



Tutorial Proposal for ISCC 2009

A Tutorial Title

Cooperative Vehicular Communication: A Top-Down Overview

B Instructor

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C Abstract

There are several emerging applications that are specific to vehicular wireless networks. For instance, safety applications would make driving safer; driver information services could intelligently inform drivers about congestion, and businesses and services in the vicinity of the vehicle. To be supported efficiently, new communications protocols have to be developed and standardized. These protocols concern all layers from physical to application layer and they are expected to provide both vehicle-to-vehicle and vehicle-to infrastructure communications. The goal of this tutorial is to give a deeper and up-to-date technical analysis of wireless vehicular communications. After giving the motivations and applications of vehicular communications, this tutorial will emphasize on technical challenges and trends as well as recent development on standardisation activities and existing prototypes and research projects.

D Scope & Objective

This tutorial is rather a top-down in-depth study of one topic namely wireless vehicular communications. Understanding the technical challenges behind enabling vehicular communications is the main scope of the tutorial. Participants working on the topic or willing to start working on it will learn the required technologies and protocols to enable wireless communications between vehicles and between vehicles and infrastructures. Furthermore, participants will learn on-going research projects and standardization bodies related to wireless vehicular communication. Technical discussions will focus on the WAVE and

802.11p emerging standards and on (geo)broadcasting techniques proposed mainly for safety applications. Routing and data dissemination delay-tolerant vehicular networks will be also addressed. A special attention will be given for the identification of available tools useful for the development and performance evaluation of communication protocols for wireless vehicular networks.

E Motivation

Vehicular wireless communication is gaining an increasing interest in the last few years. Indeed, several research conferences and workshops have been dedicated for vehicular communications (ACM VANET, WiVEC, Infocom MOVE, UBIROADS, MoveNet, etc.). Additionally, several standardisation bodies and initiatives have been initiated such car-to-car communication consortium (C2C-CC) in Europe and Vehicular Infrastructure Initiative (VII) in USA. Recently a technical committee focusing on Intelligent Transport Systems (ITS) has been created at ETSI to develop standards for intelligent transportation.

We believe that this tutorial will bring to the attendees an up-to-date knowledge about the recent advances of vehicular communications.

F Intended Audience

Broad audience including students and researchers, engineers in the public and private sectors working in the broad area of wireless telecommunications and interested in an extensive technical overview of wireless vehicular communications and the future technical evolution and applications of this new challenging environment.

G Prior History

The same tutorial has not been given by the instructor before. The instructor gives a lecture on vehicular communication for Master students at EURECOM in which he covers some aspects of those addressed in this tutorial.

H Outline

The content of this tutorial is structured as follows:

- Motivations and applications of vehicular communications
- Standardization activities and research projects
- Physical and MAC Layers for VC: DSRC, WAVE, and 802.11p
- WAVE propagation channel modelling
- Mobility models and tools for vehicular communications
- (Geo)Routing and data dissemination
- (Geo)Broadcasting techniques
- Reliable transport in VANETs
- Vehicular delay-tolerant networks
- Open research issues

I Biographical Sketch

Fethi Filali received his Computer Science Engineering and DEA degrees from the National College of Informatics (ENSI) in 1998 and 1999, respectively. At the end of 1999, he joined the Planète research team at INRIA (National research institute in informatics and control) in

Sophia-Antipolis to prepare a Ph.D. in Computer Science which he has defended on November 2002. During 2003, he was an ATER (Attaché Temporaire d'Enseignement et de Recherche) at the Université of Nice Sophia-Antipolis (UNSA) and he joined on September 2003 the Mobile Communications department of Institut Eurécom in Sophia-Antipolis as an Assistant Professor. He is/was involved in several French-funded (Dipcast, Constellation, Rhodos, Cosinus, Airtel, WiNEM) and IST FP6/7 (Widens, Newcom, Daidalos, E2R, Multinet, Unite, Chorist, iTetris, Newcom++) projects. In the context of some of these projects, he designed and developed an open, flexible and efficient architecture for the support of heterogeneous radio technologies. This architecture was integrated in Eurecom's wireless software-radio platform. His current research interests include WIMAX (802.16)-related communication mechanisms, QoS support in IEEE 802.11-based networks, sensor and actuator networks (SANETs), vehicle adhoc networks (VANETs), routing and TCP performance in wireless networks. He served as a technical reviewer of several international conferences and journals. Additionally, he is a member of IEEE and IEEE Communications Society. In April 2008, he was awarded the «Habilitation à Diriger des Recherches» from the University of Nice.

Sophia-Antipolis for his research on wireless networking. For more information, please visit Fethi Filali's web page at <http://www.eurecom.fr/~filali> for teaching experience and publications. A detailed CV is available at http://www.eurecom.fr/~filali/cv/cv_fethi_filali.pdf