International Journal of Computing and Business Research
ISSN (Online) : 2229-6166
Volume 2 Issue 3 September 2011

http://www.researchmanuscripts.com

SIMULATION STUDY OF AODV&DSR

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Abstract

Mobile ad hoc network (MANET) is an autonomous system of mobile nodes connectedby wireless links. Each node operates not only as an end system, but also as a router toforward packets. The nodes are free to move about and organize themselves into anetwork. These nodes change position frequently. A comparative analysis has been done using network simulator NS2. As per our findings the differences in the protocol mechanics lead to significant performance differentials for both of these protocols.The results presented in this work illustrate the importance in carefully evaluating and implementing routing protocols in an ad hoc environment.

Keywords: MANETS, AODV, DSR.

1. Introduction

Portable nodes-Notebooks, palmtops or even mobile phones usually compose wireless ad-hoc networks. This portability also brings a significant issue of mobility. This is a key issue in ad-hoc networks. The mobility of the nodes causes the topology of the network to change constantly. Reactive routing protocols were intended for these types of environments. These are based on the design that there is no point on trying to have an image of the entire network topology, since it will be constantly changing. Instead, whenever a node needs a route to a given target, it initiates a route discovery process on the fly, for discovering out a pathway [1]. Reactive protocols start to set up routes on-demand. The routing protocol will try to establish such a route, whenever any

node wants to initiate communication with another node to which it has no route. The different types of On Demand driven protocols are:

Ad hoc On Demand Distance Vector (AODV)[14] ,Dynamic Source routing protocol (DSR) [14] , Temporally ordered routing algorithm (TORA) [15] , Associativity Based routing (ABR) [14] Signal Stability-Based Adaptive Routing (SSA) [15] and Location-Aided Routing Protocol (LAR) [ ]

2.Description of Reactive Protocols

Reactive protocol is identified as On-demand protocols because it creates routes onlywhen these routes are needed. The need is initiated by the source, as the name suggests.When a source node requires a route to a destination, it initiates a route discovery processwithin the network. This process is completed once a route is found or all possible routepermutations have been examined. After that there is a route maintenance procedure tokeep up the valid routes and to remove the invalid routes**.** The various Reactive RoutingProtocols are discussed below:

2.1 Ad hoc On Demand Distance Vector Routing (AODV)

Ad hoc On-Demand Distance Vector (AODV) routing is a routing protocol for mobile adhoc networks and other wireless ad-hoc networks. The AODV [10, 11] routing protocol is a reactive routing protocol; therefore, routes are determined only when needed. Hello messages may be used to detect and monitor links to neighbors. If Hello messages are used, each active node periodically broadcasts a Hello message that all its neighbors receive. Because nodes periodically send Hello messages, if a node fails to receive several Hello messages from a neighbor, a link break is detected. It is jointly developed in NokiaResearch Centre of University of California, Santa Barbara and University of Cincinnatiby C. Perkins and S. Das. It is an on-demand and distance-vector routing protocol,meaning that a route is established by AODV from a destination only on demand [6].AODV is capable of both unicast and multicast routing [12]. It keeps these routes as longas they are desirable by the sources. Additionally, AODV creates trees which connectmulticast group members. The trees are composed of the group members and the nodesneeded to connect the members. The sequence numbers are used by AODV to ensure thefreshness of routes. It is loop-free, self-starting, and scales to large numbers of mobilenodes [12] [7]. AODV defines three types of control messages for route maintenance:

RREQ- A route request message is transmitted by a node requiring a route to a node. Asan optimization AODV uses an expanding ring technique when flooding these messages.Every

RREQ carries a time to live (TTL) value that states for how many hops thismessage should be forwarded. This value is set to a predefined value at the firsttransmission and increased at retransmissions. Retransmissions occur if no replies arereceived. Data packets waiting to be transmitted (i.e. the packets that initiated theRREQ). Every node maintains two separate counters: a node sequence number and abroadcast_ id. The RREQ contains the following fields [12]

RREP- A route reply message is unicasted back to the originator of a RREQ if thereceiver is either the node using the requested address, or it has a valid route to therequested address. The reason one can unicast the message back, is that every routeforwarding a RREQ caches a route back to the originator.

RERR- Nodes monitor the link status of next hops in active routes. When a link breakagein an active route is detected, a RERR message is used to notify other nodes of the loss ofthe link. In order to enable this reporting mechanism, each node keeps a ―precursor list",containing the IP address for each its neighbours that are likely to use it as a next hoptowards each destination.

2.1.2 Advantages and Disadvantages

The main advantage of AODV protocol is that routes are established on demand anddestination sequence numbers are used to find the latest route to the destination. Theconnection setup delay is less. The HELLO messages supporting the routes maintenanceare range-limited, so they do not cause unnecessary overhead in the network.One of the disadvantages of this protocol is that intermediate nodes can lead toinconsistent routes if the source sequence number is very old and the intermediate nodeshave a higher but not the latest destination sequence number, thereby having stale entries.Also multiple RouteReply packets in response to a single RouteRequest packet can leadto heavy control overhead [5]. Another disadvantage of AODV is that the periodicbeaconing leads to unnecessary bandwidth consumption.

2.2 Dynamic Source Routing (DSR)

Dynamic Source Routing (DSR) is a routing protocol for wireless mesh networks. It issimilar to AODV in that it establishes a route on-demand when a transmitting mobilenode requests one. However, it uses source routing instead of relying on the routing tableat each intermediate device [3].Dynamic source routing protocol (DSR) is an on-demand, source routing protocol [8],whereby all the routing information is maintained (continually updated) at mobile nodes.DSR allows the network to be completely self-organizing and self-configuring, withoutthe need for

any existing network infrastructure or administration.

The protocol iscomposed of the two main mechanisms of "Route Discovery" and "Route Maintenance",which work together to allow nodes to discover and maintain routes to Arbitrary destinations in the ad hoc network [9].An optimum path for a communication between a source node and target node isdetermined by Route Discovery process. Route Maintenance ensures that thecommunication path remains optimum and loop-free according the change in networkconditions, even if this requires altering the route during a transmission. Route Replywould only be generated if the message has reached the projected destination node (routerecord which is firstly contained in Route Request would be inserted into the RouteReply).To return the Route Reply, the destination node must have a route to the source node. Ifthe route is in the route cache of target node, the route would be used. Otherwise, thenode will reverse the route based on the route record in the Route Reply message header(symmetric links). In the event of fatal transmission, the Route Maintenance Phase isinitiated whereby the Route Error packets are generated at a node.

The incorrect hop willbe detached from the node's route cache; all routes containing the hop are reduced at thatpoint. Again, the Route Discovery Phase is initiated to determine the most viable route.The major dissimilarity between this and the other on-demand routing protocols is that itis beacon-less and hence it does not have need of periodic hello packet (beacon)transmissions, which are used by a node to inform its neighbors of its presence. Thefundamental approach of this protocol during the route creation phase is to launch a routeby flooding RouteRequest packets in the network. The destination node, on getting aRouteRequest packet, responds by transferring a RouteReply packet back to the source,which carries the route traversed by the Route Request packet received.

2.2.1 Advantages and Disadvantages

DSR uses a reactive approach which eliminates the need to periodically flood thenetwork with table update messages which are required in a table-driven approach. Theintermediate nodes also utilize the route cache information efficiently to reduce thecontrol overhead.The disadvantage of DSR is that the route maintenance mechanism does not locallyrepair a broken down link. The connection setup delay is higher than in table-drivenprotocols. Even though the protocol performs well in static and low-mobilityenvironments, the performance degrades rapidly with increasing mobility. Also,considerable routing overhead is involved due to the source-routing

mechanismemployed in DSR. This routing overhead is directly proportional to the path length.

3. Proposed Scheme

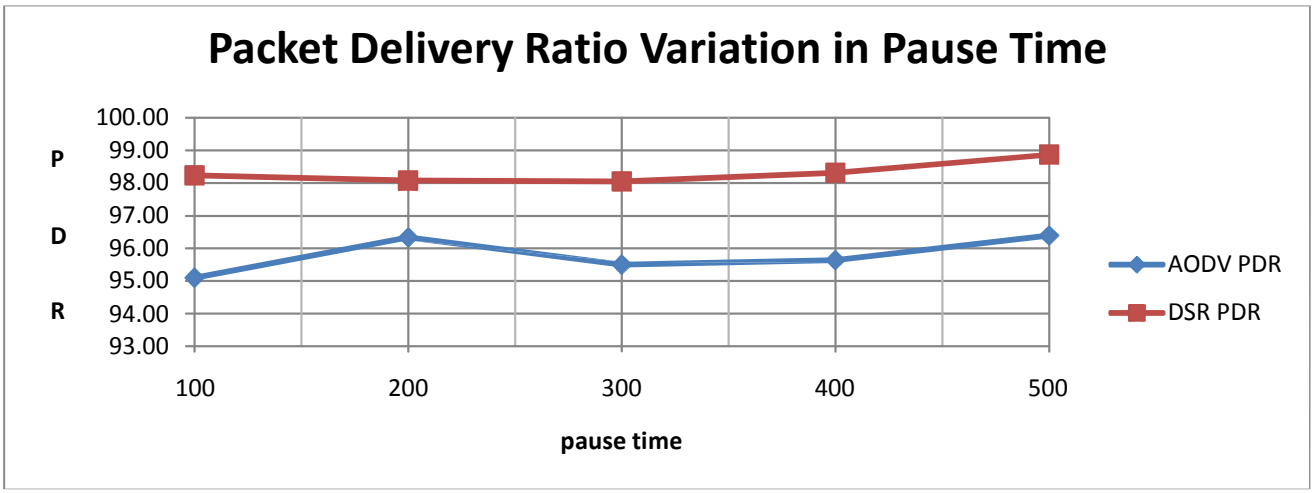
The objective of this work is to evaluate two routing protocols based on On-demand behaviour,namely, Ad hoc Demand Distance vector (AODV) and Dynamic SourceRouting (DSR), for wireless ad hoc networks based on performance. This evaluation is tobe carried out through exhaustive literature review and simulation.

4. Simulation

The Simulator used is ns-2.34. For all the simulations, the comparison is performed on the basis of Pause time & Speed.Scenarios has been created using TCL for 20 and 30 nodes. Pause time varies from 0 to 500. Speed varies from 1m/s to 6 m/s. Table -1 shows parameters used for simulation.

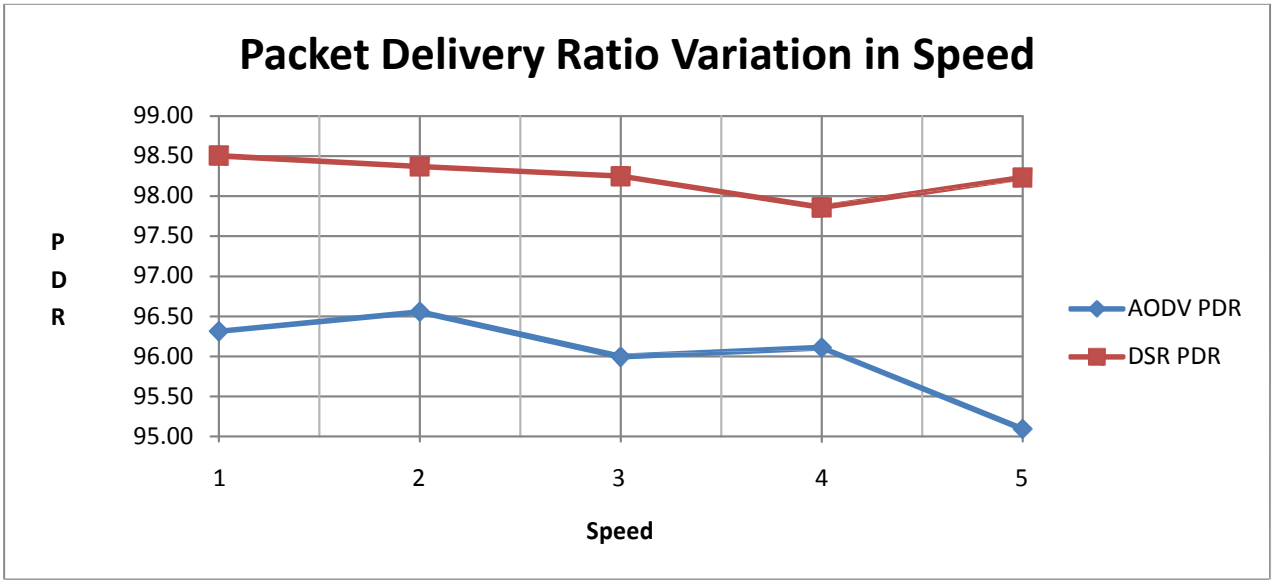
Table 1: Scenario for implementation of AODV and DSR

Parameter	Value
Number of nodes	**20, 30**
Pause Time	**500,400,300,200,100**
Speed	**1 – 6 m /s**
Environment Size	**670*670**
Transmission Range	250 m
Traffic Size	CBR (Constant Bit Rate)
Packet Size	512 bytes
Queue Length	50
Simulator	**ns-2.34**
Antenna Type	Omnidirectional

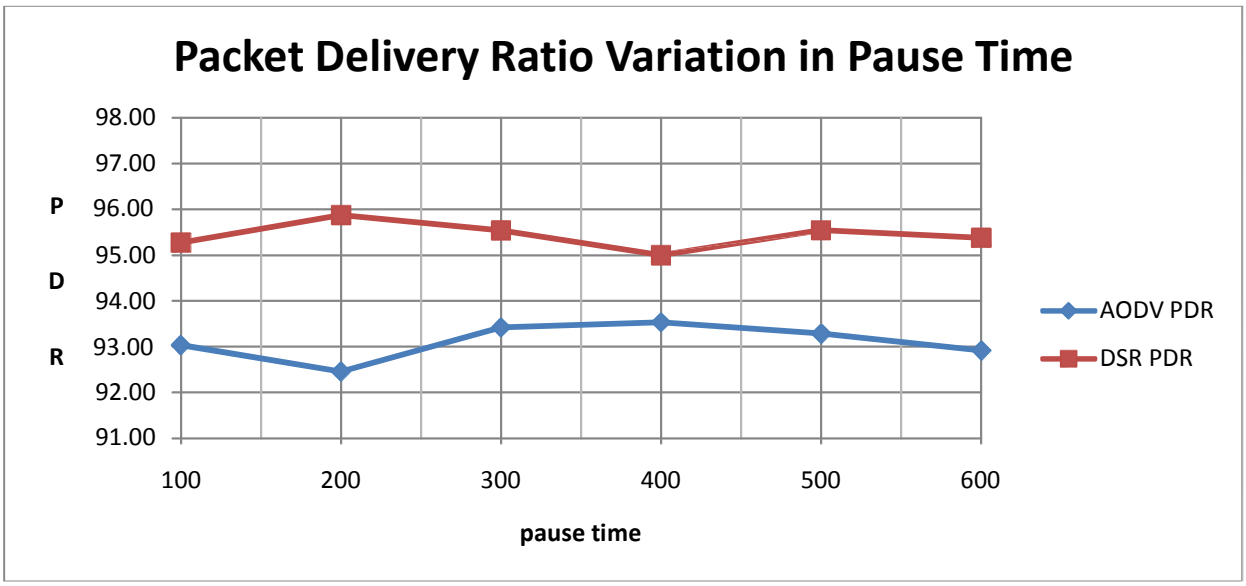


Graph 1: PDR versus Pause time of DSR& AODV [20 nodes]

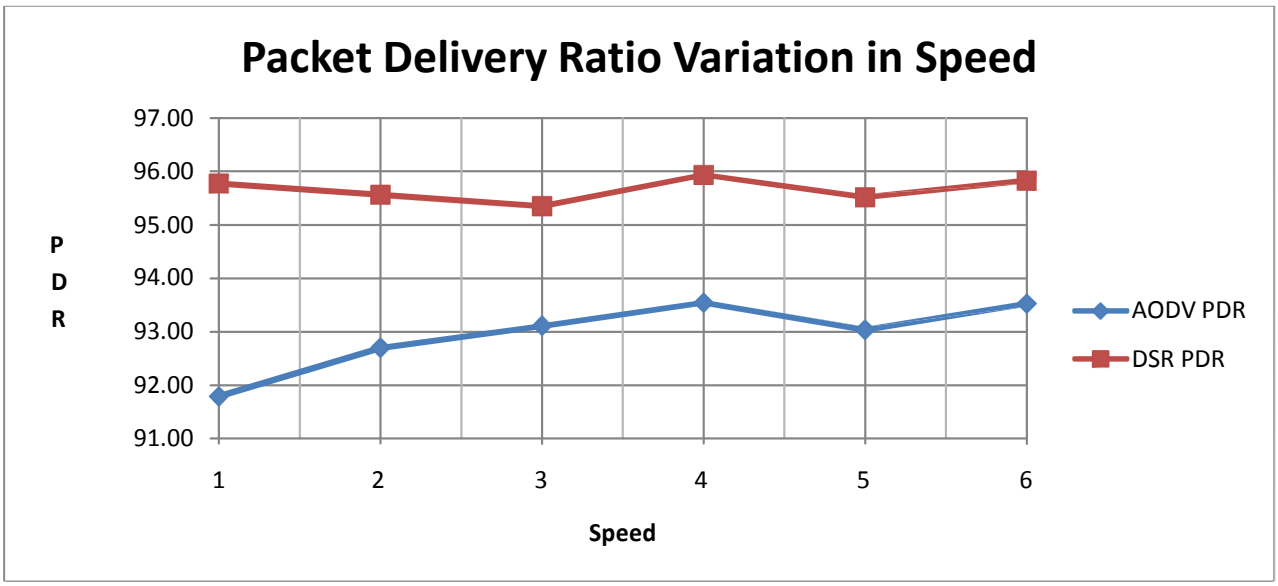
Graph1 is representation of AODV and DSR with Pause time as function, it clearly indicates that DSR is better in most of the cases. PDR reached is appx 99% in DSR and 97% in AODV. In graph 2 the same scenario has been used with speed as function, with increasing speed AODV catches up with DSR , still performance of DSR is better wth sparse medium i.e. less number of nodes.



Graph 2: PDR versus Speed of DSR& AODV [20 nodes]



Graph 3: PDR versus Pause time of DSR& AODV [30 nodes]



Graph 4:PDR versus Speed of DSR& AODV [30 nodes]

Graph 3, 4 shown similar representation of AODV and DSR with Pause time as function with 30 nodes. The results support the theory that DSR is outperforming AODV in most of the cases. performance of DSR is better with sparse medium i.e. less number of nodes.

5. Conclusion and Future Scope

A comparison of two On-demand routing protocols, namely, Ad hoc On-DemandDistance Vector Routing (AODV) and Dynamic Source Routing (DSR).

It is observed that the packet loss is very less in case of AODV, initially but it increasessubstantially as the simulation time increases. In case of DSR simulation the packet lossis very high initially but it decreases substantially on the simulation time increases.So, it Can be concluded that if the MANET has to be setup for a small amount of time thenAODV should be preferred due to low initial packet loss. DSR has overall good packet receiving ratio in comparison to AODV. Efforts are on to simulate the results of TORA and ABR along with AODV and DSR. A security aspect has been considered for future studies and an algorithm based on Encryption has been developed and will be implemented on extended AODV.

References

[1] Elizabeth M. Royer and Chai-KeongToh, ―A review of current routing protocolsfor ad hoc mobile wireless networksL, Technical report, University of Californiaand Georgia Institute of Technology, USA, 1999.

[2] Ad-hoc distance vector protocol for mobile ad hoc networkhttp://www.olsr.org/docs/report_html/node16.html#adhoc_aodv#adhoc_aodv – accessed on may 2009.

[3] J. Broch, David A. Maltz, David B. Johnson, Y-Ch Hu and J Jetcheva, ―Aperformance Comparison of Multi-hop Wireless Ad Hoc Network for mobile adhoc networksL, in Proc. 4th annual IEEE/ACM international conference onMobile Computing and Networking, Dallas, Texas, U.S. pp. 85-97, Oct. 1998.

[4] E.M. Royer and Charles E. Perkins, ―Multicast Operation of the Ad-hoc On-Demand Distance Vector Routing AlgorithmL, University of California, SantaBarbara.

[5] Luke Klein-Bernd, ―A Quick Guide to AODV RoutingL, National Institute ofStandards and Technology, US.

[6] C.E Perkins, E.M. Royer, and S. Das, ―Ad hoc On-demand Distance Vector(AODV),L RFC 3561, July 2005.

[7] Abdul HadiAbdRahman and Zuriati Ahmad Zukarnain, ―PerformanceComparison of AODV, DSDV and I-DSDV Routing Protocols in Mobile AdHoc NetworksL, European Journal of Scientific Research, ISSN 1450-216XVol.31 No.4, pp.566-576, 2009.

[8] D. B. Johnson and D. A. Maltz, ―Dynamic Source Routing in Ad Hoc WirelessNetworks, Mobile ComputingL, Chapter 5, pp. 153-181, Kluwer AcademicPublishers, 1996,

[9] http://www.networksorcery.com/enp/protocol/dsr.htm-- Dynamic source routingprotocol (DSR).

[10] C. E. Perkins, E. M. Belding-Royer, and S. Das.Ad hoc On-Demand Distance Vector (AODV) Routing.*RFC 3561*, July 2003.

[11] C. E. Perkins and E. M. Royer. The Ad hoc On-Demand Distance Vector Protocol. In C. E. Perkins, editor, *Ad hoc Networking*, pages 173.219. Addison-Wesley, 2000.

[12] C.E. Perkins and E.M. Royer, ―Ad-hoc On-Demand Distance Vector RoutingL,Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems andApplications, New Orleans, LA, pp. 90-100, February 1999.

[13] C.E. Perkins and E.M. Royer, ―Ad hoc On Demand Distance Vector RoutingL ,University of California, Santa Barbara.

[14] A.Kush "Security And Reputation Schemes In Ad-Hoc Networks Routing" International Journal of Information Technology and Knowledge Management January June 2009, Volume 2, No. 1, pp. 185-189

[15] A.Kush, C.Hwang, P.Gupta, "Secured Routing Scheme for Adhoc Networks" International Journal of Computer Theory and Engineering (IJCTE).May 2009, Volume 3.pp 1793-1799, ISSN: 1793-821X