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CCAM In-Kind contributions to Additional Activities 2023

How CCAM members' additional activities enhance the CCAM Partnership

The CCAM (Connected, Cooperative, and Automated Mobility) Partnership has been at the forefront of technological innovation in 2023. Through a series of in-kind additional activities, CCAM Association members have significantly advanced the integration and deployment of automated mobility solutions across Europe. These activities span various domains, including in-vehicle technologies, data management, safety, communication, logistics, and more, all aimed at creating a safer, more efficient, and inclusive mobility ecosystem.

The In-Kind Additional Activities Report 2023 provides an overview of the in-kind contributions made by CCAM Partnership members other than the Union, going beyond the Partnership research projects' funding. It summarizes the responses gathered from a survey conducted among CCAM Association members in March-April 2024. The total reported amount exceeded 257 million euros, which is more than three times the initial plan. In comparison, the EU committed approximately 65 million euros in projects' funding for the same year. This substantial in-kind contribution underscores the dedication and active involvement of CCAM Association members in advancing the Partnership's goals and initiatives. This document provides a summary of the CCAM Partnership In-Kind Additional Activities Report 2023.

In-vehicle technology innovations

In 2023, CCAM Association members focused on enhancing in-vehicle technologies to improve the performance and safety of automated vehicles. Key initiatives included **the industrialization of sensor fusion and image recognition under poor weather conditions**. Quantum computing was utilized to **optimize vehicle trajectory planning**, while the development of a **high-performance central car server concept (CeCaS)** aimed to **boost vehicle processing capabilities**. Other notable activities involved **testing over-the-air updates**, **developing new service-oriented EE architectures**, and **creating AI-based software stacks for autonomous driving and logistics**.

Innovations also extended to advanced driver assistance systems (ADAS) and autonomous driving functions, **integrating AI and data fusion from multiple sensors** such as cameras, RADAR, and HD maps. These efforts have significantly improved **vehicle perception, software development, and machine learning capabilities**.

A notable success story in this domain is the **UNICARagil project** by RWTH Aachen, funded by Germany. This project has developed four experimental vehicles now utilized by various German universities for international research. The vehicles serve as pioneering testbeds for cutting-edge technologies, propelling innovation in CCAM. **EU Projects like Althena and FEDERATE leverage UNICARagil's advancements in automation software and middleware**. Notably, its contributions to modular environmental perception and decision algorithms are shaping the future of cooperative and explainable AI.

Data management and utilization

Efficient data management is crucial for the success of connected and automated mobility. CCAM Association members' activities in 2023 included **developing robust data governance platforms, addressing data synchronization issues, and exploring the potential of vehicle data for various applications**. Pilot projects investigated **the use of vehicles as sensors to enhance data acquisition and improve traffic management systems**.

Advanced AI-based methods were employed for efficient data collection and processing, ensuring high-accuracy information delivery regarding road conditions. These efforts addressed challenges such as **data heterogeneity, latency, and precision**, further enabling the **exploitation of freight data for urban planning and logistics**.

Enhancing safety through simulation and validation

Safety remains a top priority for CCAM Partnership. In 2023, significant strides were made in **scenario development and simulation**, including **the creation of a reference perception system for ADAS and CAV functions**. New safety validation platforms **predicted future safety-critical scenarios**, contributing to the development of EuroNCAP protocols.

Innovations in passive and active safety systems aimed to protect vulnerable road users (VRUs) and improve occupant protection in new vehicle interiors. Projects focused on advanced vehicle dynamics,

driver condition monitoring, and the integration of smart safety warnings for VRUs. These activities have paved the way for safer automated driving environments.

An important milestone in safety is coming from the **Hi-Drive project with participation of BMW**. This Horizon2020 project played pivotal role in promoting the safety concept for passenger vehicle L3 Highway systems, **ultimately leading to their market introduction in Germany**. By leveraging advancements in technology and collaboration, this initiative demonstrated the feasibility and benefits of L3 Highway systems, accelerating their market adoption and showcasing the progress and acceptance of innovative mobility solutions.

Advancing communication and traffic management

Communication technologies are essential for the seamless operation of automated vehicles. CCAM Association members' efforts in 2023 included **addressing 5G connectivity challenges**, ensuring **compatibility across different frequencies**, and tackling **cross-border issues**. V2X communication and new techniques for road and network traffic prediction using 5G technology were also developed.

Significant investments were made in creating a **mobility digital twin to facilitate industrial zone development and integrating CCAM into traffic flow management**. An international test on **jamming and spoofing of GNSS** was facilitated, and a prototype project focused on **AI-based traffic sign generation** enhanced testing and homologation processes.

In this context, **Fluidmesh deployment by FMC Ireland** has been a success story in advancing urban connectivity. Fluidmesh specializes in robust wireless networks for industrial, commercial, and municipal use, offering high-performance solutions suitable for various applications. **By integrating Fluidmesh, the smart city enhances its connectivity infrastructure, facilitating real-time data exchange and improving mobility solutions.**

Promoting inclusiveness and public engagement

CCAM has prioritized inclusiveness by **integrating CCAM shuttles with conventional transport services and demonstrating L4 people movers in urban areas**. Automated bus platooning technology and L4 parking and highway AI-based operations were researched to enhance transport options.

Public engagement initiatives aimed to raise awareness and acceptance of automated mobility solutions. Innovative user-centric charging infrastructure solutions and collaborations with public transport sectors explored the effects and possibilities of developing automated transport systems.

Preparing for future operations and logistics

To ensure the seamless integration of automated transport systems, CCAM Association members developed a **serious game to explore urban mobility options and defined test facilities for connected and automated driving**. A real laboratory for autonomous bus concepts was also established.

In logistics, operational automation of multimodal cargo flows and supply chains within the intra-European network was a key focus. Remote operation techniques for last-mile delivery and the systematization of non-driving activities for automated heavy goods vehicles were explored to enhance logistics operations.

The MULTI-MOBY project by Cidaut stands out in this area. The project aims at implementing a fleet of multi-passenger and multi-purpose commercial electric vehicles. So far, it has developed an affordable urban electric vehicle that excels in safety according to Euro NCAP standards. It integrates advanced driving automation features, high-efficiency powertrains, robust battery packs, and a standardized charging system. Additionally, it applies secure remote updates and predictive maintenance procedures, demonstrating effective integration of CCAM principles.

Showcasing and regulatory influence

CCAM Association members showcased developed technologies through demonstration vehicles for various levels of highway automation. Public transport prototypes of autonomous vehicles were presented, reinforcing the fleet for further deployments across Europe. These demonstrations included highly automated driving and AI concepts focusing on software-defined vehicles and Human-Machine Interaction.

CCAM Association members also played a crucial role in shaping regulatory frameworks and policies. Contributions to European testing frameworks, safety assurance protocols, and participation in international regulatory bodies have helped align standards and policies with technological advancements in automated mobility.

Fostering collaboration and knowledge sharing

CCAM Association members drive synergies through leadership in different European associations, organising stakeholder events, and engaging in national and international collaborations. Participation in platforms like ERTRAC CCAM roadmap work and initiatives like Motion by Electronomous have enhanced networking and innovation.

Academic collaborations support training programs in cybersecurity, AI, and software tools, ensuring a skilled workforce for the future of automated mobility. Knowledge capitalization and dissemination through industry events, scientific publications, and stakeholder engagement have accelerated the development and adoption of CCAM systems.

In conclusion, the in-kind additional activities of CCAM Partnership in 2023 have significantly advanced the field of connected, cooperative, and automated mobility. Through technological innovation, data management, safety enhancements, communication advancements, and collaborative efforts, CCAM Partnership continues to pave the way for a safer, more efficient, and inclusive mobility future in Europe and beyond. The achievements of projects like UNICARagil, Hi-Drive, MULTI-MOBY, and the Fluidmesh deployment exemplify the dedication and progress being made in this dynamic field.