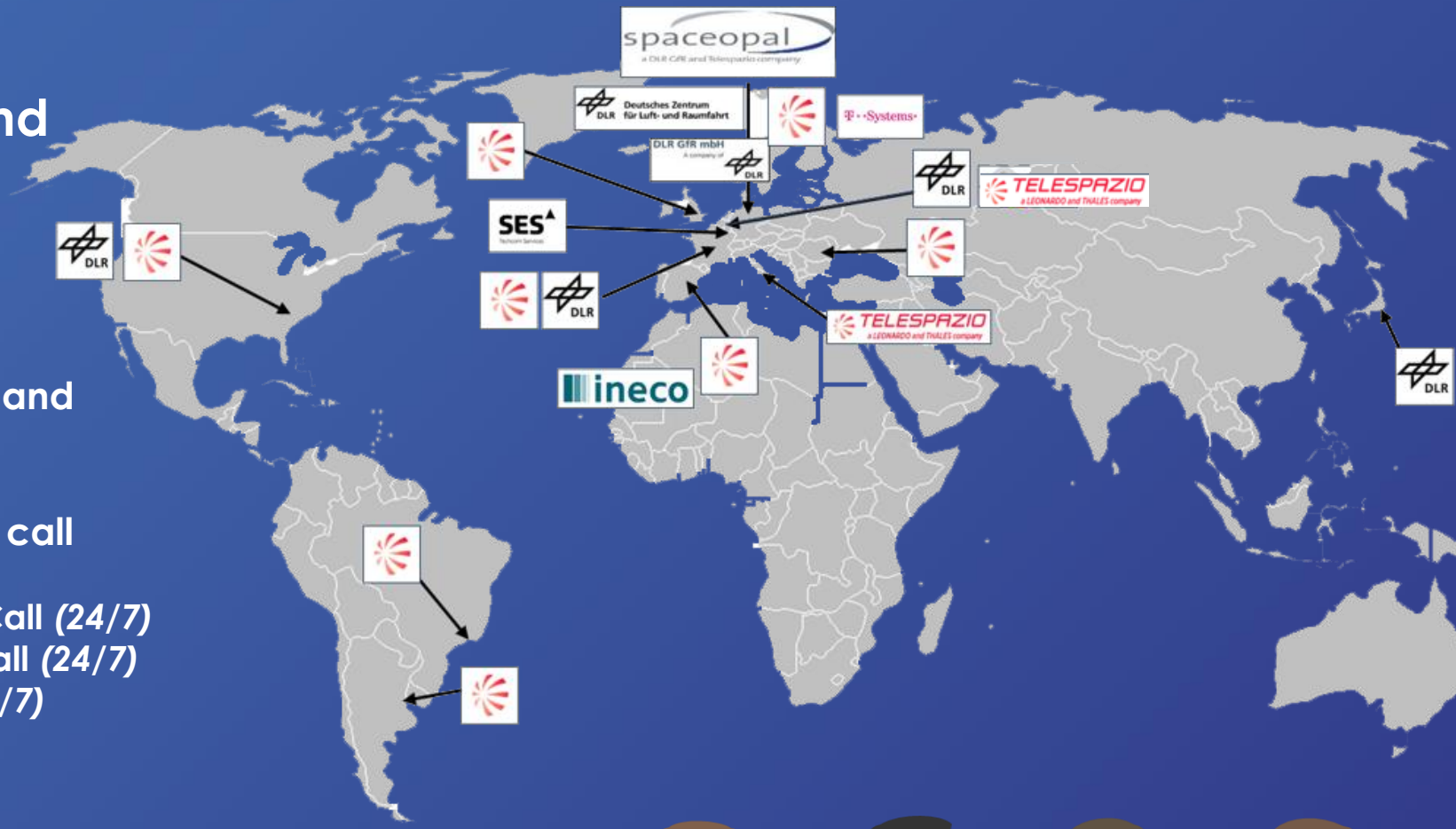
- Galileo Mission Segment (GMS)
- Galileo Control Segment (GCS)
- European GNSS Service Centre (GSC)

- Operations team organization → Responding to the needs defined by the operational processes
- Operations Service Team → A single integrated operations team coordinated by the SDM (Services Delivery Manager)

GSOp - Service Status

Team and chain of command

- More than 200 people from several European countries covering different skills
- Clear and robust Chain-of-Command for all phases of the operations
- OPS and Service team - Shift + on call
  - SDM: On-Call *(24/7)*
  - GMS: Shift + Eng. team + On-Call *(24/7)*
  - GCS: Shift + Eng. team+ On-Call *(24/7)*
  - GSC: Eng. Team + On-Call *(24/7)*



CTMs and SHs Affiliates worldwide distribution

Specialized know how, assets and privileged links

GSOp - Service Status

Galileo Service Center - Operations

GSC is a key contributor to the provision of:

- OS-NMA service
- HAS service – former CS

GSC

Fully integrated with GCCs
Access to system data
Added value services

Helpdesk User requests

- Average time to reply is 2 calendar days
- > 90% user feedbacks “very satisfied”

Full transparency towards users

GSC is the official repository of Galileo documentation: SDDs, SiS ICD, performance reports …

NAGU publication

compliant with the Galileo OS SDD NAGU Timely publication commitments

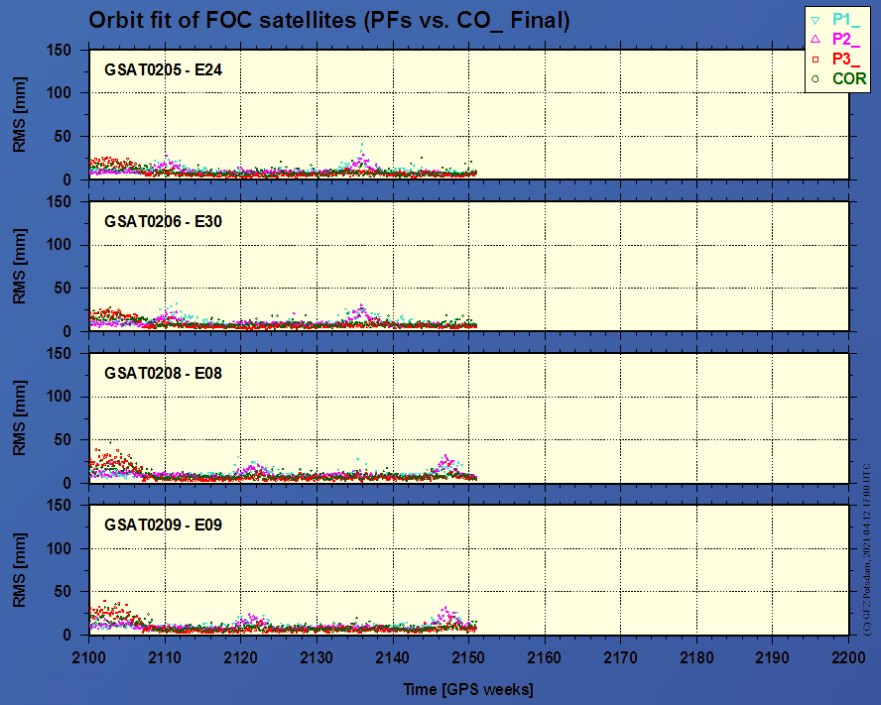
GSC Website

- > 1700 registered users
- > 99.96% availability

Contact us to get support on Galileo @GSC web portal HELPDESK gsc-europa.eu

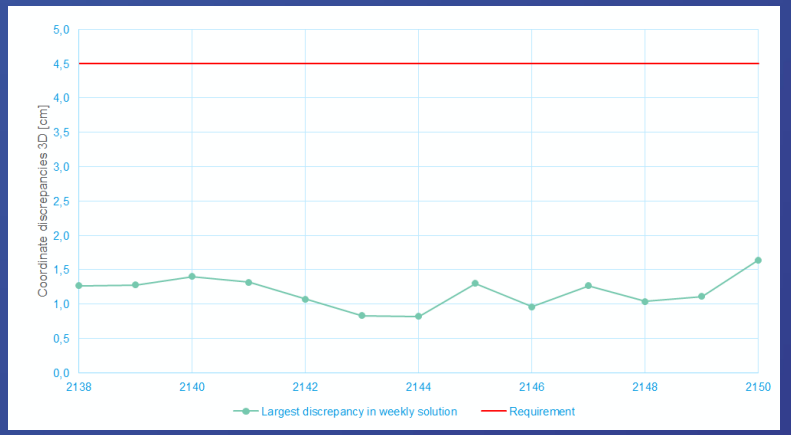
Galileo Geodetic Reference Service Provider (GRSP)

- GRSP has relying on institutional set-up such as ESOC, GFZ and AIUB
- contributing to the Galileo Service Performance maintaining the GRTF and providing periodically high performance products



Galileo Orbit and Clock (<<180mm consistency)

GRSP EOP predictions vs. IERS Bulletin A (<0.225mas)



GSS station coordinates accuracy (<4.5 cm)

GSOp - Outlook for 2021-2022

RELIABLE GALILEO SERVICE PROVISION

APPROACHING ENHANCED SERVICE stepwise implementation

CORE INFRASTRUCTURE L2/L3 maintenance handover and execution

GEODETIC REFERENCE PROVIDER FACILITY In operation

NEW CORE INFRASTRUCTURE RELEASES Integration, Validation and Operation

CYBER SECURITY requirements implementation

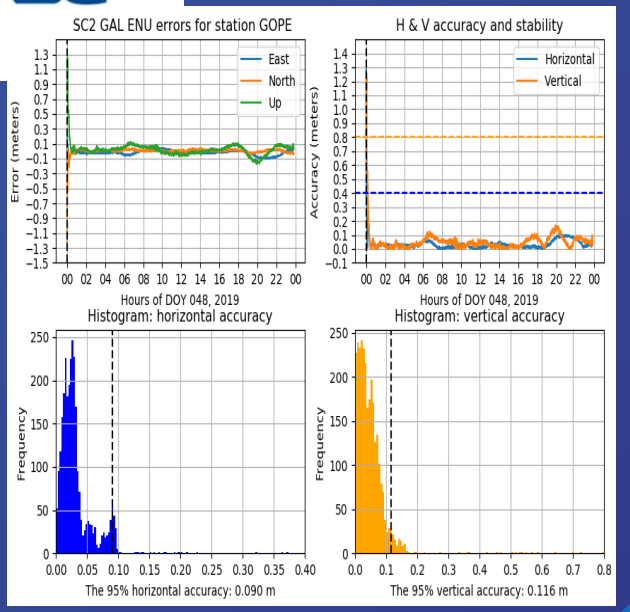
PERFORMING L11 LEOP EXECUTION FROM GCC

HIGH ACCURACY SERVICE Introduction

NEW REFERENCE STATIONS Hosting and Service Integration

High Accuracy Services

- Spaceopal develops the High Accuracy Reference Algorithm for Galileo and a set of HA user terminals
- 12-month development period with reference algorithm performance proven at early stage
- Complex development cycle and test plan execution
- Leveraging on existing expertise on high accuracy (e.g. Navcast PPP Engine)

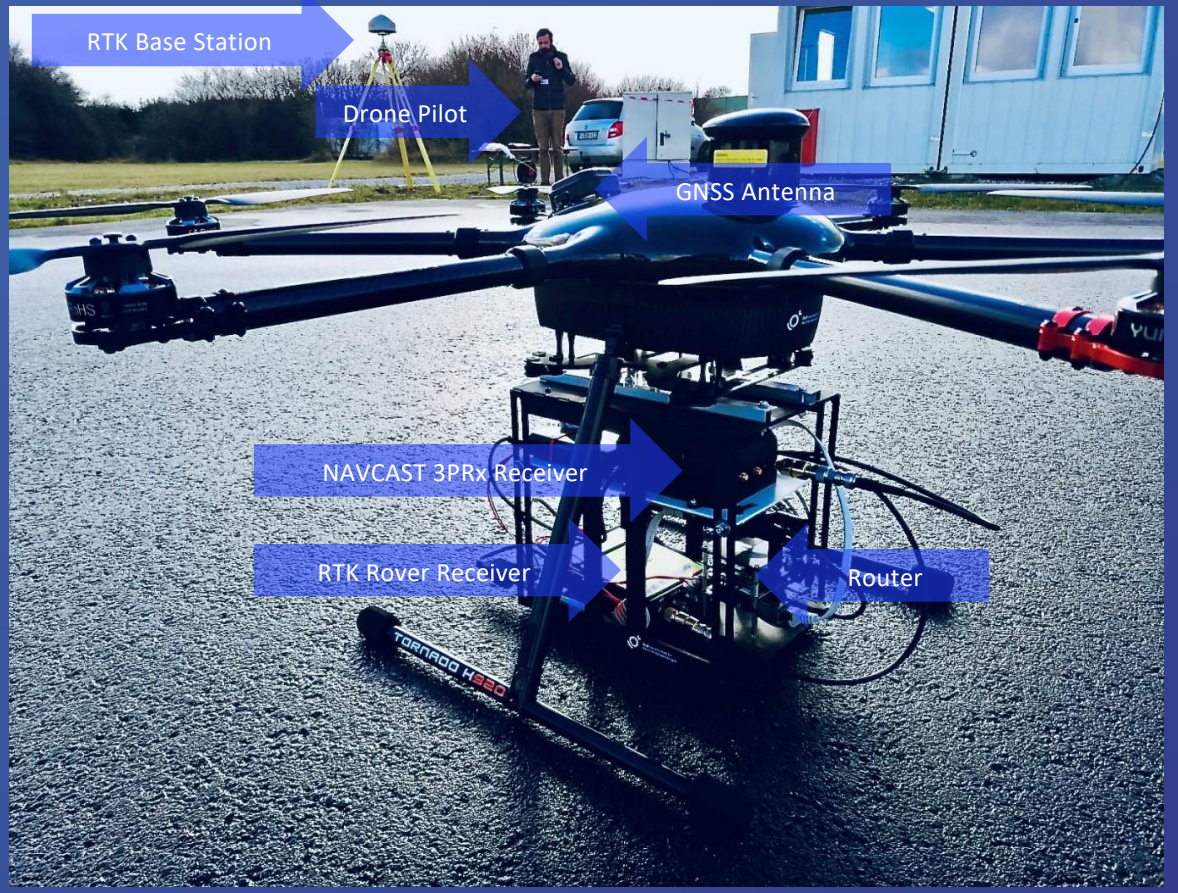


NAVCAST Service

- Global GNSS Precise Point Positioning (PPP) service 24/7 operational since 2018
- Provides real time corrections and bias to registered users **spaceopal.com/navcast**
- Enables centimetre level accuracy and fast convergence times for end users worldwide
- No need for user-owned external equipment
- Service elements like authentication, integrity, recording, alarming and safe and secure dissemination will tailor NAVCAST precisely to the needs of drone applications in the UTM sector

Application of NAVCAST in the UTM sector

- The objective was to show the dynamic behavior of the NAVCAST position solution during a drone flight
- NAVCAST 3PRx Receiver on-board the drone uses GNSS SiS and NAVCAST corrections
- NAVCAST data stream provided via LTE
- A scientific-grade RTK setup with a closeby installed base station was used as a reference
- NAVCAST and RTK receivers were connected to the same antenna
- → Performance Results of NAVCAST PPP AR in dynamic environments equal order than standard RTK



NAVCAST Application Product line

3PRx

3PGo

3PNg

- Affordable and easy to use multisensory **PPP receiver**
- Small size and weight module
- Additional sensors can be connected for enhanced performance

- High accuracy in your smartphone

GET IT ON Google Play

- Post-processing tool to calculate PPP in your desktop
- Available for NAVCAST registered users. Get it at: **navcast@spaceopal.com**

Contacts

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