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Literature Review on Probabilistic Broadcasting Techniques in Mobile Ad Hoc Network

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ABSTRACT

A wireless ad hoc network (WANET) is a decentralized kind of wireless network which is also known as Mobile Ad-Hoc Network (MANET). The mobile nodes are connected via wireless links to form an uninformed topology without using existing transportation, which is called as a self-identity-configuring network. A Mobile Ad hoc Network be able to modify the locations and arrange itself in an effective manner. Probabilistic broadcast has been broadly exploited as a flooding optimization mechanism to alleviate the effect of broadcast storm issue that handle during route discovery and other services in mobile ad hoc networks (MANETs). The broadcast scheme is broadly utilized within routing protocols by means of using a wide range of wireless ad hoc networks like vehicular ad hoc networks, smart phone ad hoc networks, and internet- based sensor networks. In this paper represents a complete summary about recent work related to the probabilistic broadcast mechanism in MANETs and how to reduce the routing overhead consider within the field of mobile nodes.

Keywords: Mobile Ad-Hoc Network, Broadcast Techniques, probabilistic based, counter-based method, Distance-based, Cluster-based Techniques

I. INTRODUCTION

The wireless communication arena has an explosive growth in the past decade worldwide owing to current progresses in wireless technology and mobile computing devices [1]. This arena has numerous segments ranging from cellular telephony communication, worldwide interoperability wireless local area networks (WLANs) and satellite-based communication for utilizing microwave access (WiMAX) [1, 2]. By ensuring interoperability of wireless transmission technologies among different vendors in that way assisting the technologies for performing at market penetration. The improvement of WLANs has fuelled by using the de facto adoption of the IEEE 802.11 standard [3]. This standard terms with two major types of WLANs depending on the underlying configurations, infrastructure less (or ad hoc) and infrastructure-based networks. The wireless internet access is provided at conferences, official location, airports, coffee shops and other public places while utilizing Wi-Fi hotspots [3]. Infrastructure-based WLANs have need of a special node known as an access point (AP), which terminals or hosts connect through existing wired LANs and act as an arbiter and router between mobile devices and the rest of the networks. The set of mobile nodes that are associated with a particular AP is called the Basic Service Set (BSS) [1]. A number of BSSs be able to be connected together by means of a backbone network to form an Extended Service Set (ESS) [5], so as to expand the Wi-Fi coverage area. During ESS, each

and every AP is a well-known of the same service set identifier, which provides as a network "name" for the network users. In several dynamic environments like battlefields, disaster sites, and temporary conference meetings, if the vehicles and/or people have to be momentarily interconnected, it can be complex and/or expensive to organize infrastructure based WLANs. A viable alternative solution is provided for these environments by infrastructure-less or ad hoc WLANs. Ad hoc WLANs do not require only the mobile nodes require several fixed infrastructure to cooperate in a peer-to-peer fashion to form a temporary network in order to exchange data. On the other hand, the configuration of the IEEE 802.11 standard is edged to single-hop communication. After that, is only applicable to mobile nodes within a mutual transmission range. This end category of ad hoc WLANs is well-known referred to as a Mobile Wireless Ad Hoc Network [1, 2, and 4]. The mobile nodes are performed due to increase the transceiver capability and processing power, it has become possible to improve the communication range of temporary network. By using the mobile nodes themselves as forwarding agents and relying on the upper layers of the protocol stack for performing multi-hop path formation.

MANETs are self-organizing networks and dynamic systems wherein the network topology can modify on-the-fly without the interference of a system administrator [6]. In case, two mobile nodes are connected with each other's radio range communication, they know how to send messages. The topology of MANET can be easily arranged with few limitations [7] and technologies and protocols for ad hoc networks. MAC/PHY layers have been needed within the wireless ad hoc networking field through the past few years novel solutions. At present, each ad hoc network trusts on IEEE 802.11 technology, which characterizes both MAC and physical layers. Packets may be communicated by intermediary nodes. Therefore, MANET is extremely flexible and suitable. A routing protocol is needful for communicating while a packet should depart via some hops to reach its destination. It is responsible for discovering a route for the packet and making sure it is forwarded through the appropriate Path [8].

The basic mode of operation is broadcasted over a wireless channel wherein each message sent over the wireless channel and that is received by all the one-hop neighbor of the transmitter. The easiest implementation of the broadcast operation to all network nodes is work like a flooding way. The flooding way is an effective and easiest technique to broadcast a packet to all over nodes in a wireless sensor network (WSN) and all nodes transmit the packet at once, due to broadcast storm issue consider as a serious case, in turn network resources become harshly wasted. The flooding is the most regularly utilized the technique for nodes to deliver routing request (RREQ) messages or exchange network information to the receiver. The basic flooding, also known as pure flooding or else blind flooding, is a trouble-free process. A broadcast packet rebroadcasts each node that receives if it only the same packet has not been received before. The overall network function is called broadcast storm problem that handles several duplicate packets parallelized. They aim to hold back the rebroadcast of duplicate packets depend upon some basic network information like retransmission probability, location, and the number of duplicate packets received before. The retransmission probabilities of all nodes are inversely determined in a proportional manner to the number of adjacent nodes [8]. In such case, the more specific information like neighbor node list is used to reduce the number of duplicate packets.

With the purpose of alleviate the broadcast storm issue handle many broadcasting mechanism used to find the route in MANET: Blind broadcast, probabilistic based techniques which includes location based approach, Distance based approach

and the counter based approach, Neighbor knowledge based schemes and Cluster based schemes have been recommended in the previous decade [9]. A basic categorization of broadcast schemes are classified into two categories, there are deterministic techniques and probabilistic techniques. In deterministic techniques, subsets of nodes are only allowed to take part in the broadcasting process. Connected Dominating Set (CDS) and Multi Point Relay (MPR) [10] are a few cases of using deterministic broadcast algorithms. But, this may possibly lead to repeated use of the same nodes. Additionally, the mobility conditions of this set of nodes should modify frequently due to the topological changes. Probabilistic broadcast techniques are capable to balance the power consumption between all the nodes in the network. After that, they choose well-balanced routes over the network lifetime. In probabilistic broadcast, nodes forward the incoming broadcast packets along with certain probability value, so as to allow all the nodes have to contribute to the broadcast process. Likewise, probabilistic techniques are more robust against attacks, failures and are unaffected by the mobility of nodes such as the deterministic techniques. In this paper analysis the main probabilistic techniques proposed in the literature view for wireless ad hoc networks and this is the first survey about probabilistic broadcast in ad hoc networks.

II. LITERATURE REVIEW

G Parimala, et al., [10] combining the neighbor coverage based techniques with the probabilistic techniques to reduce the routing traffic overhead process in the network. By keeping few factors such as rebroadcast probability, additional coverage ratio, and rebroadcast delay the duplicated packets in the network can be reduced. The retransmissions can be automatically reduced while combining the probability based methods and the area based methods. As a result of executing the NCPR routing performance can be enhanced and after that reduces the performance of the redundant rebroadcast compared between the DPR and AODV.

A. Keshavarz-Haddad, et al., [11] proposed a variation counter-based method is considered in color-based broadcasting and every broadcast message has represented a color-field. The condition to be satisfied at the expiration time is related to the original counter based scheme; so that the number of colors of broadcast messages overhead should be less than a threshold value. If it is satisfied the message that will be retransmitted with a new color allotted to its color-field. The authors proved that several backbones produced by a counter-based scheme there be presents a backbone that results from the color-based scheme with the same threshold m, in which contains the counter based backbone as a subset. The authors analyzed and compared the m ¼ 2 case, called Red-Blue broadcast, with the same counter-based approach. The color-based schemes create backbones richer than the counter-based schemes in terms of robustness against node's failures as color-based schemes treat mesh-like backbones. The simulation results demonstrated the performance of that both approaches similarly same as terms of reach ability, even as color-based scheme generates less number of rebroadcasts.

S. Priyadsrini, et al., [12] surveyed a Route Discovery in MANETs with Improved Route Lifetime and actualize our proposed algorithms in AODV and the execution time is assessed against the first AODV. Our convention improves that the system execution and reduces the computation overhead by evading incessant course revelation as pick a steady way with long lifetime [7]. By way of the support of network simulator and authenticate that suggested convention performs superior to the current strength based steering conventions with reduced routing overhead and improved packet conveyance proportion.

Hanash, et al., [13] proposed a dynamic probabilistic broadcast approach that can efficiently diminish broadcast redundancy in MANETs and the algorithm animatedly computes pt as a function of k. They compared with the approach against fixed probabilistic, trouble-free flooding, and adjusted probabilistic. By implementing them in a changed version of the AODV protocol using the GloMoSim network simulator. The experimental results demonstrated that broadcast redundancy may be significantly reduced by their approach whereas remaining the reach ability high and also demonstrated lower broadcast latency compare with all existing approaches.

Kalani G, et al., [14] The Network coding idea (COPE) is utilized in order to conquer the number of broadcast transmissions by victimization using a logical operation [9]. A 2-hop neighbor based protocol assists to mitigate that a broadcast storm in MANET by choosing the lowest amount number of hops using dominant-pruning and self-pruning. By introducing an ant colony optimization has been made using the process to the COPE protocol with pruning algorithm that is considered as a new effort. The pheromone value makes use to decide the packet combination and that value is estimated depending on the intersection of the forward node packet list by pruning algorithm and the transmitter packet list. The simulation results demonstrate the protocol that has the most excellent capability to reduce the broadcast storm issue.

Tasneem Bano, et al., [15] evaluated the performance of distance aware counter based broadcast scheme by this fuzzy logic based distance broadcasting scheme. The potential benefit of Fuzzy Logic Control technique is applied for generating dynamic probability value depend upon the node location. Fuzzy Logic Control can consequently be an effective strategy for generating varying probability value in support of broadcasting in MANET. The degradation of the number of RREQ packet initiate and forward the packet in the dense network has considerably reduced that shown in the result section. Although, the analysis has been very crude, other than that clearly portrays the superiority of inserting the fuzzy logic controller in the conventional probabilistic broadcasting technique. The simulation results revealed the proposed algorithm that makes higher throughput and reduced rebroadcast process. The evaluations illustrate that the superiority of Fuzzy Logic Control scheme over the smart probabilistic broadcasting schemes and the results tend to be more broadcasting efficient.

Xin Ming Zhang, et al., [16] a rebroadcast delay has been proposed to discover the rebroadcast order and after that the additional coverage ratio has been precisely obtained by sensing coverage knowledge. Neighbor coverage based probabilistic approach proposed for broadcast storm issue.

A connectivity issue has been described to present the node density adaptation. A rebroadcast probability has been set by joining the additional coverage ratio and connectivity factor [11]. Therefore, the approaches obtain the benefit of the neighbor coverage ratio and probabilistic technique. The experimental results demonstrate the approach that may mitigate the retransmission considerably by improving the routing performance.

Kaur G, et al., [17] proposed a scheme to mitigate the broadcast storm issue and that scheme obtain the benefit of techniques like particle swarm optimization, neighbor knowledge and probabilistic rebroadcast. The probability of rebroadcast is decided by comparing the rebroadcast probability evaluates with the value of the particle swarm optimization [16]. In order to forward the packet is decided by computing the rebroadcast delay that has determined by the neighborhoods covered seat. The results demonstrate the scheme that has the capability to

reduce the broadcast storm compare than the existing approaches.

Bani Yassein, et al., [18] The AODV protocol is proposed combined the knowledge based and probabilistic based broadcasting approaches. On the way to improve the performance of existing protocol by reducing the communication overhead attained during the route detection process. The simulation results revealed that equipping AODV protocol with adjusted and fixed probabilistic flooding assists to reduce the overhead of the route detection process. Furthermore, the results point out that the adjusted technique results in enhanced performance and then compared to the fixed one. At the same time as maintaining comparable performance levels in terms of saved rebroadcasts and reach ability as achieved by conventional AODV.

Khalaf M.B, et al., [19] proposed to mitigate the broadcast storm problem by using velocity aware route discovery approach and (Shuhui Yang, Jie Wu, 2010) suggested a scheme for efficient broadcasting in MANET by using a directional antenna. The route discovery approach excludes the unbalanced nodes while performing at the route discovery process. The network coding is mainly utilized to mitigate the number of transmissions. The simulation results demonstrate the approach that performs compare than the existing approaches in terms of RREQ packet and link stability overhead. The forwarding nodes are picked from the directional antenna for transmitting the coded messages to the predefined sectors [17] and that the scheme diminishes the number of transmissions in the broadcast application.

Hussein Al-Bahadili, et al., [20] presented a simulation model that has a complete description to analyze the performance of a probabilistic algorithm for performing the route discovery in noisy MANETs. A flooding optimization mechanism has been broadly used through the probabilistic broadcast to alleviate the result of broadcast storm problem (BSP) in MANETs. In many research analysis carried out to evaluate and increase the performance of the flooding optimization mechanism in an error-free (noiseless) environment. Therefore, in the actuality of the wireless communication channels in MANETs are performed as an error-prone and avoid from high packet-loss owing to the presence of noise.

Dongkyun Kim, et al., [21] presented a hybrid approach joining the benefits of the counter-based scheme and distance-based scheme in terms of reducing the communication overhead and reach ability of rebroadcasting without fixing all nodes with GPS devices as needed by the location-based scheme. A bounding algorithm is represented to limit the influence of the broadcast storm risk in MANETs. By using the counter-based restraint on the nodes placed above the threshold to remove excessive rebroadcasting. During the simulation results demonstrated that the approach preserves a candidate solution to satisfy two main goals, namely low redundancy and high reach ability. The implementation and execution cost is also evaluated the bounding algorithm on standard MANET routing protocols.

W. Peng, et al., [22] a new broadcast approach has been proposed to reduce and to solve the broadcast storm problem and the broadcast redundancy in wireless ad hoc network. They use their statistical information and local topology information of the copied message to remove or avoid the rebroadcast message. A new broadcast approach can be split into two parts like data broadcasting and local neighborhood discovery. In data broadcasting source node even broadcast message to it's ignore copied message and entire neighbor message received later. In local neighborhood discovery nodes can swap a hello message by using neighbor information of hello message.

Z. Hass, et al., [23] proposed gossiping-based approach that exhibits bimodal behavior in adequately large networks. In some executions, the gossip dies out hardly and quickly with some node acquires the message. And this proposed in which each node forwards a message with a few probability to reduce the communication overhead of the routing protocols. For huge networks, the simple gossiping protocol utilizes up to 35% fewer messages compare than flooding, with better performance. A substantial fraction of the nodes gets the message from the remaining executions. The fraction of executions wherein the most nodes get the message based on the topology of the network and the gossiping probability. Even in networks as small as 150 nodes, the simulation result illustrates that adding together gossiping results to AODV results for significant performance improvement.

Ambarish R. et al., [24] introduced the probabilistic rebroadcast mechanism depend upon the neighbor coverage knowledge that comprises the connective factor and additional coverage ratio to reduce the routing overhead in MANET. Due to less redundant rebroadcast, the proposed system has reduced the network collision and contention The main focus on the probabilistic rebroadcast mechanism will have good performance if the network is in high traffic load or density is high. The proposed system will make less rebroadcast traffic while occur in flooding.. The packet delivery ratio will increase and reduce the average delay of the end to end communication. Even though, the proposed work will have better performance when the network is in high traffic load or density is high.

Kim. et al., [25] proposed the probabilistic approach that combines the benefits with neighbors confirmation and coverage area. At this point a mobile node can dynamically adjust the value of rebroadcast probability according to its additional coverage in its neighborhood. Unfortunately, this scheme has no provision to handle duplicate packets and this scheme makes use of the neighbor confirmation in order to prevent an early die out of rebroadcast.

Chen, et al., [26] introduced the concept of distance into the counter-based broadcast scheme for suggested a distance-aware counter-based broadcast scheme called “DIS_RAD”. A distance threshold is employed to distinguish between border and interior nodes. This scheme provides nodes earlier to the border of the transmission range with a higher rebroadcast probability since they are able to attain a high chance of reaching more nodes. By using these two distinct RAD values are compared with the border nodes having shorter RADs than the interior nodes. This trouble-free adaptation provides interior nodes with a lower rebroadcast probability and the higher rebroadcast probability for the border nodes. Even though, the approach has advanced performance all over counter-based scheme that suffers on or after the limitation of all distance-based schemes (i.e. determination of optimal threshold value and location information).

III. CONCLUSION

The significant risk in a MANET is broadcast storm problem. With the primary goal, the theory developed into a simple as well as capable optimization algorithm for deciding the rebroadcast probability. As compared to other probability-based broadcasting techniques, every node broadcasts with fixed probability without considering the node density, remaining energy and available bandwidth of the nodes. Many schemes are performed namely, Probability, Distance-based, Cluster-based and Counter-based schemes have been suggested to avoid or remove the broadcast storm issue. They use their own benefits and difficulties. The complete survey of this paper is depicted the different probabilistic based broadcasting techniques.

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