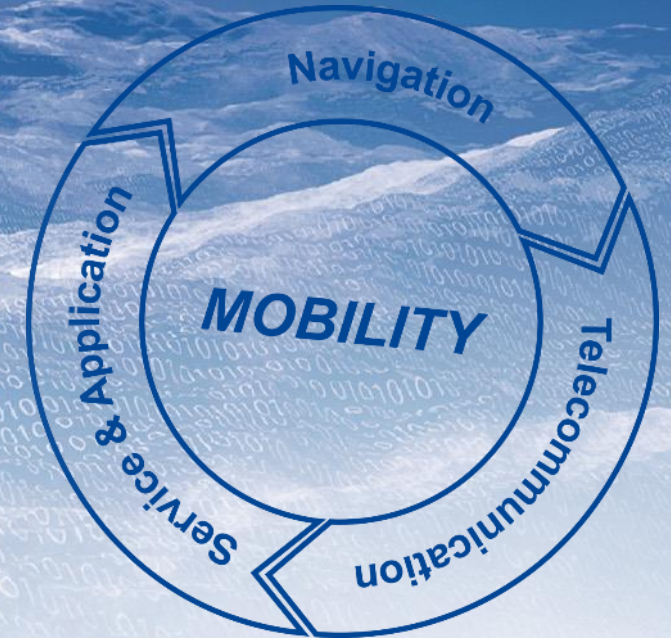


GIDAS – GNSS Interference Detection & Analysis System

NAVISP Industry Days

ESTEC, Noordwijk, The Netherlands, Friday, 18th January 2019

ESA Contract No. 4000122636/17/NL/MM



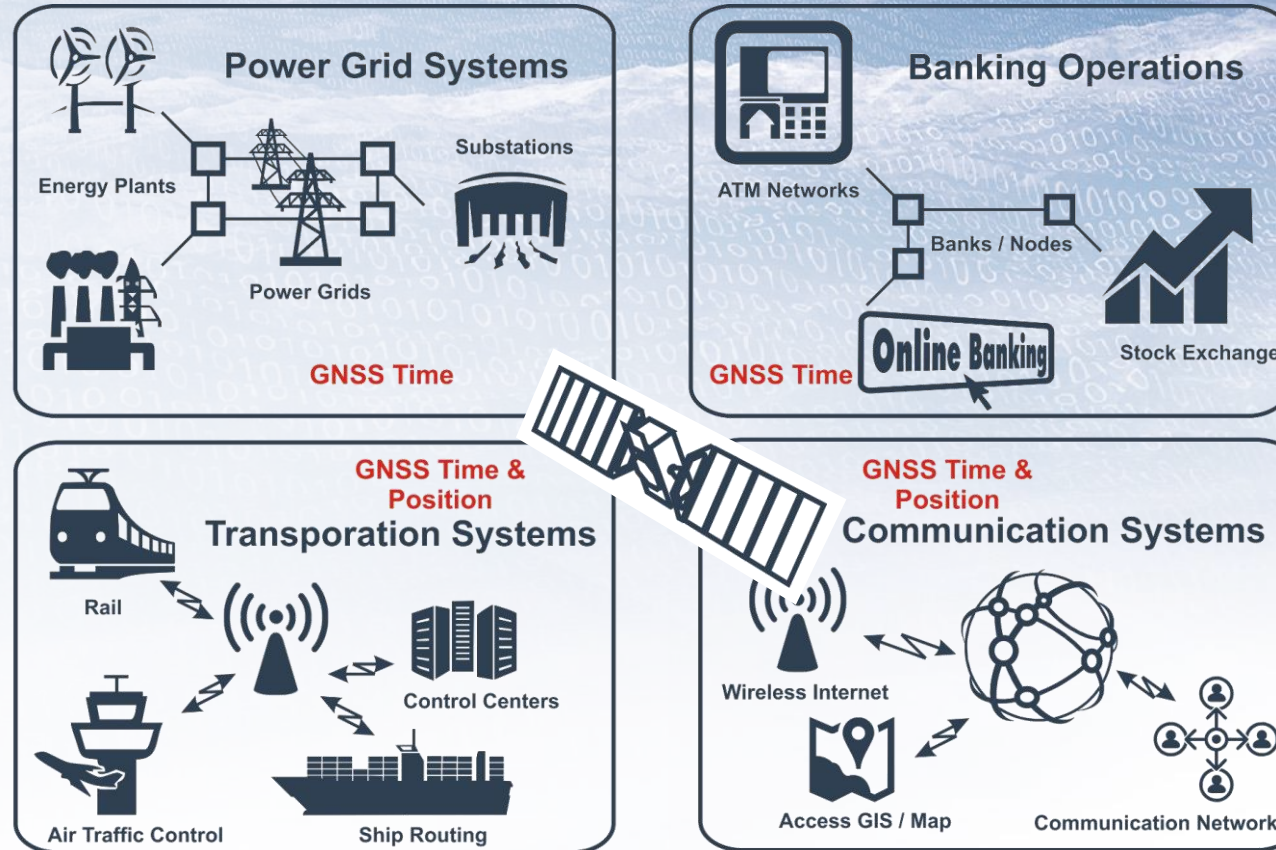
We all are navigators

- Satellite-based position and time determination, orientation and navigation are deeply rooted in our daily lives.
- European GNSS Agency Market Report 2017
 - 5.8 billion GNSS receivers in the market
 - 8 billion expected in 2020
 - ~ 1 GNSS receiver per person
- 6-7% of gross domestic product in Western countries depends on satellite navigation data?
→ € 800 billion in EU

Ref.: GSA Market Report 2017

Ref.: EC Galileo Midterm Report 2011

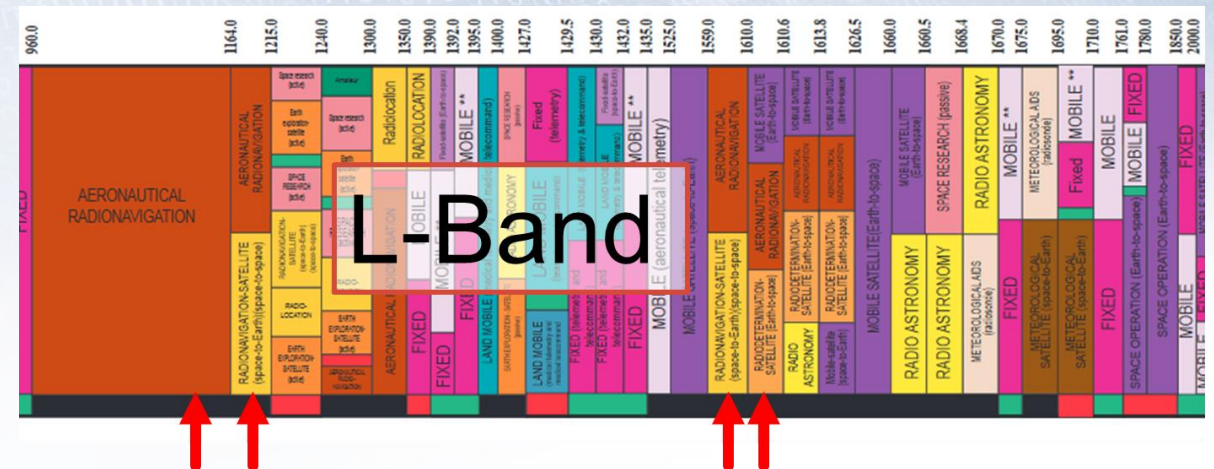
GNSS applications



Even small disruptions can cause severe errors!

GNSS interference

- Interference can be described as the effect of energy change due to the superposition of electromagnetic waves
- Unintentional interference
 - Caused by nature, other systems, multipath effects, etc.
- Intentional interference
 - Jamming
 - Denial of navigation service by masking GNSS signals with noise
 - Spoofing / meaconing
 - Manipulation, deception, counterfeit of GNSS PVT information



National Telecommunications and Information Administration (NTIA) Table of Allocations in the L-Band (1-2GHz, IEEE)

Known incidents

- Shut-down of GBAS at Newark Airport jammed
- GNSS interference attacks from North Korea against South Korea
- 117 incidents per day at Kaohsiung airport in Taiwan
- Outage of Emergency Pagers, Traffic Management Systems and ATMs in San Diego in 2007, caused by US Navy
- Spoofing of drones and ships
- Detection and localization of GNSS interference in Graz and Vienna, Austria by TeleConsult Austria

GIDAS – GNSS Interference Detection & Analysis System



GIDAS project key facts

- NAVISP2 – element 2 activity
- Consortium
 - TeleConsult Austria GmbH (lead)
 - FH JOANNEUM – University of Applied Science – Institute of Electronic Engineering



- Project start: 01/2018
- Duration: 24 month

GIDAS objectives

- GNSS Interference Detection & Analysis System (GIDAS)
- All-in-view GNSS civil signal monitoring
 - Automatic detection and classification of intentional interference sources
 - Automatic localization of interference sources by combining several monitoring stations
- Detection, classification and localization of intentional interference
 - Jamming
 - CW, chirp, FM, AM, Gaussian noise, band-limited Gaussian noise, spreading signal
 - Continuous, pulsed, frequency hopping
 - Spoofing
 - Simplistic, jam-aided, multiple, intermediate (sweep over)

What is GIDAS?

- GIDAS a scalable real-time GNSS Interference Detection & Analysis System
 - Real-time capability through low-cost commercial-of-the-shelf hardware components
 - Flexible system
 - Capable of processing different systems and frequencies
 - Designed for static and dynamic target applications
 - Scalable system
 - Capable of extending the number of channels and thus number of frequencies and systems
 - Joinable system
 - Capable of joining more systems together for localization

GIDAS features

- Multi-signal band monitoring
 - L1/E1/G1/B1 & L2/G2 & L5/E5
- Automatic GNSS jamming, spoofing and meaconing detection
 - Based on different algorithms and techniques
 - Automatic alarm generation
- Automatic classification of GNSS interference signals
- Analysis and comparison of interference events in post-processing
 - Generation of an interference event data base
 - Supporting reporting standards
- Easy adaptable to new upcoming signals and systems

Addressable market and target customers

- GIDAS is addressing private companies and public / governmental authorities, which have the following characteristics:
 - regulate safety critical infrastructures and/or operations
 - operate safety critical infrastructures and/or operations
 - operate systems or services where global navigation satellite system (GNSS) is key to achieve a required high quality of service (QoS)
- The application areas of the GIDAS solution are widely spread throughout our modern and developing societies.

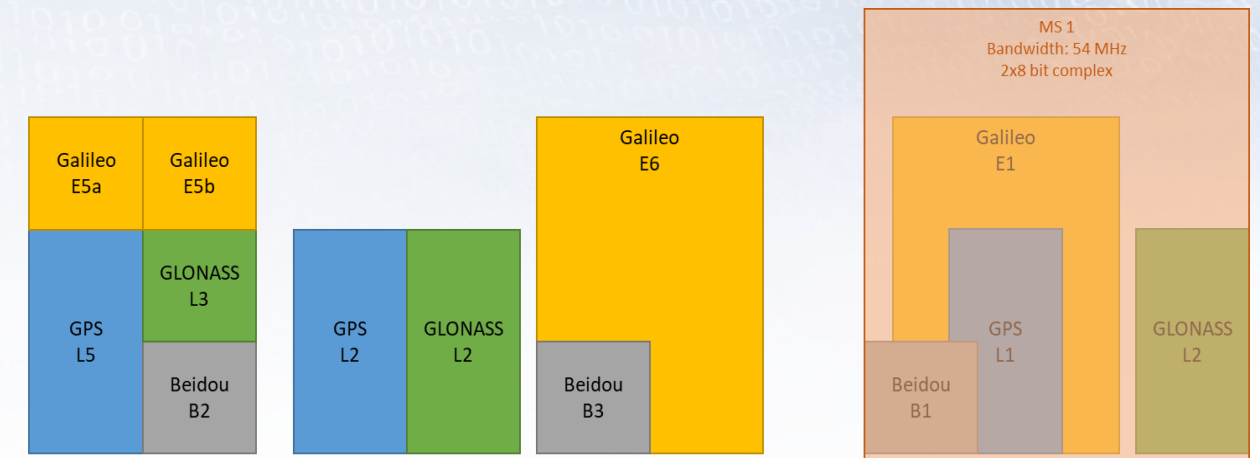
Use cases

- Depending on the user needs and requirements three different stages of expansion are available
 - Static (regional) GNSS interference monitoring for safety critical GNSS applications with high demanding requirements
 - Static (regional) GNSS interference monitoring for safety critical GNSS applications with less demanding requirements
 - GNSS interference monitoring for mission critical (dynamic) GNSS applications

Example product configuration (1/3)

- Single Station Wideband
 - Single monitoring station, wideband single-frequency, high dynamic

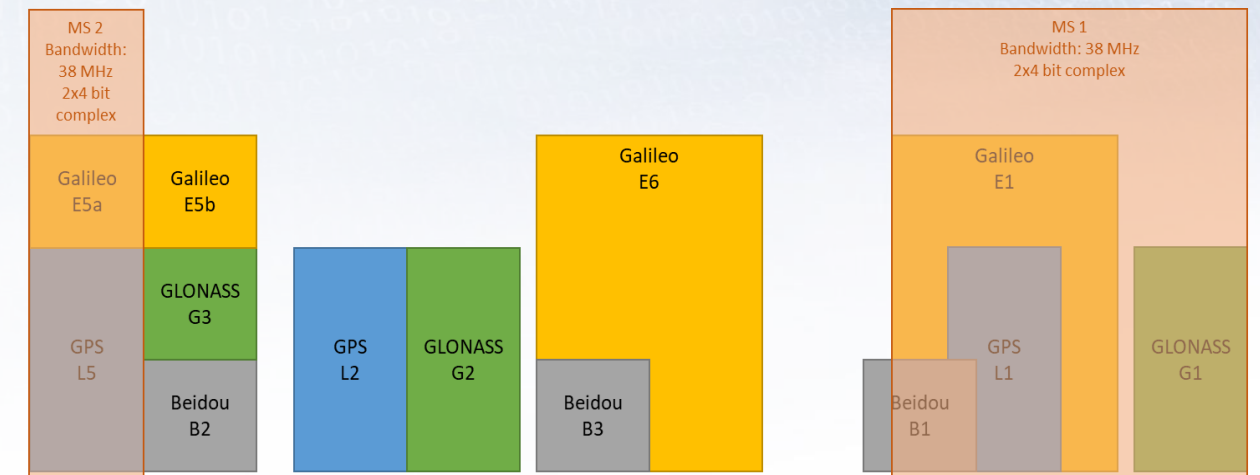
Frequency band(s)	Sampling rate	Filter Bandwidth	Dynamic range
L1/E1/G1/B1	81 MHz	54 MHz	2 x 8 bit (complex)



Example product configuration (2/3)

- Single Station Multi-frequency Narrowband
 - Single monitoring station, narrowband multi-frequency, low dynamic

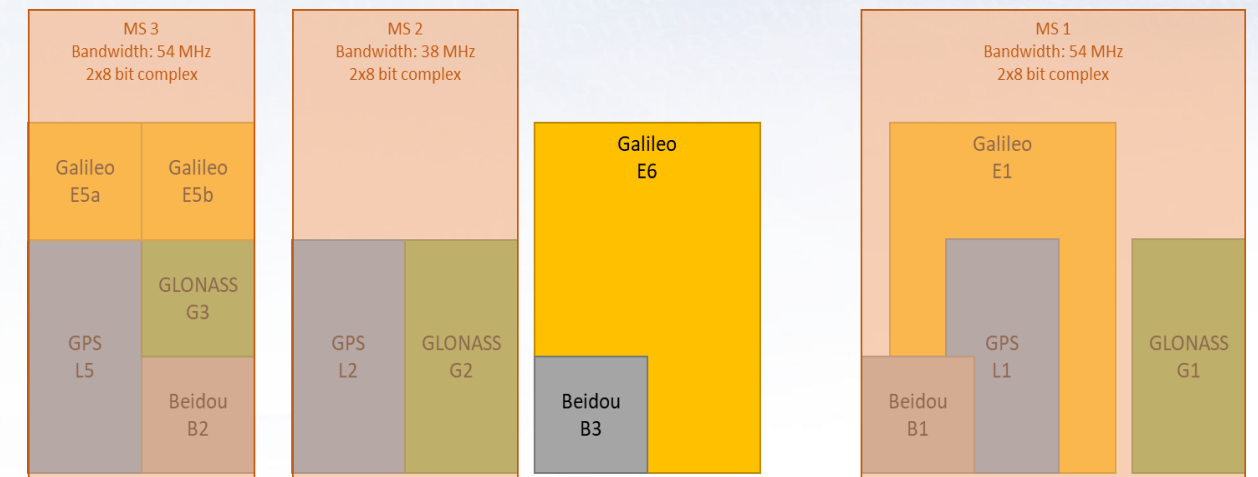
Frequency band(s)	Sampling rate	Filter Bandwidth	Dynamic range
L1/E1/G1	40.5 MHz	38 MHz	2 x 4 bit (complex)
L5/E5a	40.5 MHz	38 MHz	2 x 4 bit (complex)



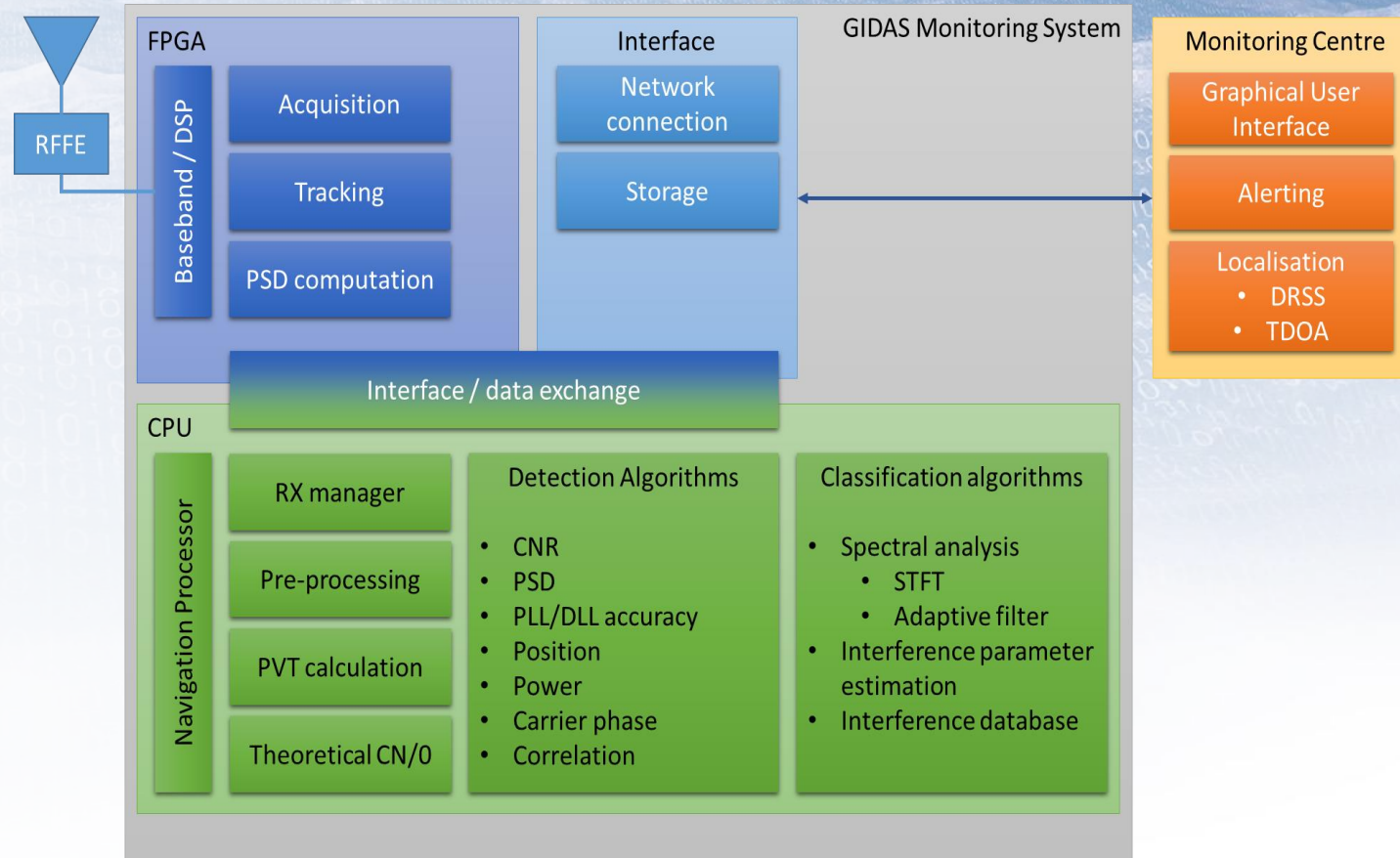
Example product configuration (3/3)

- Single Station Multi-frequency Wideband
 - Multiple monitoring stations co-located, wideband multi-frequency, high dynamic

Frequency band(s)	Sampling rate	Filter Bandwidth	Dynamic range
L1/E1/G1/B1	81 MHz	54 MHz	2 x 8 bit (complex)
L2/G2	40.5 MHz	38 MHz	2 x 8 bit (complex)
L5/E5	81 MHz	54 MHz	2 x 8 bit (complex)



GIDAS architecture



Current status and outlook

- Definition and design phase successfully completed
- Implementation ongoing
- System integration and testing in Q2 2019
- Validation and verification starting in Q3 2019
- Project Close-Out in 12/2019
- Commercialization, marketing activities
- First customers expected by end of 2019

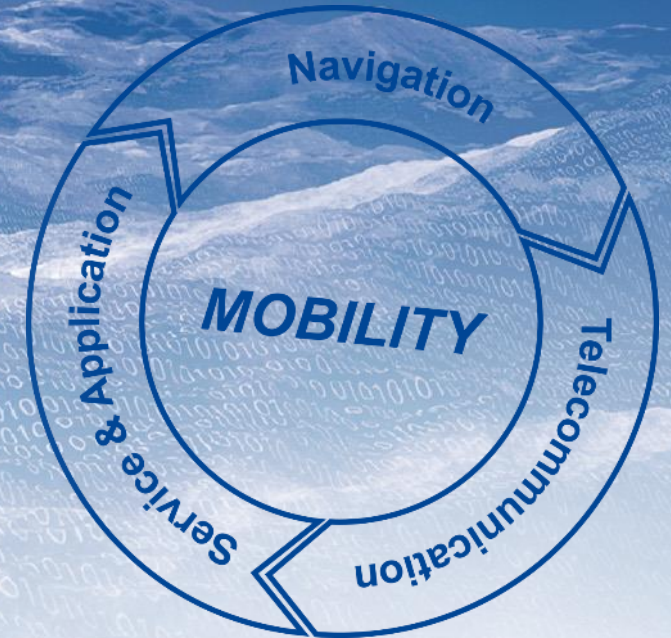


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