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Issues and Challenges in Energy Aware algorithms using clusters in MANET

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ABSTRACT

Mobile ad hoc Network is gaining popularity day by day because of lifestyle electronic gadgets with uses Wi-Fi networks. Mobile ad hoc network is self creating infrastructure less network of mobile devices; they are acting as host as well as router. This network is composed of heterogeneous devices, it is having peculiars problem of hosts are departing due to running out of battery. MANET has efficient data transmission among nodes but due to battery drainage and link breakage consumes network energy.

Many researchers has already developed energy aware algorithm based on various concept, still need has been felt to analyze already developed algorithm using minimum energy, and device new algorithm with further reduces the energy usage while data transfer. While devising new energy aware algorithm many researcher uses concept of clustering. Cluster head act as database of all neighboring nodes. For increasing life span of network clustering algorithm are proposed which has main focus on power drainage of batteries and mobility of nodes in MANET. Scalability and Stability of network is increase by overcoming these two problems in network and weights are assign to each cluster node is taken as effective solution in weighted based clustering algorithms. In this paper an attempt is made to analyze various issues and challenges of algorithm using clustering.

Keywords: Clusterhead, Clustering, gateway, Mobile Adhoc Network (MANET), scalability, stability

1. INTRODUCTION

Mobile Adhoc Network is self organizing network in which each mobile node is connected via wireless link. It does not have any infrastructure or centralized administration. Each node works as a host as well as router to forward data packet in the network. Due to the limited radio range of the wireless link in mobile ad-hoc network, it may be necessary for one node to enlist the aid of other nodes in forwarding data to a destination node not within the radio transmission range of the source [1]. Some of the applications include are:

- Military communication networks in battlefields,
- Emergency rescue operations
- Undersea operations
- Environmental monitoring
- Space exploration

As there is no infrastructure in Mobile Adhoc Network this characteristic differentiate it from other Local Area Network. It is one of the challenges in MANET because if a node lost in this case data on that node is also lost. In a MANET each node is free to move independently in any direction, and will therefore change its links to other devices frequently is another challenge. Nodes mobility results in a continuous change in network topology and, thereafter, routes connecting the nodes within the network are continuously changing [3, 4]. Energy efficient routing protocols maximize life time of network. For efficient transmission of data it requires routing in the dynamic Adhoc Network. Like flat routing protocol; proactive and reactive routing protocol. Reactive routing uses flooding mechanism in network and the considerable route setup delay become intolerable in the presence of both a large number of nodes and mobility. Consequently, a hierarchical architecture is essential for achieving a basic performance guarantees in a large-scale MANET [6]. Since a cluster structure is a typical hierarchy, many researchers have focused on developing an effective and efficient clustering scheme for MANETs. However, until now no overviews of ad hoc energy aware clustering issues have been done seriously. In this paper an honest attempt is made to analyze various issues and challenges of energy aware algorithm using clustering for MANET

Energy efficiency of Mobile Adhoc Network includes Stability, Scalability, Manageability and Mobility of mobile nodes in the network. These all are have related issues to maintain efficiently energy in the network. These are following issues which occur mainly in network

- Link breakage among nodes
- Restricted bandwidth in network
- High mobility of nodes in network
- Spatial diversity in large network
- Data diversity over unstable mobile nodes
- Path length increase among transmitting and receiving nodes
- Nodes out of Battery

To overcome above mentioned limitation number of works has been done in the area using clustering.

2. CLUSTERING ALGORITHM IN MANET

Clustering of network is the division of network into different virtual groups based on certain rules. Basis on the closeness and other factors different nodes are grouped into a structure called cluster see Fig. 1. In this figure four clusters are shown; C1, C2, C3 and C4 and each cluster has its clusterhead CH1, CH2, CH3 and CH4. A node which connects two clusters

called gateway node (GN). The two major characteristics of a clustering architecture are as follows.

- Firstly, there is only one cluster head in each cluster.
- Secondly, each node in a clustering architecture is either a cluster head or adjacent to one or more cluster heads.

A node belonging to two or more clusters is called *a gateway*. Remaining members are called *ordinary nodes*. The boundaries of a cluster are defined by the transmission area of its Cluster Head. Communication between any two adjacent clusters has to rely on their common gateway. Thirdly, any two cluster heads are not adjacent to each other. Finally, any two nodes in the same cluster are at most two hops away from each other [11].

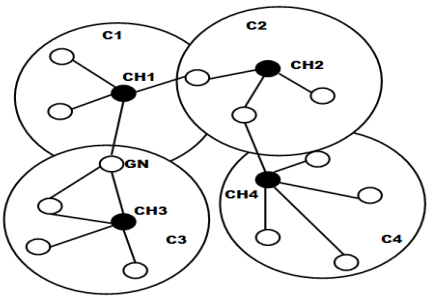

Figure 1: Clustering architecture

3. ENERGY CONSERVATION IN MANET

Energy conservation has a significant impact in mobile ad-hoc network. For prolong network life time such resources has to be handle early drain of the battery node, controlling the transmission power of a node and put low power consumption strategies together into the protocols[5]. These protocols with high mobility of nodes in a network have main focus on:

- Accumulated energy of a path
- Status of battery lifetime
- Type of data to be transmitted[5]

Now a day main focus is on energy conservation in network for efficient transmission. Clustering is one strategy which improves the efficiency in this area these are as follows:

- To increase the system capacity this facilitates the spatial reuse of resources.
- Routing because cluster nodes forms virtual backbone which restrict information transmission in the network.
- It gives a stable network [6].

Mobile nodes or mobile network died early due to excessive energy consumption of nodes. To prolong life time of network it strives to reduce the energy consumption of nodes.

3.1 Energy aware algorithms using clustering

ON CALCULATING POWER-AWARE CONNECTED DOMINATING SETS FOR EFFICIENT ROUTING IN AD HOC WIRELESS NETWORKS In this algorithm dominant set is consider for group of mobile nodes, unnecessary mobile nodes of dominant set is excluded from dominant set in this way energy consumed for serving cluster head role. In this energy level is set in place of node ID or node degree to determine cluster head role [7]. A mobile node can be deleted from the Dominant Set when its close neighbour set is covered by one or two dominating neighbours, and at the same time it has less residual energy than the dominating neighbours. This algorithm cannot balance the great difference of energy consumption between dominating nodes (cluster heads) and non-dominating nodes (ordinary nodes) because its main aim is to minimize the Dominant Set rather than to balance the energy consumption among all mobile nodes. Hence, mobile nodes in the Dominant Set still likely deplete their energy at a much faster rate. Its main focus is Dominant Set update and recalculation it is not suitable for a network with high mobility. As a result, this algorithm is more effective for a network with a large population, high density, and low mobility, such as a static wireless sensor network.

ENERGY-AWARE CONNECTED DOMINATING SET CONSTRUCTION IN MOBILE AD HOC NETWORKS In this connected dominating set are NP-hard problem; many protocols have been proposed to construct a sub-optimal Connected Dominating Set (CDS). In this algorithm, they have present two *Timer-based Energy aware Connected Dominating Set Protocols* (TECDS). These protocols extend the *Mac-layer Timer-based Connected Dominating Set protocol* (MTCDS) so that the energy level at each node is taken into consideration when constructing the CDS.

Timer-based Energy aware Connected Dominating Set Protocols uses both the benefits of Energy aware Connected Dominating Set such as no introduction of additional messages, capable of generating CDS with very competitive size and information for the protocols is strictly obtained via beacon exchanges. As with MTCDS, our protocols are able to maintain and adjust the CDS when the network topology is changed. It implies a longer lifespan for the CDS when the network is static and if topology changes due to mobility TECDS protocols can go through a higher number of CDS reconstructions [8]. This is a good indication that the network will remain operational for a longer period of time in both the cases.

EAAC: ENERGY-AWARE ADMISSION CONTROL SCHEME FOR AD HOC NETWORKS In this algorithm EAAC scheme for adhoc network based on knowledge of present and future residual energy of each node along the routing path. Only nodes with sufficient residual energy to complete the transmission of data by the application will take part in forwarding packets. Therefore, it can be avoided that any node in the routing path does not run out of its energy during the transmission of packets [9]. The future residual energy of a node is calculated using Multi-layer Neural Network model. In addition, this scheme they uses a Multi-layer neural network model to predict the future residual energy of a node based on the history of energy usage pattern. EAAC can be used in any of the existing Adhoc network source initiated routing protocols during the route discovery and maintenance phases and can be applied to other energy constrained routing in mobile networks.

NEW CLUSTERING SCHEMES FOR ENERGY CONSERVATION IN TWO-TIERED MOBILE AD-HOC NETWORKS In this, two types of nodes are considered master and slave. Each Master node can establish a cluster based on connections slave nodes. A slave node can only connected to one master node; there is no direct connection between any slave nodes. The area covered by a cluster is determined by the farthest distance between the master node and a slave node in the cluster. The purpose of this algorithm is to minimize the transmission energy used by all master slave pairs and to serve as many slaves as possible for longer lifetime and better performance of Network.

Two schemes are proposed in single-phase clustering and double-phase clustering [10]. Master node can serve only a limited number of slaves; it first allocates channels for slaves that only receive a single paging signal from itself. For each slave that receives one or multiple paging signals, it always sends an acknowledgment message back to the master from which it receives the strongest paging signal. If any free channels remain, other slave nodes, which receive more than one paging signal, are allocated channels in the order of the power level of the paging signal received from the master node. For those slave nodes, which do not receive a channel from a master in the channel allocation phase, are dropped in the further communication phase. This mechanism can reduce the call drop rate by giving priority to those slave nodes that only receive single paging signals in channel allocation. Slave nodes, which receive multiple paging signals, always try to communicate with the nearest master. Each connected master-slave pair communicates with the minimum transmission power in order to save energy. To further lower the call drop rate, double-phase clustering re-pages for slaves, which do not receive a channel in the first round, in its range. The channel allocation procedure also follows the received signal strength. The drawback of this scheme is paging process before each round of communication consumes a large amount of energy. Master node election is not adaptive, and the method of selecting the master node is not specified. Its main focus is to sets restrictions on cluster head election and communication mode. Thus, it may be more feasible for a Bluetooth scatter net.

ENERGY EFFICIENT CLUSTER BASED SERVICE DISCOVERY FOR UBIQUITOUS COMPUTING In this work a novel service discovery algorithm is introduced based on node clustering called as Service Awareness and Discovery for Mobile Ad Hoc Networks (SANDMAN). Nodes within a cluster may sleep to save energy when idle. A clusterhead node is always active and answers discovery requests on behalf of other nodes to achieve low discovery latencies [11]. Service Discovery system is especially suitable for peer based Ubiquitous computing (UC). Approach of the algorithm is based on the observation that, although devices are mobile, it can often identify sub-groups of devices with similar mobility patterns in typical Ubiquitous Computing scenarios called group mobility. To form clusters out of nodes with similar mobility patterns they exploit group mobility for service discovery. With respect to the energy consumption and latency imposed to clients until their request is severed it consider their scheduling of sleep times t_s and the idle timeout t_i. This will omit the manageability of cluster provides small discovery latencies and allows for high energy savings.

TOPOLOGY CONTROL PROTOCOLS TO CONSERVE ENERGY IN WIRELESS AD HOC NETWORKS In this protocol Geographic Adaptive Fidelity (GAF) and Cluster-based Energy Conservation (CEC) algorithm are used. These two protocol help to extend the life of network with that it also overcome some challenges like it is used to identify network redundancy, controlling the duty cycle of redundant nodes and maintain connectivity among communicating nodes when power off. GAF identifies redundant nodes by their physical location and a conservative estimate of radio range. It controls node duty cycle to extend network operational lifetime while maintaining network connectivity, independent of the involvement of ad hoc routing protocols. GAF can substantially conserve energy, allowing network operational lifetime to increase in proportion to node density [12]. Cluster-based Energy Conservation directly observes radio connectivity to determine redundancy and so can be more aggressive at identifying duplication and more robust to radio fading. CEC eliminates the dependency of GAF on global location information and its assumption about radio range. CEC measures local connectivity with low overhead and is thus able to dynamically adapt to a changing network.

From the above analysis it can be concluded that power drainage of batteries results in departing of node as well as crucial data. To overcome this problem various researches have been done. Dominate set, Multi layer neural network, master-slave node, Service Awareness and Discovery for Mobile Ad Hoc Networks are taken to overcome power drainage and efficient transmission in among nodes.

3.2 Mobility using clustering

ENERGY AND MOBILITY AWARE CLUSTERING TECHNIQUE FOR MULTICAST ROUTING PROTOCOLS IN WIRELESS AD HOC NETWORKS This is an algorithm proposed to take mobility and energy status of nodes to make stable cluster. RSIDS (Restful Stability based Insomnious Distributed Sensors), which considers both stability and residual energy of neighboring nodes when selecting critical nodes. In order to prolong the life of the network nodes and the ability of the network to communicate it is important to reduce the amount of energy spent [13]. To achieve a lower level of energy consumption, they used passive clustering instead of active clustering to create the network clusters RSIDS. A node can be in one of the following 5 states: Initial, Cluster Head (CH), Cluster Head Ready (CHR), Gateways (GW), or Ordinary Node (ON). Gateway and Ordinary Node are two temporary states of nodes. CHs and GWs can both forward packets, while ONs do not, this leads to CHs and GWs using more energy than ONs due to their increase use as forwarding route nodes. As the number of overhead packets decreases, it results in a network having less

redundant/superfluous packets, having a lower probability of collisions and a less congested wireless medium. All these advantages combined with appropriate resting periods permit an increase in the network lifespan.

ENERGY AND MOBILITY AWARE CLUSTERING TECHNIQUE FOR MULTICAST ROUTING PROTOCOL IN AD HOC NETWORK In this an energy efficient clustering technique (EECT) for multicast routing protocol, in which each node uses weight cost function based on the transmission power level, residual power and node speed to form cluster in the neighboring area and the node with the minimum weight value is selected as the clusterhead [14]. The Energy Efficient Clustering Technique can alleviate the energy consumption because the communication between clusterhead and member is adjustable with appropriate power level. The tree based MAODV and the mesh-based ODMRP ad hoc multicast routing protocols are adapted to the EECT being executed on the each clusterhead. Both the EECT-MAODV and EECT-ODMRP outperform the MAODV and ODMRP in terms of total energy consumption, mean end-to-end delay, packet delivery ratio and percentage of alive nodes for different multicast group size and node mobility.

EENMDRA: EFFICIENT ENERGY AND NODE MOBILITY BASED DATA REPLICATION ALGORITHM FOR MANET; All nodes in a MANET are capable of moving actively and can connect dynamically. The main aim of this algorithm is to develop the efficient energy and node mobility based data replication algorithm to balance the query delay, energy consumption and data availability in MANET. Replication technique makes replicated data items on the basis of access frequency of data items, current network topology and stability of wireless links. In this algorithm energy consumption model is introduced which balance between the query delay, energy and data availability [15].

AN INNOVATIVE CLUSTERING METHOD FOR MANET BASED ON CLUSTER COVERGENCE In this algorithm three parameters are considered to calculate primary weight of the nodes: Relative speed, Ndm and Battery power and then a convergence coefficient is achieved using the strength of received signals of neighbours and predicted the node mobility. In this algorithm two steps are followed to select clusterhead; firstly it finds the primary weight of nodes by using new weighted function and secondary to calculate convergence coefficient each node predict the mobility of neighbour nodes [16]. Numbers of parameters are taken into the consideration for assigning weights to a node. It also has a feature to control battery power consumption by switching role of clusterhead to ordinary nodes. Predefined threshold for the number of nodes to be created by clusterhead so that it does not degrade the MAC function and improve load balancing.

From the above analysis it can be concluded that nodes are movable in nature due to mobility of nodes data lost because of its topology changing nature. In order to form stable network, mobility metric is taken into the construction of clusters based algorithms. In this Consecutives messages are send to communicate with direct neighbors.

3.3 Scalability using clustering

OPTIMAL HIERARCHICAL ENERGY EFFICIENT DESIGN FOR MANETS Energy efficiency and scalability are two of the most important objectives of MANET. For maximize the network's lifetime and increase its scalability this breaks the problem in two parts; clustering part and routing part. In the first part, they uses cluster the network into two levels of hierarchy (cluster heads and normal nodes), connect the cluster heads (backbone) with each other, and connect the normal nodes to the cluster heads while maximizing the network lifetime [17]. In the second part, they designed energy efficient routing that uses the hierarchical structure. First part is called as the energy efficient clustering problem (EEC). In this paper, they formulated three variations of EEC as integer linear programming (ILP) problems. They considered a network with a fully connected backbone (EEC-FCB). Then, relax the fully connected constraint and consider a network with a connected backbone (EEC-CB), not necessarily fully connected. Finally, they consider a more reliable network (EEC-R) by electing a backup cluster head for each cluster.

ENERGY EFFICIENT CLUSTER BASED ROUTING PROTOCOL FOR MANETS Energy efficiency is major requirement in mobile Adhoc network because of its tremendous use of mobile nodes in the network. Cluster Based Routing Protocol (CBRP) is a robust/scalable routing protocol for Mobile Ad hoc Networks (MANETs) they added a resource management protocol to the CBRP for service advertisement and service discovery this protocols main consideration is on increasing lifetime and decreasing energy consumption of network [18]. Cluster Based Routing Protocol is better than Adhoc on Demand Vector (AODV) routing, because it has less overhead and more throughput as comparison to AODV routing. For minimizing consumption in whole network they employed sleep mechanism for all member nodes except gateway nodes that are in idle mode. In this module they define timer for showing idle and sleep state and implement the algorithm in routing layer.

From the above analysis it is evident that scalability is concerned with excessive routing information message overhead which is caused by the increase of network population and mobility of nodes. Reducing routing control overhead is main issue for scalability in routing protocols.

3.4 Stability using Clustering

MEACA: Mobility and Energy Aware Clustering Algorithm for Constructing Stable MANETs; This clustering technique stabilizes end to end communication paths and maximizes path lifetime. It also increases scalability of network and its effectiveness largely depends upon its effectiveness. To achieve stability of network low mobility and high energy is

chosen for clusterhead by keeping constructed cluster unchanged. Main difference from other clustering algorithm is that it has designed the specific indicator metric to quantitatively measures node suitability to become clusterhead. Re-clustering takes place only when a member node has lost its contact from its clusterhead or head node has lost contact to its all its member. This algorithm provide optimal algorithm which achieve longer lifetime of clusterhead, longer membership time and better algorithm [19].

A STABLE CLUSTERING ALGORITHM BASED ON BATTERY POWER FOR MOBILE AD HOC NETWORKS In this an efficient clustering algorithm is proposed in this it elects weak battery power node as a cluster head. A clustering architecture will be more stable if it can be held for a longer period of time. To be more specific, a stable clustering architecture has a longer clustering architecture lifetime. The duration from the time based clustering architecture is constructed until any cluster head in the architecture runs out of its battery power. Topology is considered as static, broadcasted packet can listen by each neighboring node in finite time and each node has its unique ID and degree for identification. With these assumptions there are three different types of beacon packets and two tables are introduced in this algorithm. Nodes are considered as bottleneck nodes to be nodes with battery power. When a bottleneck node is elected as a cluster head, it is named a bottleneck cluster head. Lower than a predefined value E threshold. The node with the largest bottleneck is first elected as the cluster head. If there is a tie, then the node with the largest battery power will become the cluster head. If a tie still exists, then the node with the highest ID prevails [20]. This algorithm is better than those of Distributed and Mobility Adaptive Clustering Algorithm and Access Based Clustering Protocol in terms of clustering architecture lifetime and network lifetime.

ABP: a low-cost, energy-efficient clustering algorithm for relatively static and quasi-static MANETs
In this distributed clustering algorithm that uses both location and energy metrics for cluster formation is proposed. In this they have introduced addresses cluster stability, manageability and energy efficiency issues. Unlike existing active clustering methods, this algorithm relieves the network from the unnecessary burden of control messages broadcasting, especially for relatively static and quasi-static network topologies:
(1) Clustering procedure is completed within two 'Hello' cycles
(2) Both location and battery power metrics are taken into account in clustering process
(3) Derived cluster formations exhibit enhanced stability by preventing unnecessary CH re-elections (4) Cluster sizes are controlled so as not to expand beyond a specified threshold
(5) For relatively static and quasi-static network topologies, control traffic volume is minimized
(6) A novel technique for Mobility Rate measurement is proposed
(7) Fast packet forwarding and delivery is enabled, as clusters are pro-actively formed and topology information is available when actual user data exchange is required.
Adaptive Broadcast Period algorithm achieves cost-effective clustering in terms of signaling traffic, especially for MANETs with low to moderate Mobility Rate [21]. Also; it represents a balanced solution between cluster stability and energy efficiency compared to existing approaches.

LIDAR: A PROTOCOL FOR STABLE AND ENERGY EFFICIENT CLUSTERING OF AD-HOC MULTIHOP NETWORKS It achieves stable cluster formation and balanced distribution of energy consumption over mobile nodes. In this node Ids are periodically re-assigned so that with low mobility rate and high energy capacity are assigned as low ID values which serves as clusterhead. This algorithm has two objective firstly it gives fast and inexpensive completion of clustering formation in this both battery power and mobility are taken into consideration for election of suitable cluster head. It poses no requirement for GPS card mounted in MHs it is a simple, novel approach to measure mobility. Secondly it has cost effectiveness and fairness in cluster maintenance. In maintenance phase it greatly reduces the control traffic volume while it prevents clusterheads energy depletion occurrences. When user data exchange is required it provide fast packet forwarding and delivery is enabled and as a result clusters are proactively formed and topology information is available [22].It also intend to extend maintenance algorithm of clustering so that it restrict number of dominated nodes by single clusterhead between lower and upper bound it will impede drainage of clusterhead at small enough and it prevent long routing path and message delivery delays. LIDAR algorithm implement node Ids are received sorted and re-assigned by single node.

From the above analysis it is depicted that dynamic nature of mobile hosts disrupts the Stability of network by their integration and disintegration as a result high computation overhead occurs. It calls for reconfiguration of cluster head and exchange information frequently among the nodes. It is recommended that stability must be considered as one of the crucial parameter while developing energy aware algorithm using clusters.

3.5 Weighted Clustering Algorithms

WEIGHTED CLUSTERING ALGORITHM A weight based distributed clustering algorithm takes into consideration number of nodes a cluster head can handle ideally (without any severe degradation in the performance), transmission power, mobility, and battery power of the nodes.WCA overcome three limitation of clustering algorithm battery usage, load balancing and MAC functionality. A predefined threshold is used which ensure that clusterheads will not be over-loaded it indicates the number of nodes each clusterhead can ideally support. In this algorithm four parameters are consider for each mobile node in clusterhead procedure. They are mobility difference M_v, degree-difference D_v, cluster head serving time T_v, and sum of the distance with all neighbours

P_v. D_v is defined as the sum of distances from a given node to all its neighbours. $D_v = | d_v - M |$ where M is number of nodes a clusterhead can handle ideally and d_v is number of neighbours of a mobility node v [23]. M is not easy to estimate the distance between two mobile nodes in a practical environment. Alone T_v cannot guarantee a good assessment of energy consumption because data communication consumes a large amount of energy and varies greatly from node to node. The combined weight factor $I_V = c_1 D_V + c_2 P_V + c_3 M_V + c_4 T_V$ where c_1, c_2, c_3, c_4 are common weight factors.
In WCA mobile nodes with minimum I_v in the local area is selected as a clusterhead. All mobile nodes covered by elected clusterheads cannot participate in further clusterhead selection. This procedure is repeated until each mobile node is assigned to a cluster. To calculated combined weight for initial clusterhead algorithm it require so much information, the cluster formation procedure requires a longer frozen period of motion for all mobile nodes.

WEIGHT-BASED ADAPTIVE CLUSTERING ALGORITHM (WBACA) This is a modified Weighted Clustering Algorithm for Stable Clustering using Mobility Prediction Scheme. In this algorithm, the cluster head selection is performed by assigning a weight value based on the factors Energy Level, Connectivity and Stability. For topology control, we propose a hybrid topology control framework that achieves both scalability and strong connectivity. Hierarchical structure management of cluster's multipath routing is used to search multiple paths and distribute traffic between them. Clusterhead selection is based on dominate set selection, to fix cluster heads in ad hoc networks a number of heuristics are proposed [24]
In this approach, any one of the following aspects decides the weight value of the cluster head selection
(i) Power Level
(ii) Connectivity
(iii) Stability
From time to time every node sends a beacon called Alive Beacon (AB).Time stamp and NODE ID field are present in AB. The neighbour data table is checked by the nodes that hear AB. A new entry is created for the sender of AB when there is no entry with AB's NODE ID it creates a new entry for the sender of AB, AB sets it's AT field to zero and initiates a timer.
Each cluster head maintains a neighbour table which contains the details of other cluster heads within its neighborhood and all of its cluster members in its routing table. The information of cluster members and neighbour cluster heads are obtained by exchanging the HELLO message.
AWCBR mainly focuses on reducing frequent topology changes and link breakages. It rapidly adjusts to the topology changes and efficiently searches for new paths with minimal power consumption.

A DYNAMIC CLUSTERING ALGORITHM FOR MANETS BY MODIFYING WEIGHTED CLUSTERING ALGORITHM WITH MOBILITY PREDICTION This is another modified weighted clustering algorithm which increases efficiency of MANET by using mobility prediction. Every time sending and receiving signal required a notable amount of energy by a mobile node at that time signal and power wasted to update positional information. Bandwidth is also wasted by sending control signals rather than using it effectively for data communication [25]. To minimize this utilization, cluster maintenance involves the process of finding out the next position that a mobile node might take based on the previous locations it visited. In this algorithm overhead is reduced in communication by predicting mobility of node using linear auto regression and cluster formation. In Linear Auto Regression technique past positions or the history is used in predicting the future positions. Based on this value Clustering is performed. When it is compared to the Original Position the resulting Cluster Formed are the same. Thus Signals sent from the member nodes to the Cluster-Head regarding the Current Position can be minimized and in this way power consumption is reduced and increase stability of network.

It is also analyzed that weighted clustering overcomes the limitations such as MAC functionality, load balancing and battery drainage of nodes in network. In this each node is associated with unique parameter called weight that decides the role of a node. Earlier deciding weights for node is must in these algorithms it is also a drawback, Weight may be the function of node transmission range or node mobility. It rapidly lose the clusterheads which increases overhead of the network.

4. ADVANTAGES AND DISADVANTAGES OF CLUSTERING

4.1 Advantages of clustering:

- Cluster facilitates reuse of resources to increase system capacity. It can better transmission event with the help of clusterhead, it saves much resources to retransmission.
- Clustering in routing is the set of clusterhead and gateway. It can normally form virtual backbone for intercluster routing and spreading routing information is restricted in the set of nodes as a result it has communication coordination.
- Cluster makes network smaller and more stable in each mobile terminal when node resides for small change then cluster need to update the information not whole network .In this way information proceed and stored by each node is greatly reused.
- As a number of nodes present are lower in cluster than the presence of number of nodes in network so in this clustering process assist aggregation topology information.
- Clustering network is stable and efficient only mobile nodes residing in the cluster are required to modify their data structure.
- Clustering helps in decreasing the transmission overhead incurred for the updating of routing tables after topological changes.

4.2 Disadvantages of clustering:

- Clustering required exchanging of control messages for that it require significant amount of bandwidth and it also exhaust energy of node.
- In some clustering scheme re-election of clusterhead required called as ripple effect, it results in degradation of upper layer protocols.
- Cluster structure consists of two sets cluster formation and cluster maintenance. Cluster formation presuming mobile nodes as stable, mobile node gain some precise information from its neighboring nodes when it becomes clusterhead. As this is assumption is not practical because mobile nodes are movable in MANET.
- Their needs completion of round to complete cluster formation scheme of clustering, as with the increasing of number of round then there is also increase in static period for mobile nodes. For quick cluster formation, mobile nodes will not be able to determine its position at particular time these lead to require different requirement for algorithms to finish for different network topologies.

5. CONCLUSION

In the area of energy efficient and mobility based clustering algorithms; various contributions has been done for increasing life of network. Battery drainage of clusterheads and Ripple effect consume more energy of network to overcome these problem and makes stable long life network these clustering algorithms are proposed. After having done through analysis in consideration that assigning weight to mobile nodes in clustering process is an efficient method. But overhead is increases because of rapidly lost of clusterheads which were further removed in weighted adaptive clustering algorithm.
Still need has been felt in this area to develop a strong energy aware algorithm using cluster which takes care of the parameters not considered by the research or less weightage has been given by them. In turn life span of the network can be increased with less energy usage by the nodes.

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