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Performance analysis of modified CGSR protocol for MANET

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Abstract

In this paper we have been proposed a new algorithm named M-CGSR (Modified-Cluster Gateway Switch Routing) protocol for cluster head selection in MANET. This cluster head selection algorithm executed hop1, hop2 and so on till it reaches the destination. Finally, performance analysis of proposed algorithm M-CGSR protocol by simulation provides better performance (Packet Deliver Ratio (PDR), End-to-End Delay, and Routing Overhead than the existing CGSR. Thus it saves energy when compared to the existing CGSR protocol and also improves route stability.

Keywords: Adhoc Networks, MANET, Routing Protocol, Clustering, M-CGSR Protocol, Mobility.

1. Introduction

Adhoc network may be an assortment of 2 or a more devices equipped to attach with the assistance of wireless network able to communicate with the device within radio range or on the far side the vary through intermediate nodes. Dynamic topology of the adhoc network with the multihop communication exploitation totally different links. But nodes at intervals the transmission vary will communicate directly. The Mobile Adhoc Networks (MANET) may be highly regarded and difficult computing surroundings to figure with the machine capability, stable storage, power backup, and communication vary of the mobile nodes are restricted. Mobile nodes together kind a painter, that communicates over radio. MANETs are terribly versatile networks associated don't want any central administrator or an existing infrastructure for communication. They transmit information on to the nodes that square measure in their transmission region out of the region nodes reached with the assistance of intermediate nodes. A MANET may be a dynamically established by a bunch of mobile nodes on a shared wireless channel. Every node is liberal to move every which way. The network's topology changes quickly and erratically, because of the restricted transmission vary of wireless network nodes.

Figure 1. Cluster formation

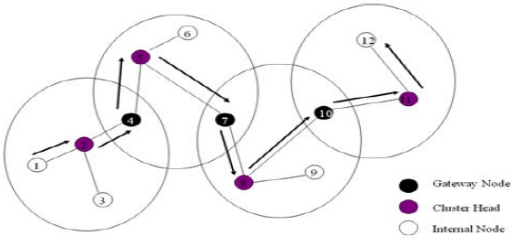

Figure 1 shows a cluster theme the mobile nodes during a MANET square measure divided into completely different teams and that they area unit allotted geographically adjacent into identical cluster consistent with predefined rules with different behaviors for nodes enclosed during a cluster. A typical cluster structure may be seen because the nodes area unit divided into variety of virtual teams supported bound rules. Below a cluster structure, mobile nodes could also be assigned a unique standing or operate, like cluster head, cluster entry or a cluster member. It absolutely was discovered that cluster design guarantees basic performance accomplishment during a MANET with an outsized range of mobile terminals. With the coordination of nodes a special node is elected among them referred as cluster head. Electing the Cluster head involves several factors like energy, transmission variation,

memory capability and conspicuously it ought to be within the variation of another cluster head. An entry node is employed to attach with the put down cluster nodes i.e. communication between 2 clusters takes place with the assistance of entry nodes. Reconfiguring the clusters is inevitable because the topology is very unstable in nature.

Performance comparisons of routing protocol in MANET were analyzed in [1]. A distributed weighted cluster based routing protocol for MANETs was discussed [2]. The cluster densities of a distributed clustering algorithm in ad hoc networks have been discussed by[3]. An efficient QOS in wireless networks using weighted clustering algorithm have analyzed in [4]. Adaptive clustering for mobile wireless networks have been discussed by [5]. Hybrid cluster routing: Efficient routing protocols for mobile adhoc networks were done by [6]. Energy efficient routing in MANET through edge node selection using ESPR algorithm were analyzed by [7]. Efficient clustering schemes for large and dense mobile ad hoc networks were studied by [8]. A weighted clustering algorithm for mobile ad hoc networks was studied by [9]. An efficient management algorithm for clustering in mobile ad hoc network have discussed by [10]. An efficient weighted distributed clustering algorithm for mobile ad hoc networks was done by [11]. A cluster-based service discovery protocol for mobile ad-hoc networks were studied by [12]. Dynamic and Secure Joint Routing and Charging Scheme with Mobile Power Back Ferry Nodes in Mobile Adhoc Networks have studied by [13]. Clustering scheme for node mobility in mobile ad-hoc network has studied by [14]. An Efficient Timer Based Minimum Path D-Equivalence CDS Construction for Wireless Adhoc Networks was discussed in [15].

2. Proposed concept

Clustering in MANET may be outlined because the virtual partitioning of dynamic nodes into various teams. Teams of the nodes area unit created with relevance their distance to neighbour nodes. 2 nodes are same to be neighbors of every different once each of them lie at intervals their transmission vary and discovered a bidirectional link between them. Cluster is a vital approach to finding capability and scalability issues in MANET wherever no physical infrastructure is on the market. A cluster head will the resource allocation to any or all the nodes happiness to its cluster. Thanks to the non-static nature of the mobile nodes, their association and dissociation to and from clusters disturb the steadiness of the network and so the configuration of cluster heads is inevitable. this can be a very important issue since frequent cluster head changes adversely have an effect on the performance of different protocols like programming, routing and resource allocation that consider it. The selection of the cluster heads is here supported the burden associated to every node: the smaller the burden of a node, the higher that node is for the role of cluster head.

Cluster Head: A cluster head is an area organizer for its cluster, acting Inter-cluster routing, information forwarding and so on. In our self-organized cluster theme the cluster head solely serves the aim of providing a novel identification for the cluster with limiting the cluster boundaries.

Cluster Gateway: A cluster entry could be a node that resides between 2 clusters and it's a non-cluster head node with inter-cluster links, therefore it will access neighboring clusters and forward data between clusters.

Cluster Member (Node): A cluster member may be a node that's neither a cluster head nor a cluster entry.

Modified CGSR Algorithm:

Step 1: Start.
Step 2: Send beacon Signals at every micro second with in transmission range from the Source node.
Step 3: Receive the beacon signal from the neighbor node and it store the routing table.
Step 4: Each node calculate its potential score and send to all other neighbor node with Transmission range.
Step 5: choose the high potential score node, to select that node as a cluster head.
Step 6: cluster head identifies and updates the gateway nodes within its transmission range.
Step 7: If the gateway nodes with have same maximum potential score, which node is direction of motion identification towards the destination and closes to the destination.
Step 8: Calculate motion of that node at time interval t.
Step 9: Calculate transmission power of that node.
Step 10: Calculate distance of that node from source node.
Step 11: if transmission power of that node and transmission power of source node have

sufficient power to forward the data.
Step 12: Accept the path between gateway nodes.
Step 13: add the path source, gateway at the distance t
Step 14: Otherwise path rejected.
Step 15: Stop.

Clustering algorithm formation:

A graph G = (V, E) is employed to model the spontaneous network during which V, E could be a finite set of nodes and two-way edges that connect the nodes. Cardinality outlined because the variety of components during a specific set. The cardinality of set V is constant; however the cardinality of set E is n't constant, since it depends on the nodes quality. Each node $v_i \in v$ should have distinctive identity, quality v_{mob}, and also the largest transmission vary v_{tr}. The node v_i is among the transmission vary of v_j if dist (v_i, v_j) &(v_J, v_I).

Where,

V = Vertices
E = Edges
V_{mob} = Mobility of the node
V_{tr} = Node transmission Range

3. Results and discussion

Simulation configurations:

To facilitate the comparison of the simulation study with different analysis works, the default state of affairs setting in NS2 has been adopted. The utmost hops allowed during this configuration setting as shown in table1. Each the physical layer and also the 802.11 mac layer square measure enclosed within the non-wired extension of NS2, wherever the overall bits transmitted is calculated mistreatment application layer information packets solely and total energy.

Table 1. Simulation parameter

Parameter	Value
Simulation area	1,000 m * 1,000 m
Number of nodes	60
Average speed of nodes	0–25 meter/second
Mobility model	Random waypoint
Number of packet senders	40
Transmission range	250 m
Constant bit rate	2 (packets/second)
Packet size	512 bytes
Node beacon interval	0.5 (seconds)
MAC protocol	802.11 DCF
Initial energy/node	100 joules
Antenna model	Omni directional
Simulation time	500 sec

In this part simulation study analysis of proposed modified CGSR protocol and existing CGSR protocol for MANET was done through simulation NS2.

The following performance metrics is done to evaluate through simulation:

Packet Delivery Ratio (PDR): The ratio of the packets that successfully reach destination.

$$PDR = \frac{TotalNo.ofPacketsDelivered}{TotalNo.ofPacketsTransferred} X\ 100$$

Figure 2 shows performance comparison of proposed M-CGSR protocol and existing CGSR protocol for MANET. Finally, proposed M-CGSR protocol improved the packet delivery ratio when compare to existing CGSR protocol as mobility is increased. So the proposed M-CGSR protocol proved better performance compared to existing CGSR protocol.

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End-to-End Delay: The end-to-end delivery is number of packet successfully delivered, at the same time delay is reduced.

Figure 2. Packet delivery ratio (PDR) vs. mobility

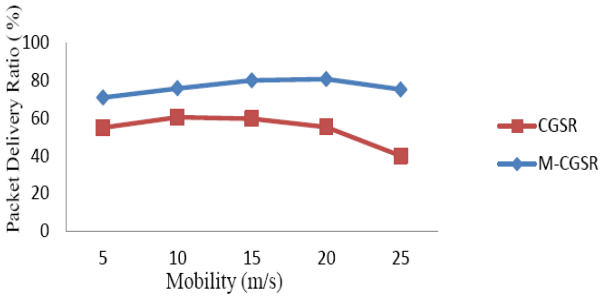

Figure 3. End-to-end delay vs. mobility (m/s)

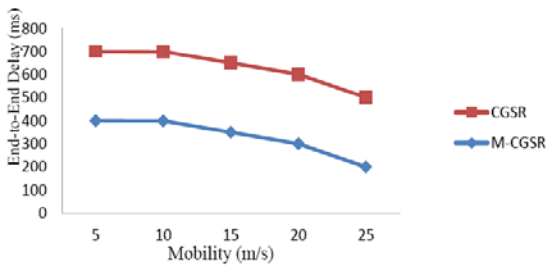

Figure 3 shows performance comparison of proposed M-CGSR protocol and existing CGSR protocol for MANET. Finally proposed M-CGSR protocol reduced the end-to-end delay when compared to existing CGSR protocol as mobility is increased. So the proposed M-CGSR protocol proved better performance when compared to existing CGSR protocol.

Routing Overhead: The number of generated and forwarded routing messages as separate metric to understand the routing overhead.

Figure 4.Routing overhead vs. mobility

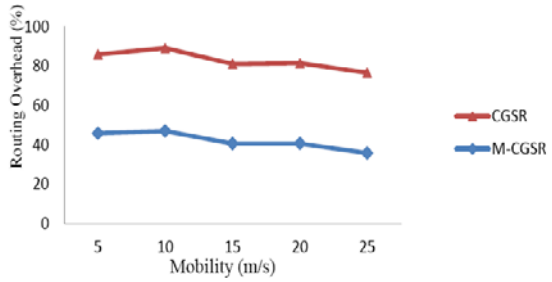

Figure 4 shows performance comparison of proposed M-CGSR protocol and existing CGSR protocol for MANET. Finally proposed M-CGSR protocol reduced the routing over head when compared to the existing CGSR protocol as mobility is increased. So the proposed M-CGSR protocol proved better performance when compared to the existing CGSR protocol.

4. Conclusion

This paper focused on the performance analysis of proposed algorithm named M-CGSR protocol and existing CGSR protocol. The proposed M-CGSR protocol provides better performance (Packet Delivery Ratio (PDR), End-to-End Delay, and Routing Overhead) when compared to the existing CGSR.

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