Counter Weight and Region Based Clustering MANET Implemented for lagging and Rapid Scenarios

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Abstract - This paper presents the idea of forming multicasting Backbone network for emergency or specific purposes. After the purpose of network is over the nodes are used for any other purposes. The Applications of these types of networks is may be in Army battlefields, disaster recovery, search and rescue operation, conferrence, political meetings, events etc..Based on the factors the networks size may vary but the type of network, communication technology, communication devices are remaining same. This paper implements the latest technique of MANET implemented with cluster based multicast routing protocol.

Keywords: - clustering,region, counter weight , lagging ,rapid,back bone,Multicas**t.**

I. INTRODUCTION

Over past few years significant development in Wireless Technology, Day to day new technologies arrives. This research introduces the concept of emergency temporary network implemented with group based clustering backbone technology.

Applications such as conferences, meetings, lectures, crowd control, search and rescue, disaster recovery, and Army battlefields typically do not have central administration or fixed infrastructure. In these circumstances ad hoc networks does not have any wired infra structured or base stations. Nodes in such a network moves arbitrarily,thus network topology changes frequently and unpredictably. Moreover, bandwidth and power are limited. This research work introduces a wireless temporary network without any fixed infrastructure with centralized node called as head node. Design the network that involves communication between the nodes through Head node. Implement some predefined text message related to situation and feed all the nodes involved in temporary network, because in emergency situation they don't to talk or type message, they will use the predefined text messages.

Generally Ad hoc networks is decentralized network each node communicate with each other through intermediate nodes. When the network size is extensive its unmanageable to routing and manage. Suppose the network is unfixed networks means the topology many change frequently. New protocol as counter weight and region based is the solution proposed here for the communicating failure while nodes are fast moving.The idea creating clusters and backbone for connecting cluster heads is the idea of making routing involved with least amount of nodes. The other normal nodes communicating through cluster heads, two clusters communicating through gateway nodes.

Application of lagging scenario is meetings, political conferrences, events, live matches etc,. For these scenario small or medium size of network is enough,because the area of this net work with ground ,stadium or Hall anything else. For these application we can able to decide the size of network, number of nodes, communication technology, use of antenna, node stability, amount of energy, life time of the network at least somewhat.

The applications of rapid scenario is Army Battel fields, Disaster relief operations, search and rescue operations etc., for these

scenario medium or some big size network needed. For these application we can not able to decide the size of network, number of nodes, amount of energy, life time of the network but which communication technology, use of antenna, node stability can able to decide.

II. COUNTER WEIGHT ALGORITHM

A.Energy

For sending and receiving of data consumes more energy(B_{PC}) than Energy consumes for electronic functions(B_{PE})

$$Bp = B_{PC} + B_{PE}$$

The initial energy of node Bp, the period time is (T),energy consumed by the node is calculated by

$$B_{PC} = T_{PC} + R_{PC}$$

// T_{PC} - Transmission energy,

R_{PC} - Receiving Energy.

Energy consumption for transmission = $T_{PC} \times T$ // T-time taken for transmission

Consumed energy for reception = $R_{PC} \times T$

Remaining battery power of particular node will calculated using following formula

$$R_{BP} = Bp - B_{PC}$$

// R_{BP}- Remaining battery power

//C_{BP} - Energy consumption for task

//B_P- Total battery power

Remaining battery power of N number of nodes

$$E = \sum_{i=1}^{n} R_{BP}$$

B.Transmission Range (Tr)

When a nodes enter into a cluster the maximum distance of the node calculated.The radius of coverage area is maximum distance. The transmission range is calculated by following formula

$$Tr = \sqrt{Ndg / Cdg} \Big/ radius$$ // Ndg - desired node degree

//Cdg - current node degree

Ndg = (Node density * Dt)

$$Dt(HN, CN) = \sqrt{\sum_{i=1}^{n} (CN_i - HN_i)^2}$$

Average radius is calculate for N number of nodes by

$$R = \sum_{i=1}^{n} Tr$$

Choose cluster head based on battery power and transmission range based values

$$HN = \max_{i \in n}(E) \bigcup \max_{i \in n}(R)$$

C.Back bone creation

The MANET have N number nodes, the MANET divided into M Number of clusters, maximize the number of nodes to each cluster (C) and select K number of nodes from each cluster as a head nodes(HN). The clusters(C) are C = {C_1, C_2, C_3, ...C_M }

$$HN \subseteq C \qquad |HN| \leq M$$

$$\left| \bigcup_{C_i} C_i \in HN \right|$$

Maximize the nodes covered in each clusters(C)

$$Max \sum_{C_i \in HN} C_i \qquad C_i \leq M_k$$

Select K nodes from each clusters C $\sum HN_i \leq K$

III. REGION BASED CLUSTERING ALGORITHM

A) Head node selection

The techniques are available for calculating coordinates and signal strength.Each node knows it own location information from the (x, y) and the current transmission range.Set the rectangle area for entire node and sub part the rectangle. Coordinates of the rectangle

is (0,0) and the end is (x,y),So the center point of the rectangle (x/2,y/2).Each partition are equal size clusters then one node will select as Cluster head.

Set Spt(0,0);
Set Ept(x,y);
Set Cpt(x/2,y/2);
Set NID(ID,(x_i ,y_i),partition_ID)
Set Length=L;
PID=(x_i /L)+(y_i /L)(x/L);
Set Tr and B_P ;

Select HN based on high energy and high transmission range values
in each partition

$$HN = \max_{i \in k}(E) \bigcup \max_{i \in k}(R)$$

$$HN \subseteq C$$

$$\left| C_i \overset{\cup}{\in} HN \right|$$

Else if
Node receives hello message from two HN's
Select as GN;
Else
Select as MN;
End If

B.Routing

Step 1**:** If S wants to transmit the data establish Rrq to its neighbour
Step 2: If D is within transmission range send Rrp to S ,communication begins.
Step 3:If D is not within transmission range the neighborhood node will check heterogeneity based geographical values.
- calculate the euclidean distance between two nodes
- identify shortest path
-establish the path ,communication begins.

1) ***Intra-cluster routing:*** Sender and receiver will directly communicate within same cluster.

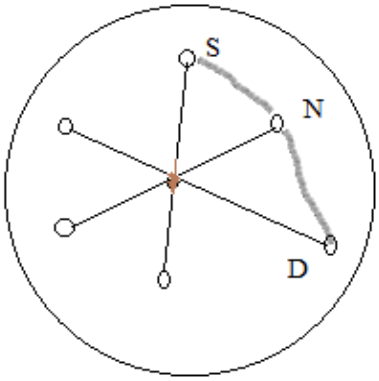

fig: 1.1 Intra cluster routing(1- Hop)

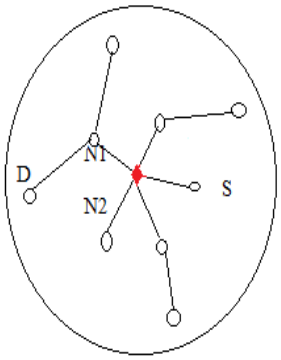

Fig1.2 intra cluster(2-hop)

Algorithm for Intra cluster routing(1- Hop)

Calculate the Dt by $S(x_1,y_1)$,$D(x_2,y_2)$ -Source and destination coordination Calculate the Dt by

$$Dt = \left| \sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2} \right|$$

If (Dt > D(Tr))

Find the immediate 1 hop neighbour(N) in the cluster

If find N

Forward the communication packets to N

Then

N will forward to D

Else

S directly forward to D

End if

Algorithm for Intracluster routing(2- Hop)

Calculate the Dt by $S(x_1,y_1)$,$D(x_2,y_2)$ -Source and destination coordination Calculate the Dt by

$$Dt = \left| \sqrt{(x_2 - x_1)^2 - (y_2 - y_1)^2} \right|$$

If (Dt > D(Tr))

Find the immediate 1 hop neighbour s (N1) in the cluster

If find N1

Forward the communication packets to N1

Then

N1 check the route to D

If route find

S forward to D

Else

Find the estimated Dt To D at

Particular time period T

Find the recent direction of node

D with deviation angle β

// β intialvalue $=15^0$

Entire radius πr^2

Area of expected Zone = $\frac{\beta}{360}\pi r^2$

Find new node N2

N2 forward the packets to D

End if

Else

N1 forward to D

End if

2) Inter Cluster Routing Algorithm

If sender wants to establish a connection with the destination, the route request(Rrq) can be transmitted through Head Node of the both Clusters.

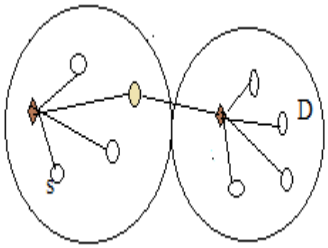

Fig 1.3: Routing in adjusting clusters

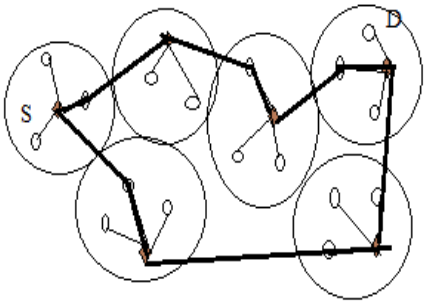

Fig 1.4: routing with m-hop away clusters

Inter Cluster Routing between adjacent clusters:

S sends the Rreq to HN

HN forward the Rrq to adjacent HN via GN

Table 3.1 simulation parameter

Then Receives Rrp with Location of D from HN

S forward communication packet to G

G calculate Expected Zone as well as request zone by $\frac{\beta}{360}\pi r^2$

If D is reachable

G forwards communication packets to D Else If

D reachable via other node

GN node forward to HN of D

HN forward to D via other nodes

in the cluster

Else

GN replies error message to S

S request the HN to reinitiate

the route discovery process.

End

Inter Cluster Routing between clusters m-hop away:

After Obtain Rrp ,S send to HN

HN Sends to angle of α via GN

Reach D's HN calculate expect zone and request zone of node D by πr^2

Direction of D 's expected Zone known by $\frac{\beta}{360}\pi r^2$

IF D is available

HN forwards to D

Else

HN forwards to other cluster

End

IV. SIMULATION RESULTS

A) Simulation parameters

Table 3.1 is the list of simulation parameter to implement region based and counter weight based algorithms.

Simulator	NS 2.35
Antenna	Omni Antenna
Channel	Wireless Channel
Radio Propagation	TwoRayGround
MAC Type	802.11
Simulation time	100 sec
Simulation area	700m X 700m
Number of nodes	23,35 ,40
Traffic type	AODV

B)

Communication range	250m,150m, 60m,50m, 55m62m,45m...
Energy	70,50

Results

Simulation was implemented with NS2.34 for evaluating region based and counterweight based algorithms. Fig 4.1 is Lagging scenario implemented with 23 nodes divided as 3 clusters 5,8,17 nodes are selected as cluster heads.routing done with head nodes.

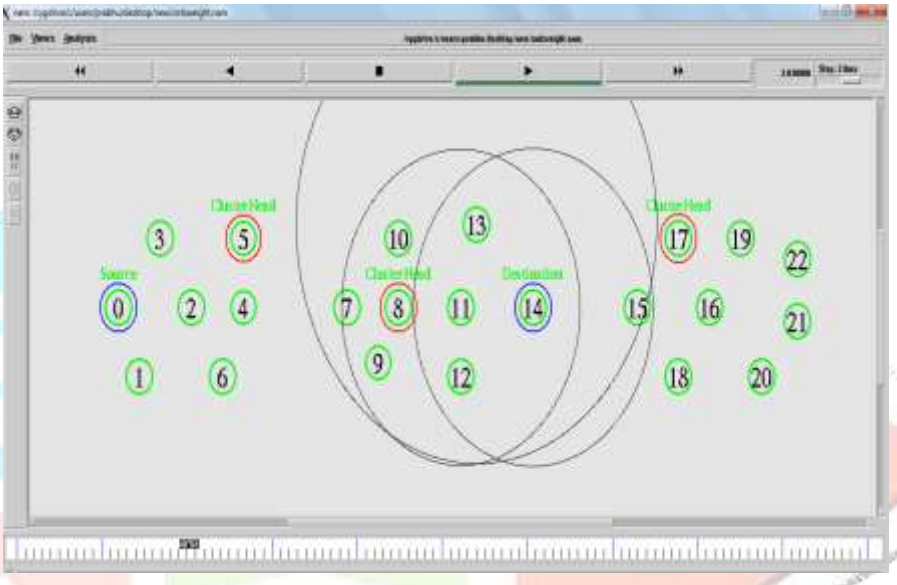

Fig 4.1 Lagging scenario

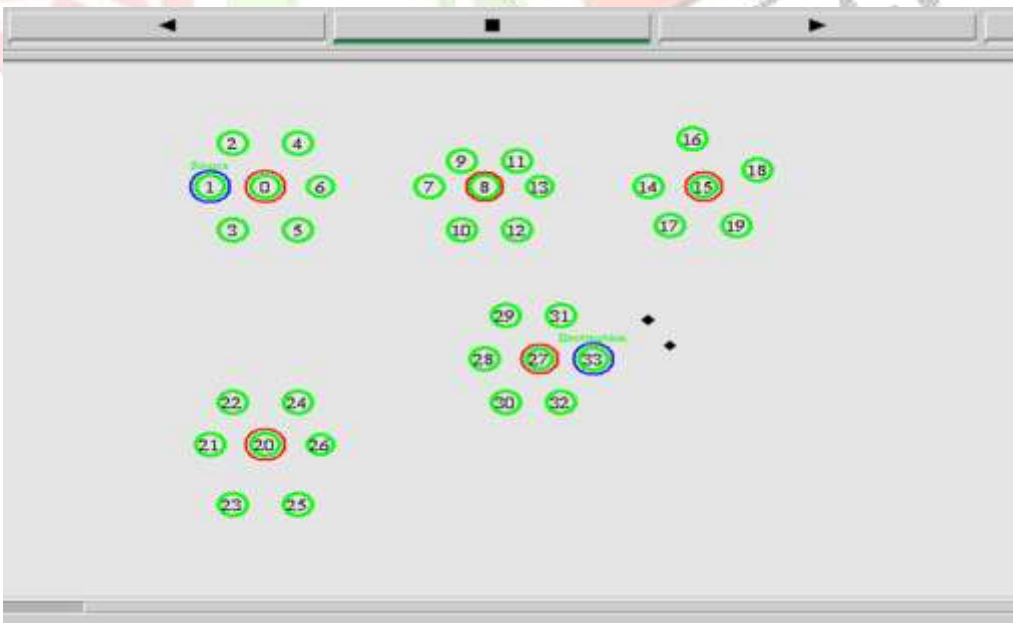

Fig 4.2 Rapid scenario

Fig 4.2 is Rapid scenario implemented with 5 and 6 cluster with 34 and 40 nodes to show the scalability. Packet drop ratio is increases while network size increases.

Fig 4.3 packet delivery ratio

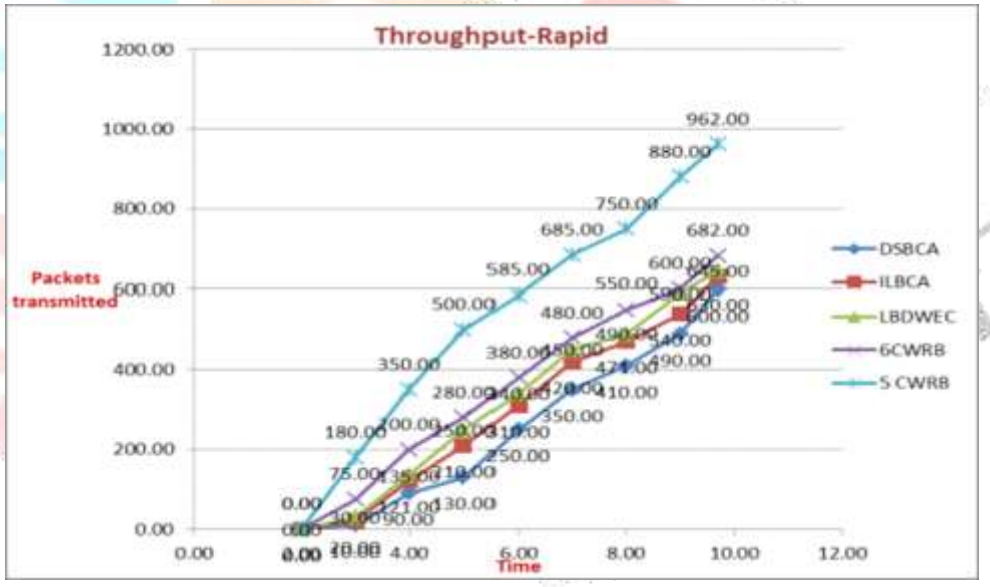

Fig 4.4 Throughput

For lagging scenario the counter weight based clustering algorithm is implemented the nodes are slowly move on may not move. Here communication achieves through intermediate node, In NS2 implementation this algorithm achieves 100% Packet delivery ratio and throughput. For rapid movement scenario the region based Clustering algorithm is implemented here the node are move fast. While network size increases routing achieves through coordinate position.In Ns2 implementation with 5 cluster and 30 node results 97% packet delivery ratio and achieving salability Ns2 implemented with 6 cluster with 42 nodes results 78%.

V. CONCLUSION

Since network size increases the packet delivery ratio has been reduced .So,reducing network size by improving cluster size but

drawback is adding more number nodes in cluster routing will delay by searching destination so through is reduce. So balancing cluster is important by fixing limitation can achieves throughput and PDR.

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