Analysis AODV, DYMO and OLSR Protocol with Uniform Pause & Speed Type over CBR&FTP Connections In Vehicular Ad Hoc Network

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Abstract **-**Over the last years vehicular Networks are receiving lots of attention as a result of the big variety of services they can give. VANETs could be a sort of mobile ad hoc network providing communications among close vehicles also as between vehicles and close fastened instrumentality, sometimes delineate as edge instrumentality. Vehicles are becoming "computer networks on wheels" and acts as mobile nodes of the network. In previous couple of years several ideas of ad hoc routing protocols are planned and enforced during this area to enhance three main functionalities, route discovery, maintenance and choice of the economical path from the varied available methods however the extremely dynamic mobility patterns of vehicles could influence the protocols performance and relevancy that shows the unsuitability of the prevailing mobile ad-hoc network (MANET) routing protocol for VANET. The reconstruction of existing protocol or introducing new plan of routing in VANET setting are going to be a milestone and also the performance evaluation are going to be a pleasant approach towards that during the present paper, it have a tendency to compare and evaluate the performance of following routing protocols: AODV, DYMO and OLSR with Uniform Pause & Speed type Over CBR and FTP Connections. The Simulation studies area measure conducted using Qulalnet 6.1.

Keywords: VANET, routing protocol, CBR, FTP, performance

1. Introduction

Over the last decades, current advancement into wireless network has led to the introduction of a new variety of network called vehicular network. The vehicular ad hoc network (VANET) may be a special and difficult category of mobile ad hoc network (manet) that change the wireless communication in moving vehicle set. And in between the vehicle to road aspect units. In VANET every vehicle behaves as a mobile node and every node acts each because the host also because the router. The nodes that are within the communication vary of every alternative will directly communicate between them. But, if a source node needs to send information to a destination node that is outside of its communication range, therein case it has to forward the information packet through intermediate nodes. However, VANET may be a taxonomic category of MANET however the network nodes in VANET moves in predefined road path and speed have an effect on the constellation. In VANET, high speed and mobility create routing even more difficult in VANET and shows the difference from manet. Schematic illustration of a vehicular Ad hoc Network present in figure.1

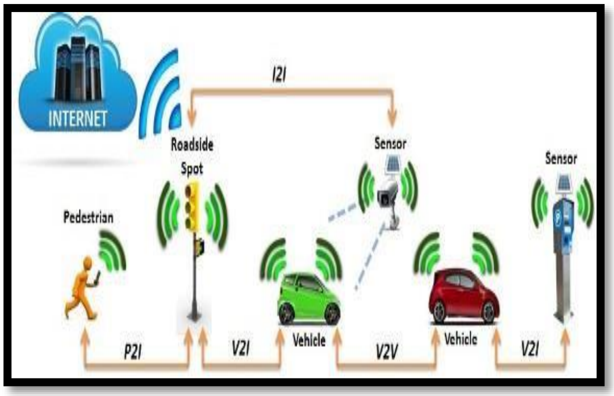

Fig.1: Vehicular ad hoc network

II. Routing and AD-HOC routing protocols for VANET

In straightforward definition, a routing protocol may be a set of rules utilized by routers to dynamically advertise and learn routes, determine that routes are available and that are the foremost economical routes to a destination. In VANET every node acts both because the host similarly because the router. The nodes that are inside the communication vary of every alternative will directly communicate between them. But, if a source node needs to send information to a destination node, that is outside of its communication vary, in this case it has to forward the information packet through intermediate nodes. Routing information between the source and destination vehicle depends on the routing protocols being employed in vehicular ad-hoc network. Nowadays all major vehicle companies focus during this area for reducing communication problems in between vehicles [1]. Several researchers have given their contribution during this area of research like DRIVE, Fleet Net. However, Routing in vehicular ad hoc network is taken into account a difficult task attributable to the forceful and unpredictable changes within the configuration ensuing from the random and frequent movement of the nodes and because of the absence of any centralized node control. The analysis of the routing protocol degrades with speed and size of the network. VANET deploys the conception of unceasingly variable vehicular motion. Nodes will move around with no boundaries on their way and high speed. This arbitrary motion of vehicles poses new challenges to researchers in terms of planning a protocol set a lot of specifically for VANETS.

A. AODV

Ad-Hoc On-Demand Distance Vector (AODV) protocol combines some property of each DSR and DSDV routing protocols with significant variations. The route discovery mechanism of AODV is comparable to DSR and routing table of AODV with destination sequence numbers is comparable to DSDV [2]. It is reactive routing protocol that establishes route ondemand in source to destination node and does not need maintaining routes to node that are not act. It has the power of unicast & multicast routing and use routing tables for maintaining route information. during this algorithmic program the sender node send a Route Request (RREQ) message to its neighbors for route discovery and when establishing route if any link failure occur than node send .information to its upstream neighbor in type of Route Error (RRER) message. This method execute until sender node not receive the data of failure link, when receiving message sender node resend another RREQ message to seek out new route [2]. The AODV has the advantage of building on-demand route in between supply and destination node with the lower delay in association setup and does not need much memory for communication however there are many disadvantage with this protocol like if the source node sequence variety is incredibly previous than the intermediate nodes will cause route inconsistency. Serious control overhead if there has multiple route reply packets for one route request packet. It consumes further information measure due to periodic beacon.

B. DYMO

Dynamic manet on Demand Routing Protocol (DYMO) is used both as proactive and reactive routing protocol as in it routes is discovered once required. In DYMO [3], a special Route Request (RREQ) message is broadcast and every RREQ keeps on ordered list of all nodes it passed through. thus each node receiving an RREQ message will instantly record a route back to the origin of the message, once a RREQ message reach its destination, a Routing Reply (RREP) message are instantly routed back to the origin indicating that a route to the destination was found. As before long because the RREP message reaches its destination a two-way route is with success recorded by all intermediate hosts and exchange of information packets will begin.

C. OLSR

An OLSR is a protocol that is proactive Optimized Link State Routing Protocol Designed for mobile and vehicular ad hoc networks (MANETs and VANETs) that show low information measure and high mobility. OLSR can be a type of classical link-state routing protocol, that depends in using an

efficient periodic flooding of control data exploitation special nodes that act as multipoint relays (MPRs). The use of MPRs reduces the quantity of needed transmissions [30]. OLSR daemons periodically exchange completely different messages in order to take care of the topology data of the whole network within the presence of mobility and un success data. The core functionality is performed in the main by exploitation three completely different types of messages: hello, topology control
(TC), and multiple interface declaration (MID) messages [3].

III. Connection Patterns

There are many forms of association patterns are presents in VANET. These patterns describe however the information is transmitted from source node to destinations node. The current paper has use CBR and FTP for the simulation purpose.

A. Constant Bit Rate (CBR)

CBR generates constant traffic throughout the simulation, wherever there is an inherent reliance on time synchronization between the traffic source node and destination node. Cbr is customized for any sort of knowledge that the end-systems need inevitable latent period and a static amount of information measure continuously obtainable for the life-time of the association. there is no assurance that knowledge with success reached at destination node due to cbr association is establish in a technique direction like from supply to destination therefore there no acknowledgment from destination for confirming the information transmission.

B. File transfer protocol (FTP)

Other forms of traffic, besides CBR, are examined; particularly FTP traffic. FTP is an application layer protocol. Nevertheless, they are studied severally, i.e. one form of traffic exists within the network in every simulation, whereas in present paper study FTP and nonspecific application traffic exist within the network. The research work examines DYMO, AODV and OLSR once FTP traffic coexists within the network with different non specific application traffic, like CBR or traffic bursts. FTP traffic coexists with non-specific application traffic. Within the second, large files are transferred from the source node to every of the destination nodes using FTP throughout the entire simulation [4].

IV. Simulation Parameters and Performance Metrics

In analysis of the performance of original AODV, DYMO and OLSR routing protocol it has a tendency to use the Qualnet in its version 6.1. Each nodes use a random waypoint mobility model and traveling at an area of speeds over a 1200 x 1200 meters area for 300 seconds of simulated time. The present paper has a tendency to used same situation for all protocols due to unique behavior of every protocol to provide the output. The simulation parameters are shown in Table 4.1

Table 4.1 Simulation parameters

Parameter	Value
Number of nodes	15, 30, 45, 60, 75
Simulation time	300 sec.
Channel type	Wireless channel
Pause time	2.0
Pause type	Uniform
Environment size	1200*1200
Traffic size	FTP & CBR
Packet size	512 bytes/sec.
Maximum speed	10.0 sec
Minimum speed	5.0 sec
Simulator	Qualnet 6.1
Mobility model	Random way point
Antenna type	Omni directional
Routing protocol	AODV, DYMO and OLSR
Network	IPV6
Packet generation rate	80 kbps
Mac protocol	IEEE 802.11e

A. Performance Metrics

There are many performances metric at which routing protocols may be evaluated for network simulation. We have a tendency to use the performance metrics in present simulation purpose are: Packet delivery ratio, Throughput, end to end delay and normalized routing overhead.

PDR- The ratios of packets received at the destination node to those of the packets generated by the source node. As of relative amount, the standard calculation of this method of measure is in percentage (%) form. Higher the percentage, a lot of privileged is that the routing protocol.

$$PDR = \frac{\sum N_R}{\sum N_G} \times 100$$

$$N_R - \text{number of received packets}$$

$$N_G - \text{number of generated packets}$$

Throughput- The throughputs of the protocols are going to be outlined because it is that the percentage of the packets received to packet sent from by source to destination. It is the amount of data per measure that's delivered from one node to a special via a communication link and is measured in bits/second.

$$throughput = \frac{\sum P_R}{\sum t_{st} - \sum t_{sp}}$$

$$P_R - \text{received packet size}$$

$$t_{st} - \text{start time}$$

$$t_{sp} - \text{stop time}$$

End-to-End Delay- It is the calculation of typical time taken by packet to cover its journey from the source to the destination end. In different words, it covers all of the potential delays like route discovery, buffering processes, varied middle queuing stays, etc, throughout the complete trip of transmission of the packet. And the unit of this metric is millisecond (ms). For this metric, lower the time taken, a lot of privileged the routing protocol is taken into account.

$$\text{End to end delay} = \sum t_{pr} - \sum t_{ps}$$

$$t_{pR} - \text{received packet time}$$

$$t_{ps} - \text{send packet time}$$

Normalized Routing Load - Normalized routing load is that the variety of routing packets transmitted per data packet sent to the destination. Additionally every forwarded packet is counted collectively transmission. This metric is additionally extremely related with the number of route changes occurred within the simulation.

V. Simulation Results and Discussion

The performance of designated routing protocols AODV, DYMO and OLSR has been analysis with uniform pause and speed type in term of CBR and FTP traffic below five totally different situations of 15, 30, 45, 60 and 75 nodes. The research works tend to measure the result in terms of packet delivery ratio (PDR), throughput, average end to end delay (E2E Delay) and normalized routing overhead [5]. The simulation results have shown by graph as follows:

A. *Packet Delivery Ratio (PDR)*

Table 5.1

Protocol	AODV		DYMO		OLSR	
No. of nodes	CBR	FTP	CBR	FTP	CBR	FTP
15	92.66	67.04	93.00	91.56	60.45	93.24
30	96.83	85.47	92.50	80.0	67.5	80.11
45	95.66	45.79	94.66	17.98	70.5	91.75
60	85.3	99.24	94.35	92.58	55.8	75.56
75	97.46	95.55	92.65	90.42	51.6	85.23

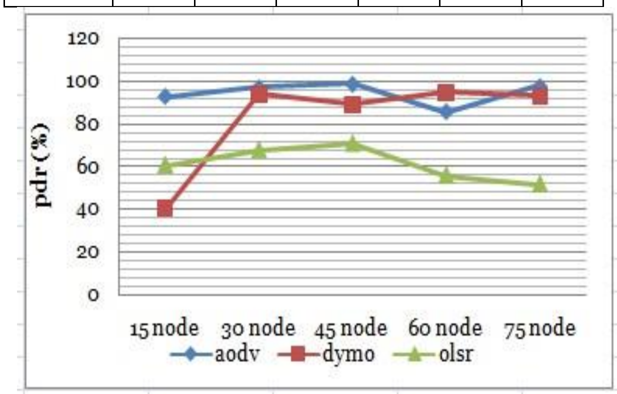

Fig.5.1 Analysis AODV, DYMO and OLSR on base of PDR with CBR traffic

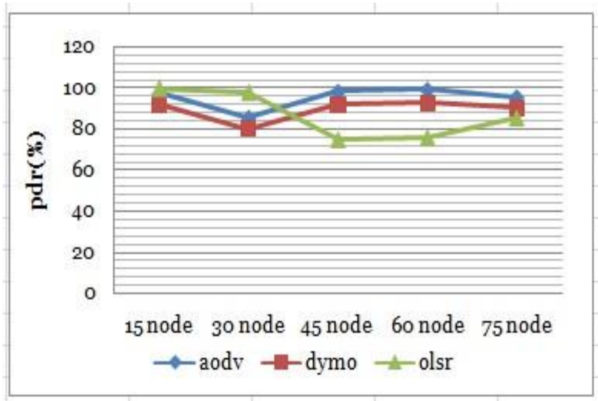

Fig 5.2 Analysis AODV, DYMO and OLS on base of PDR with FTP traffic

The figure 5.1 and figure 5.2 clearly indicates that the AODV routing protocol outcomes is best with the cbr traffic. But within the low node situation i.e. 15 node situation it perform higher with the FTP traffic however with all different network situations the protocol outcomes higher with the cbr traffic. AODV protocol performs higher as compared of different two selected routing protocols in such network surroundings. But DYMO manufacture poor result with low traffic scenarios like 15 and 30 nodes eventualities however with medium and high traffic network scenario with each cbr and FTP traffic the DYMO protocol perform well as compared of OLSR routing protocol. The performance of OLSR is best from DYMO in low traffic however not important or will say lesser from the result of AODV routing protocol performance with each cbr and FTP traffic.

B. Throughput

Table 5.2

Protocol	AODV		DYMO		OLSR	
No. of nodes	CBR	FTP	CBR	FTP	CBR	FTP
15	71.07	215.46	82.13	392.07	42.13	257.58
30	80.37	392.60	78.45	276.73	57.96	310.59
45	79.44	313.70	79.96	313.70	58.33	323.92
60	92.75	365.50	80.97	320.80	85.63	329.80
75	75.96	300.60	72.63	311.90	67.85	350.60

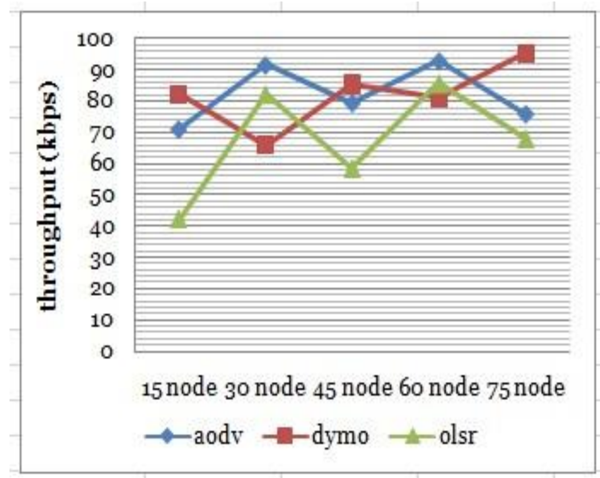

Fig 5.3 Analysis AODV, DYMO and OLSR on base of throughput with CBR traffic

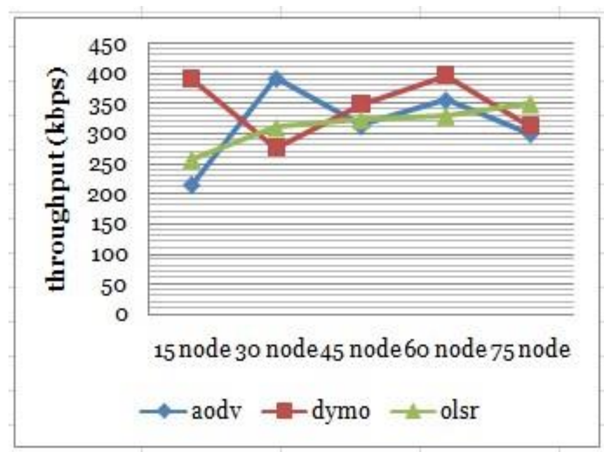

Fig 5.4 Analysis AODV, DYMO and OLSR on base throughput with FTP traffic

The throughput of research routing protocols on the base of CBR and FTP traffic shows in table 52. The result shows the network throughput is more significant in FTP traffic. When it is compare the results at the base of protocols than DYMO present the significant results in comparison of another routing protocols.

C. End to end delay

Table 5.3

Protocol	AODV		DYMO		OLSR	
No. of nodes	CBR	FTP	CBR	FTP	CBR	FTP

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15	0.7271	0.44413	0.17408	0.8492	0.8520	0.8718
30	0.9728	0.82940	0.28410	0.6120	0.9619	0.6012
45	0.13312	0.80533	0.16384	0.7124	0.7181	0.7675
60	0.6823	0.75460	0.9054	0.9526	0.9851	0.8134
75	0.7235	0.63450	0.9523	0.7048	0.7265	0.8652

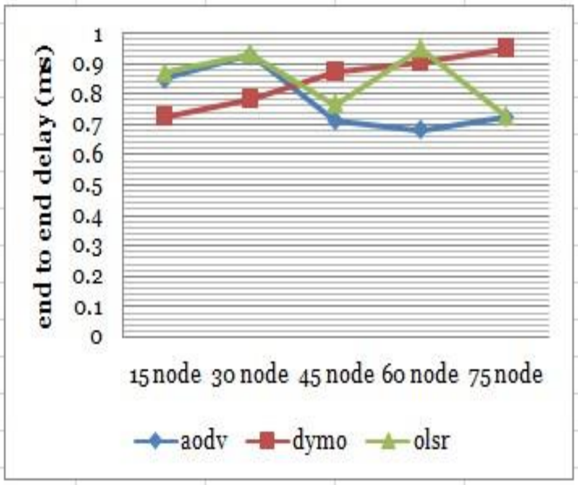

Fig 5.5 Analysis of AODV, DYMO and OLSR on base of end to end delay with CBR traffic

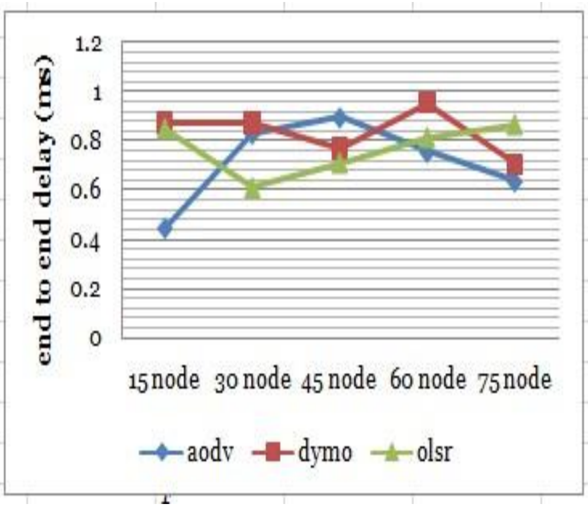

Fig 5.6 Analysis of AODV, DYMO and OLSR on base of end to end delay with FTP traffic

The table 5.3 and figure shows that delay rate is highest with DYMO routing protocol in comparison of other two AODV and OLSR routing protocol in such network environment. The protocol produce significant results with FTP traffic in comparison of CBR. AODV has advantages over DYMO and OLSR routing protocol produce lowest end to end delay results with both CBR and FTP traffic. OLSR protocol in comparison of DYMO perform well with CBR traffic whereas with FTP agent protocol performance decrease by taking more delay time in comparison of both other two AODV and DYMO routing protocols.

C. routing overhead

Table 5.4

Protocol	AODV		DYMO		OLSR	
No. of nodes	CBR	FTP	CBR	FTP	CBR	FTP
15	1.0791	0.046	1.1827	0.008	1.6541	0.030
30	1.6541	0.056	1.0810	0.019	1.4814	0.055
45	1.0327	0.142	1.0563	0.044	1.7492	0.134
60	1.8501	0.152	1.0354	0.054	1.0284	0.025
75	2.0234	0.112	1.0124	0.050	1.0173	0.056

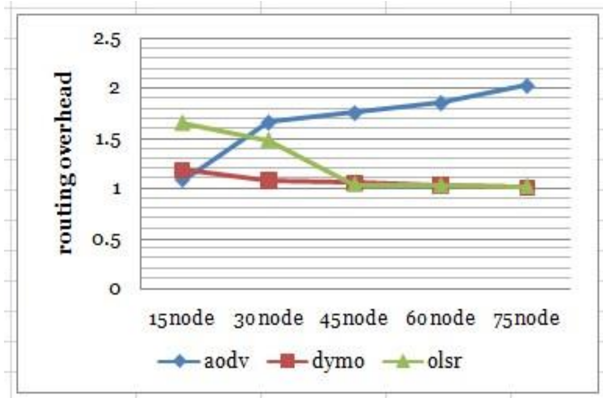

Fig 5.7 Analysis AODV, DYMO and OLSR on base of routing overhead with CBR traffic

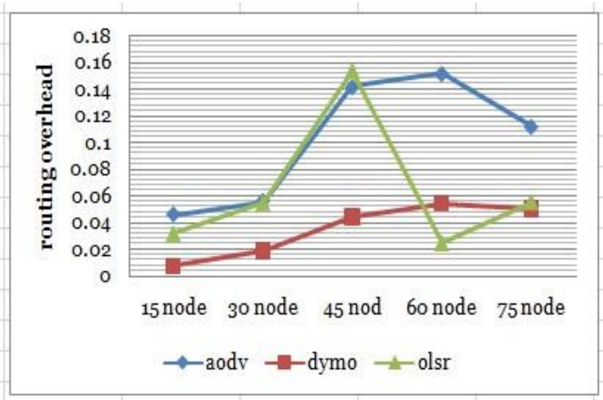

Fig 5.8 Analysis AODV, DYMO and OLSR on base of routing overhead with FTP traffic

The simulation results of selected routing protocols on the base of CBR and FTP traffic is shows in the table 5.4. As the previous simulation result work with FTP agent routing protocols perform significant results in comparison such selected protocols with the CBR traffic. AODV protocol performs better result in comparison of other selected routing protocols in network environment. However DYMO produce poor result with low traffic scenarios such as 15 and 30 nodes scenarios but with medium and high traffic network scenario with both CBR and FTP traffic the DYMO protocol perform well in comparison of OLSR routing protocol. The performance of OLSR is better from DYMO and AODV in low traffic ,the DYMO perform better as the network size grow and in the high complex network scenario the AODV routing protocol outcomes produce best results in comparison of other two selected routing protocols for the simulation purposes.

VI. Conclusion

This paper presents the comparative simulation of AODV, DYMO and OLSR routing protocol with uniform pause & speed type over CBR and FTP connection. The simulation performs with different network scenarios. The various tables in simulation result & discussion section definitely help for researchers to understand the performance of these routing protocols. However single protocol perform do not perform well in all scenarios of VANET network with the CBR and FTP traffic but as the AODV produce significant result with the FTP traffic network size increases that shows its suitability for such type of network in comparison of DYMO and OLSR routing protocols. From the experimental analysis we can conclude that in low density network the DYMO and OLSR perform better in comparison of AODV routing protocol with CBR traffic but as the size of the network increases the AODV performance increases drastically.
It produce high PDR and low End to End delay with the FTP traffic in comparison of other two DYMO and OLSR routing protocol

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