EUROPEAN SPACE WEEK

ONLINE EDITION

#EUSpaceWeek

CLUG Project

User Consultation Platform 2020

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2nd December 2020

Organised by:

European GNSS Agency

European Commission

Under the auspices of:

eu2020.de

EU Space Programme:

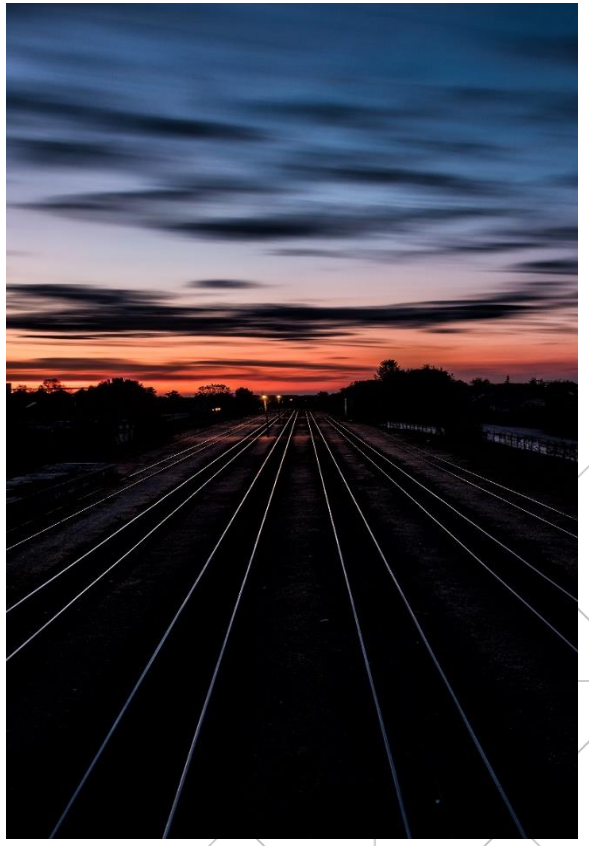
Copernicus

EGNOS

GALILEO

A new approach for train localisation

- **Proof of concept of an on-board continuous and safe localisation unit**
  - ✓ To provide the position, velocity and acceleration of the train
  - ✓ To replace or enhance the board equipment (e.g. odometry, Balise reader)
  - ✓ To decrease the cost of the trackside equipment
  - ✓ To foster new concepts as Moving block, ERTMS L3



The CLUG project ID

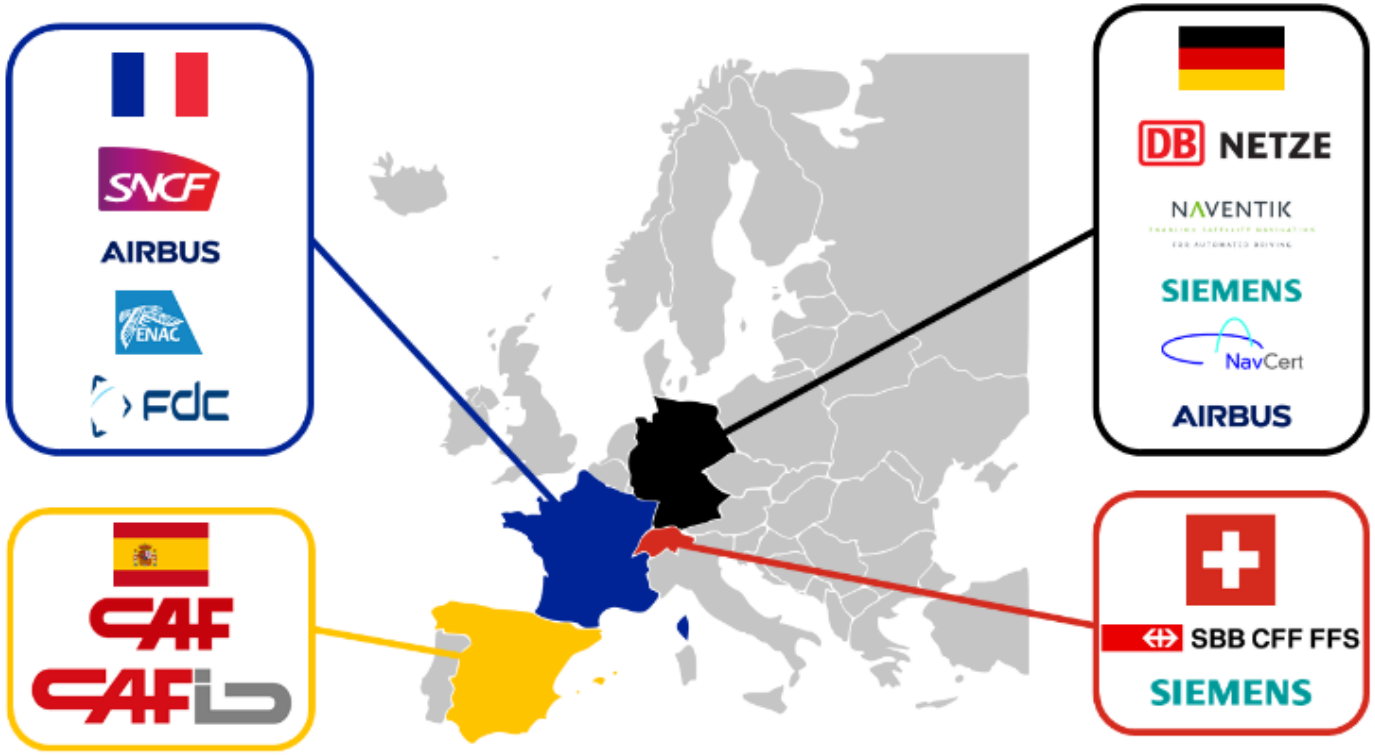
Certifiable Localisation Unit with GNSS

Funded by European GNSS Agency (GSA)
Horizon H2020 Program
Grant agreement number 870276

24 months
December 2019 – November 2021

http://clugproject.eu/fr

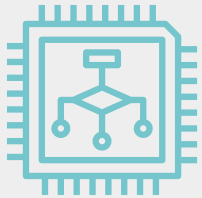
Participants



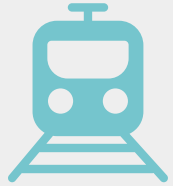
Participant Organisation Name	Country
SNCF (Coordinator)	FRANCE
AIRBUS DEFENCE AND SPACE	FRANCE
CAF	SPAIN
DB Netz	GERMANY
ENAC	FRANCE
FDC	FRANCE
NAVCERT	GERMANY
NAVENTIK	GERMANY
SBB	SWITZERLAND
SIEMENS	GERMANY

Main objectives

Mission requirements definition.



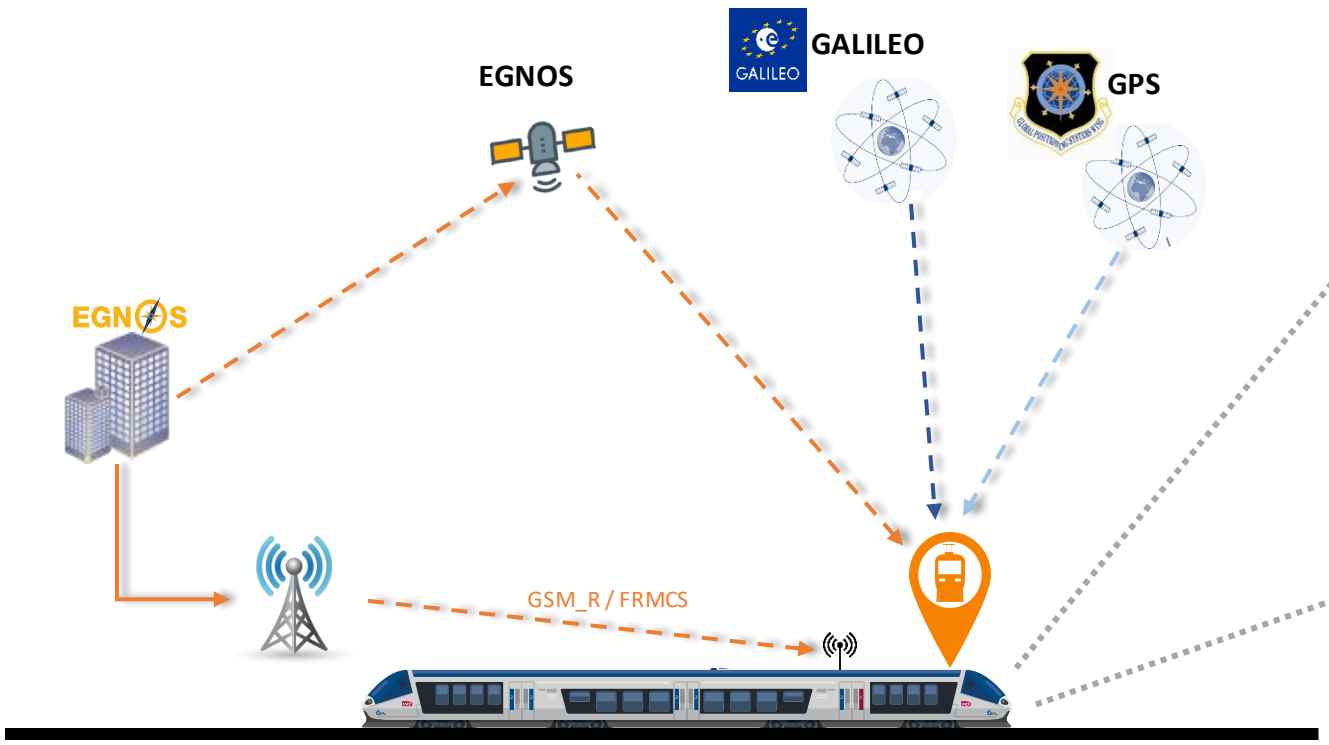
Architecture definition and algorithm proof of concept



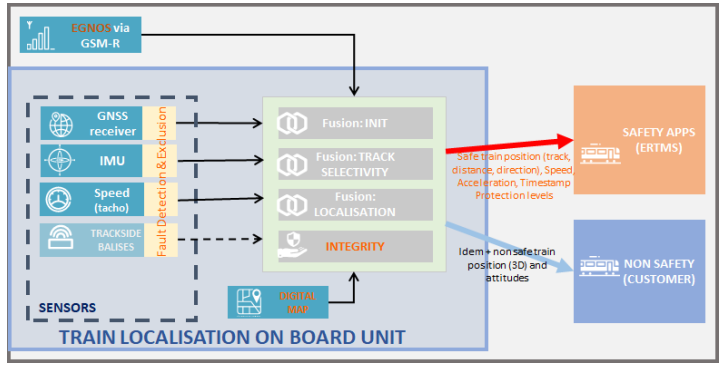
Definition of process and tools for prototypical certification of localisation unit

Demonstration of the feasibility of a multi-sensor approach

CLUG concept



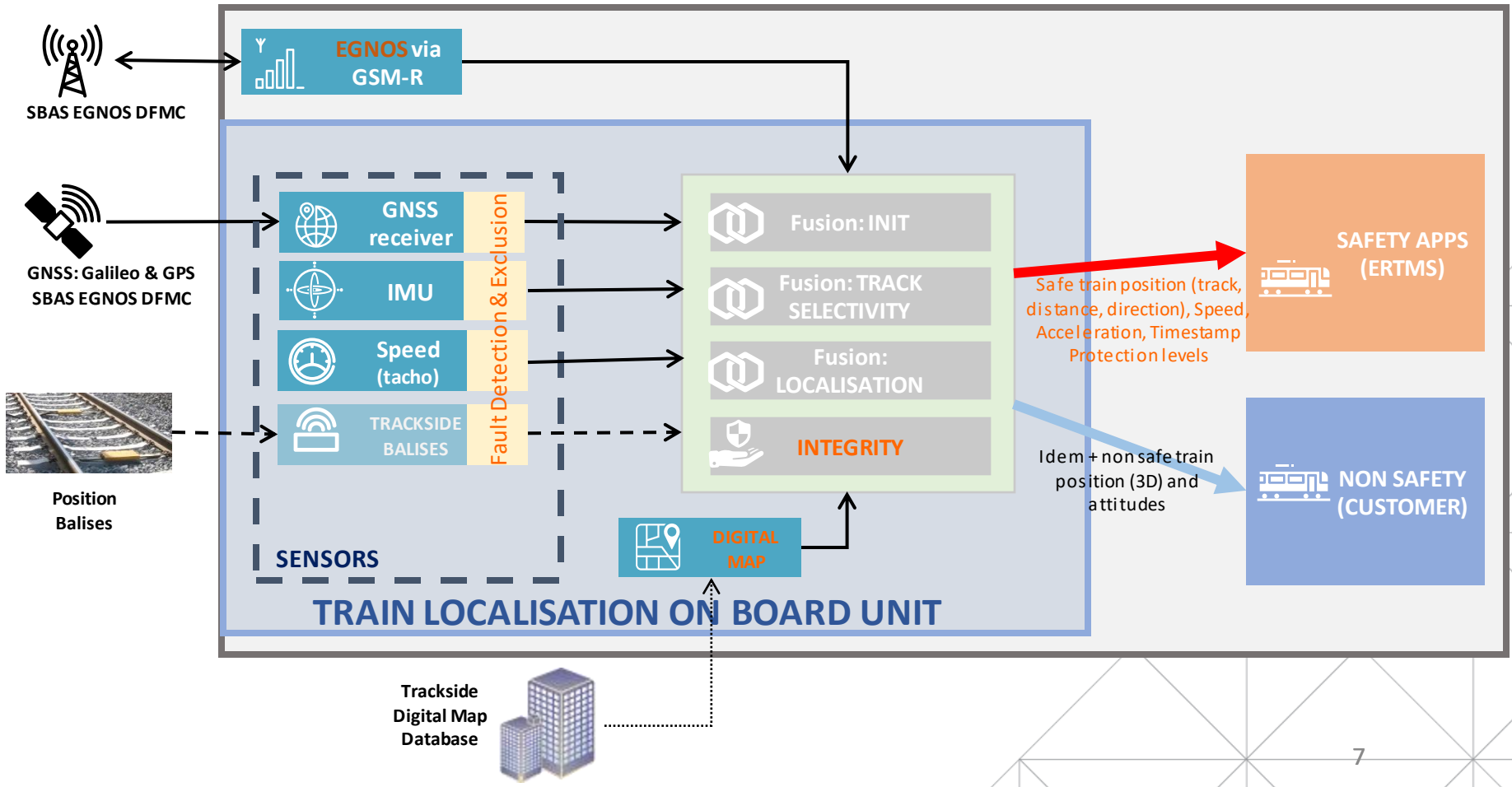
TRAIN LOCALISATION ON BOARD UNIT



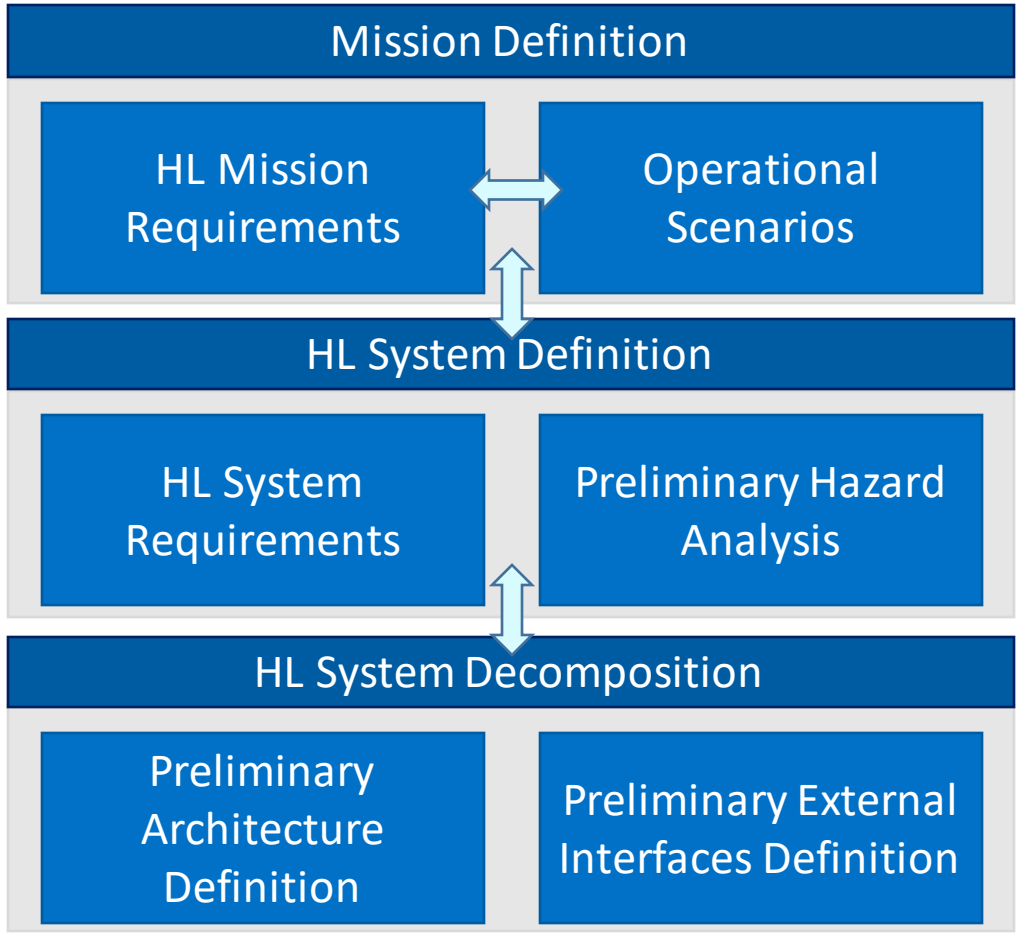
CLUG concept

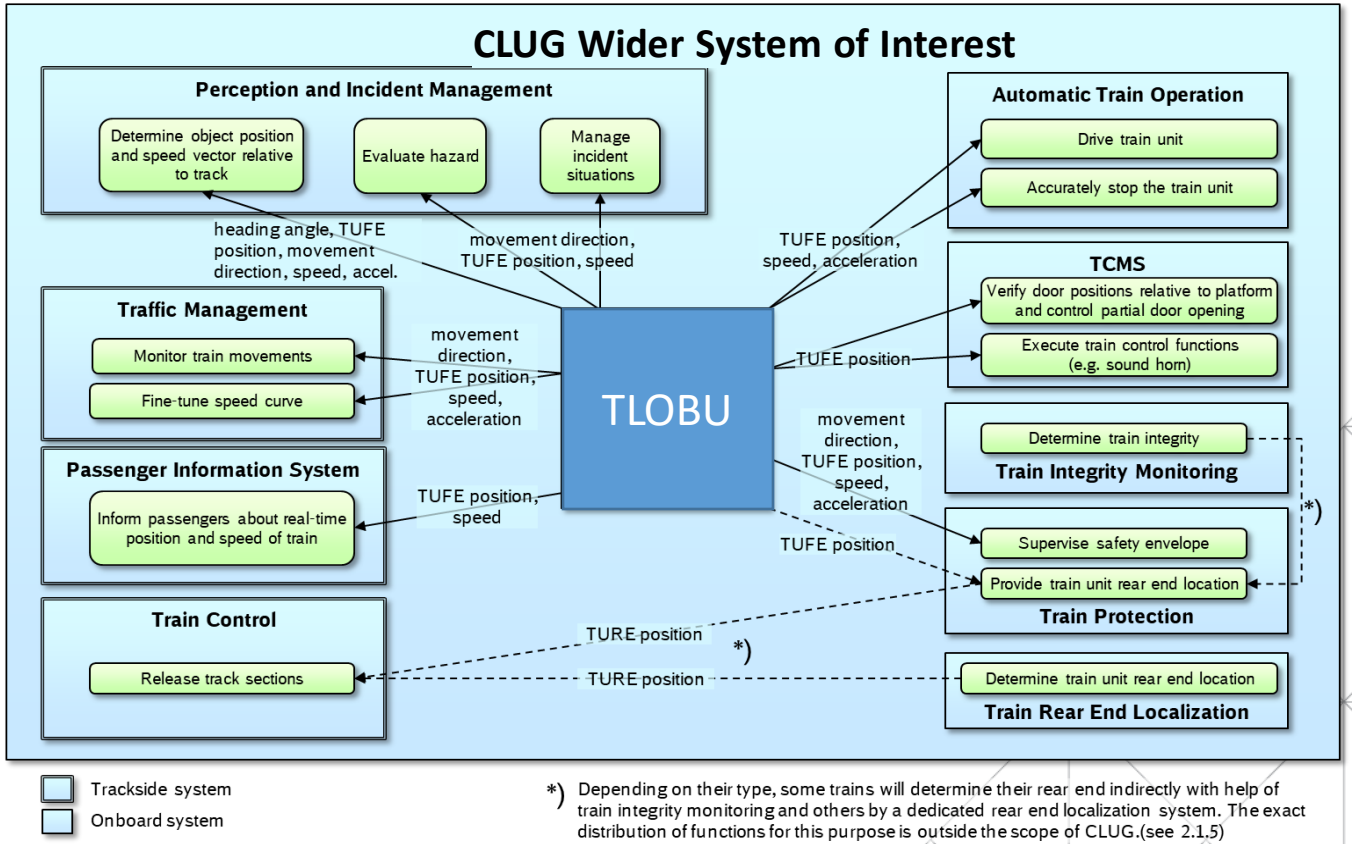
Train Localization technical objectives and challenges

- Design and evaluation of a multi-sensors localization unit
  - GNSS + EGNOS
  - IMU
  - Tachometer
  - Digital Map
  - Some remaining Trackside Balises pending Safety & Integrity level
- Definition of and adherence to **integrity and safety targets** together with the train **localization accuracy targets**
- **Focus on**: Digital map definition, Fusion algorithms, Integrity concepts, certification evaluation



Requirements definition logic



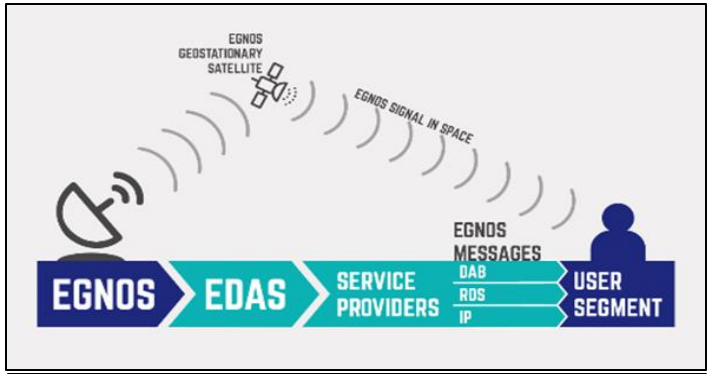


EGNOS augmentation

EGNOS augmentation is required to meet performance requirements for safety-critical operations (accuracy, integrity)

Performance assessment based on Dual Frequency Multi-Constellation (DFMC) service (EGNOS V3.2)

In CLUG Testing (WP4) only EGNOS V2 Single Frequency Single Constellation (SFSC)



EGNOS Dissemination means

EGNOS DFMC not sufficient for Railway needs

- Tailored to aviation needs
- Railway performance requirements more stringent
- Need for a different integrity concept
- Integrity for speed estimate
- Availability Nok by GEO dissemination

EGNOS augmentation

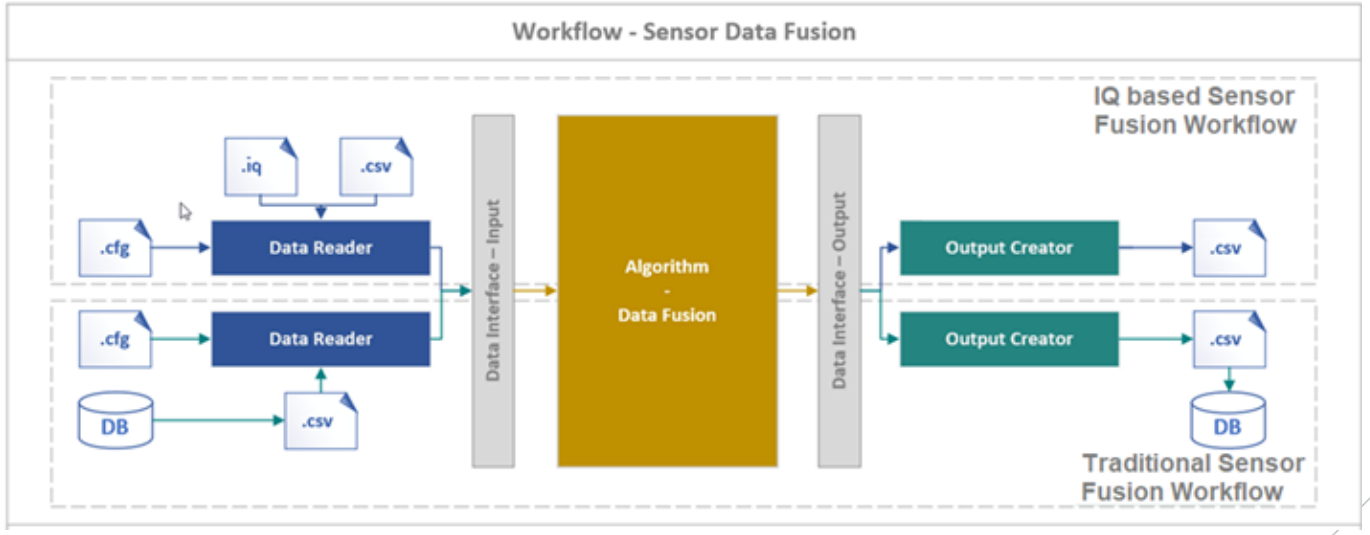
EGNOS augmentation is required to meet performance requirements for safety-critical operations (accuracy, integrity)

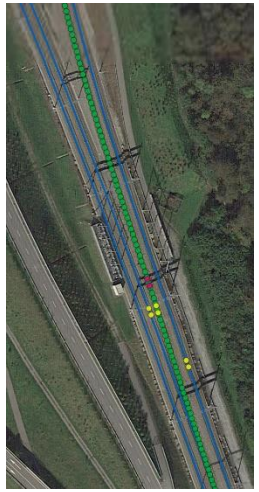
GNSS Augmentation Service for Rail

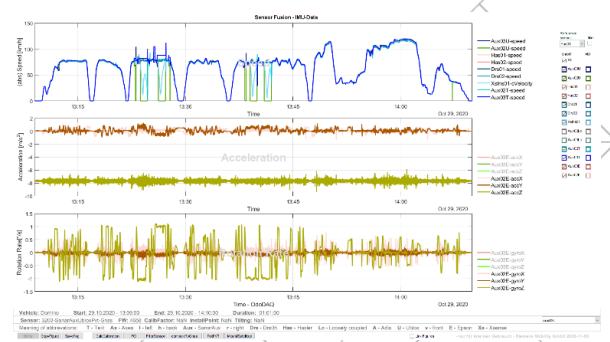
Improved orbit & clock corrections
Doppler range error & bias for speed integrity
Integrity parameters for Bayesian data fusion
Dissemination with safety terrestrial network

Tests and Evaluation

- **Aug 20** Platform installation
- **Nov 20** Beginning of measurement campaign
- **Dec 20** Generation of the ground truth
- **Feb 21** Generation of fused navigation solution and performance analysis







Roadmap

DECEMBER 2021

CLUG Final Results

JUNE 2021

Architecture & design definition including fusion and integrity algorithms

First test results evaluation

JULY 2020

Preliminary high level mission and system requirements ✓

Test plan definition ✓

NOVEMBER 2021

Test results evaluation versus design

Evaluation of EGNSS for rail

NOVEMBER 2020

✓ High level mission and system requirements

✓ Preliminary architecture and design definition

✓ Beginning of the measurement campaign(s)

Generation of the Ground truth

DECEMBER 2019

✓ Project kick-off

Thank you

Linking space to user needs

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