NAVGUARD

Advanced Galileo PRS resilience for EU Defence

NAVIGATION WARFARE

GNSS INTERFERENCE IN MILITARY CONTEXT

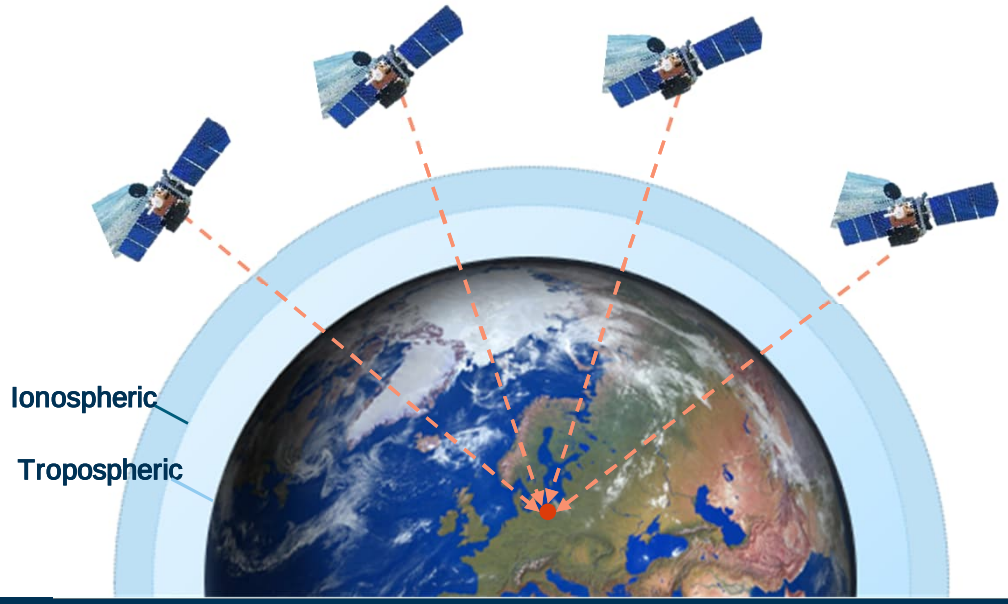
Image: Mobile truck-mounted EW station (Source GPS Spoofing report)

GNSS

IMPORTANCE

- **GNSS (Global Navigation Satellite System)** is a network of satellites orbiting the Earth providing geolocation and time information globally, free of charge
  - GPS, Galileo, GLONASS, BeiDou, NavIc, QZSS
- **Radio receivers** specifically designed to receive those satellite signals and **decode** the **signal message contents**
- With the contents of the messages from at least 4 “visible” satellites, the position can be calculated using a mathematical process known as **trilateration** (x, y, z, and t)

- **Diverse applications:**
  - Maritime, land, and air navigation
  - Time synchronization
  - Telecommunications
  - Agriculture
  - and many more…



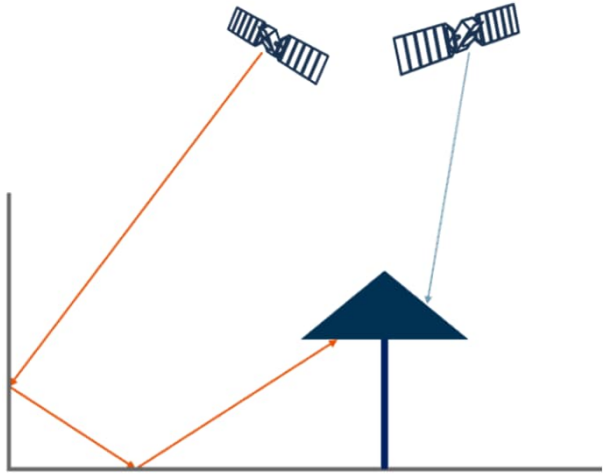
- **Vulnerabilities:**
  - Signals traveling over 20.000 km
  - Signal propagation delay
  - Multipath effects
  - Vulnerable to Jamming and Spoofing

GIDAS – GNSS QUALITY ASSURANCE

WHAT IS GNSS INTERFERENCE?

Out-of-band and unintentional interference

This type of interference can be caused by services using neighboring frequency bands or environmental influences (e.g., multipath). It usually occurs in the vicinity of other infrastructure using radio frequency links.



Multipath

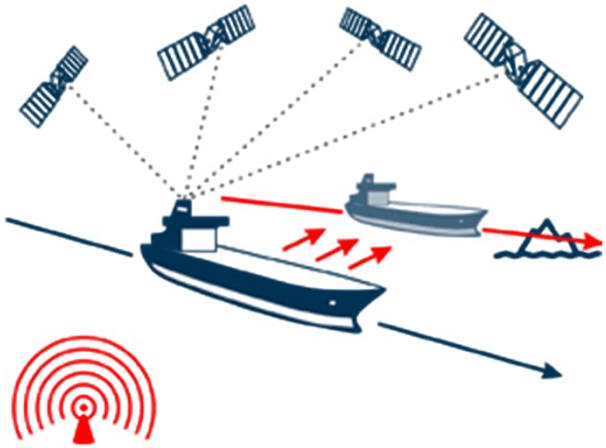
Jamming interference

The intentional attempt to disrupt the GNSS service by broadcasting higher-powered signals. With the interruption of GNSS time & positioning, the on-board system must fall back to alternative navigation systems.

Jammed plane

Spoofing interference

The intentional attempt to force a GNSS receiver into a false position/track can be challenging to detect. Spoofed GNSS receivers output false time & positioning information, increasing the possibility of collisions against the ground or other objects.



Spoofed vessel

FACTS & FIGURES

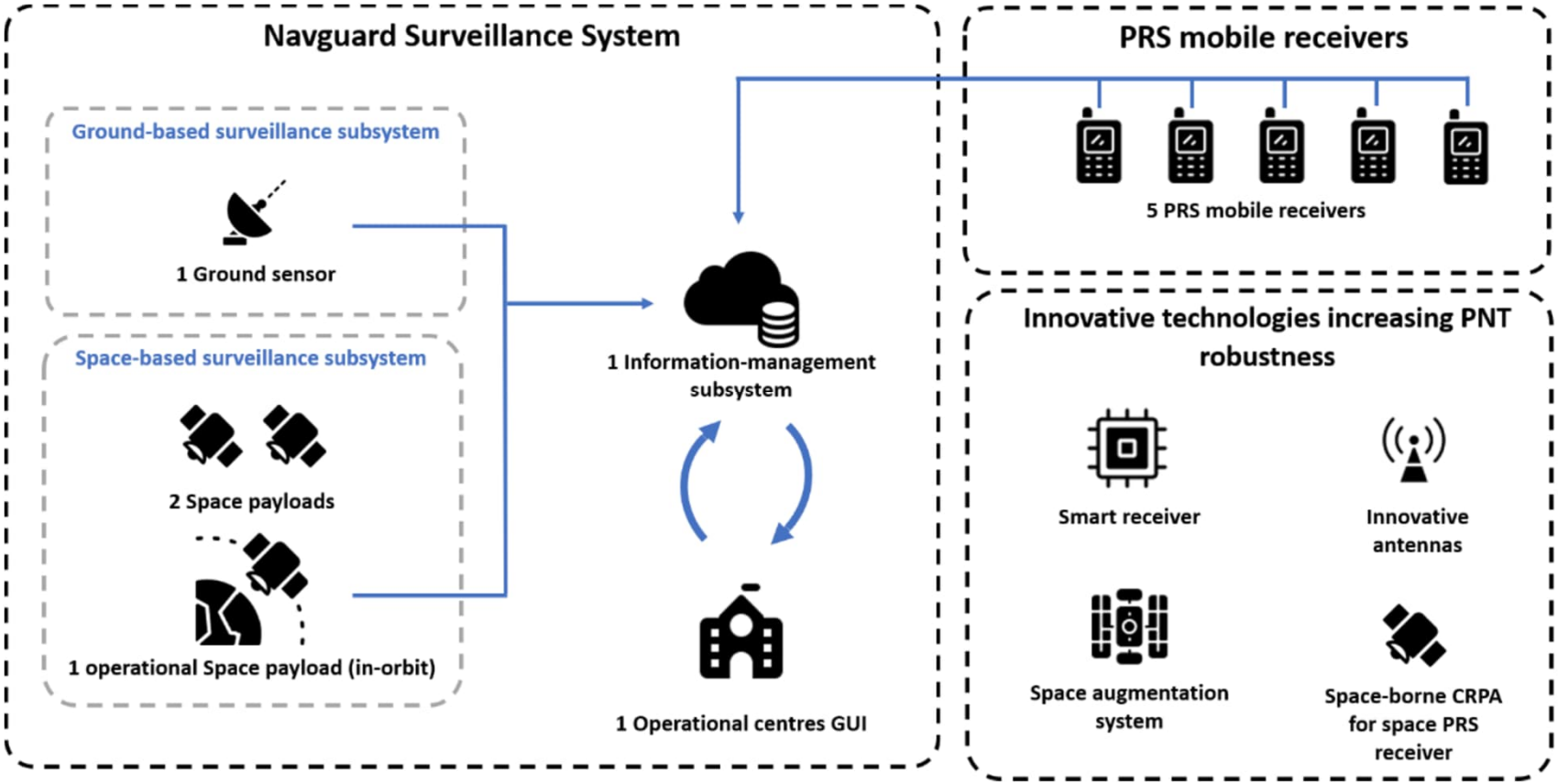
NAVGUARD

Project Name	Navguard (Advanced Galileo PRS resilience for EU Defence)
Duration	Dec 2022 – Nov 2026 (4 years)
Total Cost	56.2 M€
EU Contribution	24.37 M€
Coordinator	FDC S.à r.l.
Consortium	31 companies from 11 countries
Main Objectives	Enhance Galileo PRS resilience, detect GNSS threats, geolocate interference sources, provide situational awareness
Key Deliverables	Ground sensors, space payloads, in-orbit demo, information management subsystem, mobile PRS receivers

FDC (Coordinator, France), AEROSPACELAB (Belgium), ANTWERP SPACE (Belgium), BEYOND GRAVITY AUSTRIA (Austria), BEYOND GRAVITY SWEDEN (Sweden), DIEHL DEFENCE (Germany), ELETTRONICA (Italy), FRAUNHOFER (Germany), GMV (Spain), HISDESAT (Spain), INDRA (Spain), IABG (Germany), LEONARDO (Italy), OHB AUSTRIA (Austria), OHB SYSTEM (Germany), QASCOM (Italy), SAAB (Sweden), SAFRAN (France), SPECTRACOM (France), TECNOBIT (Spain), TELESPAZIO (Italy), THALES ALENIA SPACE FRANCE (France), THALES ALENIA SPACE ITALIA (Italy), THALES AVS FRANCE (France), THALES SIX GTS FRANCE (France), TOTALFÖRSVARETS FORSKNINGSINSTITUT (Sweden)

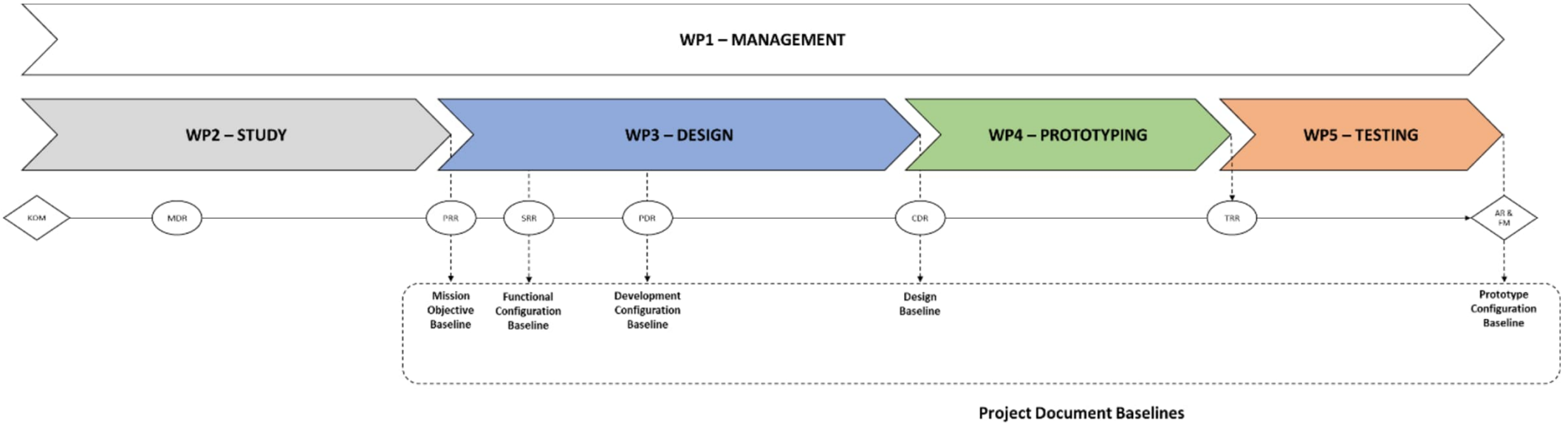
PROJECT ORGANIZATION

SCOPE OF WORK



SCHEDULE

WORK PACKAGES



Dec 2022 – Nov 2026 (4 years)

AUSTRIAN CONTRIBUTIONS

OHB AUSTRIA + BEYOND GRAVITY

GROUND-BASED SURVEILLANCE

- Interference monitoring from ground (jamming + spoofing)
- 1 Ground Sensor to be demonstrated and delivered
- Integration of innovative technologies:
  - CRPA antennas
  - PRS receiver
- Customization due to national user requirements

SPACE-BASED SURVEILLANCE

- 2 space payloads, 1 operational space payload
- Parallel subconsortia working on the PRS receivers and spaceborne payload
- In-orbit demonstration
- Interfacing with Information Management Subsystem

GROUND-BASED SURVEILLANCE

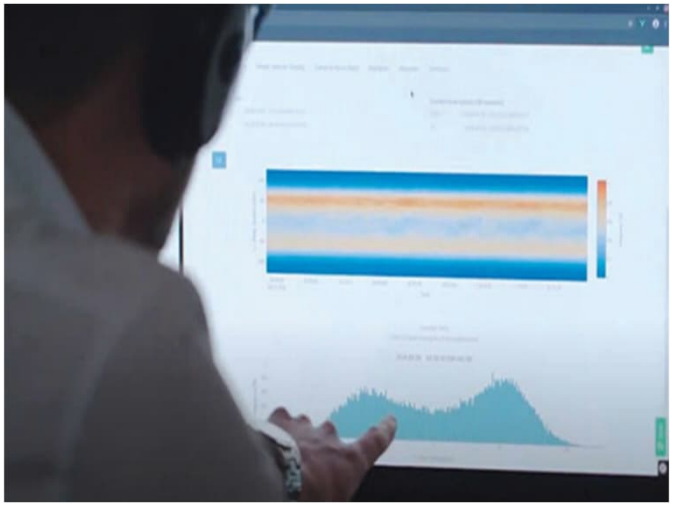
HERITAGE: GIDAS SYSTEM FROM OHB AUSTRIA

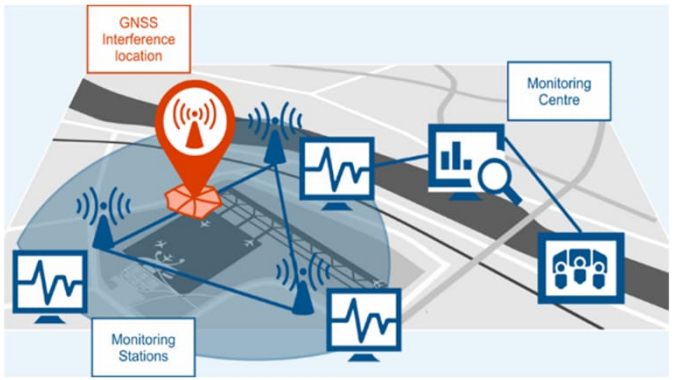
CIVIL OS GROUND-BASED INTERFERENCE MONITORING SYSTEM

- GIDAS system architecture consists of
  - **One or multiple Monitoring Sensors (MS)**
    - Antenna and monitoring receiver
    - Detection and alert generation
    - Classification
  - **Monitoring Centre (MC)**
    - Localization (in case of multiple stations)
    - Data storage and reporting
  - **Graphical User Interface (GUI)**
    - Monitoring station and user control
    - Visualization of results
    - Post-processing and detailed analysis features

DEPLOYMENT EXAMPLE

GIDAS AT A EUROPEAN AIRPORT – DEVELOPED WITH SUPPORT FROM ESA





CHALLENGES AND BEST PRACTICES

MAIN CHALLENGES

- Large, distributed consortium
- Export restrictions and handling of sensitive and classified data

BEST PRACTICES

- Keep the classification level of deliverables as low as possible
- Strict project management rules from the very beginning
- Focus on subgroups for specific tasks instead of involving the whole consortium
- Clear contributions assignments for WP contributors, internal review from WP manager
- Strong coordination with MoD

THANK YOU!

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