Volume 4, Issue 9, September 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Improving the Energy and Node Mobility in Broadcasting for Mobile Ad-hoc Network

Ajay Boora*
Research- Scholar of ECE Deptt.
I.I.E.T. Kinana Jind, Haryana, India

Mr. Amit Mahal
Associate Professor ECE Deptt., I.I.E.T. Kinana,
Jind, Haryana, India

Abstract*— In the mobile ad hoc network, nodes can directly communicate with all the other nodes within their radio ranges; whereas nodes that not in the direct communication range use intermediate node(s) to communicate with each other. In these two situations, all the nodes that have participated in the communication automatically form a wireless network, therefore this kind of wireless network can be viewed as mobile ad hoc network. Broadcasting is a fundamental communication operation in which one node sends a message to all other nodes in the network. Broadcasting is also used for topology updates, for network maintenance, or simply for sending a control or warning message. The simplest broadcasting algorithm is flooding, in which every node broadcasts the message when it receives it for the first time. Using flooding, each node receives the message from all its neighbors in a collision-free network. Therefore, the broadcast redundancy significantly increases as the average number of neighbors increases.. Moreover, it increases packet collisions, which can lead to additional transmissions. This can cause severe network congestion or significant performance degradation, a phenomenon called the broadcast storm problem. Consequently, it is crucial to design efficient broadcasting algorithms to reduce the number of required transmissions in the network.In this dissertation, the feature of M-dart protocol is used as well as the AODV protocol for the efficient broadcasting of the packet. The nodes are arranged in the hierarchical format and dynamic addressing is given similar to the M-DART protocol. The simulation is performed using NS2 tool. By proposed work, various parameters are analyzed such as PDR (Packet Delivery ratio), throughput and E2E Delay. The Packet delivery ratio as well as throughput is increased.

***Keywords*—MANET, Broadcasting, Parameter of MANET, NS2, Simulation, C++, Result**

I. INTRODUCTION

A Mobile Ad hoc Network (MANET) is a system of wireless mobile nodes that dynamically self-organize in arbitrary and temporary network topologies. In the mobile ad hoc network, nodes can directly communicate with all the other nodes within their radio ranges; whereas nodes that not in the direct communication range use intermediate node(s) to communicate with each other. In these two situations, all the nodes that have participated in the communication automatically form a wireless network, therefore this kind of wireless network can be view ideas mobile ad hoc network.

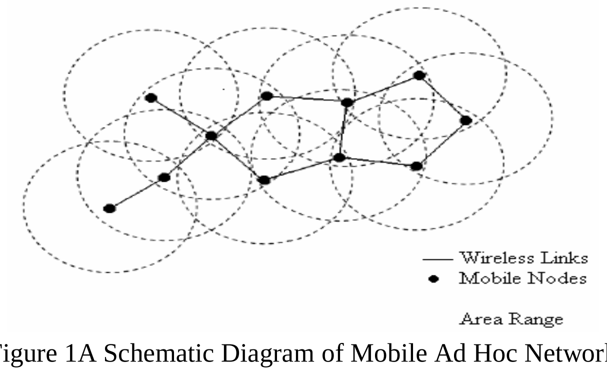


Figure 1A Schematic Diagram of Mobile Ad Hoc Network

Broadcasting is a fundamental communication operation in which one node sends a message to all other nodes in the network. Broadcasting is also used for topology updates, for network maintenance, or simply for sending a control or warning message. The simplest broadcasting algorithm is flooding, in which every node broadcasts the message when it receives it for the first time. Using flooding, each node receives the message from all its neighbors in a collision-free network. Therefore, the broadcast redundancy significantly increases as the average number of neighbors increases. High broadcast redundancy can result in high power and bandwidth consumption in the network. Moreover, it increases packet collisions, which can lead to additional transmissions. This can cause severe network congestion or significant performance degradation, a phenomenon called the broadcast storm problem. Consequently, it is crucial to design efficient broadcasting algorithms to reduce the number of required transmissions in the network.

II. BROADCAST IN MANET

Broadcast is a common operation in many network protocols and applications. By broadcast, a message is propagated to all nodes in a network. It is useful in delivering messages to users with unknown locations or a group of users whom the source need not know exactly. Broadcast plays an important role in routing, network management and other tasks in mobile ad hoc networks (MANETs). An MANET is a wireless network that is self-organized with many mobile nodes. No static infrastructure such as a wired backbone is available. Due to the limited transmission range of wireless network interface, nodes are required to forward messages for those located outside their radio coverage, thereby forming a multi-hop network. All nodes are free to move around and the network topology may change frequently. Possible applications of MANETs include emergency rescue after a hurricane or earthquake, communication between mobile robots, exchanging information on the battle field, and so on. Broadcast is expected to be performed frequently in MANETs. Many on-demand (or reactive) ad hoc routing protocols rely on broadcast to discover a route between two nodes or to update group status and multicast routes

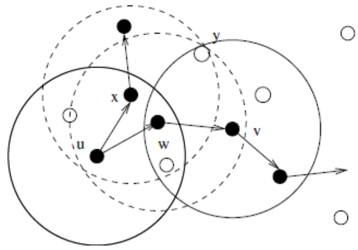


Figure 2. Forward node set in a MANET

There are two sources that cause the failure of message delivery:

- **Collision**: The message intended for a destination collides with another message. In Figure 1, if messages from nodes *w* and *x* collide at node *y*, node *y* does not receive any message
- **Mobile nodes**: The neighbor in the neighbor set moves out of its transmission range (i.e., it is no longer a neighbor). In Figure 1, when node *w* moves out of the transmission range of *u*, the nodes along the branch rooted at *w* of the broadcast tree will miss the message.

Broadcast is also a viable candidate for reliable multicast in MANETs with rapid changing topology. In a broadcast protocol, a node can play one of two roles: receiver or rebroadcasting node. A receiver is just a sink of broadcast traffic, while a rebroadcasting node rebroadcasts the messages it receives. Different protocols use different algorithms to determine the role of a node in broadcast. Current approaches for broadcasting in MANETs can be divided into three categories:

- Flooding and its variations, including the location-aided schemes.
- Cluster-based or dominating set-based schemes.
- Connected dominating set-based schemes

3.1 Problem Formulation:

Mobile nodes creates a wireless networks among themselves without using any infrastructure or administrative support dynamically. Ad-hoc wireless networks are self-creating, self-organizing, and self-administering. By communicating among their component mobile nodes they inherit from being exclusive. Therefore, in order to provide the necessary control and administration function, such communications are used for supporting such networks. The broadcast operation, as a fundamental service in mobile ad hoc networks (MANETs), is prone to the broadcast storm problem if forwarding nodes are not carefully designated. The objective of reducing broadcast redundancy while still providing high delivery ratio under high transmission error rate is a major challenge in MANETs.

3.2 Objectives:

1. Study Broadcasting and its issues in MANET.
2. Propose a new or modify the existing broadcasting technique in MANET to enhance the performance of the network.
3. Simulate the proposed technique using NS2 simulator.
4. Compare the delivery ratio, forwarding ratio, overhead of proposed technique with the existing technique.

3.3 Proposed Work:

The proposed work uses the feature of M-dart protocol as well as the AODV protocol for the efficient broadcasting of the packet. The nodes are arranged in the hierarchical format and dynamic addressing is given similar to the M-DART protocol. The physical location of the nodes can be found according to their address. the source node is selected randomly , similar the destination node. The source node will broadcast to its neighbor level. It means only the nodes that are at one level difference will get the RREQ message. The process continues until the destination node gets the request. Then the destination node sends the reply and the source gets it. This process uses the arrangement of nodes using the M-Dart protocol and the route discovery process using the AODV while the route maintenance is used similar to M-dart protocol. The whole process can be easily understood by the following algorithm:

1. Arrange the nodes of network in hierarchical manner.
2. Dynamic addressing of the nodes.
3. Select the source say S and destination say D
4. broadcasting_node=S
5. Current_dist=distance of broadcasting_node from D
6. While broadcasting_node !=destination
7. Broadcast the request message to neighbor level
8. Dist=Determine the distance of neighbor level node from destination
9. If dist<current_dist
10. Update the broadcasting_node
11. Update current_dist
12. end
13. end

4.1 simulator used for broadcasting

The above process uses the efficient broadcasting to find the path between the source and the destination node. This algorithm can be implemented using the NS2.**The Network Simulator (NS2):**

Simulation can be defined as “Imitating or estimating how events might occur in a real situation”. It can involve complex mathematical modeling, role playing without the aid of technology, or combinations. The value lies in the pacing you under realistic conditions that change as a result of behavior of others involved, so you cannot anticipate the sequence of events or the final outcome.

4.1.1 NS2 Overview:

NS is an event driven network simulator developed at University of California at Berkeley, USA, as a REAL network simulator projects in 1989 and was developed at with cooperation of several organizations. Now, it is a VINT project supported by DARPA.NS is not a finished tool that can manage all kinds of network model. It is actually still a non-going effort of research and development.

There are two languages used in NS-2; C++ and OTcl (an object oriented extension of Tcl). The compiled C++ programming hierarchy makes the simulation efficient and execution times faster.

4.2 Designing In Ns-2(Wireless Simulation In Ns-2):

Software structure and mechanism of NS-2:

The key to get to know ns-2 is it is a discrete event network simulator. In ns-2 network physical activities are translated to events, events are queued and processed in the order of their scheduled occurrences. The simulation time progresses with the events processed. And also the simulation “time” may not be the real life time as we “inputted”.

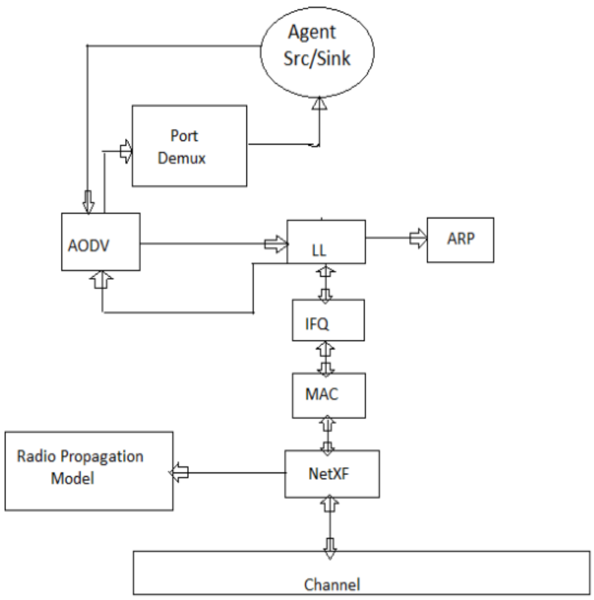


Figure.3: NS2 Simulate Layered Structure of Network

But, why is ns-2 that useful, what kind of work can be done by ns-2, it can model essential network components, traffic models and applications. Typically, it can configure transport layer protocols, routing protocols, interface queues, and also link layer mechanisms. It can be easily seen that this software tool in fact could provide us a whole view of the network construction, meanwhile, it also maintain the flexibility for us to decide. Thus, just this one software can help us simulate nearly all parts of the network. This definitely will save us great amount of cost invested on net work constructing. The following Figure 2 shows a layered structure which ns-2 can simulate for us.

4.3 Parameter Analyzed:

Various parameters used for analysis are described below:

1. **Throughput:**

The amount of data transfer from source mode to destination in a specified amount of time i.e. average number of bits delivered per second (Kbps)

Calculated as: Throughput =(Packet Size/(stop Time –start Time))*(8/1000)

2. **Packet Delivery Ratio:**

Packet delivery Fraction (PDF): It is the ratio of the amount of data packets delivered to the destination and total number of data packets sent by source.

Calculated as: PDF= (Received Packets / Packets Sent)*100

3. **Average End to End Delay:**

The interval time between sending by the source node and receiving by the destination node, which includes the processing time and queuing time.

Calculated as EED= (Time packet received - Time packet sent)

4.4 Results:

Table 4.1 and Table 4.2 shows the parameter analysed using existing MDART and proposed MDART.

Table 1 Table 4.1: Result Analysis of MDART (Existing) method

1) Number of nodes	*2) PDR*	*3) E2Edelay*	*4) Throughput*	*5) Routing Overhead*
6) 10	*7) 50.7724*	*8) 5.1445*	*9) 237.51*	*10) 0.6633*
11) 20	*12) 52.2421*	*13) 7.0115*	*14) 168.45*	*15) 2.9516*
16) 30	*17) 35.3953*	*18) 8.8112*	*19) 171.28*	*20) 7.6044*
21) 40	*22) 19.4517*	*23) 8.7702*	*24) 175.98*	*25) 13.7555*

Table 2 Table 4.2: Result Analysis of Modified MDART(Proposed) Method

26) Number of nodes	*27) PDR*	*28) E2Edelay*	*29) Throughput*	*30) Routing Overhead*
31) 10	*32) 77.2797*	*33) 2.0723*	*34) 822.87*	*35) 0.2035*
36) 20	*37) 77.3995*	*38) 2.7592*	*39) 651.27*	*40) 0.1605*
41) 30	*42) 77.0164*	*43) 3.3266*	*44) 525.19*	*45) 0.1789*
46) 40	*47) 77.2184*	*48) 3.4791*	*49) 1235.92*	*50) 0.1863*

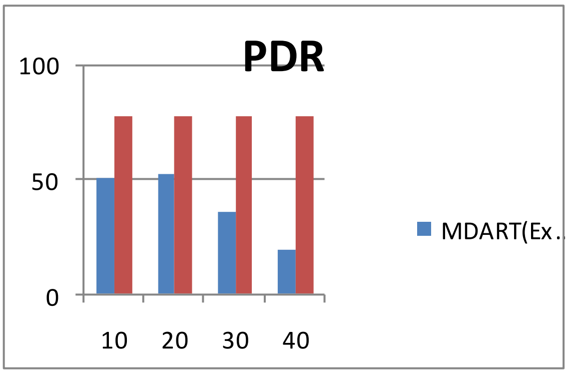


Figure 4 Comparison of PDR between MDART and Modified MDART

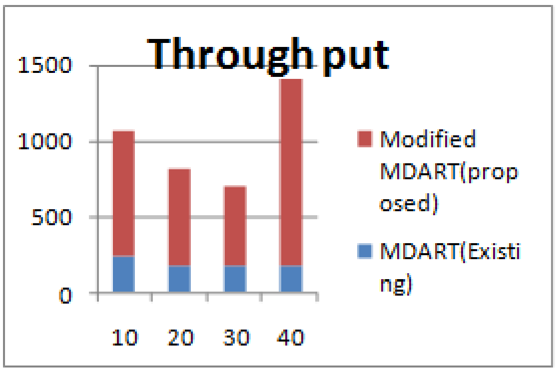
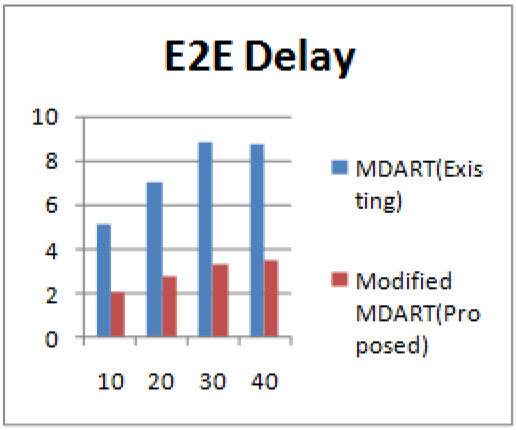


Figure 5: Comparison of Through Put between MDART and Modified MDART



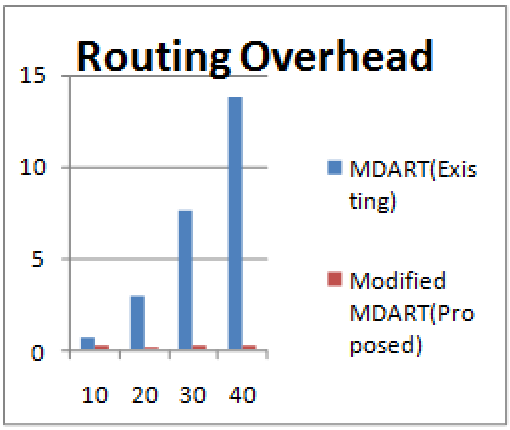


Figure 6: Comparison of E2E Delay between MDART and Modified MDART   Figure 7. Comparison of Routing Overhead between MDART and Modified MDART

V. CONCLUSION AND FUTURE SCOPE

The paperwork uses the feature of M-dart protocol as well as the AODV protocol for the efficient broadcasting of the packet. The nodes are arranged in the hierarchical format and dynamic addressing is given similar to the M-DART protocol. The physical location of the nodes can be found according to their address. the source node is selected randomly , similar the destination node. The source node will broadcast to its neighbor level. It means only the nodes that are at one level difference will get the RREQ message. The process continues until the destination node gets the request. Then the destination node sends the reply and the source gets it. This process uses the arrangement of nodes using the M-Dart protocol and the route discovery process using the AODV while the route maintenance is used similar to M-dart protocol. This work is implemented using the NS2. The comparison parameters are routing overhead, throughput, PDR and the E2edelay. The increased throughput and PDR with the decreased E2Edelay and Routing overhead show the better performance of the modified MDART as compared to the existing MDART. In future following work can be done:

1. The modified MDART protocol can be extended by using the swarm intelligence.
2. The modified MDART can be compared with other existing protocols.
3. The modified MDART protocol can be extended by using the artificial intelligence.

REFERENCES

[1] Al-Bahadili, Hussein, and Khalid Kaabneh. *"Analyzing The Performance Of Probabilistic Algorithm In Noisy Manets."International Journal of Wireless & Mobile Networks* 2, no. 3 (2010).

[2] AvinashGiri, JitendraPrithviraj, Ashok Verma, "*Analysis of DHT Based Multi-Path Routing Protocol with Other Routing Protocols in MANETS*", Volume 1, Issue 1, September 2012.

[3] Caleffi, Marcello, and Luigi Paura. *"M-DART: multi-path dynamic address routing*." Wireless Communications and Mobile Computing 11, no. 3 (2011): 392-409.

[4] Chlamtac, Imrich, Marco Conti, and Jennifer J-N. Liu. *"Mobile Ad Hoc Networking: Imperatives And Challenges."* Ad Hoc Networks 1, no. 1 (2003): 13-64.

[5] Elizabeth M.Royer, Charles E. Perkins "*An Implementation study of AODV routing protocol*" IEEE, 0-7803-6596-8/00,2000.

[6] Frodigh, Magnus, Per Johansson, and Peter Larsson. *"Wireless Ad Hoc Networking-The Art Of Networking Without A Network."* Ericsson Review 4, no. 4 (2000): 249.

[7] Goyal, Priyanka, VintiParmar, and Rahul Rishi. "*Manet: Vulnerabilities, Challenges, Attacks, Application."* IJCEM International Journal of Computational Engineering & Management 11 (2011):

[8] Gurmukh Singh, Dr. Savita Gupta, Sukhvir Singh, " *Performance Evaluation of DHT Based multi-path Routing Protocol for MANETs*", Volume 2, Issue 6, June 2012