Comparative Study of Cluster Based Routing Protocols in MANET – A Review

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Abstract— **Mobile Ad-hoc Network has broad impact on research area from past two eras. Its structure less establishment and flexibility increases its growth of attention in the field of Ad hoc network. MANET is defined as instant alteration in network topology and constrained energy. Clustering is useful to make network more efficient and scalable in MANET.**

In MANET nodes are continuously change their location due to mobility nature. Hence it became challenging task to manage them while preserving the energy. Many clustering algorithms and protocols are proposed to overcome these lacks and to make the network more stable and trusted.

In this paper we describe the most prominent aspect related to the MANET . The motive of this paper compared and analyzed different clustering algorithms under different parameters such as Reputation, Misbehavior detection, Energy efficient and mobility of node.

Keywords— MANET, Security, Clustering, Mobility, Efficiency, Stability, Misbehavior, Overhead.

I. INTRODUCTION

MANET is a host of mobile nodes that can transferring information without any stable infrastructure. MANET is used in many realistic applications such as personal area network, military and police environment, home area network, disaster relief operations. The efficiency of MANET enhances its growth in research and development area. A node in a MANET act as both as host and router for transmitting a packet. As nodes are mobile in nature and easily moveable that can lead to instant change in network topology. In large size of MANET it become difficult to handle the topological changes with frequent routing updates. In the presence of mobility in large size of network clustering is the best way to organize it.

Clustering is the technique that is exercised to supervise enormous ad hoc network. In clustering nodes are organized in groups and every group is known as cluster. A node with high energy is elected as head node that can direct all the member nodes of same cluster and it aids to make the network more manageable.

II. LITERATURE REVIEW

A lot of research has been done in the field of clustering in MANET.

S.Buchegger and J.Y.LeBoudec[1] In this paper author introduce a new protocol called confident to detect the misbehaviour of nodes. This protocol is depend upon the generousness and faith. Connection and decision of routing in confident protocol is built by observing the transmitting behaviour of other nodes.

P.Michiardi et al [2] This paper represents a collaborative reputation mechanism using watchdog (CORE). Core uses three different reputation mechanism, a subjective reputation (calculated from subject's observation), an indirect reputation (positive values) and a functional reputation (particular-function behaviour).

S. Bansal et al [3] describe a protocol called OCEAN (an Observation-based cooperation Enforcement in Ad hoc network). This protocol directly observe the behaviour of other nodes instead of using indirect reputation method. Decision of routing is taken by directly observing the behaviour of neighbouring node. Simulation study is carried out by calculating average throughput with high and zero mobility of OCEAN.

Xu Li [4] proposed a Genetic Algorithm Simulated Annealing Clustering Strategy (GASA-CS). This strategy aids to reduce the cost of clustering and get equality of topology and load inside the whole network that further assist to increase the lifetime of network

Pushpita Chatterjee [5] describe a game theoretic routing model. Two mechanisms Credit and reputation are to force the nodes to work honestly. This model mainly proposed to overcome the problem of selfish behaviour of node, where the node behave idle and stop the transmission. Cost of forwarding packet for intermediate nodes are calculated using Procurement and Dutch mechanism. STACRP find selfish

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nodes and force them to cooperate, so that the throughput of network can be increased.

Ira Nath et al [6] In this paper author proposed a new weighted adaptive clustering algorithm. The purpose of this algorithm is to decrease the transmission overhead, total required time and increase the life time of cluster head by overcoming the limitations of previous selection methods of cluster head. WACA can accustom in usual change in topology of network.

Wonchang Choi et al [7] The author proposes a distributed weighted clustering algorithm (DWCA) in this paper. The motive of this algorithm are keep stability for the structure of cluster, reducing the overhead for the setting up and maintenance of cluster, increase the life time of node and attaining suitable end to end performance. The simulation result proved that DWCA perform better in decreasing the number of reaffiliation, reduce overhead and nodes can live longer life than WCA.

Mohamed Aissa and Abdelfettah Belghith [8] The author describes new strategy for clustering in MANET advancement in WCA in this paper. A new clustering stability scheme and a simple clustering load balancing schemes are combined to introduce new mechanism to conquer the deficiencies in WCA and other identical algorithms. This algorithm also decreases the cost of communication as the cluster head is invoked only on demand.

Yang Tao and Jian Wang [9] This paper introduces a enhance maximum stability weighted clustering algorithm(EMSWCA) based on the weighted clustering algorithm(WCA) and maximum stability weighted clustering algorithm(MSWCA). EMSWCA is very innovative algorithm firstly it make Q the greatest burden parameter as cluster head that can decrease overhead and give high throughput rate; secondly both the HELLO news tool application and control mechanism allow the node to update information in two ways that lead to decrease the idle waiting time and increase the convergence speed.

Z. Xing et al [10] represents the proposed a Robust Clustering Algorithm. Power, Mobility and Workload are the three parameters used to form and maintain more stable cluster. Weight of the node is calculated on the bases of remaining power, mobility prediction and workload represented by power decrease rate.

Ditipriya Sinha et al [11] This paper introduces an agent based routing protocol for routing packets in a cluster based MANET. In this paper author proposed an algorithm that exercise in distributed way employing the idea of overlooking set of mobile nodes. This algorithm is also beware of excess of traffic and burden of routing in network. The election of cluster head is done on the basis of connectivity, stability and residual battery power. The selection of route in agent based technique leads to gain maximum throughput.

S. Marti et al [12] This paper describes Mitigate Routing Misbehaviour in mobile ad hoc network. Watchdog and pathrater tools are used to detect and mitigate the routing misbehaviour. Watchdog is to detect the misbehaviour of node in the network and path rate helps routing protocols to avoid the nodes that agree to forward the packet but unable to do so. Implementation of watchdog and path rater is done on the dynamic source routing protocol. And the parameter uses to evaluate the performance are throughput, percentage of overhead transmission, and the accuracy of misbehaving nodes.

Aida Ben Chehida et al [13] In this paper proposed a cluster-based reputation scheme for secure MANET. Author used four mechanisms to form and maintain the secure network. Delegation and isolation mechanism to detect the malicious node. Rehabilitate mechanism to allow the node enter into the network if it started well behave later. Delegation mechanism used to give the functionalities of cluster head to the member node.

III. CLUSTER BASED ROUTING PROTOCOLS (CBRP)

In cluster base routing has cluster head, which responsible for route between node and base stations. Cluster base routing reduce the routing overhead in Scalable networks. In Cluster base routing each wireless node distributes into cluster of networks with 2 hop diameter. These disjoint set or overlapping set are define as clusters. In each clusters one node is selected as Cluster Head other as member node. Cluster Head maintain the information in the cluster. Cluster base routing protocol find routes faster with minimizing flooding technique.

A. Terminology Used in CBRP

- Cluster: A group of nodes in which a specific node elected as head node. Each cluster has unique ID of the cluster head. Nodes belong to the cluster has recognized by their head ID.
- Cluster members: Nodes which are not participate in neither cluster gateway nor a cluster head are represented with the members of the cluster.
- Cluster Head: leader node of the cluster which play vital role for routing and data transferring.
- Cluster Gateways: Node that linkage information among two clusters.

IV. COMPARATIVE STUDY OF CLUSTER ROUTING PROTOCOLS

Table 1 gives comparison of various clustering routing protocols and algorithms in MANETs.

Proposed clustering techniques	Reputation	Misbehavior detection	Energy efficient	Mobility	Trust considered	Cost
S.Buchegger et al [1]	Reputation	General	Not meant to be energy efficient	Higher	Pre-existed trust considered	Not defined
P.Michiardi et al [2]	Reputation	Selfishness	Not meant to be energy efficient	Higher	No	Not defined
S. Bansal et al [3]	Not considered	Selfishness	Not meant to be energy efficient	Higher	Pre-existed trust considered	Not defined
Xu Li [4]	Not considered	Not considered	Energy efficient	Low mobility	No	Low
Pushpita Chatterjee [5]	Both	General	Not meant to be energy efficient	Permits nodes and cluster head to move	Trust evaluated online	determine the cost-per-hop
Ira Nath et al [6]	Not considered	Not considered	Energy efficient	Low mobility	No	Not defined
Wonchang Choi et al [7]	Not considered	Not considered	Energy efficient	Low mobility	No	Not defined
Yang Tao et al [9]	Not considered	Not considered	Energy efficient	Low mobility	No	Not defined
Z. Xing et al [10]	Not considered	Not considered	Less Energy efficient	Relative mobility and mobility prediction	No	Not defined

V. CONCLUSION

MANET have concerned vital attention over the □ past few years, and can be engaged in a comprehensive range of applications in both civilian and military scenarios. The design of effective, robust, and scalable routing protocols for MANETs is a challenging task. On the other hand, clustering routing protocols and algorithms, typically, can well match the limitations and the challenges of MANETs. In this paper, we have presented a rather extensive review on clustering routing protocols and algorithms in MANETs. Finally, we have analytically analyzed a MANET clustering routing protocols and algorithms in deep, and related these different methodologies based on our taxonomy and some primary metrics.

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