

Intelligent Cooperative Integrated System for Road Safety and Road Infrastructure Maintenance

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Abstract : This paper presents the architecture of the "Intelligent cooperative integrated system for road safety and road infrastructure maintenance towards 2020" (ODOS2020) advanced infrastructure, which implements a number of cooperative ITS applications based on Internet of Things and Infrastructure-to-Vehicle (V2I) technologies with the purpose to enhance the active road safety level of vehicles through the provision of a fully automated V2I environment. The primary objective of the ODOS2020 project is to contribute to increased road safety but also to the optimization of time for maintenance of road infrastructure. The integrated technological solution presented in this paper addresses all types of vehicles and requires minimum vehicle equipment. Thus, the ODOS2020 comprises a low-cost solution, which is one of its main benefits. The system architecture includes an integrated notification system to transmit personalized information on road, traffic, and environmental conditions, in order for the drivers to receive real-time and reliable alerts concerning upcoming critical situations. The latter include potential dangers on the road, such as obstacles or road works ahead, extreme environmental conditions, etc., but also informative messages, such as information on upcoming tolls and their charging policies. At the core of the system architecture lies an integrated sensorial network embedded in special road infrastructures (strips) that constantly collect and transmit wirelessly information about passing vehicles' identification, type, speed, moving direction and other traffic information in combination with environmental conditions and road wear monitoring and predictive maintenance data. Data collected from sensors is transmitted by roadside infrastructure, which supports a variety of communication technologies such as ITS-G5 (IEEE-802.11p) wireless network and Internet connectivity through cellular networks (3G, LTE). All information could be forwarded to both vehicles and Traffic Management Centers (TMC) operators, either directly through the ITS-G5 network, or to smart devices with Internet connectivity, through cloud-based services. Therefore, through its functionality, the system could send personalized notifications/information/warnings and recommendations for upcoming events to both road users and TMC operators. In the course of the ODOS2020 project pilot operation has been conducted to allow drivers of both C-ITS equipped and non-equipped vehicles to experience the provided added value services. For non-equipped vehicles, the provided information is transmitted to a smartphone application. Finally, the ODOS2020 system and infrastructure is appropriate for installation on both urban, rural, and highway environments. The paper presents the various parts of the system architecture and concludes by outlining the various challenges that had to be overcome during its design, development, and deployment in a real operational environment. Acknowledgments: Work presented in this paper was co-financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation (call RESEARCH-CREATE-INNOVATE) under contract no. T1EDK-03081 (project ODOS2020).

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