From Theory to Reality: Testing an Accident Warning System on a Real Highway Scenario

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ABSTRACT
In this paper we will describe recent research that has addressed the particular problem of assessing the performance of Vehicular Ad Hoc Network-based accident warning systems for highway scenarios. The authors of the cited works have shown that it is possible to recreate the conditions that would be experienced in reality implementing a virtual overlay network on top of a few cars. In particular, when testing an accident warning system specifically designed for highway scenarios, it has been possible to experience and observe alert messages that propagated up to 20 km away from the origin.

Categories and Subject Descriptors
C.4 [**Performance of Systems**]: *design studies, measurement techniques, modeling techniques structures.*

General Terms
Measurement, Performance, Design, Experimentation.

Keywords
VANET test-beds; Experiments; Accident Warning Systems.

1. INTRODUCTION
Pollution and accidents are two problems that are often very closely correlated in vehicular environments. In fact, very often pollution levels rapidly rise when an accident occurs on a principal arterial way or on a highway, as many vehicles remain stuck without any available detour. Hence, avoiding or mitigating the effects of accidents is not only beneficial for all those vehicles that are involved, directly or indirectly, in the crash, but also, in general, for the entire ecosystem.

Many have been the initiatives that have looked into the problem of avoiding or also simply minimizing the effects of the occurrence of an accident. One of the prominent ones includes the use of vehicular ad hoc networks (VANETs), networks where vehicles can communicate between each other directly, without the intervention of a communication infrastructure. If VANETs were in place, a vehicle that remained involved in an accident could immediately advertise the event to all those vehicles that were approaching its same area, hence giving those vehicles a chance to: (a) slow down, and, (b) detour if possible. Now, although using VANETs for such scope is very promising, this use case scenario has triggered researchers to find the most efficient way of broadcasting accident information within a platoon of vehicles, to minimize the time taken to inform all vehicles about an event. In fact, the naive solution of requiring vehicles to re-broadcast such information as soon as they receive it is not efficient, as such strategy would lead to the well-known "broadcast storm" problem, a situation where vehicles interfere between each other and hence prevent the successful delivery of an alert message. It has been shown that the optimal strategy for the delivery of an alert message in a two-dimensional highway scenario is through the *farthest-spanning* relay, i.e. the relay that can retransmit that message farthest away in space [1].

Until very recently, however, all the research that has been carried out in this domain tested the efficacy of new accident alert distribution systems solely using simulation experiments, as it is hard to assemble significant VANETs composed of more than just a few cars. Very recently we have broken such limitation, showing that it is still possible to verify the performance of an accident warning system thought for highway scenarios just using a few vehicular and computational resources [2]. In fact, as reported in [2], we have been able to observe an average of 12.5 hops travelled by each alert message, corresponding to an average distance of 1.1 km.

2. REFERENCES
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