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The Comparison Between OLSR And AODV Routing Protocols For URBAN Vehicular Ad-Hoc Routing

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Abstract

VANETS (Vehicular Ad hoc networks) is gaining a great attention in the field of research which integrates ad- hoc networks and cellular technology for better inter vehicular communications. In vehicular Ad Hoc networks, routing is somewhat typical than in any other wired networks. This is due to severe changes in topology calls for customized routing protocols. The main aim of this paper is to discuss these two such protocols OLSR and ADOV routing protocol for urban scenario.ADOV is on-demand routing algorithm which determines a route to the destination only when desired node wants to send a packet to the destination where packet holds and maintains a table containing information about the destination packet. OLSR is a proactive routing protocol mainly developed for MANETS. This paper extends the use of OLSR for VANETS. Thus comparison of these two protocol results helps selection of particular routing protocol for urban Vehicular Ad Hoc networks.

Keywords: OLSR, ADOV, URBAN, Vehicular Ad Hoc networks (VANETS).

1. Introduction

As the technology is increasing the people are expecting to use these fast developing networks all the way wherever they need. People like to move the way while maintaining the connectivity to the network. In such circumstances wireless connectivity to the network gives them the freedom of movement as they desire. Network can be easily distinguished into 2 types.

1. Infrastructure dependent.

2. Ad hoc wireless networks

Now-a-days wireless networks require fixed position routes, which require large amount of infrastructure. Today another type of networks are emerging which are Ad Hoc networks. These type of networks can be easily described as the ones which themselves create the underlying structure for communications. In these networks nodes play a vital role in routing and forwarding of packets and hence they function as routers as well as hosts. Two topologies involved in ad hoc networks are:

1. Heterogeneous – which differ in the capabilities they handle.

2. Homogeneous – all the nodes have identical capabilities and responsibilities.

Major points to be noted in these ad hoc networks are that they support peer to peer communications and peer to remote communications. These reduce administrative costs. In this paper we mainly concentrate on using these for VANETS.

2. Ad-hoc Network Routing

As the nodes in wireless ad-hoc network are connected in a dynamic and arbitrary manner, therefore the nodes have to behave as routers and maintain routes to other. nodes. The major challenges on how routing takes place in ad hoc network is dynamic topology. It should have limited number of resources such as battery, processing power etc. The main thing needed for routing is low link bandwidth. The proper security for transmission of packets should be provided.

The major knowledge of routing required is how to disseminate information about links and send packets along the particular path and how to decide which path to be used among many possibilities. The base knowledge of whether the nodes have the idea of their neighboring nodes or they can directly communicate.

2.1 *Proactive Protocols*

Here every node maintains one or more tables representing the entire topology of networks. The nodes are updated regularly in order to maintain the correct routing information from each node to node. To maintain the correct information, information needs to be exchanged between each node regularly. On other hand routes will always be available on request

2.2 *Reactive Protocols:*

Unlike the previous protocol, reactive protocol does not make the node itself to discover the route unless it finds the destination. Therefore it achieves higher latency than the proactive protocols but lower overhead.

2.3*Hybrid Protocols:*

As the name itself specifies it is a combination of two protocols i.e, reactive protocol and proactive protocol. One approach to achieve this is to divide into zones and use one protocol between them

3. Vehicular Ad-hoc network Routing

VANETS are being emerged as a new technology with the aim of providing safety to the people inside the vehicles. There are many ways of communicating messages from one vehicle to the other. Previously it was being communicated among vehicle to vehicle while later it was being termed as peer to peer communications. As mobility of nodes in VANETS is high there are lot of challenges to be achieved in this network. The road sides units provide the infrastructure support if these are within the range then packets are transmitted directly. Here store and forward kind of strategy is used for message delivery. In this paper we mainly concentrate on topology routing on how the packets are transmitted. These can be mentioned as 1. Reactive scheme and 2. Proactive scheme.

4. Ad-hoc On-Demand Distance Vector

This routing algorithm determines a route to a destination only when it is desired to send information to the destination. Routes in this network are maintained as long as they are required by the source. AODV is capable of handling both unicast and multicast routing. As mentioned previously each node maintains a table and the required information about the neighboring node and the destination. The main attraction of ADOV is sequence numbers, which gives freshness to the routes.

Sequence Numbers: When compared with other on-demand protocols this sequence numbers on AODV differs. This determines route time stamp and ensures freshness to the routes. If the sequence numbers are repeatedly used then the existing route is more up to date.

Establishing Route: In AODV protocol route is issued by RREQ message. When RREP message received route is established. When multiple RREQ messages are received multiple routes are established. And thus source updates route information if RREP holds information which is more up to date.

5. Optimised Link State Routing

This is a table driven, proactive routing protocol. The name specifies it as optimization of link since it reduces the size of control packets as well as number of control packets transmission is required. This protocol reduces the traffic overhead by using the multipoint relays. MPR is node's one hop neighbor which has been chosen to forward packets.

This OLSR is well suited to large and dense networks. Because of the use MPR in large and dense networks the optimized link state route is being achieved. The other advantage of MPR is that it determines the shortest path to the destination. The main requirement is that all MPR's should have the information of the routes. These information should be exchanged periodically.

One of the hazardous aspects when evaluating routing protocols for VANETs is the service of mobility models that replicate as closely as possible the accurate behavior of vehicular traffic. Simple random models cannot express vehicular mobility in a realistic way, since they ignore the peculiar aspects of vehicular traffic, such as cars acceleration and deceleration in presence of nearby vehicles, queue at roads intersections or traffic burst caused by traffic lights, these are the situations very much affect the network performance, since they act on network connectivity, which makes vehicular specific performance evaluations fundamental when studying routing protocols for VANETs.

Early works on performance estimate were based only on random motions, such as random walk models, and lacked any interaction between cars, generally referred as micro-mobility. Following the recent interest in realistic mobility models for VANETs, new studies appeared on performance evaluations of VANETs in urban traffic or highway traffic conditions.

As these new models generate urban specific spatial and chronological dependencies, the real mobility parameters differ from the original and controlled ones. Performance comparison may become unfair and debatable. Another critical aspect is to use the appropriate parameters in order to evaluate routing protocols. A crucial parameter influencing the performance of VANETs is referred by the generic term mobility. In simple models, mobility is equal to velocity. However, on the eve of realistic mobility models, it becomes hard to understand the real parameters controlling this mobility.

In this work, the purpose is to illustrate how realistic urban motions reduce the effect of some standard evaluation metric, and how they generate new urban-specific performance parameters. In order to model vehicular motion patterns, we make use of the MAT Lab tool. This will able to give closely reflect spatial and temporal correlations between vehicles, and between vehicles and urban obstacles. Notably, the tool illustrates clustering effects obtained at intersection, also is more commonly called traffic jam, or drastic speed decays. Accordingly, it becomes possible to more realistically evaluate ad hoc routing performances for vehicular networks.

6. Comparison of Protocol

The two protocols are compared with respect to throughput, packet loss, and end to end delay for urban scenario.

- Packet loss:

As the OLSR being a proactive, which is responsible for storing the entire information of the network has a disadvantage that it stores information of routes which are not in use therefore a messy situation is created when there is huge traffic and packet loss ratio increases.

As ADOV is reactive and stores the information of the routes which are active thus the disturbance of the routes and the information is not created therefore the correct transmission happens. Packet loss will be lesser when compared to the OLSR.

- End to End delay:

OLSR maintains all the information of the network thus even when path break down happens the route can be easily discovered from the existing node. The delay between source to destination is less.

- Throughput:

It is number of packets passing through a network in a unit of time. It is measured in Kbps. OLSR hass a lower through put and the average throughput of AODV exhibits higher than the OLSR.The higher the throughput better the network performance.

6.1 Simulation Parameters

Table 1: Simulation setup

Parameters	***Values***
Simulator	NS 2.35
Protocols	AODV, OLSR
Antenna	Omni Antenna
Mobility Model	Random Way Point
Application Agent	CBR
Traffic Agent	TCP, UDP
Maximum Simulation speed	100 sec
Network Dimension	1000X1000

7. Result Analysis

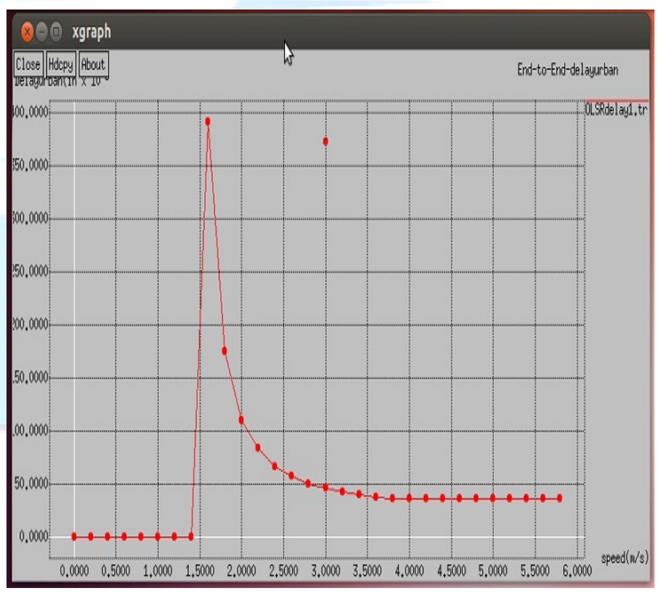

Fig 1 : OLSR End-to-End Delay (Urban)

As shown in Fig 1 graph shows End-to-End Delay in X-axis Speed is taken and in Y axis Delay .It is the result of OLSR protocol End to End delay for URBAN.

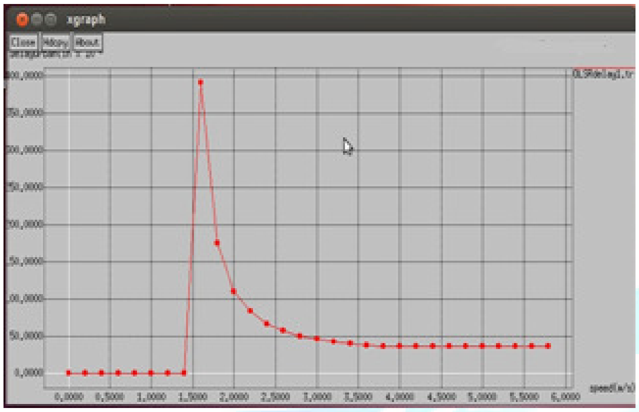

Fig 2: Packet Loss of OLSR (Urban)

As shown in Fig 2 graph shows the packet loss in the X-axis speed is taken and Y-axis Packets drop. It is the result of packet loss of OLSR for URBAN.

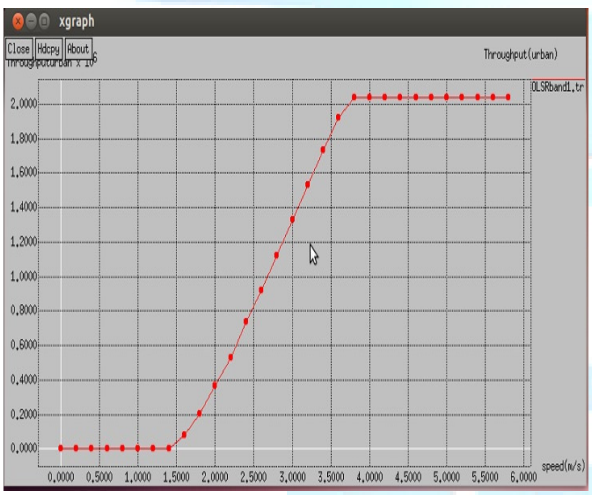

Fig 3: Throughput of OLSR (Urban)

As shown in Fig 3 graph shows the packet loss in the X-axis speed is taken and Y-axis Throughput. It is the result of Throughput of OLSR for URBAN.

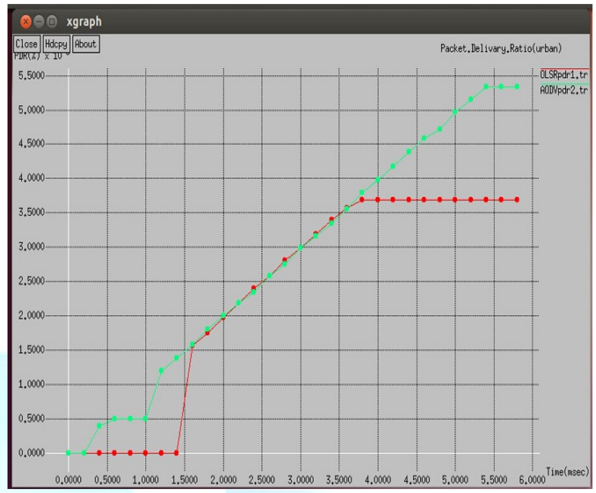

Fig 4 : Packet Delivery ratio of OLSR and AODV (URBAN)

As shown in the Fig 4 graph shows the result analysis of Packet Delivery ratio of OLSR protocol and AODV protocol for URBAN.

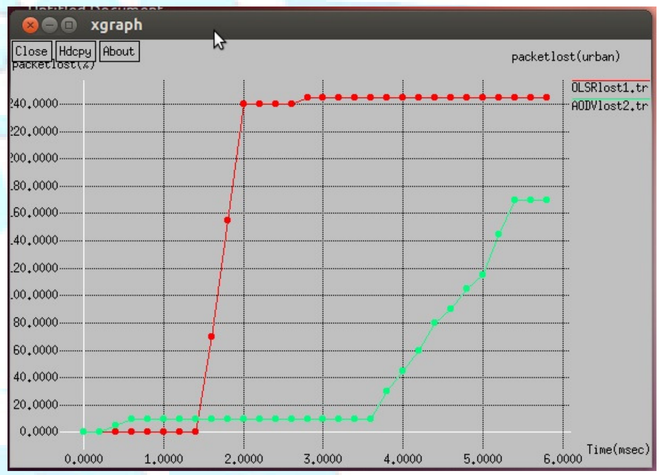

Fig 5 : Packet Loss of OLSR and AODV (URBAN)

As shown in the Fig 5 graph shows the result analysis of Packet Loss of OLSR protocol and AODV protocol for URBAN.

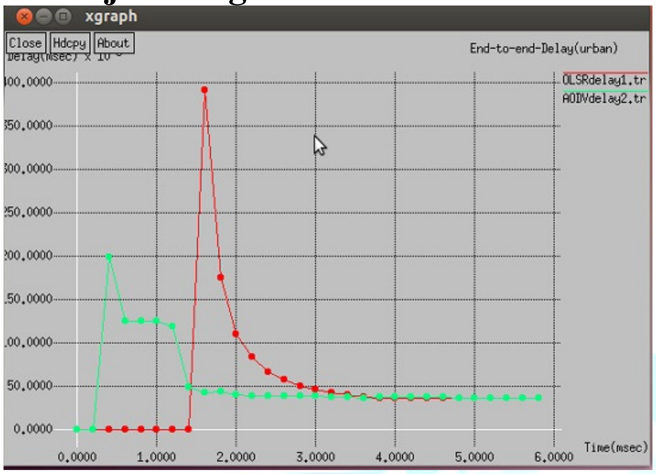

Fig 6 : End to End Delay of OLSR and AODV (URBAN)

As shown in the Fig 6 graph shows the result analysis of End to End Delay of OLSR protocol and AODV protocol for URBAN.

8. Conclusion and Future Scope

As OLSR must maintain up-to-date information at anytime, it decreases the network performance as more network overhead is needed. Control overhead is related to route discovery in AODV. AODV is well suited for network where path break downs are less. OLSR performs well when traffic can benefit from having route found route proactively.

AODV performs best when the network is more or less static control overhead is kept at minimum so energy consumption is reduced and enhances the performance of the network.

The works are done on how these routing protocols works for other networks since these protocols are proven for VANETS by using the adaptability of MANETS. OLSR mechanisms are being extended for OSPF routing protocols.

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