PNT for CCAM Thematic Window: Use Cases

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PNT for CCAM Thematic Window

Information Webinar

Time	Topic	Speaker
9:30-09:45	Welcome	P. Michel Head of Navigation Strategy and Programme Department, ESA
9:45-10:00	NAVISP Programme	R. Lucas Head NAVISP Technical Programme Office, ESA
10:00-10:20	CCAM and its benefits	N. Tsampieris Senior Manager Innovation & Deployment, ERTICO
10:20-10:40	Research and innovation perspectives on CCAM	F. Santucci, PhD Professor at Department of Information Engineering, Computer Science and Mathematics - University ofL'Aquila, Italy Director of Center of Excellence Ex-EMERGE
10:40-11:00	Scaling-Up CCAM Innovation	A. Beeharee, PhD Head of Ubiquitous Connectivity, Satellite Applications Catapult
11:00-11:15	Use Cases • Ubiquitous and High-Performance PNT for CCAM • Perception 360 for CCAM • PNT Monitoring and over-the-air updates for CCAM • PNT for Clean Mobility • Testing for CCAM related PNT technologies	S. Bandau YGT for PNT Innovation & Competitiveness, ESA
11:15-11:30	Call Organization & Requirements of the Thematic Window	A. Fiumara Head of Office NAVISP Competitiveness (Element 2), ESA
11:30-12:00	Questions and Answers	R. Lucas Head NAVISP Technical Programme Office, ESA

Thematic Window: Challenging PNT Use-Cases

Higher level Use Cases

- **Theme 1:** Ubiquitous and High Performance PNT for CCAM
- **Theme 2:** Perception 360 for CCAM
- **Theme 3:** PNT Monitoring and over-the-air updates for CCAM
- **Theme 4:** PNT for Clean Mobility
- **Theme 5**: Testing for CCAM

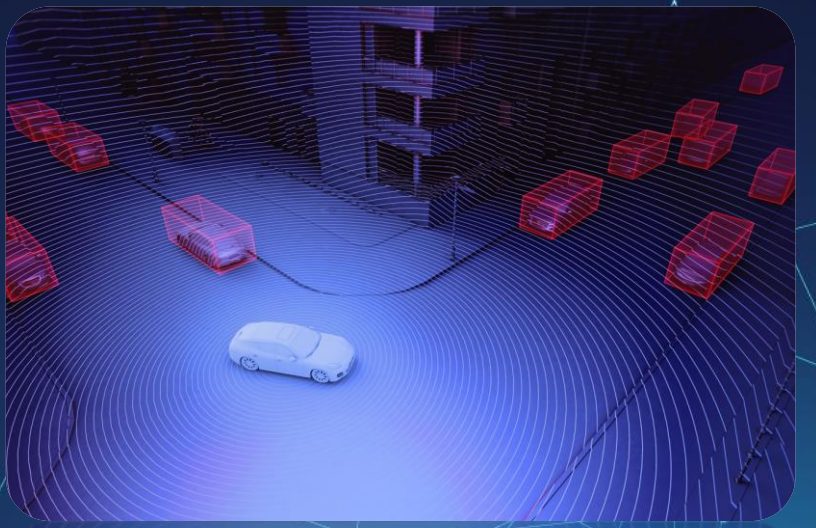
Theme 1: Ubiquitous and High Performance PNT for CCAM

Description:

- Market acceptance of CCAM requires that it enhances the driving experience and safety
- Growing importance of Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure/everything communication (V2X)

PNT Background & challenges:

- GNSS Performance is affected by the number of visible satellites and by multipath propagation
- Highly Automated Vehicles need <10 cm level of position accuracy, in real time
- Communication about position and environment need to be reliable, fast and accurate



Societal Relevance:

- Enhanced traffic flow, eco-driving, efficiency
- improve driver awareness, and traffic safety

Detailed Use case examples:

- Combined 4G/5G/satellite architecture to realize the always-connected aspect of CCAM (Satellite and 4G/5G-driven autonomous vehicles).
- Next-generation positioning On-board Units (OBU) for enabling highly automated driving such as the development of a precise positioning system for high levels of automated driving SAE-L4 and L5 for many vehicle types (e.g. cars, trucks).

Theme 2: Perception 360 for CCAM

Description:

- Moving Object Detection (MOD) is an important task for achieving robust autonomous driving
- Need for cooperation of multiple cameras and sensors for the perception of the surrounding environment

PNT Background & Challenges:

- Challenges Sensor fusion:
  - Latency in transmitting data
  - Most surround view cameras → only informative systems, dependent on visibility conditions
- Need for Real-time connectivity → precise, dynamic, real-time PNT to enable situational awareness

Societal Relevance:

- Collision avoidance, higher safety, situational awareness

Detailed Use case example:

- Use of vehicle cameras and Intelligent image processing algorithms, as part of an integrated multi-camera system –to provide an all-around view (360-degree visibility) of the vehicle environment from a bird's eye perspective;
- Goal: address major perception issue to read the surrounding environment, including complex object analysis, with a high degree of reliability in all operational domains

Theme 3: PNT Monitoring and over-the-air updates for CCAM

Description:

- Constant validation and update mechanism needs to be in place, with vehicles having the ability to share and validate information about their own condition but also road networks with others
- Over-the-Air (OTA) updates enable upgrading the vehicle functionalities or bug fixations in the embedded software installed

PNT Background & Challenges:

- OTA updates need to have complete access to the in-vehicle communication network and positioning information for HDAFs
- Constantly changing features, possibilities, improvements but also potential cybersecurity threats
- Especially important with the transition to EVs

Societal Relevance:

- Cost-effective, efficient and user-friendly services
- Vehicular safety applications

Detailed Use case example:

- Development of a networked system of vehicle sensors networked with the OEM to transmit and exchange data and monitor vehicle parameters
- Monitoring and updating of highly automated driving functions, the battery control module or infotainment systems.
- Exploitation of blockchain technologies within OTA updates as blockchain databases offer the ability to store proof of location and other forms of 5G usage of network resources, traffic flow, and billing details, enabling a new form of mobility management for OEMs or perhaps even municipal services

Theme 4: PNT for Clean Mobility

Description:

- Deployment of electric vehicles (EVs) gives potential to reduction of pollutant and greenhouse gas emissions related to the road transportation sector (responsible for 23% of CO_2 emissions globally)
- Deployment of EVs still struggles with various challenges such as long charging times and limited range
- Opportunity of integration of charging stations and vehicles itself into smart grids

PNT Background & Challenges:

- Communication about position, routing and environment need to be reliable, fast and accurate
- Need for very accurate, reliable and ubiquitous PNT data with possibility of fast adaption due to changing influences

Societal Relevance:

- Eco-driving, improved efficiency → Low/No Emissions

Detailed Use case examples:

- Infrastructure planning and optimum routing of battery electric vehicles → Limited driving range makes energy efficient route selection (eco-routing) of particular concern and is very complex
- Electric vehicles and charging stations as part of smart grids→ Timing information/synchronization is very important in this context, as it enables accurate localization of power line faults, synchronization of distributed control processes and load flows, rerouting of power flows during transmission outages, and balancing of power supply and demand through precise time stamping of end-to-end grid data sets

Theme 5: Testing for CCAM

Description:

- Digitalization, 5G and IOT open new ways to improve road safety, to develop a sustainable infrastructure and to enhance mobility.
- To fully exploit the potential of these technical possibilities, various CCAM innovations must be tested and, if necessary, improved and further developed.
- Testing new technologies is particularly important, as errors or inaccuracies can lead to the damage of vehicles, infrastructures, or even to the death of road users.

PNT Background & Challenges:

- PNT information need to be monitored, constantly verified, updated and processed
- testing and validation of CCAM functions
- Support of certification process

Societal Relevance:

- Building trust in the society
- Part of national strategy towards CCAM
- Vehicular safety applications

Detailed Use case example:

- Development of national or cross-boundary test bed in order to offers test opportunities in particular with regard to connected, cooperative and automated CCAM technologies (including vehicle-to-vehicle and vehicle-to-infrastructure communication) and its interaction with PNT information (including the use of resilient, accurate, real-time, dynamic PNT data)