International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Performance of Single Path and Multipath on-Demand Routing Protocol in Manets

Nitin K[1], Rahul K[2]

ECE Dept., Guru Nanak Dev Engg College, Bidar [1]
CSE Dept., Guru Nanak Dev Engg College, Bidar [2]

ABSTRACT

On-demand protocols incur lower routing overheads compared to their proactive counterparts. However, they are not without performance problems. High route discovery latency together with frequent route discovery attempts in dynamic networks can affect the performance adversely. Multipath on-demand protocols try to alleviate these problems by computing multiple paths in a single route discovery attempt. Performance comparison of AOMDV with AODV using ns-2 simulations shows that AOMDV is able to achieve a remarkable improvement in the end-to-end delay and is also able to reduce routing overheads.

Index Terms—AODV, AOMDV, Ns2

Introduction

Mobile ad hoc networks (Manets) are characterized by highly dynamic topology due to mobility of nodes, limited channel bandwidth and limited battery power of nodes. Here the challenge is to be able to route with low overheads even in dynamic conditions. Overhead here is defined in terms of the routing protocol control messages which consume both channel bandwidth as well as the battery power of nodes for communication/ processing. In order to reduce routing overheads, *on-demand* routing protocols build and maintain *only* needed routes. Examples include Dynamic Source Routing (DSR)[6][8] and Ad hoc Ondemand Distance Vector routing (AODV)[3][4][5][8]. Where as in proactive protocols e.g., Destination Sequenced Distance Vector (DSDV) [8] maintain routes between all node pairs all the time.

In on-demand protocols, a route discovery process is initiated whenever a route is needed. Several performance studies of ad hoc networks have shown that on-demand protocols incur lower routing overheads compared to their proactive counterparts. However, they are not without performance problems. High route discovery latency together with frequent route discovery attempts in dynamic networks can affect the performance adversely. Multipath on-demand protocols try to alleviate these problems by computing multiple paths in a single route discovery attempt. Multiple paths could be formed at both traffic sources as well as at intermediate nodes. New route discovery is needed only when all paths fail. This reduces both route discovery latency and routing overheads. Here we analyze the performance of on demand multipath distance vector routing protocol with the single path adhoc on demand distance vector routing protocol. The rest of the paper is organized as follows: The AODV routing protocol Description is summarized in section 2. The AOMDV routing protocol Description is summarized in section 3. The simulation environment and performance metrics are described in Section 4 & 5 respectively. The simulation results in section 6 and the conclusion is presented in section 7.

2 Ad Hoc on-Demand Distance Vector (AODV) Routing

AODV[3][4][5] makes use of destination sequence numbers as used in DSDV with the on-demand route discovery technique in DSR to formulate a loop-free, on-demand, single path, distance vector protocol. AODV is based on hop-by-hop routing method. Route discovery typically involves a network-wide flood of route request (RREQ) packets targeting the destination and waiting for a route reply (RREP). An intermediate node receiving a RREQ packet first sets up a reverse path to the source using the previous hop of the RREQ as the next hop on the reverse path. If a valid route to the destination is available, then the intermediate node generates a RREP, else the RREQ is rebroadcast. Duplicate copies of the RREQ packet received at any node are discarded. When the destination receives a RREQ, it also generates a RREP. The RREP is routed back to the source via the reverse path. As the RREP proceeds towards the source, a forward path to the destination is established.

Route maintenance is done using route error (RERR) packets. When a link failure is detected (by a link layer feedback, for example), a RERR is sent back via separately maintained predecessor links to all sources using that failed link. Routes are erased by the RERR along its way. When a traffic source receives a RERR, it initiates a new route discovery if the route is still needed.

3 Adhoc On demand Multipath Distance Vector (AOMDV) routing protocol

The main idea in AOMDV [1] is to compute multiple paths during route discovery. It is designed primarily for highly dynamic ad hoc networks where link failures and route breaks occur frequently. When single path on-demand routing protocol such as AODV is used in such networks, a new route discovery is needed in response to every route break. Each route discovery is associated with high- overhead and latency. This inefficiency can be avoided by having multiple redundant paths available. Now, a new route discovery is needed only when *all* paths to the destination break.

The main difference lies in the number of routes found in each route discovery. In AOMDV, RREQ propagation from the source towards the destination establishes multiple reverse paths both at intermediate nodes as well as the destination. Multiple RREPs traverse these reverse paths back to form multiple forward paths to the destination at the source and intermediate nodes. Note that AOMDV also provides intermediate nodes with alternate paths as they are found to be useful in reducing route discovery frequency. The core of the AOMDV protocol lies in ensuring that multiple paths discovered are loop-free and disjoint, and in efficiently finding such paths using a flood-based route discovery. AOMDV route update rules, applied locally at each node, play a key role in maintaining loop-freedom and disjointness properties.

4 Simulation environment

We use a detailed simulation model based on *ns-2* [7]. The Monarch research group in CMU developed support for simulating multi-hop wireless networks complete with physical, data link, and MAC layer models on *ns-2*. The distributed coordination function (DCF) of IEEE 802.11 for wireless LANs is used as the MAC layer. The radio model uses characteristics similar to a commercial radio interface, Lucent's WaveLAN. WaveLAN is a shared-media radio with a nominal bit-rate of 2 Mb/s and a nominal radio range of 250 m. The CBRGEN tool in NS2 [7] is used to generate the traffic file with 512 bytes data packet and send rate of 4 packets/second. The SETDEST tool is used to generate a scenario file for random waypoint mobility model [2]. The simulation parameters are as shown in Table I.

Table I: Simulation parameters

Simulation parameter	**Value**
Simulation time	600s
Transmission range	250m
Mobile nodes	100
Pause time	0s
Traffic pairs	10,15,20,25
Speed of mobile nodes	15m/s
Simulation area	2000m*600m

5 Performance metrics

We evaluate four key performance metrics:

(i) *Packet delivery fraction*- ratio of the data packets delivered to the destination to those generated by the CBR sources; or a related metric *received throughput* in Kb/sec received at the destination.

(ii) *Average end-to-end delay* of data packets - this includes all possible delays caused by buffering during route discovery, queuing delay at the interface, retransmission delays at the MAC, propagation and transfer times.

(iii) *Route discovery frequency* - the total number of route discoveries initiated per second.

(iv) *Normalized routing load* - the total number of routing packets "transmitted" for each delivered data packet. Each hop-wise transmission of these packets is counted as one transmission.

6 Simulation Results

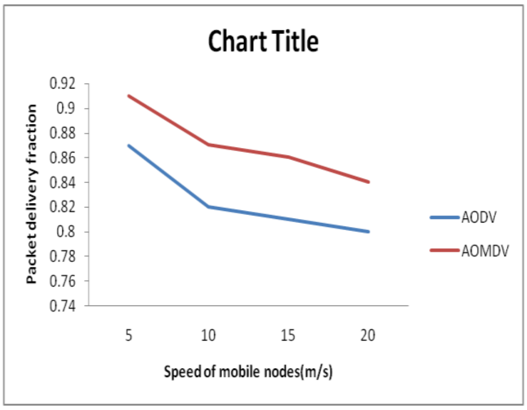

Fig 1. PDF

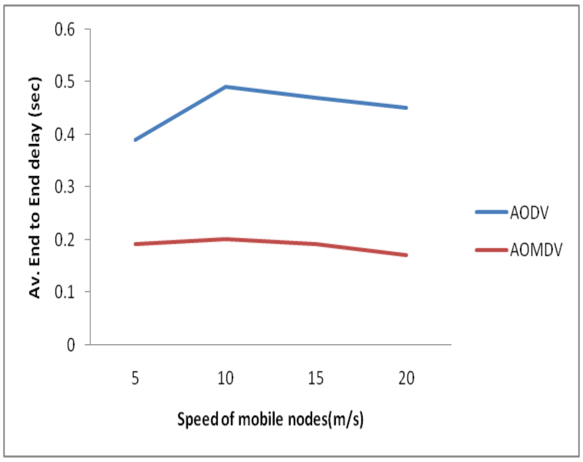

Fig 2. Average End to end delay

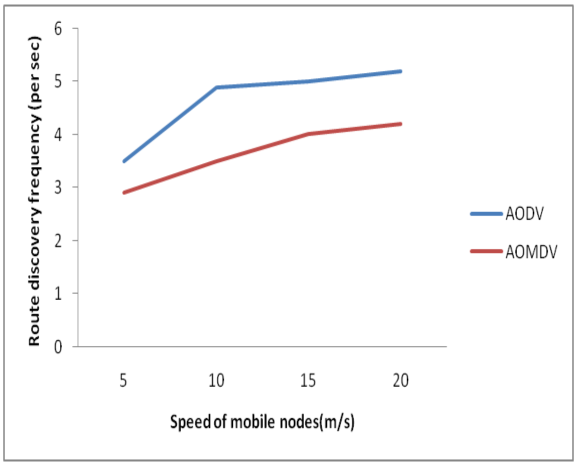

Fig 3. Route discovery frequency

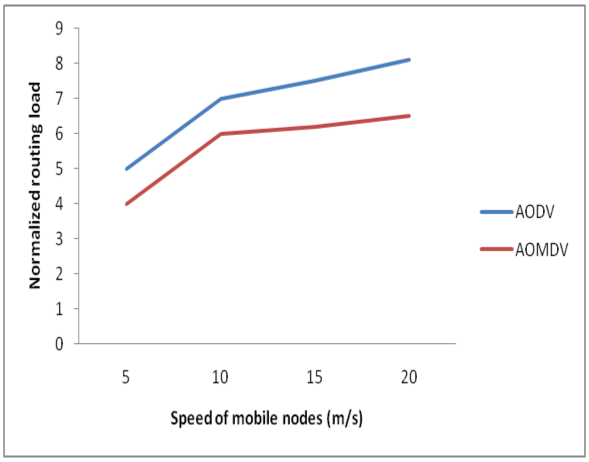

Fig 4. NRL

7 Conclusion

The performance of AODV & AOMDV protocol is studied by varying speed of nodes. We observe that AOMDV offers a significant reduction in Delay, routing load and the frequency of route discoveries. In general, AOMDV always offers a superior overall routing performance than AODV.

References

[1] Mahesh K. Marina and Samir R. Das, Ad hoc on-demand multipath distance vector routing, *Wirel. Commun. Mob. Comput.* 2006; **6**:969–988

[2] T. Camp, J. Boleng, and V. Davies, “A survey of mobility models for ad hoc network research,” Wireless Communications and Mobile Computing: Special issue on Mobile Ad Hoc Networking: Research, Trends and Application, pp. 483-502, 2002.

[3] S. R. Das, C. E. Perkins, and E. M. Royer, Performance Comparison of Two On-Demand Routing Protocols for Ad Hoc Networks, IEEE Personal Communications Magazine, Vol. 8, No. 1, February 2001, pp.16-29.

[4] Rahul K, Nitin Kulkarni, “Comparative Analysis Of AODV, DSR Routing Protocols In Mobile Ad-Hoc Networks”, International Journal of Engineering Research & Technology(IJERT) vol 2 issue7, 283-290, July 2013

[5] R Eklarkar, V Dutta, V Kohir, VD Mytri, N Kulkarni,Performance comparison of AODV, DSR and Cluster based routing in Manets, International Journal of Engineering Research & Technology (IJERT), vol 2, issue 5 may 2013

[6] D.B. Johnson, D.A. Maltz, and J. Broch, “DSR: The Dynamic SourceRouting Protocol for Multi-Hop Wireless Ad Hoc Networks,” *Ad HocNetworking*, pp. 139–172, 2001.

[7] NS -2, The ns Manual, Available at http: //www.isi.edu/nsnam/ns/doc.

[8] E. M. Royer, and C.K. Toh, A Review of Current Routing Protocols for Ad Hoc Mobile Wireless Networks, IEEE Personal Communications, Vol. 6, Issue 2, pp. 46-55, April 1999.