Performance Analysis with AODV Routing Protocol for Wireless Adhoc Network

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Abstract

Ad hoc networks are describe by multihop wireless connectivity, frequently varying network topology and the need for capable dynamic routing protocols. We evaluate the performance of two important on- demand routing protocols for portable ad hoc networks Dynamic source Routing (DSR) and Ad Hoc On-Demand Distance Vector Routing (AODV). A comprehensive simulation model with MAC and substantial layer models is used to study communication between layers and their presentation implications. We demonstrate that even while DSR and AODV share a similar on-demand performance, the differences in the protocol mechanics can lead to important performance differentials. The performance discrepancyis analyzed using unreliableload on network, node mobility and size of the network. Based on the performance, we can find out the superior protocol among DSR & AODV

Keywords: ***DSR, AODV, Proactive Routing, Throughput, PDF***

INTRODUCTION

In an ad hoc network, mobile nodes conversewith each other using multi-hop wireless links. There is no motionless infrastructure such as bottom stations. Each node in the network also acts as a router, forwarding informationpackets for other nodes. A central confront in the design of ad hocnetworks is the growth of dynamic routing protocols that can competently find routes among two communicating nodes. The routing protocol should be able to keep up with the elevated degree of node mobility that often modify the network topology drastically and impulsively. Such networks have been considered in the past in relation to cover research, often under the name of packet radio networks (see, for example, [7]). Recently there has been a transformed interest in this field due to the frequentavailability of low-cost laptops and palmtops with radio edge. Interest is also partly fueled by the growing passion in running common network protocols in active wireless environments without the obligation of specific infrastructures.

Our goal is to hold out a systematic performance study of two energetic routing protocols for ad hoc networks — *Dynamic Source* Routing protocol (DSR) [6], [2] and Ad Hoc On-Demand Vector protocol (AODV) [10], [11]. DSR and AODV share an interesting frequentcharacteristic they both commence routing activities on an "on demand" source. This *reactive*character of these protocols is animportant departure from more traditional *proactive*protocols [4], that find routes among all source-destination pairs regardless of the utilize or need of such routes. The key motivation after the design of on-demand protocols is the decrease of the routing load. High routing pack usually has a significant impact on low bandwidth wireless links.

While DSR and AODV share the on-demand performance[9] in that they initiate routing behavior only in the presence of data packets in require of a route, many of their routing mechanics are very dissimilar. In particular, DSR uses source steering, but AODV uses a table-driven routing outline and destination succession numbers. DSR does not rely on any timer-based actions, but AODV does to a certain amount. One of our goals in this study is to take out the relative merits of these apparatus. The motivation is that animproved understanding of the virtual merits will serve as a cornerstone for expansion of more successful routing protocols for wireless ad hoc networks.

The rest of the paper is organized as follows. In the following segment, we briefly review the DSR and AODV protocols. In segment III, we present the related work cited in literature. Section IV explores a simulation model and results to perform detailed evaluation of the two protocols, focusing on the dissimilarity on their dynamic behaviors that can direct to performance dissimilarity. This lays down many of the circumstance of the performance study. The section concludes the comparison study.

II. DESCRIPTION OF PROTOCOLS

A. DSR

The key characteristic of DSR [2], [6] is the use of source routing. That is, the sender knows the absolute hop-by- hop route to the purpose. These routes are stored in a *direction cache.* The information packets carry the basic route in the packet descriptor.

When a node in the ad hoc network effort to send aninformation packet to a destination for which it does not previously know the route, it uses a *route* *discovery*procedure to dynamicallyresolve such a route. Route detection works by flooding the network with route demand (RREQ) packets. Each node getting a RREQ, rebroadcasts it, unless it is the purpose or it has a route to the purpose in its route cache. Such a node replies to the RREQ with a direction reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path negotiate so far. The RREP routes back to the source by traversing this conduit backwards. The route conceded back of the RREP packet is cached on the source for future use.

If any connection on a source route is broken, the source node is notified using a route fault (RERR) packet. The source eradicates any route using this connection from its cache. A new route finding process must be commenced by the source, if this route is motionless needed.

DSR makes very destructive use of source routing and direction caching. No special apparatus to detect routing loops is desirable. Also, any forwarding node accumulation the source route in a packet it forwards for probable future use. Several extra optimizations have been projected and have been estimated to be very effective by the authors of the protocol [9], as illustrated in the following. (i) *Salvage*: Atransitional node can use an alternate route foritspossess cache, when aninformation packet meets a failed link on its source route. (ii) *Gratuitous route repair:* A source node getting a RERR packet piggybacks the RERR in the subsequent RREQ. This helps hygienic up the caches of other nodes in the network that might have the failed link in one of the cached source routes. (iii) *Promiscuous listen*: When a node overhears a packet not address to itself, it checks if the packet might be routed via itself to gain a shorter direction. If so, the node propels a *gratuitous* RREP to the source of the route with this new, improved route. Aside from this, promiscuous eavesdrop helps a node to learn different routes lacking directly participating in the routing procedure.

B. AODV

AODV [14], [11] split DSR's on-demand characteristics in that it also determine routes on an "as needed" source via a parallel route discovery process. However, AODV accept a very different apparatus to maintain routing information. It uses conventional routing tables, one entry per purpose. This is a departure from DSR, which can preserve multiple route cache entries per purpose. Without source routing, AODV relies on routing bench entries to broadcast a RREP back to the source and, subsequently, to route data packets for the purpose. AODV uses succession numbers maintained at each purpose to determine the freshness of routing information and to avoid routing loops [10]. These succession numbers are carried by all steering packets.

Asignificant feature of AODV is the maintenance of timer- based position in each node, regarding the consumption of individual routing table entries. A routing bench entry is "expired" if not used lately. A set of predecessor nodes is maintained per steering table entry, which denotes the position of neighboring nodes that use this access to route data packets. These nodes are notified with RERR packets if subsequent hop link breaks. Each ancestor node, in turn, forwards the RERR to itspossesssets of predecessors, thus successfully erasing all routes using the broken link.

The recent condition of AODV [11] includes an optimizationprocedure to control the RREQ flood in the direction discovery process. It uses an *expanding ring*to exploreinitially to discover routes to an unidentified destination. In the expanding ring investigate, increasingly larger neighborhoodsare exploring to find the destination. The explore is controlled by the TTL field in the IP description of the RREQ packets. If the route to a formerly known destination is needed, the prior hop-wise detachment is used to optimize the search.

III. RELATED WORK

Two current efforts are the most associated with our work, as they use the same ns-2based replication environment.Broch, Maltz, Johnson, Hu and Jetcheva, the uniqueauthors of the simulation model, assess four ad hoc routing protocols together with AODV and DSR [1]. They used only 50 node models with comparable mobility and traffic scenarios that we dilapidated. Traffic loads are reserved low (4 packets/Sec, 10-30 sources, 64 byte packets). Packet deliverypart, the number of routing packets and allocation of path lengths were used as presentation metrics. An earlier description of AODV was used to lock the query control optimizations. DSR demonstrated vastly better routing load performance, and somewhat better packet delivery and route length presentation. This is along the column of our observations for the loads that were measured. Routing load performance and packet delivery ratio have enhanced, however, in the current AODV model for equivalent loads, though DSR leftovers a superior protocol for lower loads with a tiny number of nodes.

A more modern work, Johansson, Larssson, Hedman and Mielczarek [9] comprehensive the above work by using originalmobility models. To distinguish these models, a new *mobility* metric is initiated that measures mobility in terms of comparative speeds of the nodes rather than unconditional speeds and pause times. Again, simply 50 nodes were used. Aninadequate amount of load test was achieved, but the number of sources has been always small (15). Throughput, hold up and routing load (both in quantity of packets and bytes) were precise. The AODV model used hello messages for district detection in addition to the link coat feedback. The DSR model did *not* use licentiouslistening thus losing some of its advantages. In malice of the differences in the replica implementations, the overall observation was comparable to ours. In low loads DSR was more efficient, while AODV was more effective at superior loads. The packet wise steering load of DSR had been almost always considerably lower than AODV, though, though the byte wise routing load has been frequently compared. The authors attributed the relative poor performance of DSR to the source-routing expenses in data packets. They used small information packets (64 bytes) thus manufacture things somewhat unfavorable for DSR. With 512 byte packets, we didn't locate source routing overheads to be a very important performance issue.

There exists other effort that the comparative presentation of these two on-demand protocols with our own [4]. The performance of the two protocols was instigated similar. However, the replication environment was rather limited, with no connection or physical layer models. The steering protocol models also did not contain many functional optimizations.

IV. PERFORMANCE EVALUATION

A. Number of nodes Vs Throughput

The count of nodes was varied every time and the throughput was intended at the destination node during a complete simulation period whose quantity was as in fig. 1.

Table 1.Number of nodes Vs Throughput

Protocol	Throughput for number of nodes			
	5	10	15	20
DSR	10.73	72.38	206.98	368.45
AODV	40.92	431.40	1639.72	3759.80

AODV shows superior throughput than the DSR. The AODV has a large amount more direction-finding packets than DSR since the AODV avoids circle and brightness of routes while DSR uses stale routes. Its throughput is superior to AODV at elevated mobility.

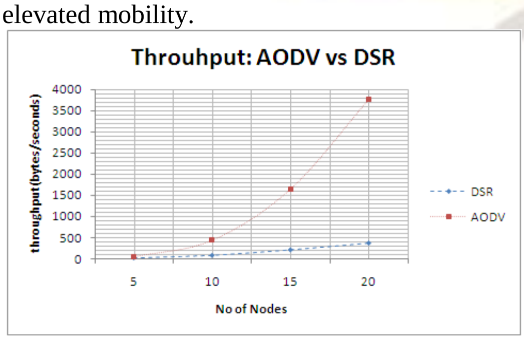

Figure 1.Throughput over number of nodes

B. Number of nodes Vs Packet Drop

A packet is dropped in two cases: the buffer is complete when the packet needs to be buffered and the instance that the packet has been buffered exceeds the boundary. Packet dropping was experimental for more than a few nodes and varied the nodes each instance and the dropped was counted at the target node during a complete recreation period whose quantity was as in Table 2.

Table 2. Packet dropped at different nodes

Protocol	Packet drop for number of nodes			
	5	10	15	20
AODV	13	12	12	11
DSR	10	8	9	10

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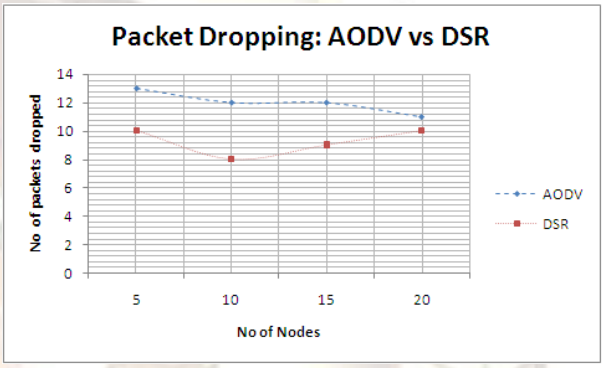

Figure 2. Packet drop over **number of**nodes

Well organized protocols can intelligently discover out routing way thus packets dropping speed reduces for them. The packet dropped for DSR is a smaller amount than that of AODV as it out performs with fewer nodes and no intermittent update is maintained in DSR

C. Packet Received Vs Propagation Delay

Packet getting statistic was performed for more than a few propagation delays in case of all Adhoc protocols, whose nature of packet difference becomes as in fig 3. DSR executes better when the propagation stoppage of nodes increases because nodes turn out to be more stationary will guide to steadier path beginning source to target. DSR is higher to AODV particularly when the node's propagation stoppage begins to increase.

Table 3. Packets received at different delays

Protocol	Packets received at propagation delay				
	10	20	30	40	50
AODV	0	453	596	596	596
DSR	0	336	504	676	820

For AODV, it shows important dependence on route immovability, thus its packet received rate is lower. Although, the quantity of packet conventional is inversely proportional to propagation stoppage, DSR has better presentation than AODV.

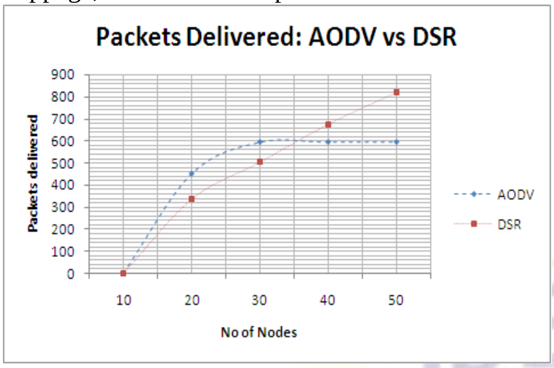

Figure **3:** Packet received over propagation delay

D. Throughput Vs Simulation Time

Throughput was gained at the target node against different dimension of networks and diverse the reproduction instance uniformly for each protocol whose calculate was as in fig 4. Throughput is the common rate of victorious message release over a communication channel. This data might be delivered over a physical or reasonable link, or pass during a certain network node. The throughput is frequently measured in bits for each second (byte/Sec), and sometimes in data packets for each second or data packet for each time slot. This is the calculate of how quickly a conclusion user is capable to receive data. It is determined as the percentage of the sum data received at required propagation time. A superior throughput determination directly impacts the user's awareness of the superiority of service (QoS).

Table 4. Throughput at different simulation delays

Protocol	Throughput at delay in ms						
	10	20	30	40	50	60	70
AODV	0	53	68	68	68	84	84
DSR	0	37	56	80	80	80	80

Based on the fig 4, it is shown that AODV and DSR have nearly same execution strategy because of avoiding the configuration of loops and its uses stale routes in container of broken links. The speed of packet established for AODV is improved than the DSR because this intermittent broadcast also adds a large in the clouds into the network. For AODV, the routing in the clouds is not likely pretentious as generated in DSR. For AODV, it shows important confidence on route constancy, thus its throughput is minor when the instance decreased.

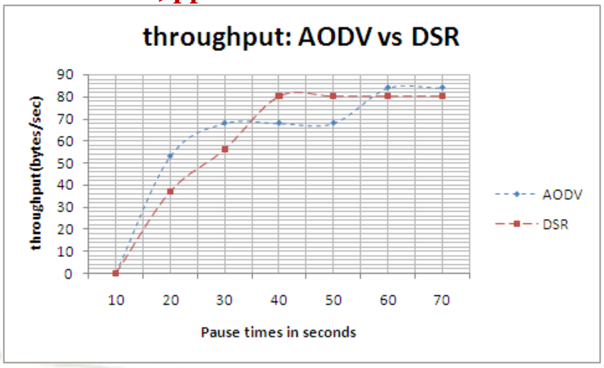

Figure **4**. Throughput over different pause times

E. Selecting the best routing protocols

Arithmetical analysis on the investigation data shown in on top of mentioned tables and consequent figures produces Table 5 where from the most excellent performing procedure with admiration to an exact network stricture can be chosen to optimize MANET presentation.

Table 5. Throughput at different simulation delays

PARAMETERS	**THE BEST PROTOCOL**
Number of nodes Vs Throughput	AODV
Number of nodes Vs Packet	DSR
Packets received Vs Propagation Delay	DSR
Throughput Vs Simulation Time	AODV, DSR

V. Conclusion:

Presentation analysis has been finished on two glowing known Adhoc networking protocols DSR and AODV. An inclusive simulation revise has been presented to evaluate these routing procedures using an unreliable workload such as throughput, packet delivered, packet drop and broadcast delay of ad-hoc system. AODV is better in case of throughput.

References:

[1] J. Broch, D. A. Maltz, D. B. Johnson, Y-C.Hu, and J. Jetcheva. A performance comparison of multi-hop wireless ad hoc network routing protocols. In Proceedings of the 4th International Conference on Mobile Computing and Networking (ACM MOBICOM'98), pages 85–97, October 1998.

[2] Josh Broch, David Johnson, and David Maltz.The dynamic source routing protocol for mobile ad hoc networks.http://www.ietf.org/internet-drafts/ draft-ietf-manet-dsr-01.txt, Dec 1998. IETF Internet Draft (work in progress).

[3] S.R. Das, R. Castaneda, J. Yan, and R. Sengupta. Comparative performance evaluation of routing protocols for mobile, ad hoc networks. In 7th Int. Conf. on

Computer Communications and Networks (IC3N), pages 153–161, October 1998.

[4] Z. J. Haas and M. R. Pearlman. The performance of query control schemes for the zone routing protocol. In Proceedings of ACM SIGCOMM'98 Conference, pages 167–177, Vancouver,Sept. 1998.

[5] Per Johansson, Tony Larsson, NicklasHedman, and BartoszMielczarek. Routing protocols for mobile ad-hoc networks - a comparative performance analysis. In Proceedings of the 5thInternational Conference on Mobile Computing and Networking(ACM MOBICOM'99), August 1999. to appear.

[6] D. Johnson and D.Maltz. Dynamic source routing in ad hoc wireless networks.In T. Imielinski and H. Korth, editors, Mobile computing, chapter 5. Kluwer Academic, 1996.

[7] John Jubin and Janet D. Tornow.The DARPA packet radio network protocols. Proceedings of the IEEE, 75(1):21–32, January1987.

[8] J. Macker and S. Corson. Mobile ad hoc networks (MANET).http: //www.ietf.org/ html.charters/manet-charter.html, 1997.IETFWorking Group Charter.

[9] David Maltz, Josh Broch, JorjetaJetcheva, and David Johnson.The effects of on-demand behavior in routing protocols for multihop wireless ad hoc networks.IEEE Journal on Selected Areas in Communication, 1999.to appear.

[10] Charles Perkins and Elizabeth Royer. Ad hoc on-demand distance vector routing. In Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, pages 90–100, Feb1999.

[11] Charles Perkins, Elizabeth Royer, and Samir Das. Ad hoc on demand distance vector (AODV) routing. http:// www.ietf.org/internet-drafts/ draft-ietf-manet-aodv-03.txt, June 1999. IETF Internet Draft (work in progress).

[12] Magnus Frodigh, Per Johansson and Peter Larsson "Wireless ad hoc networking-The art of networking without a network" Ericsson Review No. 4, 2000.

[13] D. B. Johnson and D. A. Maltz, "Dynamic Source Routing," in Ad Hoc Wireless Networks, Mobile Computing, T. Imielinski and H. Korth (Eds.), Chapter 5, pp. 153–181, Kluwer Academic Publishers, 1996.

[14] David B. Johnson and David A. Maltz, "Dynamic source routing in ad hoc wireless networks," In Mobile Computing, Imielinski and Korth (Eds), chapter 5, pages153–181, Kluwer Academic Publishers, 1996.