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Congestion Avoidance in Mobile Ad-hoc Network : A Review

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ABSTRACT

MANET is a mobile ad-hoc network that has the ability configuring itself and changing the location according to the requirement of the user. In the mobile adhoc network, at any time the nodes may join or leave the network. Congestion is the main issue in the MANET. When the number of nodes transmitted the packets across the network then there is a chance of congestion which may lead to packet loss. It has been analyzed that AODV routing protocol performs well as compared to other protocols. The AODV protocol will be improved to establish a path from source to destination to minimize the chance of congestion. In this paper, we will review the different routing techniques and the reasons of congestion.

Keywords : AODV, Adhoc network, MANET, DSDV, DSR.

I. INTRODUCTION

The Mobile ad-hoc network is the collection of two or more wireless devices which communicate with each other directly. In this type of network, no central controller is required. When there is no direct path from source to destination, the data packets are transmitted through intermediate devices. Each node in MANET work as a router that has the capability to forward the data. MANETs are the type of wireless ad-hoc network that has a movable networking environment on top of link layer ad-hoc network. Due to the moving nature of nodes and limited resources, routing creates a problem in MANET.

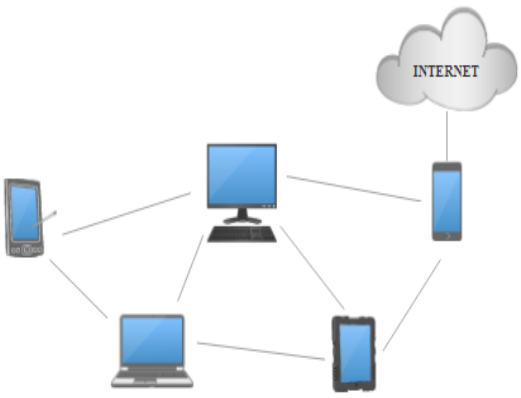

Figure 1: Mobile Adhoc Network

In ad-hoc network, the connection is built involuntarily as and when devices communicate with each other. These devices are in close range of each other. The quality of connection and speed may get affected when a large number of devices added in the network. To use these limited resources efficiently, we required efficient routing strategies which should also be adaptable to changing condition of the network like, size of the network, traffic density and network partitioning [4].

A. TYPES OF MANET

- Vehicular Ad Hoc Networks (VANETs) are used for communication between vehicles and road side equipment.
- InVANETs are mostly used to avoid the vehicle to vehicle collision, road accidents etc. It is a type of artificial intelligence.
- Internet Based Mobile Ad-hoc Networks (iMANET) are ad-hoc networks that are used to connect mobile nodes and fixed Internet-gateway nodes.

B. CHALLENGES IN MANET

MANETs have some key challenges that will be keep in consideration while working on it.These are:

- Quality of Service (QoS): It will be the key challenge in constantly changing environment. The inherent stochastic feature of communications quality in a MANET makes it difficult to offer

fixed guarantees on the services offered to a device[3].

- Packet Loss: packet loss may occur due to the error in transmission.There are some factors that are responsible for packet loss. These are interference, hidden terminals, wireless channel issues, collision due to unidirectional paths.

- Mobility of Nodes: Due to the dynamic nature of network topology the paths get break which leads to network partition that may effect the intermediate nodes.

- Power consumption: In light weight mobiles, for less power consumption the communication related function should be optimized.

- Time varying nature: The reliability of wireless channels may effected by different factors. The wireless links are time varying in nature. There are transmission barricades such as path loss, blockage, interference, fading etc.

C. ROUTING PROTOCOL

Routing is the process of transmitting a packet from source to destination. Routing protocols are the set of rules that govern how the packets routes to destination. In MANET there are many different routing protocols.

- Proactive Routing protocols: Proactive routing protocols are table driven routing protocols. In this each and every node maintain a routing information of the neighboring nodes in a table. The information in routing table updated when ever the network topology of a node changes. These protocol maintain different routing table for different protocol. Due to periodically maintenance of routing table, the proactive routing protocol are not relevant for the large networks. Example of proactive routing protocols are OLSR, DSDV, FSR etc.

- Reactive Routing Protocols: These are On-demand routing protocols. In this no routing information is maintained for every node. If any node wants to transmit the packets, it search for the route on-demand. Source first check its cache if route is not available then it starts the route discovery process then establish the connection to transmit the packets. This type of protocol use the RREQ (Route Request) and RREP (Route Reply) messages. Example of On demand routing protocols are AODV, DSR etc.

D. PROTOCOL USED

- **Dynamic Destination-Sequenced Distance DSDV:** DSDV is a table driven routing protocol which means each node in this protocol maintain a routing information table for every neighboring nodes. DSDV is the development over the Bellman-Ford routing algorithm. The routing table maintain the list of all the neighbor nodes and the number of hop to each node. Routing information constantly send to the neighboring nodes when the node moves in the network. The information in the table updated very quickly. Due to the frequent movements by the nodes in the network, there is a continuous burst of new routes transmission upon every new sequence number.

- **Dynamic Source Routing (DSR):** DSR is based on source routing and it is a reactive routing protocol. At mobile nodes all the routing information are kept. DSR is a type of self organized and self configured without the requirement of any infrastructure. The protocol uses two mechanism Route Discovery and Maintenance that work together in adhoc network to find and maintain the routes. By using the route discovery process, the optimum path from source to destination is determined. Route Maintenance is used to ensure that the route remain optimum and loop free even after the change in network condition.

- **Ad Hoc on-Demand Distance Vector Routing AODV:** AODV is a on demand routing protocol which means its discover the route on demand. For mobile adhoc networks, AODV is a very efficient, effective and simple routing protocol. in AODV, each mobile node act as a specialized router. When a source wants to transmit the packet or data, it send a RREQ message to its neighboring node and when the message reaches the node it send a RREP reply message to source node. AODV used for both unicast and multicast routing. AODV maintain the routes as long as required by the source. When the source doesn't need the link, the link will be deleted from the routing table information.

E. CONGESTION IN MANET

The mobile ad-hoc networks is suitable for establishing connection between source and destination without any external infrastructure. But due to the contagious movement of nodes and limited resources many problems are occur. These problems are topology control, security, dynamic nature of network, quality of services, routing, congestion control etc. But the congestion control is the most important issue in adhoc network.

Congestion is a state which arises when number of packets across the network is greater than the network capacity. Congestion in the network cause performance degradation, high overload, long delay, packets losses. When the large number of packet scrambling for same link then queue overflow and packets get lost.In Manet only congestion is not a reason to packet loss , there are many other factors for packet loss and these factors are link failure, mobility, interference etc. The dynamic nature of network also the cause of congestion which effect its performance.

But if we do not control congestion then network is collapse. Hence we assume that other factors leads packet loss is rare and congestion is most probable reason of packet loss [10].

II. LITERATURE REVIEW

Changling Liu et al. [1] have represented a significant and indispensable issue for mobile ad hoc networks-routing protocol design. In this is paper, the author highlighted the major practical challenges due to the vitality of the network. Routing is an integral component of communication protocols in mobile ad hoc networks. The design of the protocols is ambitious by specific goals and needs based on respective assumptions about the network properties or application area. The survey tries to review typical routing protocols reveal the characteristics and trade-offs.

Priyanka Goyal et. al. [2] Mobile ad-hoc network (MANET) is one of the most important fields for research and development of wireless network. In this paper author discuss the popularity of mobile device and wireless networks that increased over the past years, wireless ad-hoc networks has now become one of the most vibrant and active field of communication and networks. MANET has the several feature that made this technology better.This paper describes the problems related to the ad hoc network by giving its research background including the status, concept, features and vulnerabilities of MANET. This paper gives an overview of the routing protocols. Also include the several challenging issues, emerging application and the future trends of MANET.

Geetika Maheshwari et. al. [3] Mobile ad hoc network is a type of network that can change its locations and configure itself during the movement of nodes. It use wireless connections to connect various networks. In this paper the author discuss about the different challenges occurs in the MANET. Congestion control is a challenging task in mobile ad hoc network. Congestion occurs when the the availability of resources is less than its demand. There are different types of mechanisms have been proposed to overcome the congestion in the mobile ad hoc network.Congestion control mechanisms control congestion either before congestion occur or after congestion actually occurred.

B.Soujanya et al. [5] Mobile Ad Hoc Network (MANET) is a collection of multi-hop wireless mobile nodes that communicate with each other without centralized control or established infrastructure. In MANET the wireless links are error prone and due to the interference and mobility of nodes, the link can go down very frequently. Therefore, routing in MANET is a critical task due to highly dynamic nature. In recent years, several routing protocols have been proposed for mobile ad hoc networks and prominent among them are ZRP, DSR, FSR, AODV, TORA and WRP. This research paper provides an overview of these protocols by presenting their characteristics, functionality, benefits, limitations and analysis. The objective is to make observations about how the performance of these protocols can be improved.

Dr. R.K Singh et al. [6] has given the survey on energy efficient routing protocols for wireless Ad-Hoc networks. In this paper a number of ways of classification or categorization of these routing protocols are presented and did Qualitative/ Quantitative analysis of a dozen typical existing routing protocols. In qualitative analysis, properties are compared according to different criteria and in Quantitative analysis simulator NS2 is used to study their relative performance according to different criteria.

ZeyadGhaleb et al. [7] has given the estimation of proactive routing protocol -Routing Information Protocol (RIP) and reactive routing protocol-Dynamic Source Routing (DSR).The analysis of these routing protocols will be calculated based on the average jitter, throughput, energy consumption, and delay metrics. The routing information protocols (RIP) have better performance as compared to the DSR in the scenario.

Dr. Umadevi Chezhiyan et.al [8] they explained the importance of the adhoc networks which communicate and establish path between two end nodes. Routing is used for creating path between source and destination for transferring the data. Reactive routing is a performed well in MANET than proactive routing. In this paper various routing protocols with their advantages and disadvantages has been discussed. At the end measurement performance analysis is also done in MANET.

Charu Sharma and Jaspreet Kaur et.al [9] explained that MANET is a network which can be easily deployed. MANET has no central controller so topology changes dynamically. Topology change is a challenging issue in MANET. In this paper the whole network strategy with performance metrics which are to be used in the OPNET simulation for the analysis has been described. The performance metrics used are packet queue size, throughput, transmitted packet rate and received packet rate.

III. CONCLUSION

This paper gives an overview of different routing protocols (DSDV, DSR, AODV). We conclude that the AODV is the best routing protocol among DSDV and DSR for establishing path from source to destination. The AODV is used for both unicast and multicast routing. But the dynamic nature of network can cause the congestion in the network. Due to congestion, there is performance degradation, bandwidth loss, long delay in packet arrival. In our future work we use the different technique to control the congestion and increase the performance.

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