SARWS

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Real-time location-aware road weather services composed from multi-modal data

SARWS exploits and extends Cooperative Intelligent Transport Systems (C-ITS) standards from traditional road weather and pollution data sources to new, more pervasive sources, including probe vehicles, to provide location-aware real-time weather services, thus contributing to increased road safety.

Main focus

Adverse road weather conditions and air pollution are challenging for human drivers, urban population and for automated vehicles. To reach the safety, comfort and efficiency benefits of Cooperative, Connected and Automated Mobility, vehicles need to sense road conditions and see beyond the fog and/or rain wall. In addition, existing solutions for road weather services are limited in their scope and are mostly limited by: i) scalability, ii) their offline nature, and iii) high latencies. Therefore, there is the need of integrated solutions that can take the most benefits from a real-time analysis of the data gathered from weather and pollution sensing technologies and provide an on-time appropriate reaction to the end user and/or to the automated vehicles. This objective requires a higher level of intelligence to be integrated into the sensing and communication infrastructures, with decentralized aggregation and decision for robust and timely decisions to be taken.

Approach

The recent development of C-ITS standards based on a common ITS station communication architecture is an opportunity for a new generation of solutions, taking advantage of the integration of roadside units and road weather/pollution stations, vehicle' data, road weather sensors and ultimately the mobile device data from each handheld device from the road' users. Dedicated sensors embedded in vehicles can also report pollution level to build high-resolution dynamic maps accounting both weather and pollution, besides all other data already available in such maps.

Many C-ITS services are currently developed and deployed in non-interoperable silos due to the lack of an interoperable communication system and the lack of open data formats. This is one of the reasons why many connected vehicles ser-
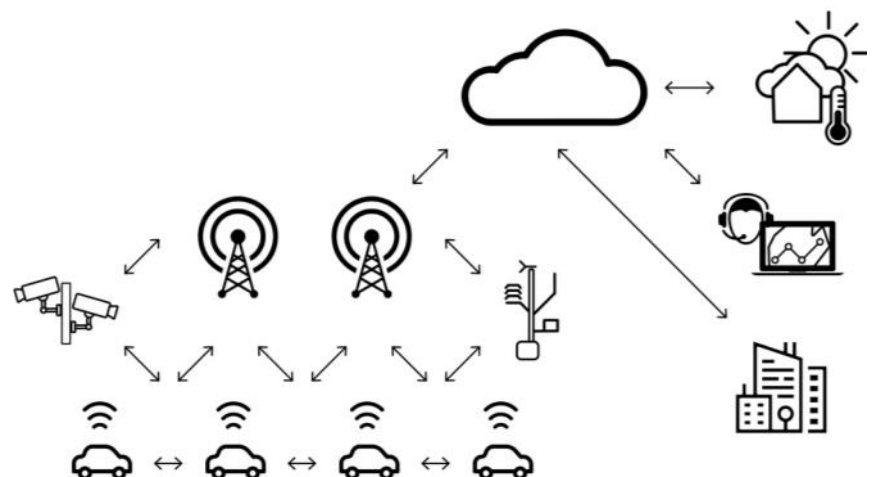

Figure 1—SARWS conceptual architecture

vices are developed on smartphones which offer a de-facto common communication platform. However, such solutions have many drawbacks: the communication system is not designed for road vehicles and not well integrated in the in-vehicle network which causes an increasing number of security issues, and maintains V2X, sensor networks and other communication means in silos. The ITS station reference architecture and Cooperative ITS standards offer the opportunity to change this situation.

One of the important aspects of SARWS research concepts are that all vehicles could take benefit about geo-referenced information, including legacy ones. A system allowing to warn any driver, including autonomous driving, with practically any kind of on-board instrumentation is interesting to many local road authorities in participating countries. In order to employ minimum fleet, scholar buses, heavy truck companies etc. are employed to host measurements. Dedicated sensors embedded in vehicles will also report pollution level, using the same data collection mechanisms. These crowdsourced data will be used to build pollution maps at street level. Such maps may be used by public authorities who may, for instance, impose adaptive traffic restrictions.

Main results

1. Advanced vehicular systems and on-board sensors allow the exploitation of on-board observation data in the road weather services, making them more accurate, real-time and delivered to vehicles exactly when needed.

2. Improved vehicle performance depending on weather conditions by incorporating local meteorological data with on-vehicle measurements provides a concrete link between these two distinct sets of data: the vehicle behavior correlated to certain weather conditions can be quantified to improve vehicle design in future applications, and the vehicle behavior correlated to specific weather phenomena can be used directly to improve real-time weather sensing.

3. High-resolution pollution maps at street level, by combining weather and air quality data with traffic information, it will be possible to update these maps in real-time, and to obtain air quality forecast up to 1 day.

4. Optimize the Quality of Service and Security of V2X communications based on C-ITS standards.

Impact

SARWS will provide innovative solutions for enabling road weather services in a challenging environment. Location-aware, real-time weather services and fine-grained weather models will enhance vehicle performance while contributing to increased road safety.

Industrial partners will exploit project outputs, both products and services, through their commercial channels. The outcomes of the project will contribute to scaling up their business areas through the diversification of its portfolio and core business. Academic partners will further specialize their researchers in the area of the project and will transfer this knowledge to the industry.

About Celtic–Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World" paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the intergovernmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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