Cluster Head Selection Based Energy Aware Routing Protocol for Manet

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Abstract - In this paper a technique of cluster formation is proposed choice of the first cluster head and secondary cluster head. Further, once 2 clusters come back nearer to every alternative they merge and form one cluster. In such case out of 2 CHs secondary has got to withdraw the role and first can take over. A replacement economical technique of merging each clusters is additionally projected within the analysis paper. They use this methodology as associate degree Improved Cluster Maintenance theme (CMS) and primarily targeted on minimizing CH once ever-changing topology so as to reinforce the performance. CH methodology is enforced to avoid any style of offensive model on the network with 2 head nodes rule besides avoiding delay and energy; it will increase the node speed additionally. Network machine (NS2) is employed to simulate the projected rule and compared with Weight based Cluster (WBC), Primary and Secondary Weight based Cluster (PS-WBC). The projected cluster methodology and enforced within the take a look at system provides secure transmission and additional reduces routing overhead, delay and energy conjointly will increase potency of topology.

Keywords: MANET, Cluster head, Primary Cluster, Secondary Cluster, Delay, Energy, overhead.
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1. Introduction

Considerable work has been exhausted the event of routing protocols in several kinds of mobile spontaneous networks like table driven, on-demand, hybrid Networks. To gift a theme that ends up in cluster formation this with efficiency uses the resources of the MANETs. They initial of all the nodes produce in specified region, secondly; type the clusters of created nodes, finally, applying the Selection Economical Protocol (SEP) protocol for the election of the cluster head node and this created cluster head node are going to be of larger life show in figure 1.

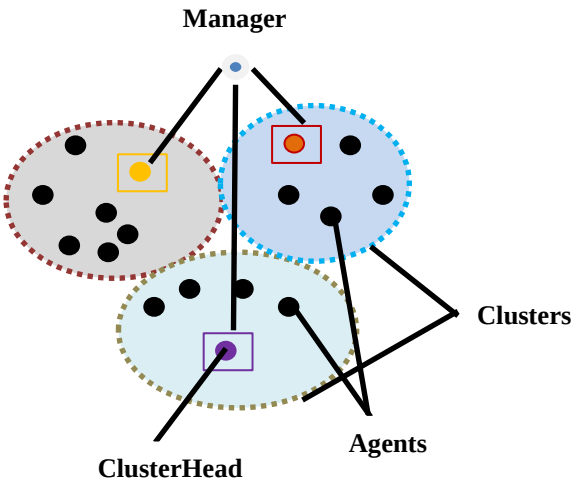

Figure 1 Cluster Head in MANET

Cluster head selection process: Cluster head choice is required in cluster primarily based Network, should analysis has been done on election of cluster head during a cluster atmosphere. In MANET, there's no position to regulate the election method and quality is additionally a problem. Another Cluster Head Election technique was planned supported remaining energy and relative position of the node within the cluster, the cluster head is chosen on the idea of threshold price T, Threshold is calculated by the 3 factors Energy, Distance and site and chance of the node, each node generates a Random range, if it's smaller than a predefined price the node elects itself as a Cluster-head. Another Cluster Head Election technique was planned supported remaining energy and relative position of the node within the cluster, the cluster head is chosen on the idea of threshold price T, Threshold is calculated by the 3 factors Energy, Distance and site and chance of the node, each node generates a Random range, if it's smaller than a predefined price the node elects itself as a Cluster-head.

2. Background

A design principle for reliable mobile radio networks with frequency hopping signalling was done by phremides, et al (1987). Mobile wireless computing was discussed by G.Forman and J.Zahorjan (1994). Mobile computing was taken by Imielinski, et al (2010).Performance comparison of

routing protocol in MANET was analyzed by K.Prabu, et al (2012).A survey routing protocols in MANET was specified by Swati, et a l(2014).Multicluster mobile multimedia radio network was addressed by M.Gerla, et al (1995).Routing in clustered multihop, mobile wireless networks with fading channel was taken up for research by Chiang, et al (1997).Cluster based routing protocol functional specification was performed by M. Jiang, et al (1999). Cluster based routing protocol was found by Jiang, et al (1999).A weighted clustering algorithm for mobile ad-hoc networks was highlighted by Chatterjee, et al (2002).A survey of clustering schemes for mobile ad hoc networks was done by Jane Y.Yu, Peter H.J.Chong (2005).A simple clustering mechanism for OLSR Challenges in ad-hoc networking was discussed by Baccelli E (2006). A cluster-based OLSR extension to reduce control overhead in mobile Ad hoc networks was taken by Ros FJ, Ruiz PM (2007). An improved cluster maintenance scheme for mobile Ad hoc networks was analysed by Pathak, et al (2014).

3. Problem Definition

Mobile nodes can elect, supported some QoS criteria, a delegated node that is termed a cluster head. during this work, we have a tendency to aim to outline a replacement cluster choice approach supported the energy and delay criterion that's one in every of the foremost necessary QoS parameters of a commercial ad hoc network so as to produce an extended network life, in addition on cut back energy consumption for spontaneous network, significantly in cluster and routing. The planned approach aims to reinforce the routing method and produces a little range of stable (higher residual energy) cluster heads. Within the literature, many cluster approaches were planned. They often take issue on the used cluster head choice criterion. In our proposal, we have a tendency to gift a 2 cluster approach primary and secondary that elects a reduced and cheap range of cluster heads that have a high residual energy. This could prolong the life of the complete network and enhance the routing method. This 2 cluster technique provides higher performance compared to the present routing protocols and additionally reduces routing delay and routing overhead energy between intermediate nodes.

4. Proposed Concept

Algorithm description: energy aware Wight based Cluster (WBC) bunch in MANETs is outlined as a virtual partitioning of mobile nodes into totally different network teams. These teams square measure designed with relevance their concerning every other's. Clusters during a MANET is categorised as overlapping clusters or non-overlapping clusters. They need primarily based our work on the energy based primary and secondary model planned by NS2 live Energy consumption of every node. The residual energy is used as a metric to optimize the quantity of cluster heads and to maximise the network time period. At the start of every simulation, the node energy is about to the initial energy that is then decremented once causing or receiving packets.

PRIMARY AND SECONDARY CLUSTER HEADS SELECTION FORMATION:

{
Received node_info from all its neighbour
First max_weight primary = max (weight[node (id)]) and P-Chid=node (id)
Second max_weight secondary = max (weight [node (id)]) and S-Chid = node (id)
IF CHid> 1 Then
IF CHid = 1 Then
CHid = Lagest_Value_ID
SEND "Construct CH_advertisement message and broadcast"
END IF
}
CLUSTER_CH_PRIMARY and SECONDRY NODES (higher forward capacity)
{
Old_P-CH Received Hello from New_S-CH
Delay timer =delay period
Max_limt=Tran_Range/2*node speed
Request interval = transmission time
Delayed clusterhead change for delay timer.
IF S-CH is in the same radio range P-CH
WHILE delay_time<=Max_limt
P-
CH_Priority_factor=Max_degree_ch+Battery_life
P-
CH_Priority_factorMax_degree_CH+Battery_life
IF S-CH_Priority_factor>P-CH_Priority_factor
S_CH=1
P_CH=0
Exit (0)
ELSE
delay_time=delay_time+hello_interval
END IF
ENDWHILE
IF Pch_ID<=Sch_ID
S_ch=1
P_ch=0

Exit (0)
END IF
}

ALGORITHM DESCRIPTION: ENERGY AWARE CLUSTERING

Transmitted Energy eitxðΔtÞ ¼ P tx _ txtime; ð1Þ (4.1)

Receiving Energy eirxðΔtÞ ¼ P rcv _ rcvtime; ð2Þ (4.2)

Idle Energy eiidleðΔtÞ ¼ P idle _ idletime; ð3Þ (4.3)

eitotalðΔtÞ ¼ eitxðΔtÞ þ eirxðΔtÞ þ eiidleðΔtÞ; ð4Þ (4.4)

EiðtÞ ¼ Eiðt−ΔtÞ – eitotalðΔtÞ ð5Þ (4.5)

Where

Tx-time Transmitting time for a packet,

Rx-time Receiving time for a transmitted packet

Idle-time Time where a node is in the idle state

Ei(t) Residual energy at a given time t

Ei (t−Δt) Residual energy total at t-Δt

eitotal (Δt) total energy consumption during the interval[t−Δt ,t].

Enery consumption modelseach node:

Transmission power =P_tx.
Receiving power =P_rcv.
Idle power =P_idle.
P idle < P rcv< P tx ð6Þ (4.6)

Election algorithmic program of cluster heads in a very clustered PS-WBC network, every node will be in one amongst 3 modes:

Undecided: once a node has simply arrived or it's simply left its cluster and has no neighbour in its neighbourhood, its standing isn't set however. There's no cluster heads or cluster member. It should anticipate the receipt of greeting messages.

Cluster head: The node changed greeting messages, and it's the very best worth of residual energy. It creates a cluster during which it had been appointed head of the cluster.

Member: The node has changed greeting messages; its residual energy is a smaller amount comparison to its neighbour nodes and is an element of the cluster members.

Thus, every node will discover network conditions favourable to vary its mode.

- If criteria one (Ei≥E) is true, the node moves from Undecided to cluster head mode.
- If criteria two (Ei<E) is true, the node moves from Undecided to Member.
- If the node i is within the Member mode (respectively in mode cluster heads) and it receives a greeting message with criteria one (respectively criteria 2), it moves in cluster heads mode (respectively moves in Member mode) as a result of its mode must modification.
- If the node i is in Member mode and it receives a greeting message with criteria two (respectively criteria 1), it remains in Member mode (respectively remains in mode cluster heads) as a result of its mode has not modified.

5. Results and Discussion

In this work, the lowest forward capacity nodes are provided the ability to loss packets. This way, weakest nodes simply drop message and acknowledgement the packets that they receive and send back to secondary forward capacity node to reduce loss packets to their previous nodes whenever necessary. This is a common method for degrade network performance while still maintaining their reputation. The proposed approach PS-WBC is designed to tackle weaknesses oldest cluster based scheme.

Table 1 Results of Parameter Values

Routing Overhead					
RO/NN	**20**	**40**	**60**	**80**	**100**
WBC	0.20	0.33	0.39	0.48	0.57
PS-WBC	0.16	0.27	0.35	0.41	0.43
Delay					
AD/NN	**20**	**40**	**60**	**80**	**100**
WBC	0.52	0.47	0.41	0.33	0.24
PS-WBC	0.44	0.39	0.31	0.24	0.17
Energy					
AE/NN	**20**	**40**	**60**	**80**	**100**
WBC	0.14	0.19	0.24	0.29	0.34
PS-WBC	0.07	0.12	0.17	0.22	0.27

RO = Routing protocol, AD = Average delay, NC = Average Energy, Number of cluster, NN = Number of nodes, WBC = Weight based cluster,

PS-WBC = Primary and secondary - weight based cluster

The impact of packet drop on routing overhead is analysed using the two algorithms and the simulation results are shown in figure 2 and table 1.

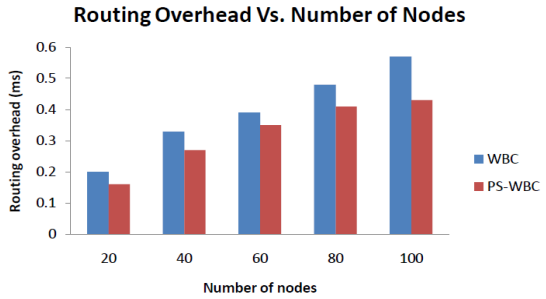

Figure 2 Routing overhead Vs Number of nodes

Simulation results reveal that the proposed algorithm reduces the routing overhead by 7% than WBC. If any of the primary cluster nodes is found to be busy, then the proposed algorithm is able to transmit through secondary cluster node using PS-WBC itself which reduces the overhead.

Figure 3 shows the graph of Average delay when the number of nodes is increased from 20 to 100.

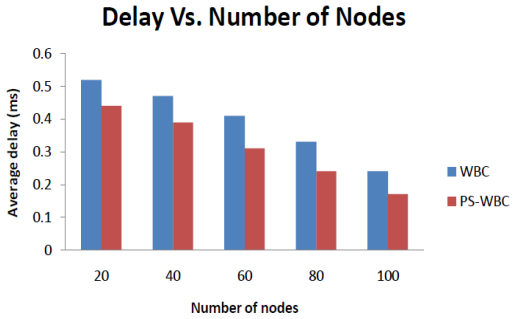

Figure 3 Average delay Vs Number of nodes

According to figure 3 and table 1, it is clear that in all, the proposed scheme PS-WBC surpassed the performance of WBC in minimising average delay by 8.4% when there are 20 to 100 nodes in the network. As the proposed algorithm finds two highest capability clusters in initial stage, it is possible to minimize the delay. Finally average energy is analysed using the two algorithms when the total number of nodes is varied from 20 to 100 and the simulation results are shown in figure 4 and table 1.

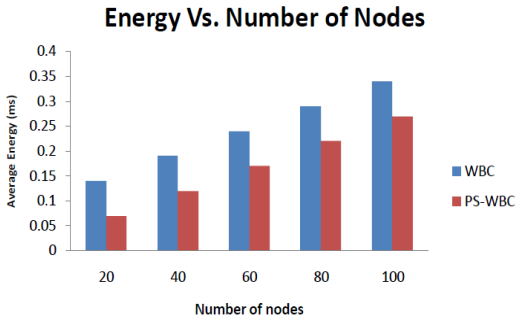

Figure 4 Average energy Vs Number of nodes

Figure 4 and table 1 describe the decrease in energy obtained by the proposed PS-WBC when there are dynamic packet drops. PS-WBC algorithm reduces the average energy by 7% as the proposed algorithm is capable of finding unbreakable short route while transmitting and receiving packets.

6. Conclusion

In this paper a new approach for cluster formation is proposed for routing in MANET. The proposed algorithm is a Primary and Secondary Weight Based Cluster (PS-WBC) approach that takes three parameters into account. The first parameter is the overhead degree that gives the idea of population of nodes in is around. The second parameter is the average delay requirement that gives the busyness of the node. The third parameter is the average energy decreased in increasing number of mobile nodes. Based on these three parameters a weight function is derived and weight is calculated. Cluster formation of the cluster and selection of the primary and secondary cluster head, the protocol considers the weight of every candidate for cluster head. This merging algorithm proposed here compels two cluster heads to weight for a certain time interval before assume and select single cluster. This PS-WBC provides better performance compared to the existing WBC routing protocol by decreasing average delay by 8.4% lowering routing overhead by 7% and reducing average energy by 7%.This approach reduces the chances of unnecessary cluster selection in case of passing by clusters. The algorithm of PS-WBC is simulated in ns-2 and compared with WBC protocol.

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BIOGRAPHICAL NOTE

Prof. K. Thamizhmaran received his M.E degree from Faculty of Engineering Annamalai University, Tamilnadu in the year 2012 respectively, M.sc in yoga degree from Faculty of Education, Annamalai University, Tamilnadu in the year 2019 respectively and Post Graduate in Guidance & Counselling degree from Faculty of Psychology, Annamalai University and Tamilnadu in the year 2020 respectively. He is currently pursing Doctor of Philosophy in Mobile Ad-hoc Network (Network Security), Faculty of Engineering Annamalai University from 2013 to till date. He is currently working as an Assistant Professor in the Department of Electronics & Communication Engg, Government College of Engineering, Bodinayakkanur, Theni, and Tamilnadu, India. Teaching Experience 13 years & 04 months and Industrial Experience 02 months (team leader in honey drops-chennai). His research interest includes Wireless Communication, Ad-Hoc Networks, and Networks security. He has published more than 192 technical papers at various National / International reputed Conferences and in journals including SCI/Scopus with UGC approved publications. He has published 02 technical books for International Publication and 06 book chapters from international publication including India & Germany also editor of 02 international conference books from India & Turkey. He is a life member of 24 professional bodies. He is editor, advisory board member and reviewer of 24 international journals.

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