An Efficacy of Transmission Power on DYMO Routing Protocol in VANET

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***Abstract*— A Vehicular Ad hoc Network (VANET) is made up of groups of moving or stationary vehicles that are linked by a wireless network. It arose from the concept of creating an automobiles network to achieve a specific need or situation, such as Intelligent Transport System (ITS) and smart cities. VANET are now recognized as reliable network that vehicles are used for communication on highways and in cities. Basically, when the vehicles communicate with one another directly is known as Vehicle to Vehicle (V2V), or it can communicate with Infrastructure or a Road-side Unit (RSU so it is called Vehicle to Infrastructure (V2I) and Vehicle to Everything (V2X). This paper presents the evaluation of Dynamic MANET On-Demand (DYMO) routing protocol for a vehicular network with a single RSU in order to elaborate the influence of different transmission power values on QoS parameters. The simulation results are obtained using OMNeT++ with INET and Veins frameworks communicate with a SUMO traffic road simulator to implement DYMO. The findings depict a good foundation for researchers in evaluating the efficacy of transmission power of the vehicles on the QoS metrics of DYMO routing protocol in terms of packet delivery ratio, normalized routing load, and throughput in a VANET environment.**

***Keywords*— VANET, DYMO, OMNET, Veins, Sumo, QoS.**

I. Introduction

VANET is an abbreviation for Vehicular Ad hoc Network, a subset of a wireless multi-hop wireless network with the restriction of rapid topology changes due to high node mobility. It supports a wide range of applications, including collision avoidance, blind crossing, consistency, real-time traffic condition, dynamic route scheduling, monitoring, and so on [1, 2].

Vehicles and infrastructure communicate and exchange critical information about traffic situations, road conditions, and many other topics. Vehicles can communicate directly with one another vehicle to vehicle (V2V) or through road-side unit (infrastructure) vehicle to infrastructure (V2I) and with vehicle and road-side unit at same time vehicle to Everything (V2I) [3, 5].

As technology evolves and the number of smart vehicles increases, VANETs face several technical challenges in development and management due to decreased flexibility, scalability, poor connectivity, and insufficient intelligence.

Routing protocol optimization is one of the important challenges in VANETs for information transmission and due to the rapid and constant changes in network topology. As a consequence, various studies have focused on developing appropriate routing protocols to deal with the highly dynamic nature of VANET [6, 7].

The transmission power in vehicles is an important factor which identifies the vehicle transmission range.

The goal of this paper is to investigate the effect of transmission power performance for various density and speed of vehicles by using Dymo (Dynamic Manet On-Demand) routing protocol. The rest of paper is organized as follows: Section 2 introduces related work. The VANET communication types, characteristics and routing protocol are presented in Section 3. In Section 4, the proposed methodology is defined and its results analysis in Section 5. Finally, Section 6 summarizes the conclusions and future work.

II. Relaterd Work

A remarkable number of studies have been conducted on comparing and evaluating the performance of VANET network routing protocols. Table 1 summarizes some recent studies in this field that have evaluated the vehicular network performance using various simulators and investigated the effect of different network parameters such as traffic density, speed, pause time, packet size, communication range, and traffic distribution on different VANET routing protocols.

TABLE I. Existing Related Works

Research	Simulator	Routing Protocol	QoS Metrics
Ref. [8]	OPNET	AODV and DSR	Throughput and Delay
Ref. [9]	NS-2	AODV, DSDV, OLSR, GPSR, and GPCR	Routing overhead, E2E delay, and Throughput
Ref. [10]	QualNet	DYMO and OLSRv2	E2ED, throughput, packet delivery ratio (PDR), and jitter.
Ref. [11]	NS-2	AODV, AOMDV, DSDV, and DSR	Average throughput, packet loss ratio (PLR), and PDR
Ref. [12]	OMNeT++	AODV and GPSR	E2E Delay, Packet Drop Ratio, PDR, Throughput.
Ref. [13]	NS-3	AODV, DSDV, and OLSR	PLR, packet overhead and throughput
Ref. [14]	OMNeT++	AODV, DSDV and DYMO	Average trip time and latency
Ref. [15]	NS-3	AODV, OLSR, DSR, and DSDV	PDR, overhead and throughput
Ref. [16]	NS-3	AODV, OLSR, DSDV, GPSR, MM-GPSR and GPSR-M.	PDR, PLR, Mean Hop Count, Av. E2EDelay, throughput and jitter.
Our Study	OMNET++	DYMO	PDR, PLR, Routing overhead, and Throughput

Accordingly, this paper investigates the effect of transmission power in the Dymo routing protocol using two different scenarios based on network density and vehicles