



A Literature Review on Clustering Mechanisms in Ad Hoc Network

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Abstract— *The world is moving highly towards wireless connectivity. The communication in network is the one which has evolved to experience the wireless mode of exchanging the data. The ad hoc nature of the network has been indispensable for the present and future communication purpose. This network functionality need to be improved since this will rule the forthcoming network communication happens in this real world. In line with that the clustering has been a technique which maintains the functionality while the modular growth happens in network. This paper points out such clustering techniques and non-clustering protocols in ad hoc networks.*

Keywords— *PAC, S-PAC, W-PAC.*

I. INTRODUCTION

As the world is moving toward digitalization technology with the advent of network, the wired mode of communication will not make footprint further. The wireless mode of communication makes the network so updated with the current expectations. This wireless modes comes with ad hoc nature ensures the communication while the objects are making movement. The ad hoc property needs to be given special care to make the communication hassle free. The ad hoc network has been confined due to the number of nodes which are in communication. So, the nodes which are in network should be handled properly to get good performance of the network. This could be achieved with the help of the clustering mechanism on nodes which are belonging to ad hoc network. This clustering technique not only produces better results but also reduces the burden of the nodes based on the role to which the nodes are assigned. Thus, this review paper has been devised to discuss various clustering mechanism on top of ad hoc networks.

This paper has been orchestrated as follows. Section 1 gives out the introduction. Section 2 mentions related works. Section 3 specifies the conclusion.

II. RELATED WORKS

The real world scenario demands the communication to happen on the way. This has been driving force to fine-tune the efficiency of the ad hoc network. There are plenty of algorithms which run on top of ad hoc network at the network layer level. These algorithms are categorized as reactive based and proactive based algorithm. The proactive protocol DSDV(Malkin,1995; Perkin,1994) has been identified as a suitable protocol for wireless network. But this protocol has been confined by various limitations. Since the route updation has to happen periodically irrespective of the need of updation. Though this has eliminated the duplication with the help of sequence number due to the unnecessary bandwidth consumption of network activity didn't make the protocol to usher an edge over other protocols.

The reactive mechanism of DSR [4][12] has given an improved results on DSDV. This protocol applies route discovery and route maintenance to send the data towards destination. This ultimately reduces the burden of the network. But this protocol doesn't have strategy to maintain the link break and eliminating the stale routes in its route table.

The desperate situation provoked to come up with the AODV [18][19][3] protocol. This has been a protocol which takes the fruitfulness of DSR a reactive based protocol and goodness of DSDV which is proactive based protocol. This protocol does well as long as the network size has been confined to certain boundary. When it crosses the boundary there will be a fall in performance has been experienced. This can be avoided with the advent of some supportive mechanisms on top of the ad hoc network utilizes AODV as a routing protocol.

The Reference [2] tells that cluster based networks will reduce the routing overhead by proposing routing protocol based on shortest hop count. The author also speaks about the logical cluster formation. The routing path gets reduced due to clustering mechanism has been understood through this paper.

The importance of clustering on ad hoc network has been realized through research and simulations of clustering protocol. The paper (Zhang Junna,2009) tells that the cluster routing protocol purpose in ad hoc network and shows the routing protocol mechanism on ad hoc network.

The Reference [5] describes the clustering technique on AODV protocol. This clearly shows that the routing table size gets reduced ultimately and limited by bandwidth.

The paper [17] puts down new cluster routing protocol and ushers that this proposed protocol adapts the scalability. It compares the existing AODV with the AODV_clustering protocol. This deals with the logical level of clustering the network which different from having distinguished clustering technique.

The Reference [1] illustrates that the clustering technique based on the battery power proves the stability of the ad hoc network. It gives situation to change the cluster head which is based on the battery energy.

The paper [6] shows the cluster formation procedure which can be enhanced to the wireless sensor networks. This works comes with the implementation through MATLAB as a simulation tool.

The author of this paper [10] clearly describes the different clustering mechanisms which identifies the cluster head and cluster characteristics.

The paper [7] deals with the proper selection of cluster head and when the selection changes the impact of that on cluster structure also identified by the author.

The paper [8] addresses the inefficiency and scalability problem of the network. This work points out the necessity of the clustering to solve those problems.

The study of this paper [20] makes to give an understanding on the overheads involved in clustering mechanism. This also tells the impact of bandwidth and its consequences on throughput of the networks.

The Reference (Yongquan Zhou, 2009) discusses k-means and fish-school algorithm towards cluster formation. This paper brings out the swarm intelligence in cluster formation and analysis. The analysis has been carried out with the help of simulator.

The Reference [16] gives out the classification of clustering algorithms. These algorithms are of numeric, discrete and partitioned types. This also specifies which type of clustering method is preferable for a given data set.

The paper [15] takes the cluster formation procedure in two phases. In the first phase the neighbors are identified , the second phase groups the cluster to show hierarchical level in cluster formation.

The cluster formation algorithm K-means had been dealt by this paper [11]. This also added the implementation of the algorithm in java as a programming language.

The clustering technique with the advent of bayes theorem on classification of data had been discussed in this paper [9]. The role of conditional probability in cluster formation also been dealt.

The reference [24] tells the cluster formation depends not only on distance parameter but also on various parameters. This parameter computation will find the weight associated with each node. The selection of cluster head is based on the weight of the node.

The paper [25] speaks about the clustering mechanism K-means and also genetic algorithm based shortest path routing within the cluster to improve the performance of the network.

The reference [26] tells about the importance of weighted clustering algorithm to form the clusters. This work states that cluster formation could not be in fixed manner and formation happen dynamically in accordance with the change in the structure. This also suggested the improvement of the algorithm with the help load balancing factor to distribute the cluster head load to reduce the overburden of the cluster head.

The author of the paper [27] points out the role of the weighted clustering algorithm in wireless sensor networks. In this work the existing parameter comes under weight will not be sufficient to determine the cluster head election has been mentioned. Thus, some additional parameters along with the basic parameters determine the weight factor of the node.

The paper [28] describes the weight based clustering algorithm in ad hoc networks. This work mainly suggests the technique to reduce the clustering burden with the help of proxy apart from the cluster head as master in the cluster. In this way the re-clustering and re-affiliation of nodes can be avoided. This also distributes the load when cluster head is exhausted in its functionality. This also points out the non over lapping cluster formation with 3 hop distance away from the master and proxy pair.

The reference paper [29] describes the optimization of cluster formation in ad hoc networks. The results are compared with the existing weight based cluster formation procedure. This also mentioned the drawback of GA method in obtaining the optimum results. This CLPSO method identifies that the GA method computationally ineffective. This takes velocity of the mobile node as a parameter to be added with the parameters specified in WCA.

The author of this paper [30] clearly describes the clustering mechanism. The burden of the nodes has been minimized in this approach. The node with maximum weight has been taken as cluster head. The random values assigned to each node helps to identify the mobility factor of the nodes.

The author [31] discussed the importance of an effective clustering mechanism in ad hoc network. This shows that the effectiveness has been stated as in terms of cluster formation time. The existing k-means takes more time had been identified and reduced formation time was suggested with the proposed PAC(Partitioned Around Cluster head). This work lacked in taking several parameters in formation of clusters. This approach couldn't able to devise maximum number of clusters. Thus, an improved PAC known as Ex-PAC [32] has been proposed to provide optimized clusters.

The cluster formed using single parameter has been confined to yield better results. In real life scenario, single parameter based clusters wouldn't able to give quality clusters. So, multiple parameters [33] are considered such as distance, energy and neighbors count to form the clusters.

The author [34] has proposed clusters based on energy level of the nodes. This approach tells that the cluster head identification is based on the energy level of the node. This means the node which has highest energy at a particular instant will be chosen as clusterhead.

The mobility analysis explains the situation of nodes mobility while they are on communication [35]. This approach identifies the re-clustering time period based on the mobility of nodes. The re-clustering happens when the clusterhead is

put under heavy amount of pressure by handling more number of nodes due to mobility. Further, the author explains the framework proposal on ad hoc networks which make use of clustering.

The clustering technique for an efficient ad hoc network will be based on the stability. The frequent change happens in the state of node leads to high re-clustering process. The index based cluster formation [36] explains the perfectness of clusters and time to do re-clustering process in order to handle the mobility scenario of the ad hoc networks.

The ad hoc without clustering and with clustering has been dealt obviously in this study. The non-clustered networks showed a down side in performance when the number of nodes is increasing linearly. This has been apparently proved by various research works. The clustered network has come out with an efficient result when the networks behave dynamically. Further, clustering mechanism when combined with swarm intelligence and neural networks the results would be enhanced and eventually optimization is achieved.

III. CONCLUSION

This study shows the role of clustering the ad hoc networks. This clustering mechanism on ad hoc network clearly improves the performance of the network which is clear based the existing the research works and their results. Further, this cluster formation may consider neural networks to decide the possibility of forming the optimum number of effective high quality clusters which can withstand heavily even at the mobility scenario.

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