Car-to-Car Communication

Abstract

Car-to-car communication aims at increased driving comfort and safety. Moreover, it changes the role of vehicles from mere transportation means to “smart objects”. Despite many R&D activities in the last years, this technology still poses multiple challenges on the wireless transmission and network protocols. Aspects like efficient message dissemination, network scalability, and information security mechanisms are still major research areas in the area of vehicular ad hoc networks. In this paper we present the potential of future car-to-car and car-to-environment communication systems, introduce the major research challenges in this field, and provide a selection of current research results.

Introduction:

In the last couple of years communication between vehicles has attracted the interest of many researchers around the world. In the European Union some research projects look into the potential of reducing road fatalities under the eSafety initiative (e.g. GST, PreVent). The same is true in other countries like the USA or Japan. Car-to-car communication (C2CC), often referred to as vehicular ad hoc networks (VANETs), enables many new services for vehicles and creates numerous opportunities for safety improvements. Communication between vehicles can e.g. be used to realize driver support and active safety services like collision warning, up-to-date traffic and weather information or active navigation systems. However, besides enabling new services VANETs pose many challenges on technology, protocols, and security which increase the need for research in this field. VANETs have similar characteristics as mobile ad hoc networks, often in the form of multi-hop networks. Due to the high mobility of nodes network topology changes occur frequently. All nodes share the same channel leading to congestion in very dense networks. The decentralized nature of VANETs leads to the need for new system concepts and information dissemination protocols. In addition, new approaches for data and communication security have to be designed to fit the specific network needs and to guarantee reliable and trustworthy services. Technologically, a number of more general questions have to be answered. These

include decision on the wireless communication standard to be used and message dissemination schemes capable of exchanging messages in many different network scenarios. Not independent from this, issues like quality of service (QoS) and high speed real-time communication will have to be tackled to enable on-the-fly collision warning or autonomously driving vehicles. The second important area of interest is the services and applications enabled through C2C communication. As will be shown later, the design and provisioning of attractive car-to-environment or car-to-infrastructure services is crucial for the successful market introduction of C2CC systems.