

Dependable Vehicular Communications for Improved Road Safety

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Wireless vehicular networks for cooperative Intelligent Transport Systems (ITS) support cooperative applications that can improve vehicle and road safety, passenger's comfort and efficiency of traffic management. Some of these applications are safety critical and have tight timeliness and throughput requirements. Despite the obvious potential benefits of vehicular communications, designing dependable wireless vehicular networks is a research challenge, due to the high speed mobility and the open nature of such environment.

In the last few years, a research team from "Instituto de Telecomunicações" led the vehicular communications work package of the FP7 project "Intelligent Cooperative Sensing for Improved traffic efficiency", providing the following contributions to the state-of-the-art:

- A flexible ETSI ITS G5 station (IT2S), based on reconfigurable hardware, supporting time-triggered packet transmission and protection, at the medium access control (MAC) layer, against non-compliant on-board units (OBU);
- A TDMA based real-time MAC protocol, the Vehicular Flexible Time Triggered (V-FTT), providing both spatial and temporal redundancy;
- A fault-tolerant network architecture supported by the road-side infrastructure, including techniques to enforce fail-silent behavior and active replication in the critical nodes of the network;
- A Human-Machine Interface (HMI) application, able to present safety events to drivers and passengers and enabling the implementation of the recent eCall system in Europe.

The aforementioned contributions were successfully tested and validated in the field trials conducted in the A5 highway in Lisbon with the collaboration of Brisa and other members of the ICSI consortium. The field trials included the installation of six road-side units (RSUs) placed along the motorway, some vehicles equipped with OBUs and the integration with the ICSI Web and data distribution platforms.



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FIGURE 1

ICSI field trials in A5 motorway in Lisbon.

FIGURE 2

Dependable vehicular network architecture proposed in the scope of ICSI project.

