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Appraising Vehicular ADHOC Networks Routing Protocols Using NS2

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Abstract

Vehicular ad-hoc networks (VANET) are a subset of Mobile Ad-hoc Networks which have acknowledged considerable responsiveness in many vehicular developments and manufacturing clusters. In this paper, we have been simulated the Dynamic Source Routing Protocol (DSR) and Destination Source Distance Vector routing protocol (DSDV) over Ad hoc on Demand Distance Routing protocol (AODV). These performances have been evaluated in a vehicular environment using Network Simulator 2 (NS2).The Mobility model of Vehicular Adhoc Networks has a significant effect on simulation results. These three ad hoc routing protocols adopted for Vehicular Adhoc Networks are evaluated in both city and highway scenarios. In this paper, the results have been taken and compared using the performance metrics such as packet delivery ratio, end-to-end delay, and throughput. IEEE 802.11 b standards are used for the communication of VANET.

Keywords: Vehicular Ad hoc Networks (VANET); Routing Protocols; Network Simulator 2 (NS2)

1. Literature Survey

Yasser Kamal Hassan et al[1] states a variety of routing protocol were targeted specifically at this environment. Performance evaluation of protocol for MANETs, the realistic conditions were tested. Comparing the performance of protocols for routing between wireless mobile host in an ad-hoc network. Observation made from this simulation is that AODV based on Standard Distance Vector Algorithm maintains the route cache. Route discovery mechanism is initiated when a route to new destination is needed by broadcasting a Route request Packet(RREQ).

Samir et al[2] stated On demand routing protocols use much lower routing load, especially with small number of peer -to- peer conversations. The traditional link state and distance vector protocols provide better packet delivery and end to end delay. Computing nodes deployed in a mobile ad hoc environment can be low power and small size devices.

Vaishali D.Khairnar et al[3] compared the ad hoc routing performance for vehicular nodes using MOVE, which is using random waypoint models. The results have been obtained from moving random waypoint model. Movements of vehicles depend upon static configuration which is derived in the Vehicle Movement Editor. Mobility model is generated off-line and it is used by Network Simulator.

Mohamed Abbas et al[4] have been compared, analyzed and examined with various mobility models. Evaluation was done by the metric which is a packet delivery. This paper has been used for the development of various mobility models. Several other mobility models are compared with DTMM. Simulation results shows better packet delivery ratio.

Mitul.K.Patel[5] mentioned the various mobility models available for VANET and comparison of network and traffic simulators. Many VANET simulators are consists of both mobility component and networking component .Only VANET simulator support hybrid simulation.

2. Routing Protocols

In this paper we have been chosen the performance evaluation with topology-based protocols DSR (Dynamic Source Routing Protocol)[8], DSDV (Destination Source Distance Vector)[9] over AODV (Ad hoc on Demand Distance Routing)[10].

2.1 Dynamic Source Routing

When a source node wants to send a packet to a particular destination it checks route cache. A host dynamically discovers a route only when it needs to send a packet through that route. No periodic routing message.DSR only monitors the operation of the route which is in use.

2.2 Destination Source Distance Vector

Distance Vector uses the principle of distance effect in which the location tables update frequency is determined by the distance of the registered nodes. DSDV is a Distance Vector Protocol and it triggers an update when the network is changed.

2.3 Ad hoc on Demand Vector

Whenever a source node has to communicate with a destination node such that it has no routing information in its table it first initiates route discovery process. Each host maintains a traditional routing table, one entry per destination.

3. Performance Evaluation Metrics

By using NS2 (Network Simulator) we evaluated the performance of routing protocols.Network Simulator (NS) is a simulation tool targeted at both wired and wireless (local and satellite) networking research. Metrics such as Packet Delivery Ratio,Throughput and End to End Delay.

3.1 Packet Delivery Ratio

Packet delivery ratio is defined as the ratio of data packets received by the destinations without fail. Mathematically, it can be defined as:

$$PDR = Sa / Sb \quad (1)$$

Where
Sa = sum of data packets received by the each destination
Sb = sum of data packets generated by the each source

3.2 Throughput

Amount of work done is referred as throughput. The number of bits delivered successfully per second to the destination. It is represented in kilo bits per second (kbps). Mathematically, it can be defined as:

$$Throughput = N/1{,}000 \quad (2)$$

Where
N= the number of bits received successfully by all Destinations.

3.3 End- to End Delay

End to End refers both loss time and receive time. Delay refers as how long it takes to reach. Mathematically, it can be defined as:

$$Average\ end\text{-}to\text{-}end\ delay = S/N \quad (3)$$

where
S= sum of time spent to deliver packets for each destination
N= number of packets received by the all destination nodes.

4. Tables and Graphs

4.1 Tables

Some of the parameters and values of this project are tabulated below:

Table 1: Simulation Parameters.

Parameters	Values
Simulation time	1,500 seconds
Simulation area	1000 m × 1000m
Packet rate	8 packets/sec
Node pause time	60
Bandwidth	2Mbps
No. of vehicles	10 to 80
Routing protocols	AODV, DSR and DSDV

4.2 Graphs

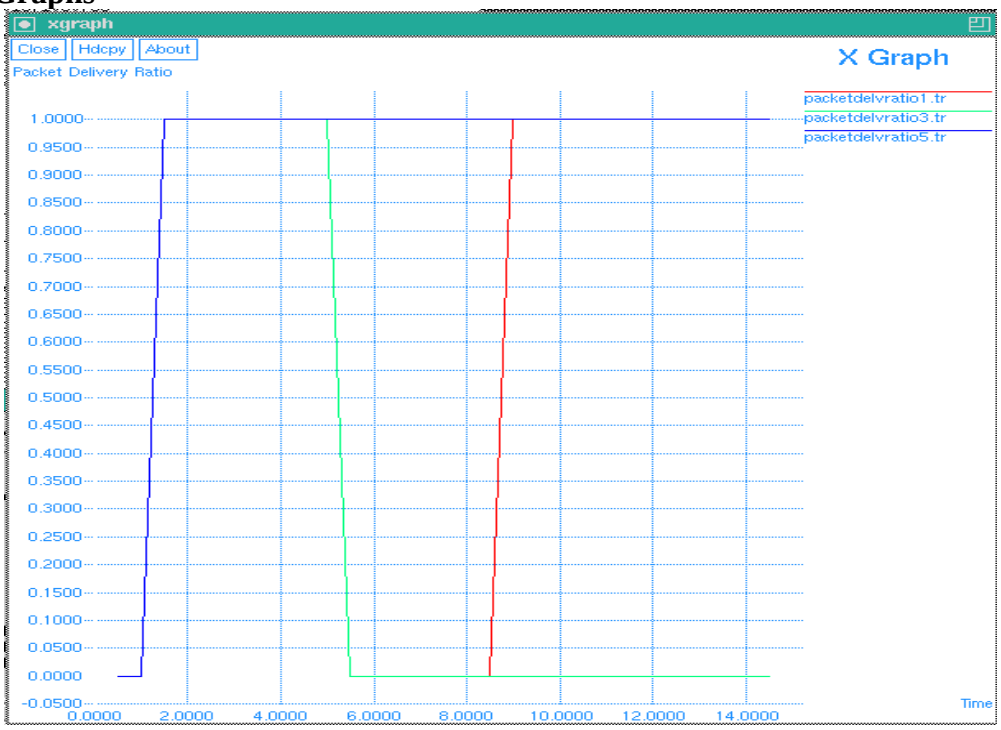

Fig. 2: Packet Delivery –Highway AODV/DSR/DSDV.

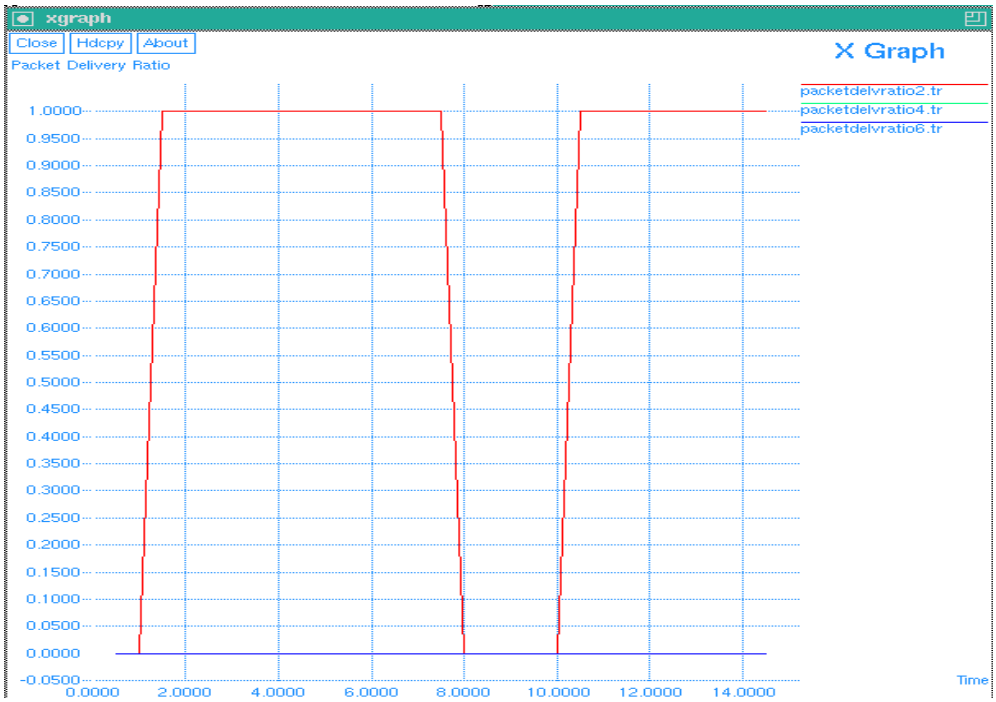

Fig. 3: Packet Delivery-City.

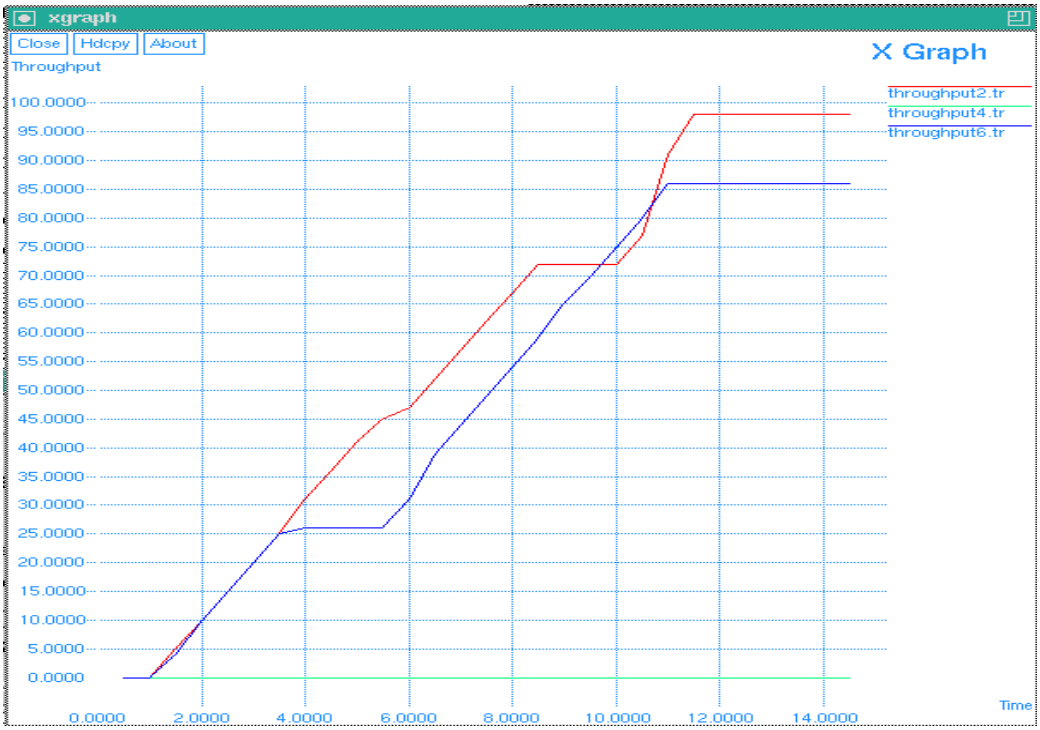

Fig. 4: Throughput-City.

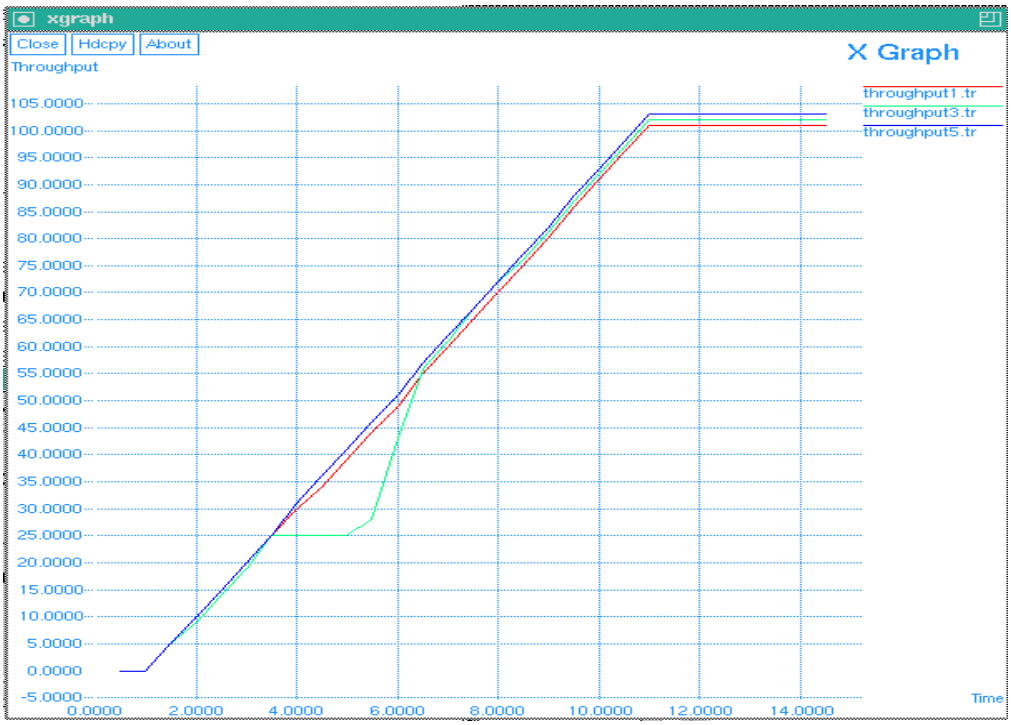

Fig. 5: Throughput – Highway.

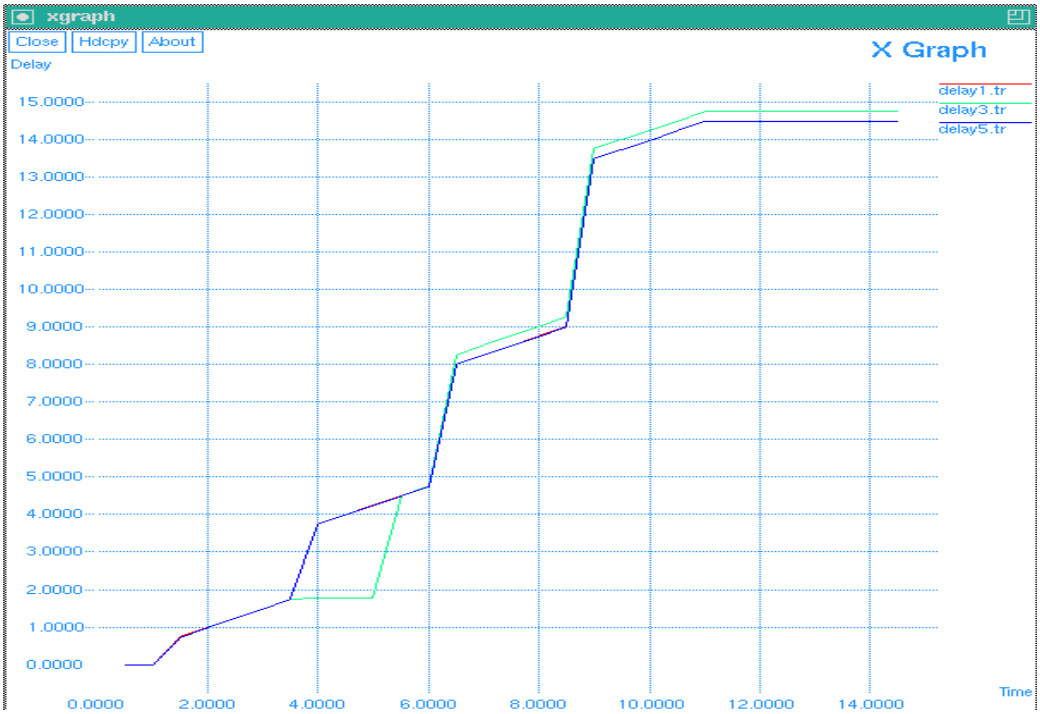

Fig. 6: Delay-City.

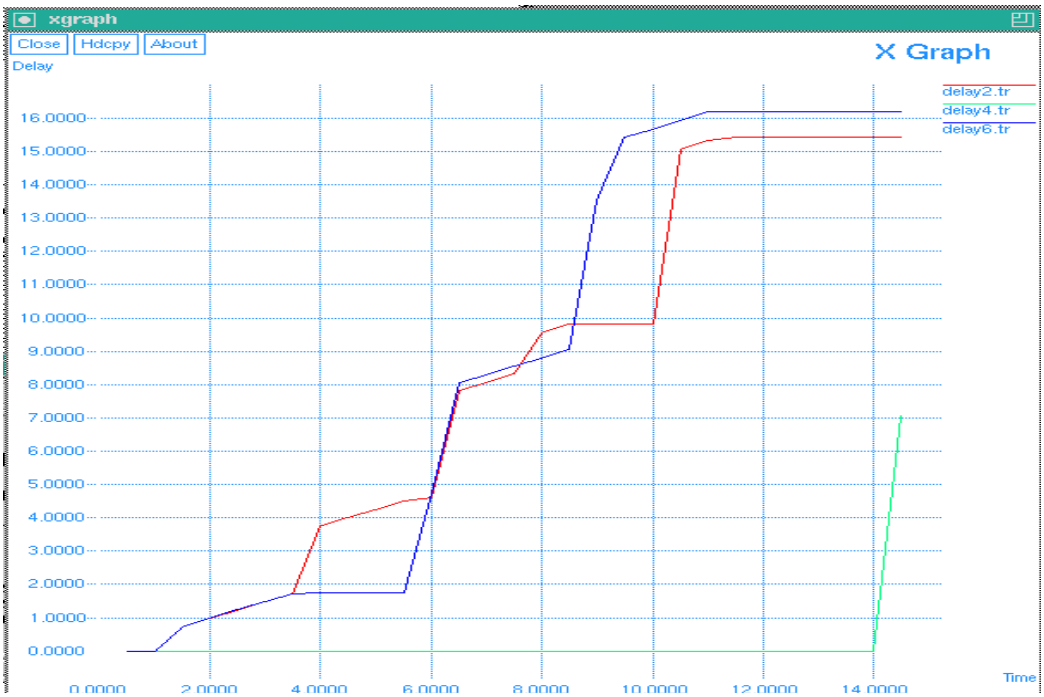

Fig. 6: Delay-Highway.

5. Conclusion

In this paper the performance of three routing protocols AODV, DSR and DSDV were evaluated for vehicular ad hoc networks in city and highway scenarios. Mobility model has significant effects on the standard performance evaluation of the ad hoc routing protocols. The three protocols were tested against node density for various metrics.

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