ENHANCE PERFORMANCE OF AODV USING CLUSTERING APPROACH IN MOBILE AD-HOC NETWORKS

Ketan Vora[1], Pragnesh Patel[2], Vikram Agrawal[3]

[1]*Student, M.E. (Computer Engineering), IIET, Dharmaj, Anand, Gujarat, India.*

[2]*Assistant Professor, Dept. of CE, IIET, Dharmaj, Anand, Gujarat, India.*

[3]*Assistant Professor, Dept. of IT, BVM, VallabhVidhyanagar, Gujarat, India.*

ABSTRACT

Wireless networks are becoming more and more popular because they are very easy to use. Mobile ad-hoc networks has become very important technology in last few years because wireless devices increases rapidly. Battery power is an important parameter because mobile devices are battery operated nowadays. Clustering in MANET has evolved as an imperative research domain that enhances system performance such as PDF, throughput and it increases system capacity in MANET in the presence of mobility and large number of mobile terminals. In clustering, mobile nodes are divided into different virtual groups. Election of cluster head is very much important in clustering. In the existing systems only one or two performance parameters are evaluated and in some systems only theoretical concepts are given. The proposed algorithm considers battery power parameter for election of cluster head. The proposed algorithm forms Cluster by selecting all the nodes which are nearer to CH in one Cluster. When CHs' energy falls below threshold our algorithm elect the node which has highest energy as CH in Cluster.

Key words- MANET, Clustering, Routing, Cluster-Head, AODV, Throughput, PDF.

1. INTRODUCTION

Mobile Ad-hoc Network (MANET) is approach without central control in the wireless system which consists of free moving nodes. Wireless systems are getting popular due to their ease of use now a days. MANET sometimes called mobile mesh network, is a self-configurable wireless network. A MANET comprise of mobile nodes, a router with multiple hosts and wireless communication devices. A MANET is a network in which nodes are connected together by wireless links without any fixed infrastructure.These networks have no fixed routers, every node could be router. All nodes are capable of moving and can be connected dynamically in an arbitrary manner.

In particular, a very large no. of recent studies focused on Mobile Ad-Hoc Networks (MANETs). This kind of self-organizing network is very useful when the fixed infrastructure is economically practical or physically possible such as battlefield Scenarios, natural disaster, and etc. The development of dynamic routing protocols is considered as one of design issues of ad hoc network that can find routes between two communicated nodes efficiently. Based on the method of delivery of data packets from the source to destination, classification of MANET routing protocols could be done as 1) Unicast Routing Protocols and 2) Multicast Routing Protocols.

2. RELATED WORKS

In any network, for clustering the main goal is that the information should flow among various nodes. Before the actual data transmission the control information between source and destination is exchanged and data information is routed by various nodes. If the network topology is large and dynamic then the overhead of information passing

increases. Cluster-based routing is based on the implementation of a hierarchical approach [6] in which the network is organized into subsets of nodes, known as *Clusters*. Every clustering algorithm consist of two mechanisms, cluster formation and clustermaintenance.

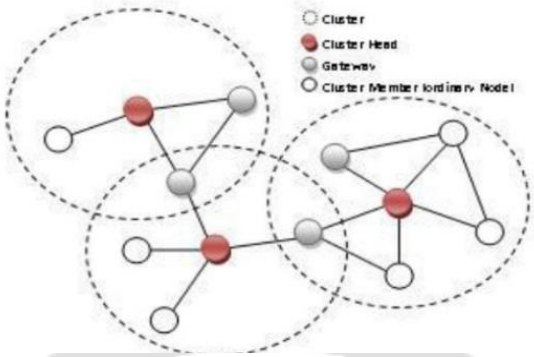

Fig-1: Clustering in MANET [6]

Cluster head is the node which manages the cluster activities like, managing cluster process, updating routing table, and discovery of new routes. The nodes other than the cluster head inside the cluster are called *ordinary nodes*. Nodes having inter cluster links which can communicate with more than one clusters are called *gateway nodes*. If the destination is inside the cluster, ordinary nodes send the packets to their cluster head that distributes the packets inside the cluster, or if to be delivered to other cluster then forward them to a gateway node. The next phase of cluster maintenance comes into picture when there is the node movement. So, it needs to do re-affiliations among ordinary nodes and cluster heads.

Routing Protocols:Routing is basically an act of moving the information from a source to destination. If a source is very much nearer to the destination then the information can sent without the help of any node. At least one node is encountered if the destination is far from the source node. There are some metrics that are used as a standard measurement to calculate that which one is the best routing path for the packets to reach the destination [8]. Routing provide the maximum possible reliability during the routing one can use alternative router if an intermediate node fail.

1)Proactive (Table-Driven): Proactive Protocol is a table driven approach where each node maintains a routing table and any changes to the network topology should be updated in each routing table and it is stored reliably. During transmission, each and every node maintains a routing information table that communicates all the other nodes in the network to update the changes in network topology and this information should be reflected to all other nodes within the network [9]. Though it establishes the routes quickly with a small delay, it requires larger resources and the major disadvantage is that, there is a tendency of creating loops within the network.

2)Reactive (On-Demand): It is an on-demand approach in which the routes are being established only when there is a request from the sender node. When there is no route from one node to another it helps in establishing a connection between them by creating a route. A route is acquired through the route discovery function which is initiated from the source node. The route is being maintained through the route maintenance function [9]. When compared to Proactive Protocol, this consumes more power with large delay. The flexible operations are done through reduced routing loads since it has no loop formation within the network.

AODV (Ad-hoc On Demand Vector Routing):AODV is a reactive protocol as it only requests a route when needed. Route discovery in AODV is done by RREQ (Route Request) and RREP (Route Reply) packet. RREQ is sent to neighbors till the destination node is found or lifespan of packet is finished [3]. If destination or route to a destination is found the routing table is updated through RREP. If a node receives more than one RREP packets for same destination from different nodes in the network, then node will choose the shortest route to destination. AODV do not contain loops. It can handle changes in routes and can create new routes if there is an error.

3. PROPOSED METHODOLOGY

In the Continues process it has proposed an algorithm in which node energy is considered as a one parameter for selecting a Cluster Head. So, most suitable node which has highest battery power will be elected as Cluster Head.After selecting CH node; this algorithm will form the Cluster by selecting all those nodes as Cluster Member which are nearer to CH.In the proposed algorithm, it works for maintenance of cluster, due to this lifetime of cluster will be increased.Condition for re-clustering is when Cluster Heads' energy will falls down to a predefined threshold

value, this algorithm will select next suitable candidate node as CH based on energy parameter. This proposed work will evaluate two parameters like PDF (Packet Delivery Fraction) and Throughput.

In a Clustering approach the mobile nodes are divided into different groups in MANET & Clustering scheme is separated into two phases:

- Cluster Formation.
- Cluster Maintenance.

// Steps for Cluster Formation:

1. Deploy the nodes. (i.e. 20, 30,50)
2. Determine energy level and position of every nodes.
   (Each node assigned 100W energy for simplicity purpose)
3. Select the source node. (with the use of topology)
   If we want to form two clusters then we have to select two source node but they must not be neighboring nodes.
4. Cluster Head. Select the node which has lesser distance from the source node as a cluster head (CH).
5. CH will send Hello message to all nodes which are in its transmission range.
6. Nodes which will reply to CH's Hello message will becomes a part of cluster.
   (Nodes will reply with its energy level and position)
7. Stop.

// Steps for Cluster Maintenance:

1. After formation of cluster, CH will send Hello message to all cluster member nodes periodically.
2. CH will collect the information about the remaining energy level of each cluster member.
3. When (CH's energy < Threshold value)
   CH will send the life_down message to all cluster member nodes.
4. The re-election procedure for CH will be considered and all cluster will participate in it.
5. The node with the highest energy level will be elected as a cluster head (CH).
6. Stop.

3.1 Evaluation parameters:

- PDF (Packet Delivery Fraction): The ratio between the amount of incoming data packets and actually received data packets.
- Throughput: This metric represents the total number of bits forwarded to higher layers per second. It is measured in bps. It can also be defined as the total amount of data a receiver actually receives from sender divided by the time taken by the receiver to obtain the last packet.

Table-1: Experimental parameters

Simulation Parameters	**Values**
Dimension of Space	1000*1000
Protocol	AODV
No. of Nodes	20, 30, 50
Ns2 Version	ns-2.34
Simulation Time	150s
Packet Size	512 bytes
Type of Traffic	CBR (Constant Bit Rate)

Node Placement Strategy	Random
Mobility Model	Random Way Point

4. SIMULATION RESULTS

In the proposed clustering scheme, there are mainly two scenario considered as (1) with two clusters & (2) with three clusters. In both scenarios there are 20, 30 and 50 nodes considered which gives the better performance as compared to the simple AODV approach as given below:

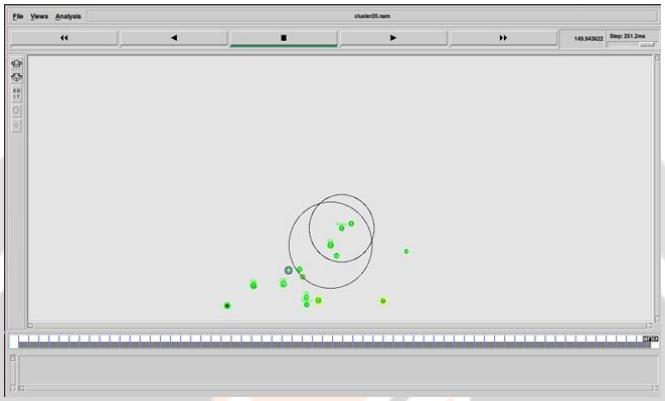

Fig-2: Screenshot of clustertcl20.tcl file with two clusters

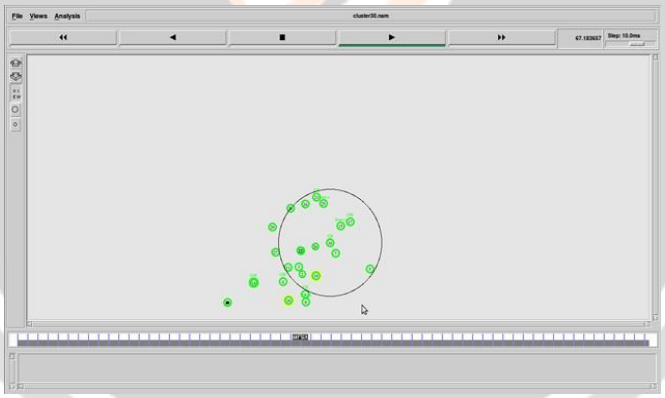

Fig-3: Screenshot of clustertcl30.tcl file with three clusters

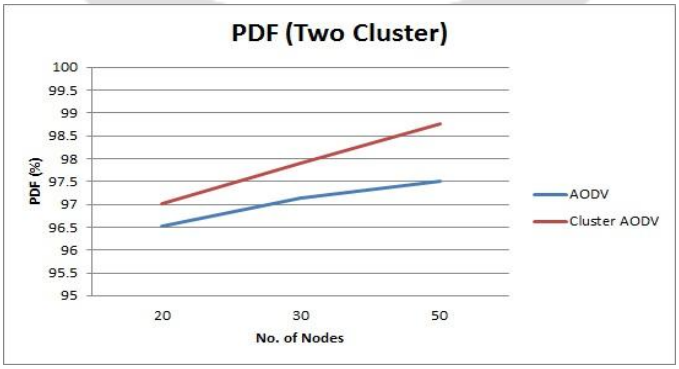

Chart-1: PDF comparison graph of simple AODV & Cluster AODV for two cluster.

Chart-2: PDF comparison graph of simple AODV & Cluster AODV for three cluster.

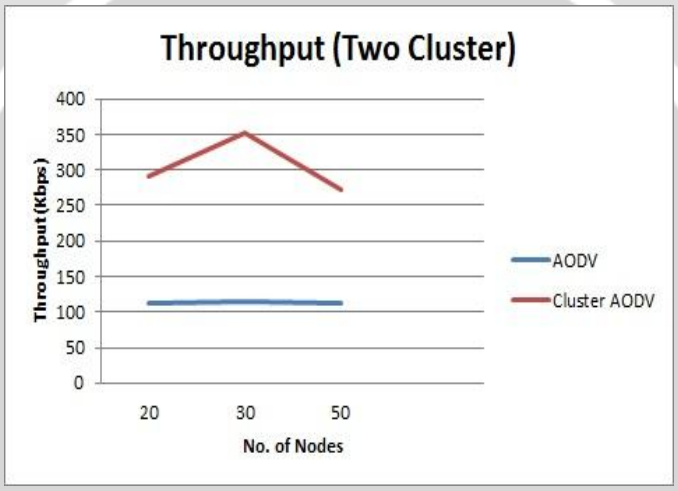

Chart-3: Throughput comparison graph of simple AODV & Cluster AODV for two cluster.

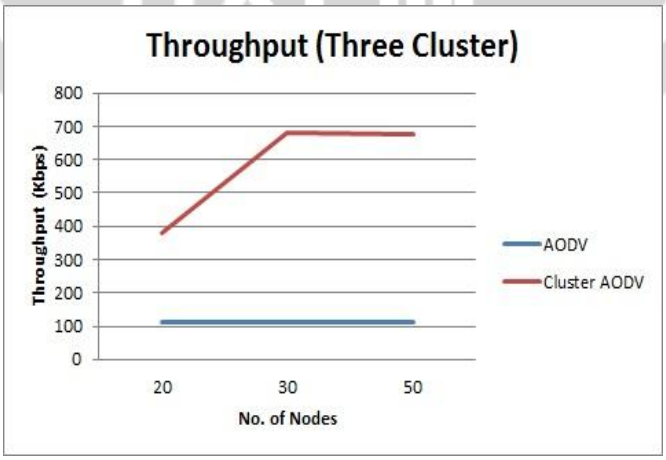

Chart-4: Throughput comparison graph of simple AODV & Cluster AODV for three cluster.

5. CONCLUSION

Cluster Based Routing approach is more suitable for MANET because the performance of it in MANET. It can be seen that there is wide range of routing protocols and clustering algorithms available for routing in MANET. Different types of protocols and algorithms used for specific purpose. There is no same algorithm available for both cluster formation and maintenance. So in the proposed work it was working for such an algorithm which cover both the phases of clustering and there were two different parameters evaluated like PDF & Throughput to enhance the efficiency of cluster based routing approach in mobile ad-hoc networks. In this implemented work it was compared between simple AODV & Cluster AODV for mainly two parameters like PDF & Throughput. In future this work can be useful for evaluating other parameters like routing overhead, E2E delay etc.

REFERENCES

[1].Alak Roy, ManasiHazarika, MrinalKantiDebbarma, "Energy Efficient Cluster Based Routing in MANET" IEEE 2011.
[2].Siddapuram Arvind, Dr. V.D. Mytri, PreetiPatil, "Throughput Enhancement using Cluster Based Approach in Wireless Ad-Hoc Networks" IJERT 2012.
[3].QutaibaRazouqi Ahmed Boushehri Mohamed Gaballah Lina Alsaleh, "Extensive Simulation Performance Analysis for DSDV, DSR and AODV MANET Routing Protocols" IEEE 2013.
[4]. Dhirendra Kumar Sharma, Chiranjeev Kumar, Surajit Mandal, "An Efficient Cluster Based Routing Protocol for MANET" IEEE 2013.
[5].Dhari Ali Mahmood, Rahul Johari, "Routing In MANET using Cluster Based Approch" IEEE 2014.
[6] Dr. Mohammad Bokhari and Hatem S.A.Hamatta, "A Review of Clustering Algorithms as Applied in MANETs" IJARCSSE 2012.
[7] Aarti, Dr. S. S. Tyagi, "Study of MANET: Characteristics, Challenges, Application and Security Attacks" IJARCSSE 2013.
[8] Sunil Taneja, Ashwani Kush, "A Survey of Routing Protocols in Mobile Ad Hoc Networks" IJIMT 2010.
[9] Kapila Vyas, Amit Chaturvedi, "Comparative analysis of routing protocols in MANETS", IEEE, 2014.
[10] Sheetal Mehta, Priyanka Sharma, KetanKotecha, "A Survey on Various Cluster Head Election Algorithms for MANET", IEEE, 2011.
[11] Ms. S. Suganya, Dr. S. Palaniammal, "AN OPTIMIZED ENERGY CONSUMPTION ALGORITHM FOR MANET", Elsevier, 2012.