Performance Analysis of WiFi Direct for Vehicular Communication

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Declaration

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Abstract

Vehicular communication is the key enabler of intelligent transport services (ITS). Vehicular ad-hoc networks can be considered to be the integral component of such communication. The state of art dedicated short range communication (DSRC), which is a technology defined for vehicular communication, requires dedicated hardware. This hinders the penetration of ITS, especially in developing countries. In this thesis, we focus on analyzing the feasibility of using Wi-Fi Direct (WD), which is readily available on many smartphones, as an alternative communication technology for VANETs.

We simulate VANETs using DSRC and WD with the help of network simulator NS3 and traffic simulator SUMO. We validate our model first using existing results, and perform simulations to evaluate the performance of both single and multi-hop communications. Metrics such as throughput, end-to-end delay, packet receiving/loss ratios for both WD and DSRC are considered.

As expected, DSRC demonstrates a better performance with regards to most of the measured parameters. However, we observe that the performance of WD is not drastically inferior. Delays is the most crucial performance measure in a VANET. Experiments with different WD modifications show that the delays in WD based VANETs can be reduced by modifying the WD protocol. As a whole, our results indicate the potential of WD as an alternative communication technology for VANETs. Several performance gaps are identified and suggestions are provided in order to enhance WD and bridge those gaps.

Index terms— Wi-Fi Direct, Dedicated short range communication, Vehicular ad-hoc networks.

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List of Abbreviations

Abbreviation	Description
DSRC	Dedicated Short Range Communication
VANET	Vehicular ad-hoc networks
OBU	On Board Unit
RSU	Road Site Unit
WPS	Wi-Fi protected setup
DHCP	Dynamic Host Configuration Protocol
P2P	Peer To peer
CTS	Clear to send
RTS	Request to send
ACK	Acknowledgement
UDP	User Datagram Protocol
TCP	Transmission Control Protocol
IP	Internet protocol