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Conceptual Performance Of Various Cluster Based Olsr

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Abstract

The future of networking moves towards wireless technology. One of the portable and mobile wireless technology is Mobile Adhoc Network (MANET).The highlighted characteristics of MANET are topology is dynamic in nature, nodes does not have centralize control, each node act as a router. We would like to contribute our work towards one of the proactive routing protocol of MANET namely Optimized Link State Protocol. To improve the performance of OLSR, we would like to concentrate on Cluster based OLSR algorithm. This paper aims to provide a comprehensive study of the routing protocol performance of cluster based OLSR.

Keywords: OLSR, cluster based OLSR, performance

I. Introduction

The "Mobile Ad-hoc Network" is a collection of self-configuring mobile node without any infrastructure[9]. It is a multi-hop process because of the limited transmission range of energy constrained mobile nodes and thus each device in network topology acts as a router. Routing protocols are necessary to find paths to reach other node. "MANET" (Mobile Ad-hoc Network) is a self organizing and self configuring network without the need of any centralized base station. In "MANETs", the nodes are mobile and battery operated. As the nodes have limited battery resources and multi-hop routes are used over a changing network environment due to node mobility, it requires energy efficient routing protocols to limit the power consumption, prolong the battery life and to improve the robustness of the system. One of the proactive routing protocol of MANET is Optimized Link State Protocol.

OLSR utilizes multipoint relay (MPR) for computing the shortest way between its neighboring nodes[8]. The flooding instrument is kept up by MPR, with the goal that it can avoid repeated broadcasting. OLSR comprises of two kinds of routing message ie., HELLO message and TC message. OLSR has trademark to refresh data regularly and furthermore it keeps up node data in routing table. Since the nodes are versatile in nature and constant refresh of data required. Using OLSR we will be able to ensure the performance of MANET network. To improve the overall performance of OLSR by avowing packet transmission delay, network congestion and packet loss, we can use clustering approach in OLSR. This paper aims at the performance of various cluster based algorithm used in OLSR.

The remaining part of the paper has being arranged as follows. Section II brief about the clustering concept in OLSR. Section III review about the various cluster based OLSR algorithm. Section IV deals with the performance aspects of various cluster based algorithm and we conclude in Section V.

II. CLUSTER BASED OLSR

We consider that clustering system is executed in Adhoc network. The creation and maintains of cluster is taken care by Cluster head. One hop neighbour cluster nodes are called border nodes or gateway nodes. Fig 1 Show the cluster based network. These border nodes will have information about the their own cluster nodes and also its neighbour cluster nodes. These cluster information is maintained by HELLO messages.[1] TC messages are forwarded only to the border nodes. And border nodes know that TC nodes belong to same cluster group, since TC node maintains all cluster nodes membership details. By this way, we can restrict the forwarding of TC message by using cluster. We use Multipoint relay (MPR) feature for calculating the shortest path between neighbouring nodes. The flooding mechanism is maintained by MPR, so that it can avoid the repeated broadcasting. The role of MPR remains same in cluster based OLSR. The information which are to be maintained to perform cluster based OLSR are:

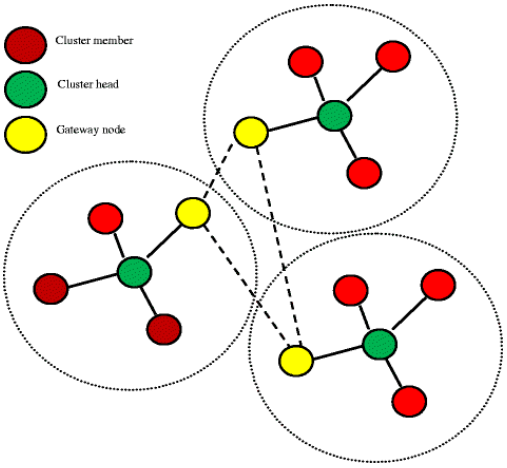

Fig 1 Cluster based network

Neighbour Cluster Set: Maintains the list of neighbour cluster information.

Adjacent Neighbor Cluster Set: Maintains the cluster list which are near to the node. One -hop neighbour of each node and their cluster information is maintained here.

Neighbour Cluster 2-hop Set: Two hop neighbour of the cluster is maintained.

Adjacent Neighbour Cluster Set: Records the list of clusters which are adjacent to the node itself. That is, each entry means that the current node has a neighbour (1 hop away) which belong to that particular cluster.

Neighbour Cluster 2-hop Set Includes the list of clusters which are neighbours of those in the "Neighbour Cluster set".

Cluster Topology Set Similarly to the OLSR "Topology Set" but at the cluster level, it stores the set of clusters which are visible to the node, plus the neighbouring cluster used to reach nodes in that cluster.

Cluster based MPR Set: Maintains the clusters which have been chosen as C-MPRs by the node.

Cluster based HELLO message: are used to identify the neighbouring clusters and compute the Cluster MPR (C-MPR) set.

Cluster based TCs message: maintains the list of neighbouring clusters and broadcast the to the remaining clusters

III. VARIOUS CLUSTER BASED OLSR ALGORITHM

Mohamed Dyabi[2] proposes clustering algorithm based on nodes performances. In this work, residual energy, free memory, processor speed and hard disk space are cluster heads. So the nodes will be most powerful one. To measure the weight associated with each metrics, Rank Order Centroide (ROC) is used, which is one type of multi-criteria analysis method. This methodology is applied to OLSR. OLSR in this proposal, works in three states. State O- It is a wait state before node could arrive or node just left the cluster or when it has no neighbour. State 1: It acts as cluster head and exchange HELLO messages. State 2: It act as member of cluster. This algorithm seems to be having great improvement and better stability in terms of performance of cluster head.

Ali Choukri [4] proposes Efficient Heuristic Based on Clustering Approach for OLSR .One solution commonly proposed for routing on large scales is to introduce a hierarchical routing by grouping geographically close nodes. Each group, called cluster, is represented and managed by a particular node called cluster head. This protocol uses metrics as density of nodes and identifier of nodes for selecting cluster head. The mean diameter of the clusters of the same size, the stability of the cluster structure, and the communication overhead for maintaining the cluster structure for the proposed clustering technique are performed using simulation. This proposal give good results in terms of stability and it outperforms it in terms of average end-to-end delay, control routing overhead, and packet delivery ratio when compared with standard OLSR.

Y. Hamzaoui[5] proposes Enhanced OLSR Routing Protocol Using K-medoids Clustering Method in MANETs which uses K-Medoids algorithms to generate the clusters. In first, it is assumed that each node in "network" is an independent cluster; and then we need to use ascending sequence partitioning. Finally we combine the nodes from the same neighbourhood in the same cluster. Until, we reach the final cluster. Using this method, stable clusters are created which leads to less routing information cost. This proposals put forward two new versions of OLSR routing protocols called OLSR Med and OLSR Med+.

Abdelkarim[6] proposed SC-OLSR: Secure Clustering-Based OLSR Model for Ad hoc Networks. In this proposal, Nodes residual energy and connectivity index are the basis for SC-OLSR hybrid model. In this model head clusters are selected co-operatively. The selected head clusters are responsible for validating the broadcast TC messages. The algorithm based on cluster head first select a set of most favourable cluster head. Then these cluster heads will select a favourable MPR nodes. In this proposal, to overcome selfishness nodes, compatible

mechanism based on the reputation concept is proposed. This will makes the nodes to select the network according to the reputation of the nodes. This models was able to achieve prolong lifetimes of the network.

Hadi Otroka[7] proposes Cluster-Based Model for QoS-OLSR Protocol. This proposal was able to achieve extended network lifetime and QoS assurance. This can be obtained by reducing the number of MPR nodes along with maintaining QoS and also we consider the residual energy level, connectivity index, and bandwidth of these relay nodes. This algorithm can be implemented using clustering in OLSR. We use novel clustering algorithm and also relay selection based on combinations of metrics like connectivity, residual energy, and bandwidth. The model shows much better results in network lifetime and path length and very close result in terms of available bandwidth.

IV. PERFORMANCE OF VARIOUS CLUSTER BASED OLSR ALGORITHMS:

Algorithms	Pros	Cons
Clustering algorithm based on nodes performances	Great improvement and better stability in terms of performance of cluster head	TC messages are more prone to be lost in the case of the cluster head-based and hybrid approaches
Efficient Heuristic Based on Clustering Approach for OLSR	It give good results in terms of stability and it outperforms it in terms of average end-to-end delay, control routing overhead, and packet delivery ratio	It gains more bandwidth
Enhanced OLSR Routing Protocol Using K-medoids Clustering Method in MANETs	The protocol boosts performance and stability in the QoS of MANETs	Protocol has to be improved in terms of mobility
SC-OLSR: Secure Clustering-Based OLSR Model for Ad hoc Networks	It can efficiently prolong the network lifetime.	The resulting paths connecting the pairs of nodes would be longer when compared with standard OLSR
Cluster-Based Model for QoS-OLSR Protocol	It shows much better results in network lifetime and path length	It shows marginal bandwidth average difference when compared with standard OLSR

V. CONCLUSION

We have some limitations on standard OLSR protocol like maintaining the routing table for all the possible routes, increase in mobile nodes increases the overhead also, requires more processing power. These limitations can be overcome by using cluster based OLSR, because clustering makes it probable to assure basic levels of system performance. In this work, we introduce cluster based algorithm for efficient performance of OLSR.

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