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SURVEY ON CONTROL MECHANISM OF FLOODING OPERATION OF ROUTING PROTOCOL IN MANET

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ABSTRACT

Routing plays vital role in mobile ad-hoc networks because of frequent changes in topology. Due to this nature, route or path breaks in rapid manner which causes routing overhead and decreases performance. In this environment, effective routing is essential for data transmission in which each participating node behaves as a router. Several schemes have been advised for routing to discover route, one of them is flooding. Flooding scheme offers to discover route through flooding of routing packets in the network. In this scheme routing packets are traversing throughout the network infinitely that consumes resources unnecessarily such as battery power and bandwidth which causes routing overhead and throughput degradation. This paper presents review of best neighbor mechanisms to control flooding of routing packets.

KEYWORDS- MANET, Routing Protocol, Flooding Operations.

INTRODUCTION

Wireless mobile ad-hoc network is a collection of mobile devices, which does not need of fixed infrastructure or centralized control. Every device in the network serves as routers, which relay data to other nodes. There are many applications of mobile ad hoc networks, for example batter-field area, meetings or conventions, emergency disaster relief personnel coordinating efforts after a earthquake [1]. Wireless mobile ad hoc network faces several issues related to routing and quality of service (QoS) for real time applications due to variable nature and limited resource constraints. In such network, effective routing is essential for data transmission in which each participating node behaves as a router. Several schemes have been advised for routing to discover route, one of them is flooding. Flooding scheme offers to discover route through flooding of routing packets in the network. In this scheme routing packets are traversing throughout the network infinitely that consumes resources unnecessarily such as battery power and bandwidth which causes routing overhead and throughput degradation.

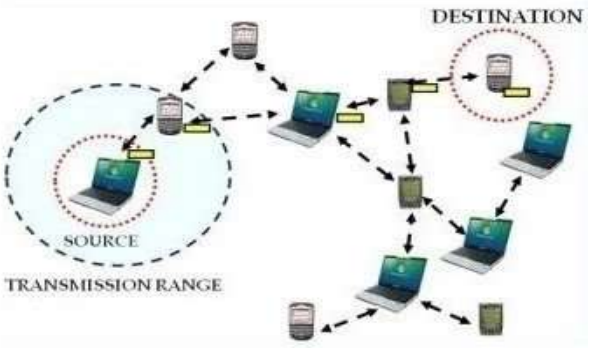

Figure 1 Mobile Ad-hoc Network

The mobile nature and lack of fixed infrastructure, MANET has added a number of characteristics as defined below:

Infrastructure less: MANET is self-organized and autonomous collection of mobile nodes. In which each mobile device is connected by wireless links and does not depend on any pre- established infrastructure or central access point.

Autonomous Terminal: In MANET each mobile device is an autonomous and may independently perform the function of a router or a host for communication [3].

Multi-hop Routing: In MANET ad-hoc routing algorithms are single-hop and multi-hop based on different routing protocols and link layer attributes.

Dynamic Network Topologies: All mobile nodes in MANET are free to move arbitrarily in any direction and frequently change its topology to other nodes in the network.

Energy Constrained Operation: Each mobile devices have limited power supply because it carries battery power [3].

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Manet Issues

The key issues faced at different layers of MANET [5] are shown in figure 2. It shows the layered architecture of ad - hoc networks.

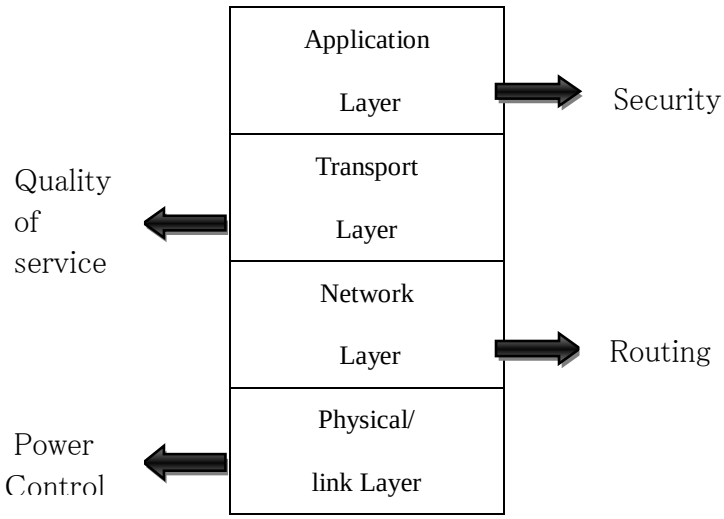

FIGURE 2 ISSUES OF MANET

Some of the issues of MANET as described below:

Routing: Since the mobile nodes of MANET are free to move randomly in any direction, so the topology of the network is constantly changing and the communication between any pair of nodes is challenging task. Most of the routing protocols have been developed to recover the path.

Limited wireless transmission range: Wireless networks have limited radio bandwidth and it can offer data rates much less than as compared to wired networks. The limited transmission range also affects the routing protocols to maintain the topological information.

Packet losses due to transmission errors: Ad-hoc wireless network suffers a packet loss problem due to many reasons such as high bit error rate in a wireless channel, hidden terminal problem, presence of interference problem, location dependent, unidirectional link, path break etc [6].

Security and Reliability: Due to the feature of distributed operation, ad-hoc network requires the security of connection between mobile nodes in the network. It is easy for malicious hosts to eavesdrop during communication session and this could lead to unauthorized access, information theft, interference, jamming and service degradation. Wireless links also have a reliability problem because of the limited wireless transmission range, the broadcast nature of wireless medium e.g. hidden terminal problem, mobility causes packet loss and data transmission errors.

Quality of Service: Providing quality of service in constantly changing environment will be difficult task. MANET has dynamic environment and does not provide the guarantee of services during transmission.

Energy Constrained: All of the nodes in MANET may rely on batteries then the most important criteria of system design are based on energy conversation.

Limited Bandwidth: Wireless links may have significantly lower capacity than the wired network. Also due to the multiple access, fading, noise and interference condition its the wireless links have lower throughput [6].

BACKGROUND

Flooding is one of the most fundamental operations in MANETs. Most of the major routing protocols, like DSR [13], AODV [27], LAR [17], ZRP [10], etc., rely on flooding for disseminating route discovery, route maintenance, or topology update packets. Flooding is a very frequently invoked function in MANETs. Therefore, an efficient implementation of the flooding scheme is crucial in reducing the overhead of routing protocols and improving the throughput of networks. Efficient flooding schemes are different from the broadcast mechanisms discussed in

[19][44]. The broadcast mechanism is used in transmission of a large amount of data or stream media data. These applications require an efficient broadcast route before the actual transmission of data, so that data can be transmitted efficiently along the pre-found route. In contrast, flooding is usually used in dissemination of control packets, which is a one-off operation and it does not need routing beforehand.

- **Pure flooding**

Pure flooding also called blind flooding, is the simplest flooding technique. The basic idea of this approach is every node in the network retransmits the flooding message when it is the first time to receive it [9] [12]. A node, on receiving a broadcast message for the first time, has the responsibility to rebroadcast the message. It costs n transmissions in a network with n nodes. This simple scheme guarantees that a flooding message can reach all nodes if the network is connected and there is no collision.

- **Probabilistic flooding scheme**

One approach to alleviate the broadcast storm problem is to inhibit some nodes from rebroadcast to reduce the redundancy, and thus contention and collision. Sze-Yao Ni et al. [26] presented a probabilistic scheme that use a probabilistic rebroadcasting and differentiate timing of rebroadcasts to avoid redundancy and collisions. The basic idea of probabilistic flooding schemes is that each node forwards a flooding message with probability P upon receiving it for the first time. Clearly, when P=1, this scheme is equivalent to pure flooding. The probabilistic schemes can be classified into four types: counter-based, distance-based, location-based and cluster-based. These schemes differ in how a node estimates redundancy and how it accumulates knowledge to assist its decision. Except the last scheme, which relies on some local connectivity information, all schemes operate in a fully distributed manner.

- **Flooding with Self Pruning (FSP)**

The simplest flooding scheme based on 1-hop neighbor knowledge is flooding with self pruning (FSP) proposed by Lim and Kim [22]. FSP is a receiver-based scheme which uses 1-hop information. A sender forwards a flooding message by attaching all of its 1-hop neighbors to the message. A receiver compares its own 1-hop neighbors with the node list in the message; it will not forwards the message if all its 1-hop neighbors are already included in the list, otherwise it forwards the message as a sender.

RELATED STUDY

To reduce the flooding traffic, many approaches have been proposed [7].

0-hop schemes: Many flooding techniques developed in early time are in this category. These techniques try to reduce flooding cost without any assumption on neighborhood knowledge. For example, one can simply make each host rebroadcast flooding packets with some predetermined probability. This probabilistic-based scheme was first proposed in [8] [9] and further investigated in [10].

1-hop schemes: The technique called Flooding with Self Pruning (FSP) in [11] is a 1-hop flooding scheme since it requires each host to track its neighbors within 1-hop distance. In this scheme, when a host broadcasts a packet, it includes all of its 1-hop neighbors in the packet header. Upon receiving a broadcast, a host checks its own 1-hop neighbors and if all of them have already been listed in the broadcast packet header, it does not forward the broadcast.

2+ -hop schemes: Most existing flooding approaches are in this category and they can be further divided into reactive schemes and proactive schemes. In proactive schemes [11] [12] [13] [14], a broadcasting host selects some of its 1-hop neighbors as rebroadcasting hosts. When a host receives a broadcast, it drops off the packet if it is not designated as a rebroadcasting host; otherwise, it recursively chooses some of its 1-hop neighbors as rebroadcasting hosts and then for- wards the broadcast.

PROBLEM DEFINITION AND PROPOSED SOLUTION

Problem Definition

Routing is essential operation in the mobile ad-hoc network for data transmissions because every node serves as router in absence of central router. Several routing schemes have been advised to discover route, one of them is flooding. Flooding scheme offers to discover route through flooding of routing packets such as route request **(RREQ)** in the network. In this scheme routing packets are traversing throughout the network infinitely that consumes resources unnecessarily such battery power, bandwidth and cause throughput degradation.

Proposed Solution

To remove flooding of routing packets in mobile ad-hoc network, an approach is proposed on the basis of earlier approach which control flooding operation. Proposed approach deals with the discovery of suitable or optimum

neighbor of source and further downstream nodes in the network. For discovery of suitable nodes, an approach determines mobility factor, energy and receiver gain of nodes.

EXPECTED OUTCOMES

After the simulation of proposed approach following results will be expected.

- Minimizing flooding of routing packets.
- Maximize network lifetime.
- Maximize network performance in terms of packet delivery ratio, throughput and routing overhead.

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