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Energy Efficient Reactive Protocol with Varying Transmission Range in MANET

A. J. Lakshmi Priya
M.E communication systems, Mahendra Engineering College, Namakkal, India
B. Leena
M.E communication systems, SriGuru Institute of Technology,Coimbatore, India
D. Chitra
Assistant Professor/ECE, Mahendra Engineering College, Namakkal, India

Abstract:
The significant factors for MANET are Energy efficient Optimal AODV routing protocol is used ,which is the modification of conventional AODV routing protocol. Successful release of RREP is important in MANET. In this procedure if reply is lost, new direction detection procedure has to be reinitiated. EOAODV avoids redundant broadcasting of RREQ in sequence. In this scheme, the node does not broadcast the direction-finding request (RREQ) if it do not have sufficient power, and until the node thickness in its neighboring exceed a exacting doorsill. After compare reactive direction-finding with EOAODV in terms of throughput, it is empirical result exposed that the new procedure is a great deal better than AODV and lengthen the series lifetime and also the broadcast range, mobility and dissimilar numeral of nodes as a organization limitation affect the in general power utilization and recital of wireless ad-hoc networks. AODV has maximum packet release ratio and utmost throughput; it is in a straight line proportionate to broadcast range.

Key words*: Qos, energy optimal ad-hoc on demand distance vector routing (EOAODV), opnet, transmission range*

1. Introduction

1.1 Mobile ad hoc network (MANET)
A mobile ad hoc network is a self-configuring infrastructure less network of mobile devices connected by wireless. Ad hoc is Latin and means "for this purpose". Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet..There are various routing protocols available for MANETs. The most popular ones are DSR, AODV and TORA. In this thesis, an attempt has been made to compare these three protocols on the performance basis under different environments. The results also illustrate the important characteristics of different protocols based on their performance and thus suggest some improvements in the respective protocols. Protocol names: MANET, AODV, DSR, TORA, OPNET,FTP.

1.2 Routing Protocol Requirements
These protocols fall into two categories:
- Re-active
- Pro-active
- Hybrid

In this paper, we see the overview of reactive protocols.

1.2.1. Reactive Routing Protocols
Reactive routing protocols for mobile ad hoc networks are also called "on-demand" routing protocols. In a reactive routing protocol, routing paths are searched only when needed. A route discovery operation invokes a route-determination procedure. The discovery procedure terminates either when a route has been found or no route available after examination for all route permutations. Examples are Dynamic Source Routing (DSR) , Ad hoc On- demand Distance Vector routing (AODV) and TORA (Temporally Ordered Routing Algorithm) .

1.2.1.1. AODV
AODV is another routing algorithm used in ad hoc networks.Unlike DSR, it does not use source routing, but like DSR it is on-demand. In AODV, each node maintains a routing table which is used to store destination and next hop IP addresses as well as destination sequence numbers. Each entry in the routing table has a destination address, next hop, precursor nodes list, lifetime, and distance to destination. AODV routing protocol in ad hoc network communicate between mobile nodes through 3 types of different messages.

- Route Request (RREQ) – to discover the packet.
- Route Reply (RREP) – to acknowledge the source and
- Route Error (RERR)- it generate when there is no path or link breakage**.**

1.2.1.2. TORA
TORA is a reactive routing algorithm based on the conception of link reversal and used in MANETs to improve the scalability. Highly dynamic mobile ad hoc networks can be used by TORA. It is an adaptive routing protocol and used in multi-hop networks. It makes scaled routes between source and destination and Directed Acyclic Graph (DAG) is used to build in the destination node.. A data packet goes from up flow to down flow according the height difference between nodes. TORA has the capacity that many nodes can send packets to a given destination is provided by DAG. It also guarantees that all routes are loop free.

1.2.1.3. DSR
DSR was developed at Carnegie Mellon University. It is simple and efficient reactive routing protocol which is specially designed for multi-hop ad hoc network of mobile nodes. The nodes in the network easily join or leave the network without any information. The network using DSR is not requiring existing network infrastructure or administration. The node desiring to transmit a packet define route for the packet because it is based on source routing. DSR works for ad-hoc network of approximately 200 nodes. Each node participating in adhoc network should forward packets and discard the erroneous packets (corrupted). DSR has two mechanisms: route discovery and route maintenance.

2. Existing Method
Existing works are focused on Energy Based Time Delay Routing (EBTDR) AND Highest energy routing (HER). These algorithms try to increase the operational lifetime of an adhoc network but leads to complexity in network. The insufficient nodes in energy, routing and network capacity causes delay in the network. The route selection besed on the energy drain rate information in the route request packet. Such algorithms can be seen as complex networks of simple links. The power control is achieved by new route selection mechanisms. Reducing power consumption and efficient battery life of nodes in an adhoc wireless networks requires an integrated power control and routing strategy. The goal of QoS provisioning is to achieve a more deterministic network behaviors, so that information carried by the network can be better delivered and network resources can be better utilized. In this paper, we have analyzed the impact of an alternative approach and make a case for variable-range transmission control. Effective transmission power control is a critical issue in the design and performance of wireless ad hoc networks Prior research on only focuses on maintaining the network connectivity, minimizing the transmission power of each node, whereas ignores the energy efficiency of paths in constructed topologies. This may cause inefficient routes and hurt the overall network performance.

3. Proposed Method
Mobile ad hoc network is coordinated without fixed infrastructure. In the conservative AODV routing protocol, source node always forwards RREQ (Route Request) packet to neighbor for finding path to the destination node. The intermediary (neighbor) node having less lifetime or energy, as well forwards RREQ and lifetime expires after some certain time, i.e. node goes down; it cannot forward RREP (Route Reply) on reverse path and source node has to regenerate RREQ that results in needless RREQ rebroadcast, less packet delivery ratio, throughput and more end to end delay. The solution of the above problem, here we propose energy optimal AODV (EOAODV) routing protocol based on reactive routing protocol. In this proposed approach, source node does not send any RREQ; no enough energy (battery life time) and received RREP until the node density in its neighboring exceeds a particular threshold. Effective transmission power control is a critical issue in the design and performance of wireless adhoc networks. In this paper, we analyzed some of the routing protocols (DSR, TORA, AODV) with varying transmission range, mobility speed and number of nodes relative to Qos parameters such as data dropped, delay, routing load and throughput.Packets are transmitted in whole network and nodes are receiving this data packet, update their routing information for the each source node and store the information in the node‟s buffer of routing table. In addition to the source node consists IP address, source sequence number and broadcast ID and the RREQ message contains the generally recent sequence number for the destination node of which the source node is alert. When node receiving the RREQ message may send a route reply (RREP) if it is either the destination node or if it has route information to the destination with consequent sequence number always greater than or equal to that enclosed in the RREQ. Destination node always sends the reply to source node and maintain unicasts a RREP back to the source node. Otherwise, it retransmitted the route request (RREQ) message to the destination node. Source nodes always maintain path of the RREQ's source IP address an broadcast ID .

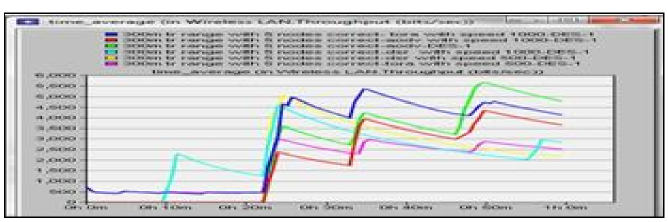
4. Simulation Environment
We have analyzed the performance of a AODV by creating different scenario in Opnet Modeler 14.5. For the experimental results 5, 20 nodes are configured in these scenarios. Better performance is possible with the modification of some of the protocol´s parameters, without modifying the protocol algorithm.

4.1.Simulation Settings

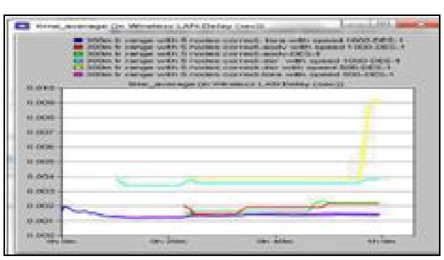
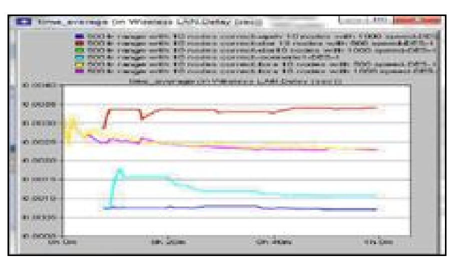
Parameter	Value
Simulator	OPNET 14.5
Simulation time	3600 sec
Number of nodes	(5,10) for transmission range (5,20) for aodv and eoaodv
Data rate	11 Mbps
Environment size	1000*1000 meters
Traffic type	FTP (High load)
Maximum Speed	500m/s,1000m/s
Packet size	512
Network protocol	IP
Propagation Model	Random Way Point Model
MAC protocol	802.11
Routing protocols	AODV, DSR andTORA
Transmission range	300m, 500m

Table 1

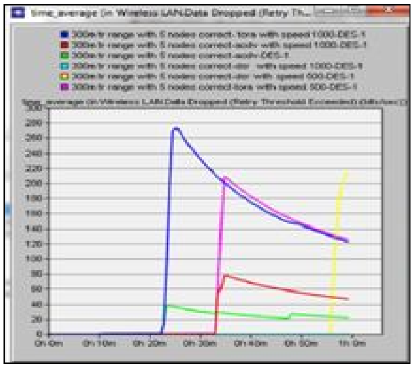
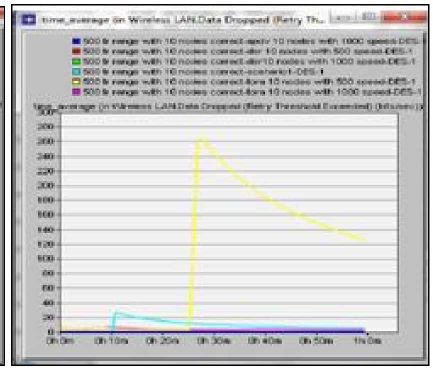
- **Routing Load**
  On different reactive routing protocols (aodv,dsr and tora) the routing load depending on their internal efficiency, and thus protocol efficiency may or directly affect data routing performance.. In 5 nodes, we can see that aodv Protocol has highest routing load when it uses transmission range 300m. Routing load in AODV Protocol is inversely proportional to transmission range in 500m. When the transmission range is highest, routing load is minimum and at lowest transmission range routing load in maximum. Tora protocol is performing better than aodv and dsr protocol when transmission range is above 300m.
- **Throughput**
  With highest mobility and 500m transmission range AODV having the highest average throughput for 10 nodes. As observed from results AODV performed better in terms of average throughput as compared to DSR and TORA when mobility is lowest 500m/s .
- **Delay**
  In DSR protocol it is higher than both the other protocols in both 5 and 10 node scenario. For 5 nodes TORA protocol shows very less average end to end delay on range 300m. For 10 nodes with 500m transmission range AODV protocol has very less delay.
- **Data dropped**
  When highest mobility at 1000m/s TORA protocol is better when compared to aodv and dsr in 300m and 500 transmission range with the variation of 5and 10 nodes. Dsr is having less drop data rate in 300m and aodv is having less drop data rate in 500m with high speed 1000m/s.



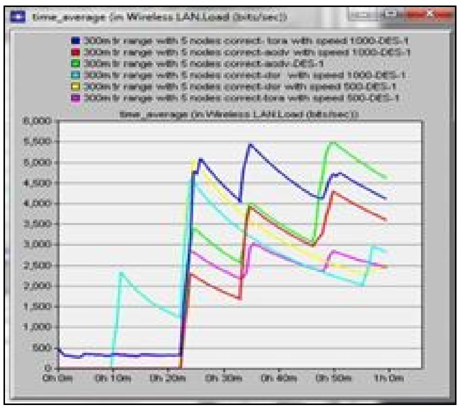
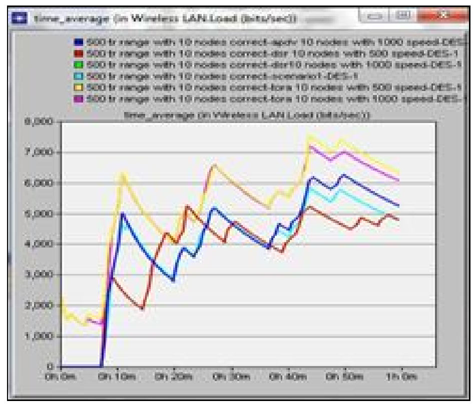
300m transmission range with speed 500 and 1000m/s with Throughput of 5 nodes

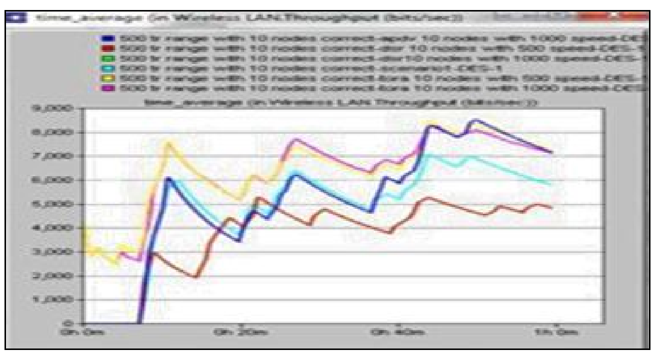
300m transmission range with speed 500 and 1000m/s with delay of 5 nodes
500m transmission range with speed 500 and 1000m/s with delay of 10 nodes

300m transmission range with speed 500 and 1000m/s with Data dropped of 5 nodes
500m transmission range with speed 500 and 1000m/s with Data dropped of 10 nodes

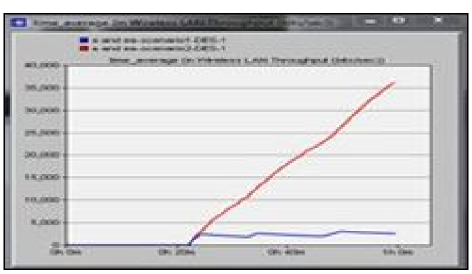
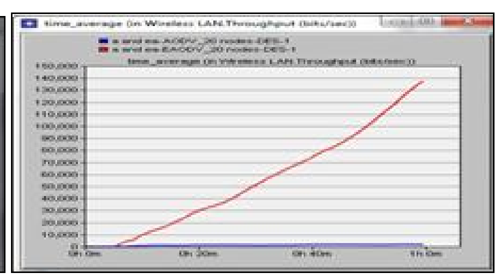



300m transmission range with speed 500 and 1000m/s with routing load of 5 nodes
300m transmission range with speed 500 and 1000m/s with routing load of 5 nodes



500m transmission range with speed 500 and 1000m/s with throughput of 10 nodes

5. Comparison of AODV and Optimal AODV with Corresponding Nodes

5 NODES *20 NODES*

6. Conclusions and Future Work

The transmission range, mobility and different number of nodes as a system parameter affects the overall energy consumption and performance of wireless ad-hoc networks. The performance of these three routing protocols shows some differences by varying transmission range, mobility speed and number of nodes. From our experimental analysis we conclude that AODV has maximum throughput, it is directly proportionate to transmission range. AODV has highest routing load than DSR and TORA but average delay is maximum in DSR which decreases its performance to some extent factors for MANET. Energy efficient Optimal AODV routing protocol is proposed. Successful delivery of RREP is significant in MANET. EOAODV avoids unnecessary broadcasting of RREQ information. After comparing reactive routing with EOAODV in terms of battery lifetime and throughput, it is experiential result shown that the new protocol is much better than AODV and lengthens the battery lifetime. Our results can be used to determine the proper radio transmission range in different mobility speed environments for reactive routing protocols such as AODV,TORA and DSR in wireless ad hoc networks without degrading a system performance.

7. References

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