

A Comprehensive Paper on Performance Analysis between AODV & DSDV Routing Protocol

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Abstract

Keeping the routing overhead minimal is the key to design an efficient routing protocol for mobile ad hoc network MANET. This type of networks is a non infrastructure, self-configuring and decentralized set of mobile nodes. The node moves at different speeds in independent random form, connected by any number of wireless links, where each node is ready to pass or forward both data and control traffic unrelated to its own use ahead (Routing) to other nodes in a flexible interdependence of wireless communication in between. In contrast to infrastructure wireless networks, where the communication between network nodes is take place by a special node known as an access point. It is also, in contrast to wired networks in which the routing task is performed by special and specific devices called routers and switches. In this paper we compare the performance of AODV & DSDV by two parameter PDR & End to End Delay.

Keywords: MANET, End to End Delay, PDR, Routing etc.

1. INTRODUCTION

A Mobile Ad hoc Network (MANET) is a kind of wireless ad-hoc network, and is a self-configuring network of mobile routers (and associated hosts) connected by wireless links – the union of which forms an arbitrary topology. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Such a network may operate in a standalone fashion, or may be connected to the larger Internet.

Issues in MANETs: If there are only two nodes that want to communicate with each other and are located very closely to each other, then no specific routing protocols or routing decisions are necessary. On the other hand, if there are a number of mobile hosts wishing to communicate, then the routing protocols come into play because in this case, some critical decisions have to be made such as which is the optimal route from the source to the destination which is very important because often, the mobile nodes operate on some kind of battery power. Thus it becomes necessary to transfer the data with the minimal delay so as to waste less power. There may also be some kind of compression involved which could be provided by the protocol so as to waste less bandwidth. Further, there is also a need of some type of encryption so as to protect the data from prying eyes. In addition to this, Quality of Service support is also needed so that the least packet drop can be obtained. The other

factors which need to be considered while choosing a protocol for MANETs are as follows:

- i.** Multicasting: This is the ability to send packets to multiple nodes at once. This is similar to broadcasting except the fact that the broadcasting is done to all the nodes in the network. This is important as it takes less time to transfer data to multiple nodes.
- ii.** Loop Free: A path taken by a packet never transits the same intermediate node twice before it arrives at the destination. To improve the overall, we want the routing protocol to guarantee that the routes supplied are loop-free. This avoids any waste of bandwidth or CPU consumption.
- iii.** Multiple routes: If one route gets broken due to some disaster, then the data could be sent through some other route. Thus the protocol should allow creating multiple routes.
- iv.** Distributed Operation: The protocol should of course be distributed. It should not be dependent on a centralized node.
- v.** Reactive: It means that the routes are discovered between a source and destination only when the need arises to send data. Some protocols are reactive while others are proactive which means that the route is discovered to various nodes without waiting for the need.
- vi.** Unidirectional Link Support: The radio environment can cause the formation of unidirectional links. Utilization of these links and not only the bi-directional links improves the routing protocol performance.
- vii.** Power Conservation: The nodes in an ad-hoc network can be laptops and thin clients, such as PDAs that are very limited in battery power and therefore use some sort of

stand-by mode to save power. It is therefore important that the routing protocol has support for these sleep-modes [1] [2].

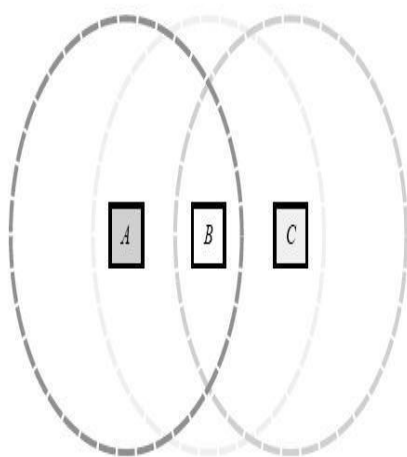


Fig 1: A Simple MANET

In figure 1, let's suppose that node A wants to send data to node C but node C is not in the range of node A. Then in this case, node A may use the services of node B to transfer data since node B's range overlaps with both the node A and node C. Indeed, the routing problem in a real ad hoc Network may be more complicated than this example suggests, due to the inherent non uniform propagation characteristics of wireless transmissions and due to the possibility that any or all of the hosts involved may move at any time [5]. One of the main difficulties in MANET (Mobile Ad hoc Network) is the routing problem, which is aggravated by frequent topology changes due to node movement, radio interference and network partitions. Many Routing protocols have been proposed in past and reported in the literature. The proactive approaches attempts to maintain routing information for each node in the network at all times, where as the reactive approaches only find new routes when required and other approaches make use of geographical location information for routing

2. RELATED WORK

Ad-hoc On-demand distance vector (AODV) is another variant of classical distance vector routing algorithm, based on DSDV and DSR. It shares DSR's on-demand characteristics hence discovers routes whenever it is needed via a similar route discovery process. However, AODV adopts traditional routing tables; one entry per destination which is in contrast to DSR that maintains multiple route cache entries for each destination. The initial design of AODV is undertaken after the experience with DSDV routing algorithm. Like DSDV, AODV provides loop free routes while repairing link breakages but unlike DSDV, it doesn't require global periodic routing advertisements. Apart from reducing the number of broadcast resulting from a link break, AODV also has other significant features.

Whenever a route is available from source to destination, it does not add any overhead to the packets. However, route discovery process is only initiated when routes are not used and/or they expired and consequently discarded. This strategy reduces the effects of stale routes as well as the need for route maintenance for unused routes. Another distinguishing feature of AODV is the ability to provide

unicast, multicast and broadcast communication. AODV uses a broadcast route discovery algorithm and then the unicast route reply message. The following sections explain these mechanisms in more detail. [5]

Route Discovery

When a node wants to send a packet to some destination node and does not locate a valid route in its routing table for that destination, it initiates a route discovery process.

Source node broadcasts a route request (RREQ) packet to its neighbors, which then forwards the request to their neighbors and so on. Fig. 2 indicates the broadcast of RREQ across the network.

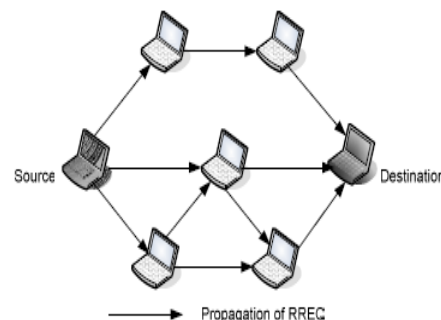


Fig 2: Propagation of RREQ Packet

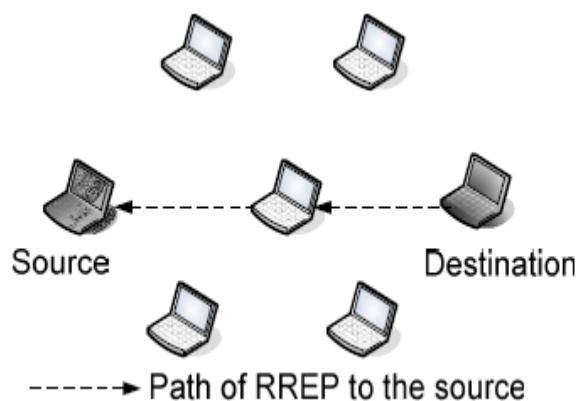


Fig 3: Route Reply through RREP Packet

To control network-wide broadcasts of RREQ packets, the source node use an expanding ring search technique. In this technique, source node starts searching the destination using some initial time to live (TTL) value. If no reply is received within the discovery period, TTL value incremented by an increment value. This process will continue until the threshold value is reached. When an intermediate node forwards the RREQ, it records the address of the neighbor from which first packet of the broadcast is received, thereby establishing a reverse path. When the RREQ is received by a node that is either the destination node or an intermediate node with a fresh enough route to the destination, it replies by unicasting the route reply (RREP) towards the source node. As the RREP is routed back along the reverse path, intermediate nodes along this path set up forward path entries to the destination in its route table and when the RREP reaches the source node, a route from source to the

destination established. Fig. 3 indicates the path of the RREP from the destination node to the source node. [5]

Route Maintenance

A route established between source and destination pair is maintained as long as needed by the source. If the source node moves during an active session, it can reinitiate route discovery to establish a new route to destination. However, if the destination or some intermediate node moves, the node upstream of the break remove the routing entry and send route error (RERR) message to the affected active upstream neighbors. These nodes in turn propagate the RERR to their precursor nodes, and so on until the source node is reached. The affected source node may then choose to either stop sending data or reinitiate route discovery for that destination by sending out a new RREQ message.

DSDV is one of the most well known table-driven routing algorithms for MANETs. It is a distance vector protocol. In distance vector protocols, every node i maintains for each destination x a set of distances $\{d_{ij}(x)\}$ for each node j that is a neighbor of i . Node i treats neighbor k as a next hop for a packet destined to x if $d_{ik}(x)$ equals $\min_j\{d_{ij}(x)\}$. The succession of next hops chosen in this manner leads to x along the shortest path. In order to keep the distance estimates up to date, each node monitors the cost of its outgoing links and periodically broadcasts to all of its neighbors its current estimate of the shortest distance to every other node in the network. The distance vector which is periodically broadcasted contains one entry for each node in the network which includes the distance from the advertising node to the destination. The distance vector algorithm described above is a classical Distributed Bellman-Ford (DBF) algorithm [4] [7].

DSDV is a distance vector algorithm which uses sequence numbers originated and updated by the destination, to avoid the looping problem caused by stale routing information. In DSDV, each node maintains a routing table which is constantly and periodically updated (not on-demand) and advertised to each of the node's current neighbors. Each entry in the routing table has the last known destination sequence number. Each node periodically transmits updates, and it does so immediately when significant new information is available. The data broadcasted by each node will contain its new sequence number and the following information for each new route: the destinations address the number of hops to reach the destination and the sequence number of the information received regarding that destination, as originally stamped by the destination. No assumptions about mobile hosts maintaining any sort of time synchronization or about the phase relationship of the update periods between the mobile nodes are made.

Following the traditional distance-vector routing algorithms, these update packets contain information about which nodes are accessible from each node and the number of hops necessary to reach them. Routes with more recent sequence numbers are always the preferred basis for forwarding decisions. Of the paths with the same sequence number, those with the smallest metric (number of hops to the destination) will be used. The addresses stored in the route tables will correspond to the layer at which the DSDV protocol is operated. Operation at layer 3 will use network layer addresses for the next hop and destination addresses, and operation at layer 2 will use layer-2 MAC addresses [7].

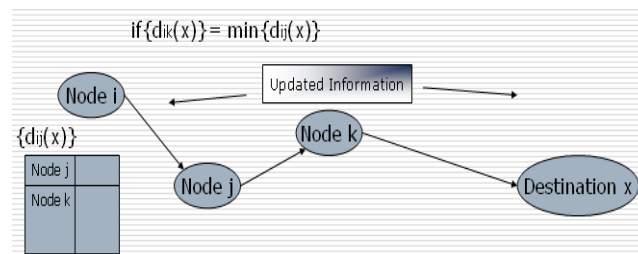


Fig 4 Illustration of DSDV:

3. Problem identification

A mobile ad-hoc network (MANET) is a kind of wireless ad-hoc network, and is a self- configuring network of mobile routers (and associated hosts) connected by wireless links – the union of which form an arbitrary topology. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. Routing is the act of moving information from a source to a destination in an internetwork. During this process, at least one intermediate node within the internetwork is encountered. The routing concept basically involves, two activities: firstly, determining optimal routing paths and secondly, transferring the information groups (called packets) through an internetwork. The later concept which is known as packet switching is straight forward, but the path determination could be very complex. Routing protocols use several metrics to calculate the best path for routing the packets to its destination. The process of path determination is that, routing algorithms initialize and maintain routing tables, which contain the total route information for the packet.

This route information varies from one routing algorithm to another. Proactive protocols maintain the routing information even before it is needed. Each and every node in the network maintains routing information to every other node in the network. Routes information is generally kept in the routing tables and is periodically updated as the network topology changes. Many of these routing protocols come from the link-state routing. The proactive protocols are not suitable for larger networks, as they need to maintain node entries for each and every node in the routing table of every node.

4. PARAMETER FOR ANALYSIS:

(i) Packet delivery fraction: The ratio of the number of data packets successfully delivered to the destinations to those generated by CBR sources. Packet delivery fraction = (Received packets/Sent packets)*100. Fig 5(a) & 5(b) shows a comparison between both the routing protocols on the basis of packet delivery fraction as a function of pause time and using different number of traffic sources.

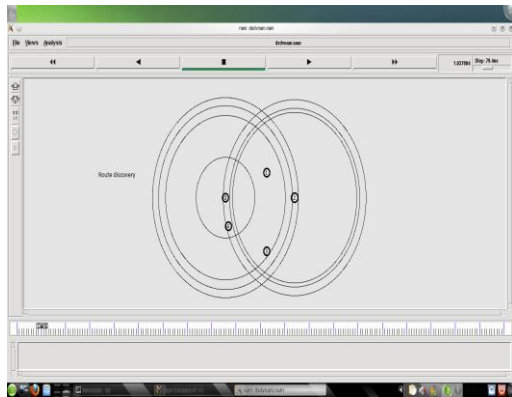
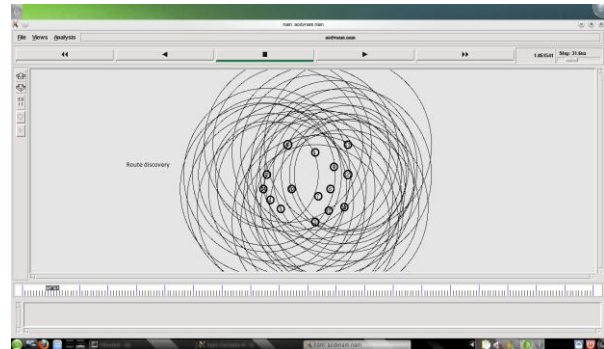
(ii) Average End to end delay of data packets: The average time from the beginning of a packet transmission at a source node until packet delivery to a destination. This includes delays caused by buffering of data packets during route discovery, queuing at the interface queue, retransmission

delays at the MAC, and propagation and transfer times. Calculate the send(S) time (t) and receive (R) time (T) and average it.

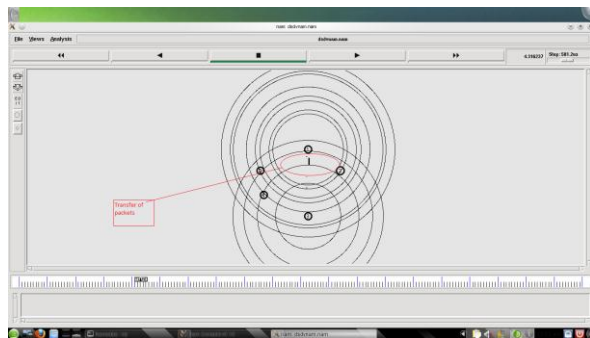
5. EXPERIMENTAL RESULT:

Data Transfer in 15 nodes

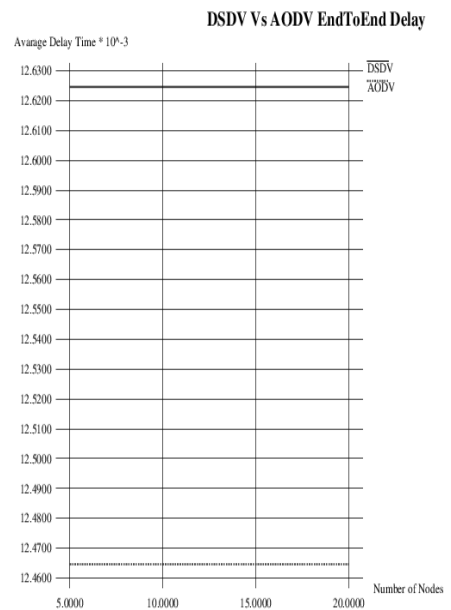
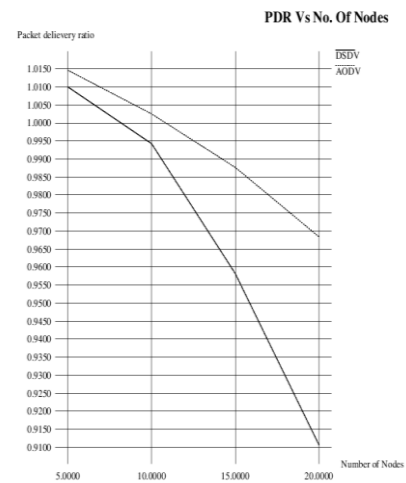
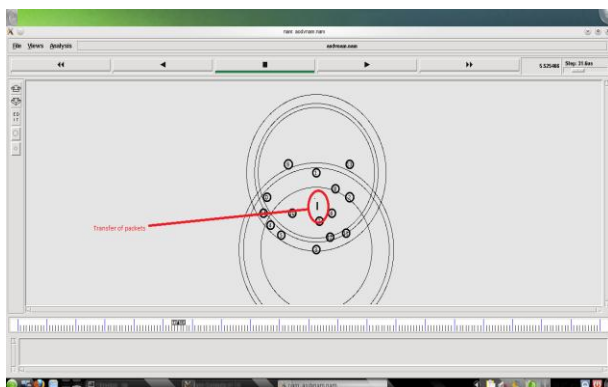
Route discovery in 5 nodes



Data transfer in 5 nodes



Route discovery in 15 nodes



6. CONCLUSION

This paper discusses the performance comparison of proactive (DSDV) & Reactive (AODV)

ad-hoc network Routing Protocols Based on simulation Results with the network Simulator(NS-2).Different types of metrics are used for the performance comparison of protocols.

*Delay of AODV is higher than DSDV

*Packet loss of AODV is less than DSDV For better performance of protocols; PDF must be large, while delay packet loss must be minimum, Here AODV PDF is higher, packet loss is minimum but delay is higher than DSDV. So overall performance of AODV is better than DSDV.

7. REFERENCES

- [1] Banoj KumarPanda , Bibhudatta Dash , Rupanita Das , Ajit Sarangi “Mobility and its impact on Performance of AODV and DSR in Mobile Ad hoc Network”,IEEE -2012
- [2] Mrs. Geetha V, Dr. Sridhar Aithal , Dr. k. chandraSekaram “Effect of Mobility Over Performance of the Ad hoc Networks”, IEEE-2006
- [3] Kapil Suchdeo , Durgesh Kumar Mishra “Comparison of On-Demand Routing Protocols”IEEE Fourth Asia International Conference on Mathematical/Analytical Modeling & Computer Simulation,pp 556-560,2010
- [4] Mohammed Bouhorma , H. Bentaouit , A. Boudhir “Performance Comparison of Ad hoc Routing Protocols AODV & DSR” IEEE-2009
- [5] S.R. Biradar , Hiren H D Sharm , Kalpana Sharma , Saber Kumar Sarkar , Puttamadappa C “Performance Comparison of Reactive Routing Protocols of MANETS using Group Mobility Model”IEEE-2009.
- [6] N Vetrivelan, Dr. A V Reddy “Performance Analysis of Three Routing Protocols for Varying MANET Size” Proceedings of the International MultiConference of Engineers and Computer Scientists 2008 Vol II IMECS 2008, 19-21 March, 2008, Hong Kong.
- [7] C. E. Perkins, E. M. Royer, and S. R. Das, “Ad Hoc On-Demand Distance Vector (AODV) Routing”, Internet Draft, draft-ietf-manet aodv-10.txt, work in progress, 2002.
- [8] D. O. Jorg, “Performance Comparison of MANET Routing Protocolsin Different Network Sizes”, Computer Networks & Distributed Systems, 2003.
- [9] S.Basagni, I. Chlamtac, V. R. Syrotiuk, and B. A. Woodward, “A distance routing effect algorithm for mobility (dream),” in Proceedings of the IEEE/ACM international Conference on Mobile Computing and Networking (MOBICOM’98), 1998, pp. 76–84.
- [10] Staub.T., (2004). Ad-hoc and Hybrid Networks: Performance Comparison of MANET Routing Protocols in Ad-hoc and Hybrid Networks. Institute of Computer Science and Applied Mathematics, University of Berne, Switzerland, pp.1-38.
- [11] Tutorial for the network simulator “ns”.<http://www.isi.edu/nsnam/ns/tutorial/>