

EPICURE – PRELIMINARY INTEGRITY CONCEPT PRINCIPLES

1/12/20



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EPICURE background



EGNOS is the European SBAS and augments the GPS L1 C/A civilian signal by providing corrections and integrity information for positioning and navigation applications over Europe. In particular, integrity information is provided as part of EGNOS Safety of Life (SoL) Service.

The next generation of EGNOS, **EGNOS V3**, will augment GPS and Galileo constellations in the L1 and L5 bands and will extend the service area to the entire landmasses of EU member states.

The European Commission is defining the long-term evolution of the EGNOS programme beyond EGNOS V3, including new services or uses/applications of EGNOS. One potential evolution could lead to the provision of an EGNOS service focused on the liability and payment-critical applications and specifically on Pay As You Drive (PAYD), Pay How You Drive (PHYD) applications (i.e. insurance telematics applications).

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Technical overview of the activity

/// Main objectives of the activity

- / To develop an **appropriate integrity concept** for payment/liability critical applications focused on the **road sector**
- / To **define a dedicated EGNOS service** that shall fulfil the user requirements for PAYD/PHYD applications (and possibly road tolling) **in the 2025-2035 timeframe**

Results must be validated by stakeholders



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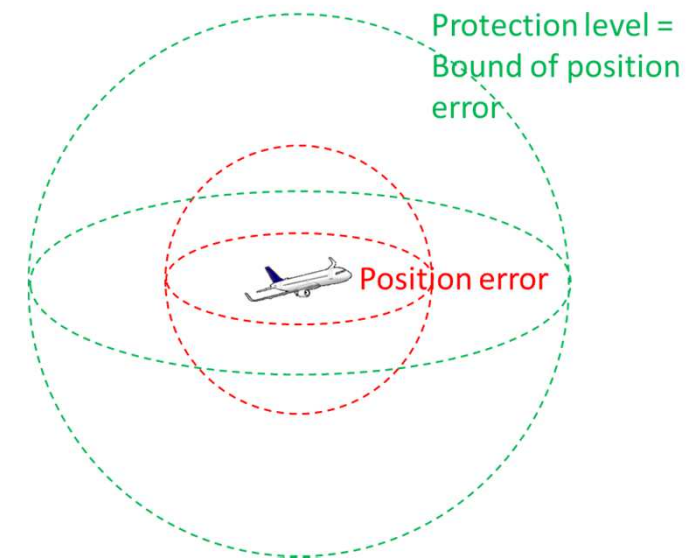
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OVERVIEW OF EPICURE INTEGRITY CONCEPT

/// Aviation concept background

- / Fully described in technical standards such as **MOPS** (Minimum Operational Performance Standards)
- / Based on the calculation of **Protection Levels**
- / **EGNOS Safety of Life (SoL) service** is requested to ensure that for airplane users, the probability that the protection level fails in bounding the real position error shall be as low as **2×10^{-7} (i.e. 0.00002 %)** for each **period of 150s**



OVERVIEW OF EPICURE INTEGRITY CONCEPT

/// Why aviation concept is not appropriate for road users ?

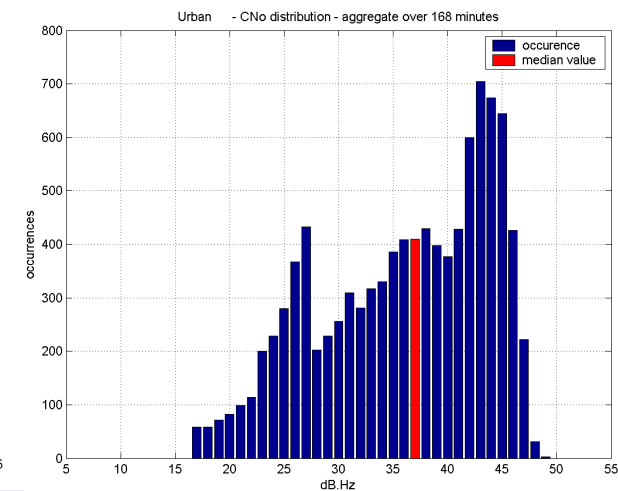
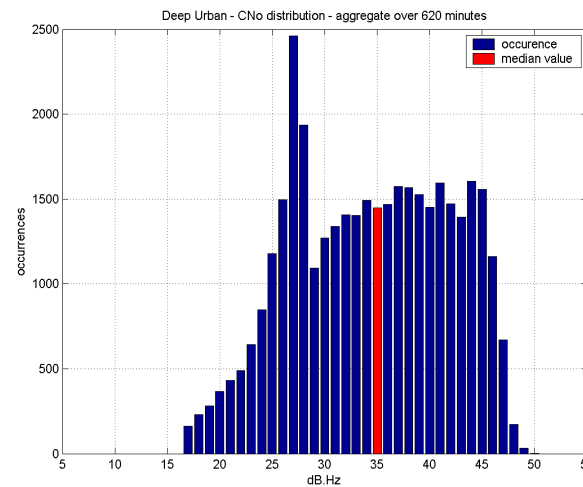
/// Urban environment (most critical one for these applications):

- / Is largely disturbed by **multipath**, very specific to the geometry of the different obstacles present around the GNSS antennas.
 - => impossible to define a standard user model that would be valid for all users.
 - => mandatory to define techniques able to first **mitigate** and second **estimate** the residual error due to multipath



/ Is also associated to:

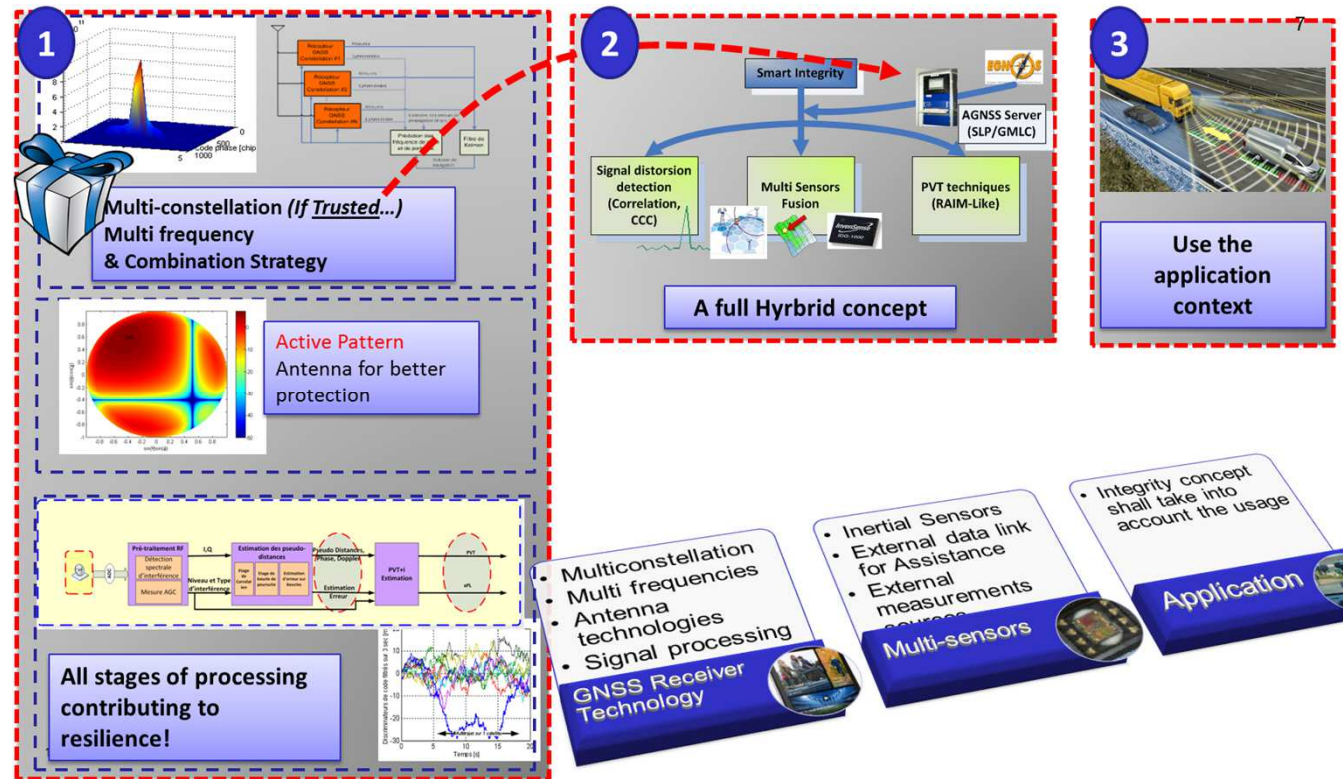
- **Masking**
- **Interferences**
- => need for additional sensors such as inertial sensors or odometers



OVERVIEW OF EPICURE INTEGRITY CONCEPT

/// EPICURE Modular integrity concept

1. All the indicators derived in the processing stages of the **GNSS receiver** are used to contribute to the integrity (starting from RF pre-processing stage)
2. GNSS is coupled with **other on-board unit sensors**
3. The **application context** can be used to compute a protection level associated to any metric involved in the billing process (e.g. bound of distance error).



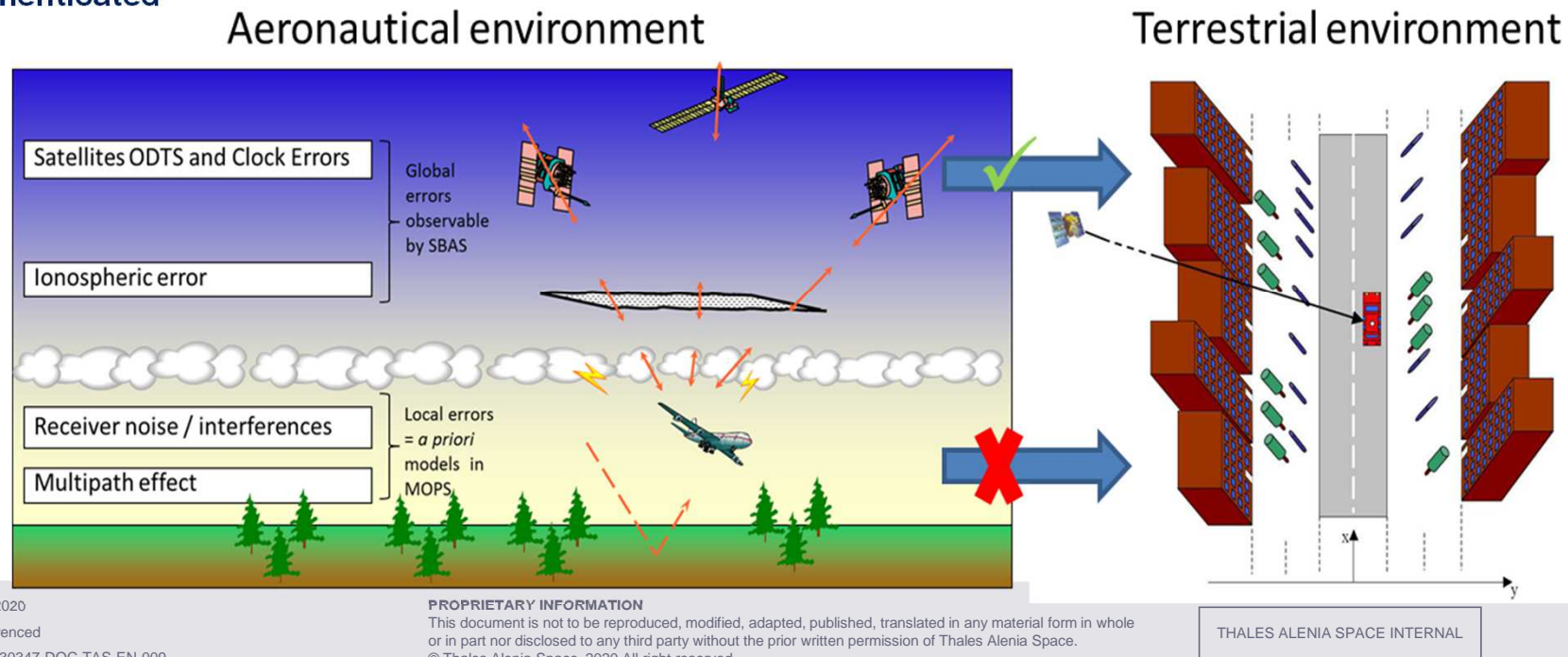
OVERVIEW OF EPICURE INTEGRITY CONCEPT

/// What could be EGNOS role in this new EPICURE integrity concept ?

/// EGNOS contribution is only one contributor to the OBU

/ EGNOS pseudo-range integrity service **EPRIS**

- Provision of **reliable bounds of errors** in GNSS individual measurements **which have a global nature**
- Through appropriate **communication channel**
- **Authenticated**



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QUESTIONS TO THE AUDIENCE

- /// We already **thank the stakeholders who have accepted to be part of EPICURE initiative** : Your inputs are very valuable !
- /// Beyond the initiated consultation (mainly towards insurance / road tolling stakeholders), we take benefit of this large UCP audience, to raise some questions :
- / Could a new integrity concept based on these principles and relying on “EGNOS pseudo-range integrity service” be of your interest ? For which potential **applications / use cases** ?
- / What will be the **conditions** for you to **adopt** such a new integrity concept, relying on “EGNOS pseudo-range integrity service” (e.g. clear and attractive liability schemes, shared liabilities in case of accident, guarantees for their users, cost of the receivers...)?
- / Would you be interested in **additional information** provided by this service (e.g. planned EGNOS configuration changes, ...)
- / What would be your **needs** associated to the service ? In particular:
 - Confidence level, e.g. 10-4 (ie one fault over 10 000 samples)
 - Availability, e.g. 95% – 99.9 %

CONTACT DETAILS

/// Please do not hesitate to contact me for further exchanges:

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