Performance and Routing Analysis of Scalable VANET

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Abstract - *Routing in Vehicular Ad hoc Network is a tough job due to the same features of Mobile ad hoc network such as high mobility of nodes, dynamically alternating topology and highly subdivided networks. It is a challenge to confirm reliable, nonstop communication in the presence of fast moving vehicles. The performance of routing protocol depends on several internal factors mobility of nodes and external factors road topology and problems that block the signal. This demands an extremely adaptive approach to deal with the dynamic scenarios by selecting the best routing and forwarding strategies and by using appropriate mobility and propagation models. In this paper a comparison of different routing protocols like AODV, DYMO, OLSR and LAR1 with different scenarios using a scalable number of nodes is analysed and hence which protocol works better in urban area can be concluded.*

***Key Words*: MANET, VANET, ITS, QualNet, AODV, OLSR, DYMO, LAR1.**

1. INTRODUCTION

Vehicular ad hoc networks (VANETS) are different kind of mobile ad hoc networks (MANETs) that are formed between moving vehicles on required base. VANET are developing technology, which enables a wind range of applications, containing road safety, passenger convenience and intelligent transportation. The VANET helps to create safer roads by indicating the information about the road condition and traffic scenarios between the vehicles in a timely manner. Along with the safety applications, VANETs propagates valuable, real time information to the user such that transmitting information, weather information and other multimedia applications. VANETs takes some of the feature such that mobile nodes and self-organizing behavior from MANETs. However, VANETs have certain distinctive features such that high mobility of nodes, time changing density of the node, frequently changing topology, and these all makes them more challenging.

It is challenge to build network between vehicles and guarantees reliable, safe communication among the vehicles in movement. Routing in VANETs is important issue. These paper emphases on the issues linked to routing in VANET scenarios and give a detained analysis of several routing protocols for vehicular ad hoc networks.

2. ISSUES OF ROUTING IN VANET

Even though VANETs are capable of allowing much different application, the design of operative intravehicular communication leftover as challenges. The node in the VANETs is designed by vehicles with high mobility. The node in VANETs can join any time and they can leave the network. The time changing vehicles density results in a quick change in topology, which make maintaining a route a tough job. This in turn, results in low throughput and high routing overhead and also affects the performance in VANETs producing less packet reception rate. The distribution from the high rise building makes problems such as routing loops and forwarding an incorrect direction, which gives more delay. The issue of passing network division and the issue of broadcast storm further complicate the design of routing protocols in VANETs. The routing protocols in VANETs should be accomplished of creating the routes dynamically and keeping the routes during the communication process. They should be capable of determining different routes rapidly on-the-fly in the event of losing the track.

3. TAXOMONY ROUTING IN VANET

The present routing protocol of MANETs is considered in the situation of VANETs but they cannot be directly applied due to the different feature of VANETs. The performance of VANETs routing protocols mainly depends on the internal and external factors. The density of vehicles and the interference features depend on the type of driving atmosphere.
The protocol should perform well in both dense and sparse traffic scenario and in both city and highway atmosphere. One promising feature of VANETs is the patterned mobility of the nodes along with the road topology, which enables the prediction of the direction and speed of the moving vehicles.

The design of VANET routing protocol is a tough task, in which one has to decide the suitable condition and network architecture to outfit the application in hand. While designing the routing protocols, one has to choice suitable routing and forwarding plans and applies suitable mobility and broadcast models to improve the performance of routing algorithms and to attain the essential Quality of service metrics. The experiment also lies in designing VANETs as a self-organizing and self-managing system to deliver consistent and continuous facility in spite of moving nodes. VANETs allows inter vehicular communication such that vehicle-to vehicle (V2V) and communication through roadside units such as Infrastructure-to-vehicle (I2V) and vehicle –to-Infrastructure (V2I). V2I or I2V gives improve service in sparse network and long distance communication, Whereas V2V provides direct communication between the vehicles and also at location where roadside units are not present. The architecture for VANETs can be either of pure cellular/WLAN or pure ad hoc or hybrid architectures. Within the network, communication can flow in a multihop fashion, where packets travel between multiple consecutive vehicular nodes to reach the destination.

4. DIFFERENT ROUTING PROTOCOLS

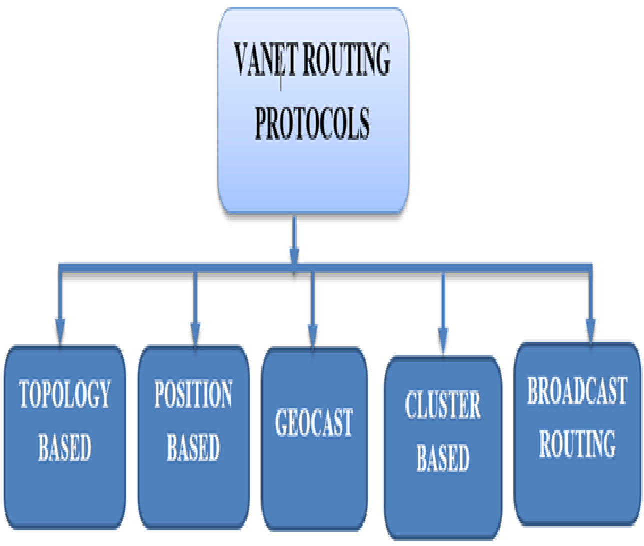

Figure 1: Routing protocols

Several routing protocols used in VANETs are topology based routing protocols, position based routing protocols, geo-cast based routing protocol, broadcast based routing protocols and cluster based routing protocols. These protocols are categorized according to their area of application. Figure 1 shows different routing protocols of VANETs.

4.1 AODV

The AODV is an on demand routing protocol. This protocol stores the routing table information between the nodes when it is required. It also collects the next hop router values for packets to forward. AODV has two parts first route discovery and second route maintenance.

4.2 OLSR

OLAR is a proactive routing protocol and also called as table driven protocol. In this protocol the routing table initially contents all the details of the nodes. Only symmetric links are used in OLSR for route setup development and relays. Every node in the network need to send its reorganized information to some selective nodes called as Multi Point Relays (MPR), which resends this information to its other selective nodes. The nodes which are not in MPR set can read and process the packet. MPRs are also used in route calculation to form the route from source to destination node.

4.3 DYMO

The DYMO is a Dynamic MANET On demand. It is a reactive routing protocol. The DYMO is a less memory stores routing information and provides control packets when a node receives the packet from route way. The initial process of DYMO source router to provide a route request (RREQ) message to destination routers. Intermediate node store route information added to routing table.

4.4 LAR1

Location aided routing, is an improvement to flooding algorithms to decrease overhead. Most on demand approaches, containing DSR and AODV use flooding to find a route to the destination. LAR1 goals to decrease the overhead to send the route request only into a defined area, which is probably to have the destination. This results in an adjustment between decreased overhead and increased latency which wants to be balanced correctly.

5. SIMULATION SETUP

The performance of different routing protocols like AODV, OLSR, DYMO and LAR1 are simulated for VANET scenarios using QUALNET Simulator. Here considered the simulation area of 3000mx3000m, with bidirectional road as a background image in a scenario. Here considered different number of nodes in a scenario to analysis the various parameters like total packet received, throughput, delay and jitter with all routing protocol. The simulation study focused on packet delivery ratio, throughput, Delay and jitter. The simulation parameters for the network scenario are described in Table below.

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Table 1: Simulation Parameters

Simulator	QUALNET
Terrain size (m)	3000*3000
Urban Terrain format	QualNet format
No. of Terrain Files	1
Data type	CBR
Radio/Physical Layer	802.11p CCH and 802.11p SCH
Pathloss model	Urban model Autoselect
Propagation Environment	Urban
No. of channels	2
Channel frequencies	5.92GHz and 5.95GHz
Antenna Model	Omni Directional
Routing Protocols	AODV,OLSR,DYMO,LAR1
No. of Nodes (Density)	10,25,30,50,60
Simulator time(sec)	580,560,600,600,550

The different number of nodes scenario like 10, 25, 30, 50 and 60 nodes scenario setup are constructed and the sample scenarios of 10 and 60 nodes are shown in figures below figures 2 and figure 3 respectively. The scenario setup consists of all device, link and wireless subnet connections. The mobility connections between the vehicular nodes and with the road side units are established in scenario setup.

5.1 10 NODE SCENARIO

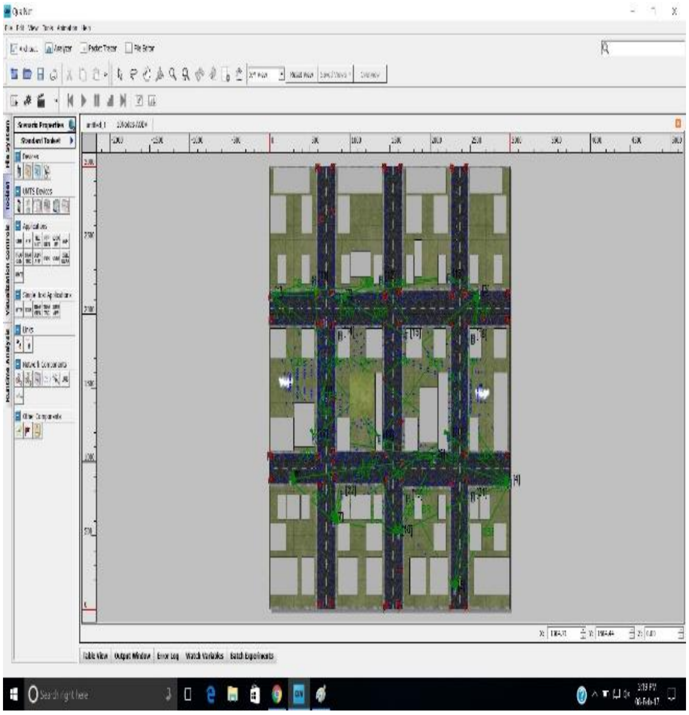


Figure 2: 10 Nodes scenario

5.2 60 NODE SCENARIO

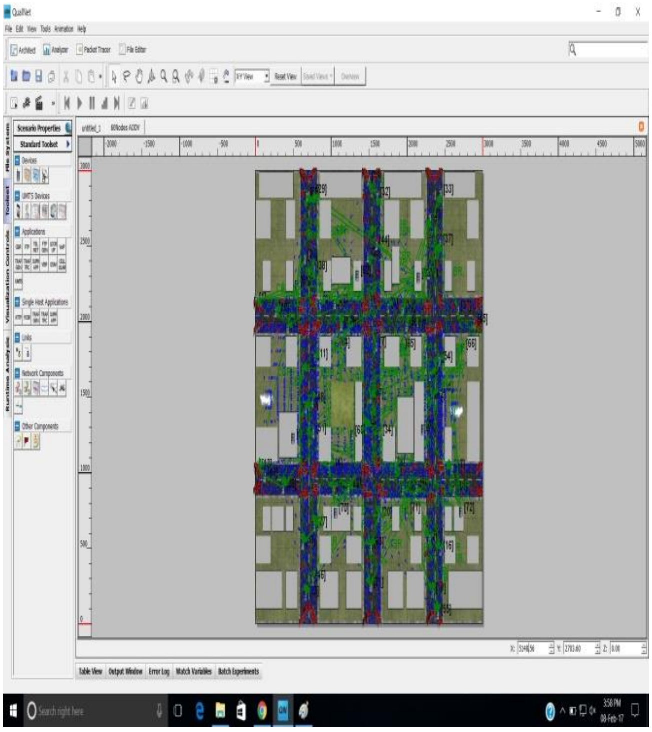
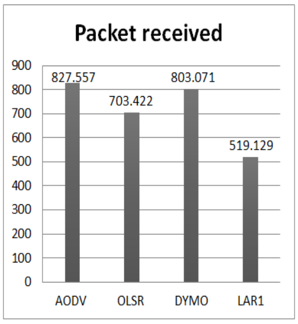


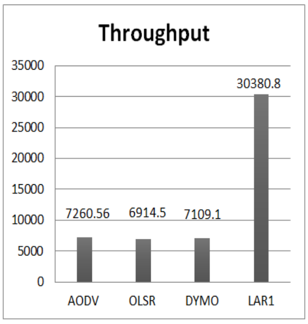
Figure 3: 60 Nodes scenario

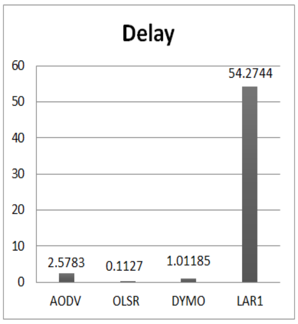
6. RESULT ANALYSIS

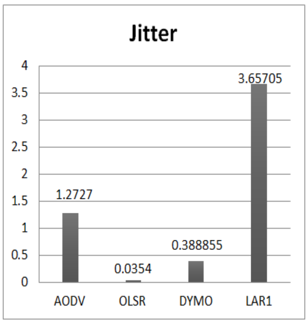
The four parameters considered for analyzing are Total Packet received, Throughput, End to end delay and jitter. This parameter was analyzed for different routing protocol AODV, OLSR, DYMO and LAR1 for different scalable node scenarios. The comparison is shown in the graphs below.

6.1 10 NODES SCENARIO

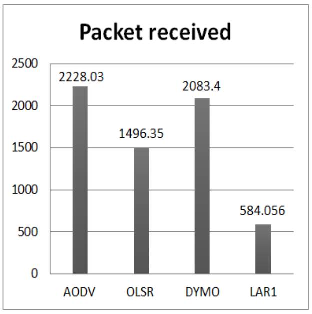


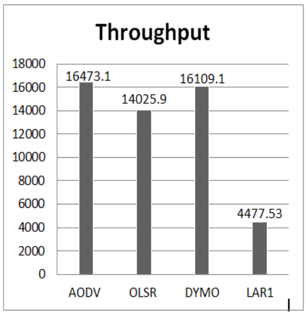


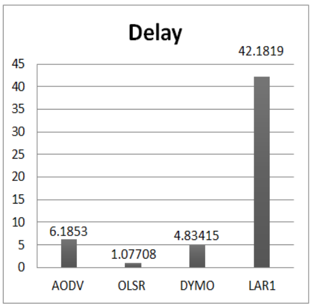


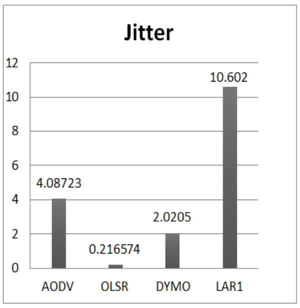


6.2 25 NODES SCENARIO

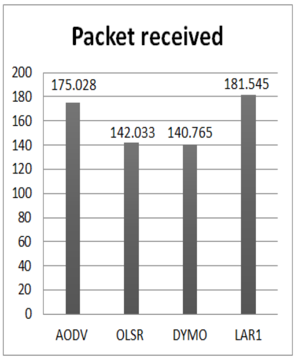


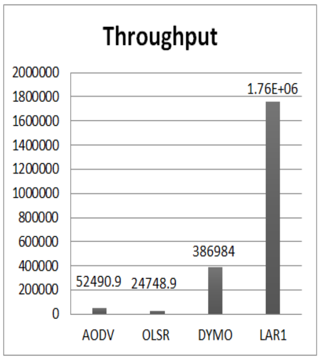


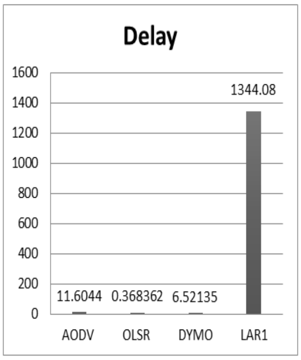


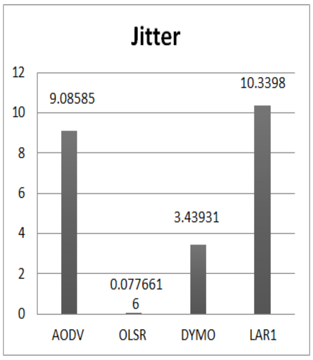


6.3 30 NODES SCENARIO

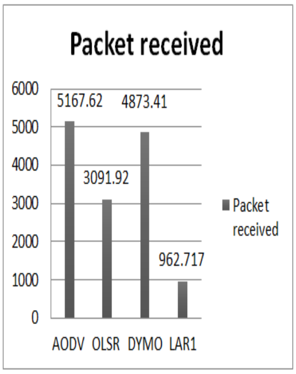


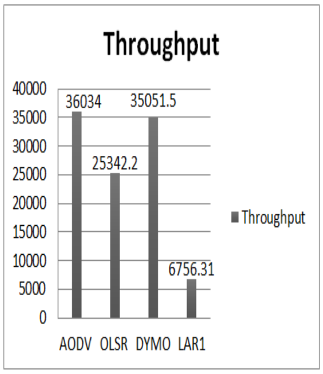


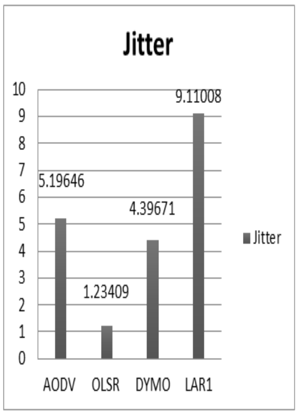


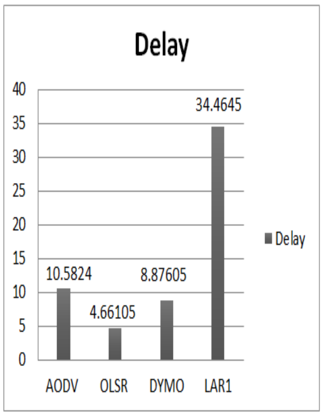


6.4 50 NODES SCENARIO

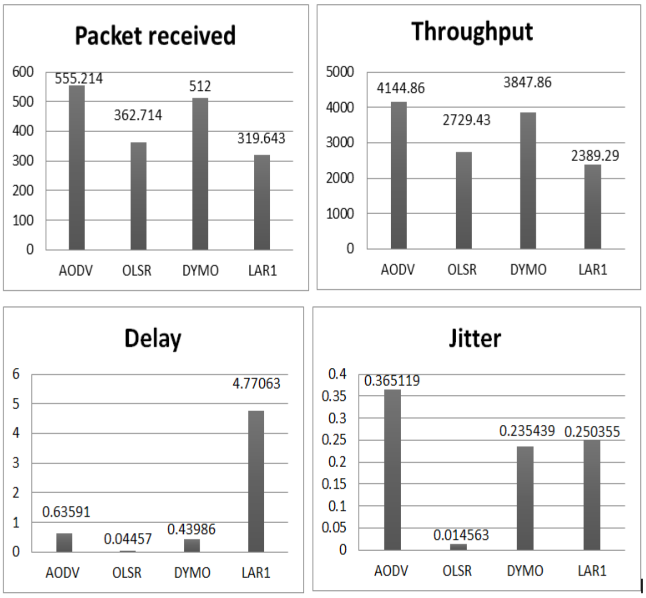








6.5 60 NODES SCENARIO



7. CONCLUSION

From the above results, it may be concluded that the packet received in all node scenarios for AODV routing protocol gives better result. The LAR1 routing protocol gives more throughput and delay, whereas OLSR and DYMO routing protocol gives average parameter values for all scenarios compared to AODV and LAR1 routing protocols, hence by the above analysis, consideration for the best protocol with respected to parameters considered, for an actual scenario can be selected.

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