

Performance Evaluation of Energy Efficient Routing Protocols in MANETS

C KRISHNA CHAITANYA REDDY, L JAGADEESH NAIK

Department of Electronics and Communication Engineering

BIT Institute of Technology, Ananthapur Dist. AP, India

ckcr1991@gmail.com

jagadeeshnaik@gmail.com

Abstract—

In this paper the mobile ad-hoc networks where there is no fixed infrastructure the mobile nodes are highly dynamic mobility. Due to mobility of node cased increasing over head and also require more energy consumption. , in mobile ad hoc network major challenging issue is energy and network overhead because of mobile nodes have limited energy source which are operated with only DC source. The effective use of energy requires efficient routing protocol. A performance comparison of Dynamic Source Routing (DSR) and Ad hoc On-Demand Distance Vector (AODV) routing protocols with respect to average energy consumption and routing energy consumption are explained thoroughly. The performance of the DSR protocol is compared with AODV protocol in terms of energy consumption, network overhead, throughput, end to end delay. The simulation parameters are carried out using network simulator ns 2.35.

Keyword: AODV, DSR, MANETs, Energy

I. INTRODUCTION

In the next upcoming generation of the wireless communication systems, there should be need for the rapid much deployment of independent mobile or any wireless devise users. So that many examples include establishing for survivable systems, efficient systems, dynamic communication systems for emergency or rescue operations, disaster management for relief efforts, and military wireless networks. Such above said network scenarios cannot easily rely on any centralized and any organized connectivity, this can be conceive as many applications of the Mobile Ad Hoc Networks. A MANET is a self collection and organization of mobile users that may be a communicates over relatively similar with the bandwidth constrained of the wireless links. Since nodes are mobile, which are freely moved from one place to other place around of the network so that the topology of the network may be changes much rapidly and unpredictably over with time. The network may be a decentralized, where the networks activities are including discovering network topology, delivering the messages that must be executed by the wireless nodes themselves with any coordination i.e., the routing functionality may be an incorporated into the wireless mobile nodes.

In mobile ad-hoc networks where there is no fixed infrastructure support as is the case with wireless networks, and since a destination mobile

node might be out of range of a source mobile node transmitting packets; a routing procedure must be always required to find a path so as to forward the packets appropriately between the source node and the destination node. In the mobile ad-hoc networks each mobile node must be able to forward data to other mobile nodes. This connection topology crates additional problems along with the troubles of dynamic topology which are unpredictable connectivity changes.

II. ROUTING PROTOCOLS

Routing is the most primary research issue in the MANET and must deal with restrictions such as high power consumption, little bandwidth, high error rates and impulsive whereabouts of nodes. Generally, current routing protocols for MANET can be categorized as mainly one is proactive and reactive routing protocols.

Proactive (Table-Driven): In the pro-active routing protocols are the same as in progress internet routing protocols such as the first one RIP(Routing Information Protocol), second one DV(distance-vector), third one OSPF (Open Shortest Path First) and finally link-state routing . They attempt to maintain dependable, up-to-date routing information of the whole network. Each node has to preserve one or more tables to store routing information, and response to changes in network topology by distribution and propagating.

existing pro-active ad hoc routing protocols: there are several routing protocols such as first one DSDV (Destination Sequenced Distance-Vector), second one WRP (Wireless Routing Protocol), third one CGSR (Cluster head Gateway Switch Routing), fifth one GSR (Global State Routing), sixth one FSR (Fisheye State Routing), seventh one HSR (Hierarchical State Routing), eighth one ZHLS (Zone based Hierarchical Link State) and other STAR (Source Tree Adaptive Routing).

One of the fundamental challenges of MANETs is the propose of dynamic routing protocols with superior presentation and less overhead. To augment the system performance and to reduce the overhead we use different protocols. They are AODV Protocol and DSR Protocol. Based on the parameters like Routing overhead, delay, Packet delivery ratio and, Energy consume, packet drop ratio the performance analysis of the AODV, DSR protocols can be analyzed.

III. PROTOCOL OVERVIEW

A. DSR (Dynamic Source Routing)

DSR is an efficient routing protocol proposed specially to be used in multi-hop mobile Ad hoc networks. It has two phases including Route Discovery and also Route Maintenance. These two phases help nodes to find and maintain the best source routes to destinations. The Source Routing is a loop-free routing that intermediate nodes do not need any up-to-date routing information by allowing nodes to cache the routing information for future use [3]. Each node in this protocol controls each packet for source-route information and forward it based on this routing information. If routing information is not found in the packet, it will provide the source route by knowing the route. When the destination is not known, node caches the packet and finds the routing information to the destination by sending route queries to all nearby nodes. Then it sends the Route-Replies back to the source.

B. AODV (Ad hoc On-Demand Distance Vector)

On the other hand, AODV is another reactive routing protocol with quick adaptation to dynamic link conditions and low network utilization in mobile Ad hoc network. AODV does not discover and maintain any routes until two nodes need to communicate with each other. AODV uses the destination sequence number to guarantee the route freshness and loop freedom of the route. Like DSR, routing method in AODV has two steps: route discovery as well as route maintenance. When a node needs to send data to another node which has no routing information, Route Discovery process is initiated. It broadcast

a Route Request (RREQ) packet to its neighbors. Each neighboring node either replies the RREQ by sending a Route Reply (RREP) packet or increasing the Hop-count field and rebroadcasting the RREQ to its own neighbors. It means that nodes reply to the RREQ by a RREP packet only if they have a fresh route for the desired destination. The source node restarts the discovery process to make a new route to the destination if receives Route Error (RERR) control packet from nodes in case of link breakage .

IV. Energy optimization in DSR and AODV

An energy efficient routing protocol decreases the power consumption of the nodes by routing data on paths that consume the least amount of energy. There are some special mechanisms to achieve this goal. used an efficient caching technique for storing information to propose an energy efficient routing protocol. They showed that it has a better performance in terms of energy savings compared to DSR protocol. Moreover, proposed a loop-free energy conserving scheme which tries to decrease routing and storage overhead to provide optimization of resources use in large scale networks. It is based on source routing and named Energy Conserving Dynamic Source Routing (ECDSR). They also evaluated the performance of this scheme by simulation and showed better results. Furthermore, proposed a comprehensive energy optimized routing algorithm based on AODV protocol. This algorithm was created based on the combination of device runtime battery capacity and the real propagation power loss information. Moreover, proposed algorithm used the AODV routing protocol to select the optimal route based on the basis of the maximum energy of each route. Furthermore, proposed a new routing algorithm based on the energy level of the node. The results showed the advantages of this protocol in terms of energy consumption. In addition, investigated AODV based algorithm with less energy consumption during route founding by establishing routes that are lower congested than the others. Their scheme decreased more than 20 % of total energy consumption. Presented new routing protocol EMRP by combining the prediction of the node mobility and residual energy state. According to simulation results, EMRP can increase the lifetime of the network.

V. RESULTS AND COMPARISONS

Table 5.1: SIMULATION PARAMETERS

Simulation parameter	Value
Routing Protocols	AODV, DSR
Simulation area	100×100 sq.m
Number of Nodes	10,20,30,40,50,60,70,80
Traffic Type/ CBR Rate	VBR, CBR
Simulation time	100 sec
Energy	30J
Mobility	Random waypoint
Antenna	Omni Directional
Propagation mode	Propagation/TwoRayGround

In order evaluate the performance of the DSR routing protocol with AODV routing protocol with different simulation parameters. The simulation results are carried out using Network Simulator 2(ns 2.35). The simulation parameters considered as show in table 5. 1.

Table 5. 1: Simulation parameter

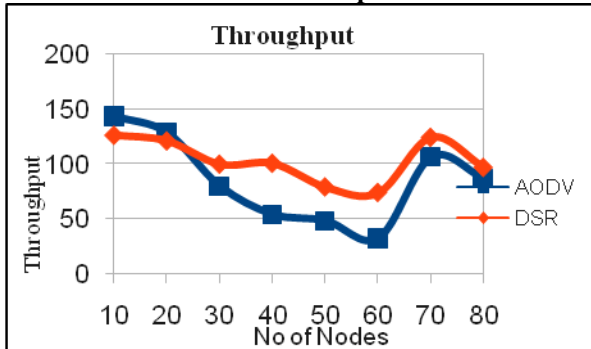


Figure 5.1: Comparison of Throughput Vs No of Nodes

The throughput of AODV and DSR protocols for varying number of nodes. Their comparison is given by the superimposed plot shown in Figure 5.1. We can observe from the graph that the throughput of DSR is much higher than AODV. Hence DSR is gives more throughput than AODV protocol by varying number of nodes. The number of nodes varied from 10 nodes to 80 nodes as shown in figure 5.1.

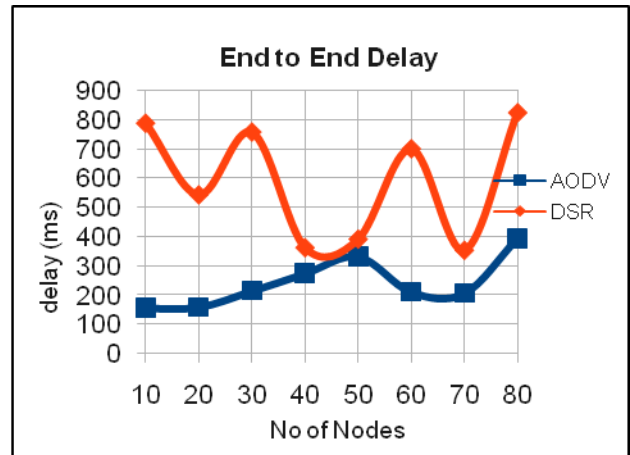


Figure 5.2: Comparison of end to end delay Vs No of Nodes

The delay of AODV and DSR protocols for varying number of nodes. Their comparison is given by the superimposed plot shown in Figure 5.2. We can observe from the graph that the end to end delay of DSR is much less than AODV. Hence DSR is gives less delay than AODV protocol by varying number of nodes. The number of nodes varied from 10 nodes to 80 nodes as shown in figure 5.2.

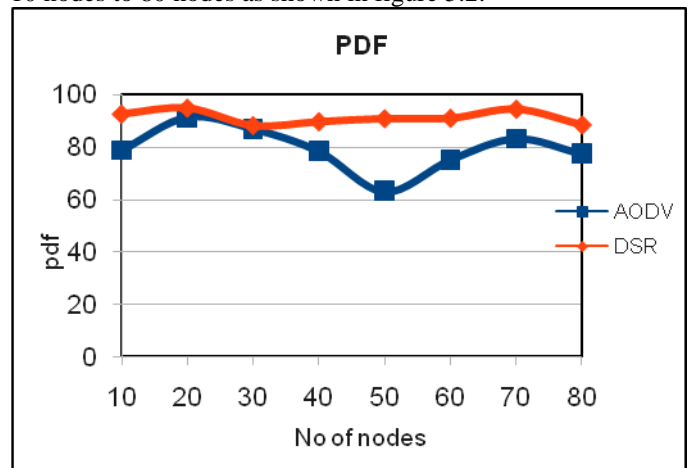


Figure 5.3: Comparison of packet delivery fraction Vs No of Nodes

The packet delivery fraction of AODV and DSR protocols for varying number of nodes. Their comparison is given by the superimposed plot shown in Figure 5.3. We can observe from the graph that the packet delivery fraction of DSR is much higher than AODV. Hence DSR is gives more packet delivery fraction than AODV protocol by varying number of nodes. The number of nodes varied from 10 nodes to 80 nodes as shown in figure 5.3.

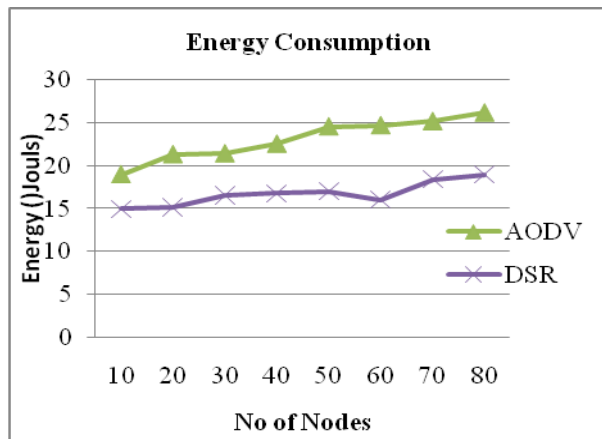


Figure 5.5: Comparison of Energy Consumption Vs No of Nodes

The power analysis of routing protocols is one of the most important analyses of Mobile Ad hoc network. Because of MANETs are generally work with DC source of their nodes run on limited power supplied by batteries.

The Power Consumption of AODV and DSR protocols for varying number of nodes. Their comparison is given by the superimposed plot shown in Figure 5.5. We can observe from the graph that the Power Consumption of DSR is much less than AODV. Hence DSR is more throughput than AODV protocol by varying number of nodes. DSR is more energy efficient than AODV protocol because of it consumes less power than AODV protocol by varying number of nodes. The number of nodes varied from 10 nodes to 80 nodes as shown in figure 5.5.

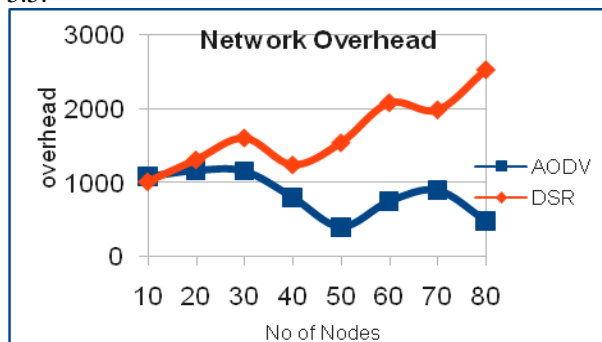


Figure 5.6: Comparison of overhead Vs No of Nodes

The overhead of AODV and DSR protocols for varying number of nodes. Their comparison is given by the superimposed plot shown in Figure 5.6. We can observe from the graph that the throughput of DSR is much higher than AODV. Hence DSR is gives more throughput than AODV protocol by varying number of nodes. The number of nodes varied from 10 nodes to 80 nodes as shown in figure 5.6.

CONCLUSIONS

In this paper, the performance of the DSR protocol is compared with AODV protocol in terms of energy consumption, network overhead, throughput, end to end delay. Through put and energy consumption is less in DSR routing protocol. The Network overhead is high in DSR protocol. In case of overhead AODV routing protocol is good performance than DSR reaming all the simulation parameters DSR given good performance. The simulation parameters are carried out using network simulator ns 2.35.

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