Cluster Based Topology Control for Efficient Multicasting in Dense Wireless Mesh Networks
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Abstract:
A cross-layer approach which is based on transmission count can enable high-throughput reliable multicasting in multi-hop dense wireless mesh networks (DWMN). The multicast routing metric, which is used in this work, is called the approximated multicast transmissions count (AMT).AMT is designed to capture the combined effects of MAC layer re-transmission based reliability, link quality awareness. AMT-based multicasting routing uses topology control methods. So computational complexity of the algorithm is very less, while using in dense networks. Topology control methods helps to save energy and considerably increases lifetime of the network. In this work we used clustering as the topology control method. Simulation results shows that, in comparison with baseline approach, multicasting using AMT-based multicast routing algorithm provides high throughput reliable multicasting in dense wireless mesh networks.

Keywords: Wireless mesh network, Approximated Multicast Transmission Count, Clustering, multihopping

I. INTRODUCTION
Multi-hop wireless mesh network has much more applications in new generation networking [1]. Because low cost establishment of broadband network infrastructures to local communities is become possible by multihop WMN. In this paper we are considering group communication in between mesh clients. For that we are using multicasting as the method. Multicasting is an important transmission mechanism commonly defined in wireless networking standards. However, the deployment of wireless mesh networks has a major challenge, which is throughput scalability. So throughput reliable communication is a question, if the number of nodes and number of hoper increases [2]. So we can utilize the wireless broadcast advantage in the design of routing algorithms in case of dense wireless mesh networks [13]. Also topology control methods helps to extend the life time of the network. In this work we used cluster based topology control for making the algorithm simple. Cluster head selection is determined by the combination of the residual energy and location.

II. LITERATURE SURVEY
IEEE802.11 standard do not specifies a scheme for multicasting, which uses the basic RTS/CTS for multicasting [3]. Error Recovery mechanism, is not present in this basic multicasting. Many researchers put forward different algorithms to improve the reliability of MAC layer multicasting, but most of these studies are concentrated on single hop multicasting [4, 5, 8, and 9]. Roy et al. [12] studied several routing metrics for throughput efficient multicast in WMN. They are all based on the conventional multicast mechanism defined in IEEE802.11 standards, and do not take MAC-layer retransmission based reliability into account. In [16] Xin et al. proposed EMTX [EXPECTED MULTICAST TRNSMISSION COUNT] based algorithm for multicasting in multi-chip WMN, which is implemented over adhoc routing protocol RMAC[6]. We used the same routing metric for algorithm development, but in a different way. We developed algorithm over multicast routing protocol Multicast Adhoc On-Demand Distance Vector with Backup Branches (MAODV-BB) [10]. Cluster based topology control is used to avoid computational complexity in dense networks, [18]. The topology control is an effective approach which can improve the quality of wireless sensor network at all sides.

III. IMPORTANCE OF TOPOLOGY CONTROL
In Wireless mesh networks (WMNs) each node can act as a mesh router as well as a mesh client. Where mesh routers have less mobility and form the backbone of WMNs. Despite recent advances in wireless mesh networking, many research challenges remain in all protocol layers. Theoretical network capacity and the protocols for WMNs are explored with an objective to point out a number of open research issues. Several recent works focused on multi-radio multi-channel WMNs. The topology control is an effective approach which can improve the quality of wireless mesh network at all sides. Network topology architecture controls is not only the premise and basis for studying high-efficiency node deployment and routing protocol design, but also the basic assurance to comprehensively save node energy and improve network performance [17, 19]. Therefore, studies of the topology architecture control strategy and algorithm with low energy consumption, low network delay, and high reliability serve as the ground-work for wireless mesh networking.
Model, The maximum number of MAC-layer transmissions is set to eight for each packet at each node. In each experiment, we setup one multicast constant bit rate (MCBR) session from the source (S) to the set of destination nodes D. The size of each multicast packet is 512 bytes. Bit rates are considered for the MCBR traffic is 512 Kbps.

IV. AMT-BASED MULTICAST PROBLEM

A. Network Model

AMT based protocol is a link quality awareness protocol. So we used a wireless mesh network, which supports link- layer acknowledgement for multicast transmissions. We are considering the group communication scenario. Firstly clusters are formed by random grouping. Then cluster head selection occurs. In cluster head selection we put forwarded two criteria, which are energy of the node and distance from the base station. In the figure 1 different cluster are shown in different colors and stared nodes are the cluster heads. Cluster head can communicate and transfer information between other cluster heads, also to underlying nodes. For the data transmission we

B. Protocol Implementation

In the mesh-based multicast routing protocols keep multiple path between each source and receiver, and delivers a more secure data delivery path; sometimes, it brings on more control overhead to maintain multiple paths in case of dense WMN. But AMT based multicasting implemented over a clustered WMN. Each cluster head keeps information about the nodes under it and approximate number of multicast transmissions needed to send a packet within the cluster. Also the all information about other cluster heads. Cluster head take care of the AMT based routing inside the cluster.

C. Simulation Setup

We used NS2 [15] to simulate a network with 30 mesh routers. The nodes are uniformly distributed in an area of size 1,500 X 1,500 m. Each node has one interface, working in IEEE 802.11b. All experiments use the two ray propagation

V. SIMULATION RESULTS AND PERFORMANCE EVALUATION

Figure 3 shows throughput of the WMN with 30 numbers of nodes. Routing is done by using normal multicasting algorithm. Maximum throughput of the system is 160kbits/sec. Figure 5 shows throughput of the WMN with same number of nodes, but routing done with cluster based AMT algorithm. From the simulation results it is clear that AMT based routing improves the throughput of the system. Can use AMT base multicasting. Number of nodes in each cluster is small and each cluster can work independently. So the transmission time can be minimized and at the same time computational complexity can be reduced.

VI. CONCLUSION

Focus of this paper is on developing high throughput reliable multicast routing in multi-hop dense wireless mesh networks. To address this challenge, here used clustering as the topology control method and AMT based algorithm in the clustered
WMN, AMT, as a robust metric that captures the combined effects of MAC layer retransmission based reliability, wireless broadcast advantage, and link quality awareness. Both centralized and distributed algorithms have been designed for the multicast problem. Then implemented the distributed algorithm as a multicast routing protocol. Extensive simulation experiments have confirmed that, compared to the baseline approach, cluster based AMT multicast routing can effectively reduce transmission overhead and yet enhance multicast throughput.

VII. REFERENCES


[17] Liang Zhao and Errol L. Lloyd, the Impact of Clustering in Distributed Topology Control,


