

A Survey on An Energy Efficient Routing Protocol based on AODV Protocol in MANET

Jalpa Kunpara¹, Prof Janak Tank²

¹Jalpa Kunpara, Dept. of Computer Engineering, LDRP-ITR College, Gandhinagar, Gujarat, India

²Prof. Janak Tank, Dept. of Computer Engineering, LDRP-ITR College, Gandhinagar, Gujarat, India

Abstract - Mobile Ad Hoc Network (MANET) is collection of multi-hop wireless mobile nodes that communicate with each other without centralized infrastructure. Its network topology is continuously changed when node is moved from network. Therefore, routing in Manet is critical task due to highly dynamic environment. In recent years, several Energy Efficient Routing protocol based on Aodv protocol have been proposed for increasing network lifetime and provide efficient delivery of data packet in Manet among them are LEAR-AODV (Local Energy Aware Routing), Energy Efficiency of Load Balancing in MANET, Improved AODV Using Mean Energy Value, SBNRP (Stable backbone routing protocol), Adaptive Load Balancing in AODV etc. This research paper provides a brief overview of these protocols by presenting their characteristics, functionality, benefits and limitations and then makes their comparative analysis to analyze their performance. The objective is to make observations about how the performance of these protocols can be improved.

Key Words: MANET, AODV, Various kind of AODV Protocol

1. INTRODUCTION

The Mobile Ad Hoc Network consists of multiple hosts communicating among themselves without any infrastructure and centralized control, so the mobile nodes are moved independently in any direction. The mobile node act as a router so, they are used to discover and maintain the routes to other nodes in networks.

Characteristics of MANET

- Easy installation
- Communication via wireless network
- No infrastructure needed
- Dynamic network topology
- Nodes perform roles of both hosts and routers
- Can be set up anywhere
- Flexible

Applications of MANET

- Military application (Soldiers, tanks, planes)

- Personal area networking (cell phone, laptops)
- Civilian environments (meeting rooms, sport stadiums)
- Emergency operation (search and rescue operations, firefighting)
- Wireless mesh networks, wireless sensor networks, etc.

The main problem was occurs in MANETs are the efficiently packets delivery to the mobile nodes in the network because network does not have any fixed base stations and topology of network.

2. OVERVIEW OF AODV ROUTING PROTOCOL [5]

In this section we study about Ad hoc On Demand Distance Vector (AODV) Protocol which is designed for use in MANET. AODV is a Reactive Routing Protocol, so the route is established based on requirement. Working of AODV is based on DSDV and DSR. It is used less number of broadcast by establishing routes based on demand and it does not maintain route to every node to every other node in network. The AODV discovers routes on as requirement basis using a route discovery with one entry per destination.

AODV protocol used following key step for set up new route as:

(1) Route Discovery

Aodv initiate the route discovery procedure with two messages (1) Route Request (RREQ) (2) Route Reply (RREP). The source node create the RREQ message with its IP address, Destination IP address, its sequence number, the destination last sequence number, and broadcast ID. The broadcast ID and IP Address are unique for each data packets and sequence numbers are used to define the timeline of the data packets. The broadcast ID incremented each time when source node is create the new RREQ messages. When source node wants to send a packet to destination node, it will start with broadcasting of RREQ to its neighbors for certain destination. After receiving RREQ message from intermediate node, it checks its routing table for route to destination. If yes, sends RREP to source. If No,

it rebroadcast to its neighbor node. It will then set up reverse path to source node in its route table. It ignores RREQ if it is processed already.

(2) Route Maintenance Stage

A route maintenance procedure is required, if any intermediate node moves, neighbor node can detect the link failure and send the link failure notification to its upstream neighbor. These nodes propagate the Route Error (RERR) to their predecessor nodes. This process continues until the failure notification reaches the source node. Based on this failure notification, source node was stop sending data otherwise if route is needed then source node was sending new RREQ message for reinitiate the route discovery process.

Benefits and Limitations of AODV

The benefits of AODV protocol is, it supports both unicast and multicast packet transmission even for nodes in constant movement. When topology is failure then it gives the responds very quickly. It does not put any additional overhead on data packets. AODV Routing Protocol are required limited memory space for maintain active routes and also increasing the performance of network. The limitation of AODV protocol, for wide network it is not suitable. It does not support asymmetric link and does not perform well. AODV is vulnerable to various kind of attacks based on the assumption that all node must cooperate and without their cooperation, no route can be established.

This section describes the Ad Hoc on Demand Distance Vector (AODV) Routing Protocol, its benefits and limitation. Later part of the section contains explanation of related work and the summary of the related work

2.1 RELATED WORK

In this section, we study various Energy Efficient Routing Protocol based on AODV in MANET which are proposed in the literature that reduce energy consumption, increasing network lifetime, provide efficient delivery of data packet and longer battery life. Various Protocols have been proposed for MANET. All of the MANET routing methods have advantages, disadvantages and scope for further research. The MANET routing methods in the papers we reviewed are based upon energy efficient routing protocol which is explained in this section.

2.1.1 Local Energy Aware Routing [1]

Local Energy Efficient Routing (LEAR-AODV) that balance the energy consumption among all participating nodes and provide the longer battery life. In normal AODV protocol, each node must forward the packet to other nodes. But in proposed AODV protocols, based on remaining

battery power of node, each node decide that which packet is forwarded or which packet is dropped. When the remaining battery power of node is less than the threshold value of that node, then the RREQ message is dropped or discarded based on the condition. When the destination node was receives a RREQ message only when all intermediate nodes have sufficient amount of battery power. The destination node is unicast the RREP message to the source node using that reverse path. Route maintenance was needed when the connection between some nodes on the path are lost due to node mobility. When the node is moved during the transmission process, the route error message was send to the source node for reinitiate the route discovery mechanism. This proposed protocol works based on remaining battery capacity of nodes.

2.1.2 Energy Efficiency of Load Balancing in MANET [2]

Energy Constrained Routing Protocol and Work load balancing techniques used for improve the energy efficiency by apply the new energy efficiency metrics to MANET Routing Protocol and proposed two new concepts as (1) Node Caching Enhancement and (2) Adaptive Load balancing techniques. In Node caching mechanism, the nodes involved in recent data packet forwarding have more reliable information about its neighbors and have better locations than other MANET nodes. The cached nodes are nodes recently involved in data packet forwarding, and use only them to forward route requests. In adaptive load balancing technique, route request packet is drop or accept based on each node load status. If load of node is low then it is forward packet otherwise its drop packet.

2.1.3. Improved AODV Using Mean Energy Value [3]

In this paper, author has proposed schema for extend validity of network life by considering less battery power consumption of mobile nodes. In normal AODV protocol, the source node broadcast the RREQ message, destination node receive it and sends the RREP message to source node. Then the path is created between the source node and destination node. In this paper, author proposed the improved AODV protocol with mean energy value. The remaining energy of node is participating in the communication process between source nodes to destination node. By dividing the whole energy calculated into the number of nodes participating in network. Which is obtains using the hop counter after obtaining the mean energy of network on the participation path. The destination node was unicast the RREP message to that source node who has the highest mean energy value message, destination node is sends the RREP message to that source node. Then the path is created between the source node and destination node.

2.1.4 Stable backbone routing protocol for MANET (SBNRP) [4]

In this research paper, the backbone is used for setup valid route without use any alternate path. Based on the number of nodes and battery capacity of node, backbone is chosen. Each route table stores the number of backbone nodes attached to it and their battery status. Here, the protocol is divided into three phase route as (1) Route Request (REQ) (2) Route Repair (REP) (3) Error phase (ERR).

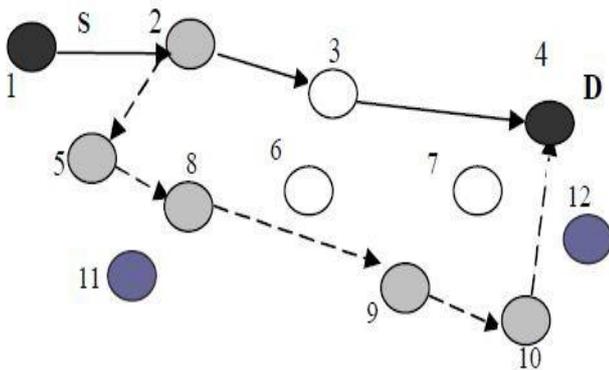


Fig -1: Stable backbone routing protocol for MANET (SBNRP)

Consider an example as shown in figure 2.2. We consider the source node's index is 1 and destination node index is 4. The node have index 3 is not stable node because it have low power than other node. It is in danger zone, the path 1-2-3-4 is shortest route but the node with index 3 have critical power status so this shortest route are not more stable. Consider the other path is 1-2-5-8-9-10-4. It is longest path but it is more stable than the shortest path 1-2-3-4 based on active power status is considered. Link break is generated when some node is moved during packet transmission process in network, then we use the backbone nodes for set up the path and the route is created again without affect performance of network.

2.1.5 Adaptive Load Balancing in AODV [6]

Based on energy of node and denser medium of network, author is proposes the load balancing technique with energy efficiency. In normal AODV, when source node wants to communicate with a destination node it does not have any routing information. It will flood the route request to find route by broadcasting a RREQ again. The intermediate nodes itself take the decision if it is qualified. Qualified decision is based on its queue length. If the threshold value of node is greater than the length of queue, then the node is selected for forward packet to other node, otherwise it is not selected and drops the packets. The queue length is defined by the amount of packet waiting in interface queue for transmission.

Method	Comment
Local Energy Aware routing (LEAR-AODV) [1]	Each intermediate node decides accept or discard packets depending on it battery level. It only considers energy of intermediate nodes for Routing.
Energy Efficiency of Load Balancing in MANET [2]	It uses node Caching and Adaptive load balancing techniques.
Improved AODV Using mean Energy [3]	It checks the mean energy value of each path.
Stable backbone routing protocol for MANET (SBNRP) [4]	This method use when any node goes out of the range or link fails. No need to find any alternate path. Not necessary it's a Short path.
Adaptive load Balancing in AODV [6]	It is useful for load Balancing.

Table -1 Summary of Related work.

3. CONCLUSIONS

As we have presented some protocols which works on Manet which has sort of energy, network coverage, feasibility, climate conditions etc. So by identifying such parameters it is been included that reliability is less in adhoc network with respect to energy and data packets transmission. Thus we have concentrated some parameters like energy, reliability, stability and some other as well.

Here, we came to a conclusion from present scenario that proper management of implementation, its execution, and protocol we can do much better and deliver fast and efficient solution for proper execution in the adhoc network.

4. FUTURE WORK

On the basis of present scenario and stepwise implementation we came to conclusion by improving such ADOV protocol we can have better and energy efficient protocol which can help in many areas. So will proposed new and improved AODV protocol in further extension of this work.

REFERENCES

[1] S.M. Senouci, M. Naimi, "New Routing for Balanced Energy Consumption in Mobile Ad Hoc Networks", PE-WASUN'05, Montreal, Quebec, Canada, October 10-13, 2005.

[2] Sunsook Jung, Nisar Hundewale, Alex Zelikovsky, "Energy Efficiency of Load Balancing in MANET Routing Protocols" Proceedings of the Sixth IEEE International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing and First ACIS International Workshop on Self-Assembling Wireless Networks(SNPD/SAWN'05), IEEE 2005.

[3] Jin-Man Kim, Jong-Wook Jang, "AODV based Energy Efficient Routing Protocol for Maximum Lifetime in MANET" Proceedings of the Advanced International Conference Tele-communications and International Conference on Internet and Web Applications and Services (AICT/ICIW 2006), IEEE 2006.

[4] Vinay Rishiwal, Ashwani Kush, Shekhar Verma, "Stable and Energy Efficient Routing for Mobile Adhoc Networks" Fifth IEEE International Conference on Information Technology: New Generations 2008, Page(s): 1028-1033.

[5] Sunil Taneja, Ashwani Kush, "A Survey of Routing Protocols in Mobile Ad Hoc Networks" International Journal of Innovation, Management and Technology, Vol. 1, No. 3, ISSN: 2010-0248, August 2010, Page(s): 279-285.

[6] R. Vinod Kumar , R.S.D. Wahida Banu, "E2AODV Protocol for Load Balancing in Ad-Hoc Networks "Journal of Computer Science 8 (7): 1198-1204, ISSN 1549-3636, 2012, Page(s): 1198-1204.