A Comparative Study of Bandwidth Utilisation of OLSR and AODV Protocols

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***Abstract*— A mobile ad hoc Network is self-configuring wireless of mobile device network. Each device is free to move solitary in any direction , and at any time. However challenging task is that it has to maintain the information required to properly route traffic. It also maintains flexibility as long as node is connected. There are many routing protocols proposed such as OLSR, AODV, ZRP, DSDV to improve the routing performance and reliability. In this work we describes the performance of ad hoc routing protocols OLSR and AODV considering bandwidth utilization by protocols for same simulation scenario . This comparative shows that OLSR, performs better in dense networks when there is low mobility.**

***Keywords*— AODV,OLSR, MANETs, Routing Protocols.**

I. INTRODUCTION

The rapid increases in the applications of Personal Digital Assistants (PDAs) devices such as tablets, laptops, smartphones etc. has made popularity of wireless networks. One of the major types of wireless networks is Mobile Ad-Hoc networks (MANET). Every node in this network behaves as a relay station or router to forward data to the designated node. In this kind of network nodes are mobile and constantly switch its position from one MANET to another. The application of this network is such as emergency situation, like disaster recovery, crowd control, battle fields etc. Many routing protocols have been proposed for the mobile ad hoc network and classified as Proactive or Table Driven routing Protocol, Reactive or On Demand Routing Protocol.

II. ROUTING PROTOCOL IN MANETS

MANETs is an acronym for Mobile Ad hoc Networks. When the network is formed, nodes communicate with each other by sending packets in the network. If the sender and the receiver are separated by two or more hops then some intermediate nodes are required for forwarding packets in the network. For this reason routing protocols are required to find reliable route in network, which is free of loops and comprising of minimum hop count. There are different types routing protocols available in MANETs, which can be classified into two types, namely Proactive (table driven) and Reactive (On Demand) routing protocol. The Proactive protocol consists of OLSR, and reactive protocol consist of AODV,. In this work, we do a comparative study on OLSR and AODV Protocol based on their performance.

III. MANETS ROUTING PROTOCOLS

A. Reactive protocols

This routing is known as on- demand routing or source-initiated routing protocol. It imposes less overhead due to route messages on the network but at the same time, in route finding process it has high latency time and rarely excessive flooding of the communication packets may lead to network blockage. All nodes need not maintain up-to- date routing information here. Dynamic Source Routing (DSR) [1], Adhoc On- Demand Distance Vector Routing (AODV) [4] and Temporally Ordered Routing Algorithm (TORA) [2], are some of the examples of reactive routing protocol.

- *Ad-Hoc on Demand Distance Vector Protocol*: In this network node broadcast a request if it requires connection. Other nodes forward this message to the node which requires connection and records this node in their routing table. When a node receives such a message and already has a path to the desired node, it sends a message backwards through a temporary path to the requesting node. The needy node uses the route that has the minimum number of hops through other nodes. Entries which are not used in the routing tables are recycled after some time. When a link failure occurs, a routing error is transmitted to a transmitting node, and the process repeats. Complexity of protocol is to lower the messages to conserve the capacity of network. This can be done by using sequence number and time to live.
- *Advantages and Limitation* The advantage of AODV is that it do not create extra traffic load for communication along existing links. Also, distance vector routing does not require much memory or calculation as it is simple. The connection setup delay is lower. However AODV requires comparatively extra time to set a connection, and to establish a initial path is heavier than some other approaches and if the source sequence number is very old, the intermediate nodes can lead to inconsistent routes. Also, many RouteReply packets in response to a single

RouteRequest packet can lead to hefty control overhead. it consumes unnecessary bandwidth due to periodic beaconing.

B. *Table Driven (Proactive) protocols*

Proactive routing is also often termed as table- driven routing. In these routing protocols, lists of destinations and their routes are maintained by periodic distribution of routing tables throughout the network and this category of protocol always strives to maintain consistent and updated routing information at each node [3]. This protocols use link-state routing algorithms which frequently flood the link information about its neighbors and the main drawback of proactive routing protocol is that all the nodes in the network always maintain an updated table. Destination-Sequenced Distance-Vector Routing Protocol (DSDV) [4] and Optimized Link-State Routing (OLSR) [5] are the two common proactive routing protocols.

- *Optimized Link State Routing Protocol:* Optimised Link State Routing Protocol (OLSR) is a stable and a table driven (proactive) routing protocol where routes are calculated in advance. Packet delivery in the network is usually faster as routes are pre-calculated. In this protocol, nodes periodically floods network with HELLO messages to show its presence in the network and to get information of neighbours. With help of HELLO message it receives acknowledgement neighbours, it also contains additional information which helps in to determine MPR (Multi Point Relay). Role of MPR node is to forward the messages through it. Proper selection of MPR improves performance of OLSR protocol. MPR are reduces no of topology maintenance messages circulated in network.

- *Advantages and Limitation* OLSR is a flat routing protocol and it does not need central administrative system to handle its routing process. The link is reliable for the control messages, since the messages are sent periodically and the delivery does not have to be sequential. This protocol is best suitable for high density network and does not allows long delays in the transmission of the packets.

  However, as a limitation this protocol needs that each node periodically sends the updated topology information throughout the entire network, this increase the protocols bandwidth usage. But the flooding is minimized by the MPR's, which are only allowed to forward the topological messages.

IV. PERFOMANCE EVALUATON

We have run simulation in Network Simulator 2 (ns2.34) on Ubuntu 13.04. Simulation is done in square area of dimension 1500 meters by 1500 meters. Total 25 nodes were created. Maximum speed of node is set at 15 m/s Motion of nodes are set to random with help of tcl script. Both protocol i.e. OLSR and AODV are tested for same simulation. Results of simulation are stored in trace file. Trace file stores information of node at particular time, data in trace file is stored as text file which can be accessed as column data by using awk script. Graphs for bandwidth are plotted using GNUplot.

A. Bandwidth: It is the measure of the number of packets transmitted to their final destination per unit time. It is the ratio between the number of packets send vs time.

Table 1: Simulation Parameters

Network Simulator	Network Simulator 2.34
OLSR	UM-OLSR 1.0.0 patched version for NS2
AODV	In built version for NS2
Simulation time	200 sec
Node speed	Random (max speed 15 m/s)
Simulation area	1500 by 1500 meters
No of nodes	25
HELLO message interval (OLSR)	0.5 sec
HELLO message interval (AODV)	3.0 sec
Link bandwidth	1 Mbps

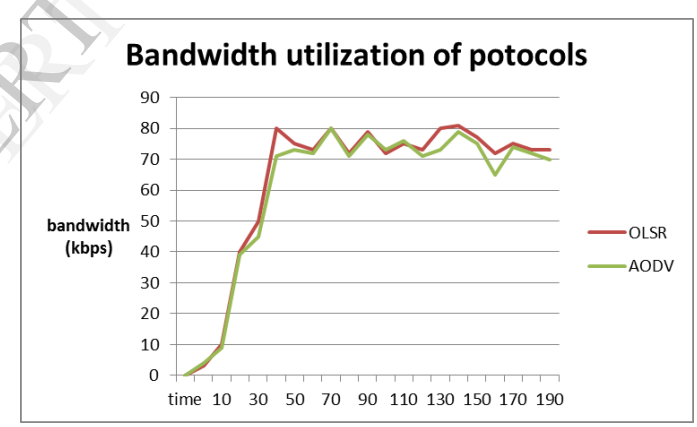

Fig I: Bandwidth utilization of Protocols

V. CONCLUSION

We compared the characteristics of three different routing protocols which are of two different types i.e. reactive (AODV) and proactive (OLSR). OLSR gives stable route and is suitable for dense networks where node needs to communicate with each other; they don't have to find route as route is already calculated. AODV is efficient as it builds route when required but response to create route is higher compared to OLSR. Throughput of OLSR is better than AODV protocols in both high and low mobility scenario as route is calculated beforehand. Jitter is also low in OLSR as it performs well in both low and high mobility. So we can conclude that no protocol is perfect, but selection of protocol should be application specific.

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