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REVIEW ARTICLE

A REVIEW ON CONGESTION CONTROL IN AD-HOC NETWORK

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Abstract- In wireless network communication mobile network communication has becomes very important. Manet is a temporary network that means nodes moves without any fixed infrastructure. In Manet nodes are generally communicated with each other over various wireless links and also changes network topologies due to nodes are movable. Routing is a problem in Manet because there is no router between source & destination so; mobile nodes themselves act as the routers. In Manet, routing depand upon topologies, router source etc. In Manet, congestion control is a major problem. Congestion means when transmission of number of packets across the network is greater than the capacity of the network then network becomes congested. Due to congestion packets have to be dropped and also decrease the performance of the network. So, finding the congestion free shortest path is a main issue in Manet. To avoid this problem we apply a fuzzy based algorithm.

Keywords: MANET, Routing Protocols in Manet, Congestion control, Fuzzy Logic

I. INTRODUCTION

Earliest MANETs were named as packet radio. Mobile Ad hoc Networking (MANET) is a collection of mobile nodes that are connected over various wireless links. In Manet there is no any existence fixed infrastructure. It is relatively working on a some constrained bandwidth. While in single hop cellular network information exchanged between the nodes totally depand upon wired network and fixed base stations. The network topologies may arbitrarily change in an non-predictable manner from time to time

because nodes are free to move in Manet. The network topologies may change as nodes move, so the change in network topologies must be made known to the other nodes to updated the outdated network topologies. Routing is the issue in manet because there is no router. So, each device must act as a router for transferring any packets among each other. This network can incorporate into local area network (LAN). There are three types of MANET. It includes Vehicular Ad hoc Networks (VANETs), Intelligent Vehicular Ad hoc Networks (InVANETs) and Internet Based Mobile Ad hock Networks (iMANET) [1]. In mobile ad hoc network nodes are in movable format means they can form any topology as they change their position so by considering nodes are movable we are currently having many protocols for routing in multipath. The main purpose of multipath routing protocols is to provide reliable communication to enhance quality of service of MANETs [10]. In MANETs, mobile nodes communicate with each other in a multi-hop fashion. That means a mobile node sends a packet to a sink via intermediate nodes. Hence, the availability of each node is equally important in MANETs. Otherwise, overall performance of the network may be affected by single intermediate node. Here we discussed mainly application, advantages and disadvantages of MANET. These are explained as:

- ***APPLICATION OF MANET***

1. URGENT BUSINESS MEETINGS

2. MILITARY

3. PERSONAL AREA NETWORKING AND BLUETOOTH

- ***ADVANTAGES OF MANET***

1. Manet provide access to information and services

2. These networks can be setup at any place and at any time.

- ***DISADVANTAGES OF MANET***

1. Less physical security.

2. More attack prone.

3. Lack of authorization facilities.

4. Dynamically network topology makes it hard to find out malicious node.

In section II, Types of Routing Protocols In Manet is explained. In section III, Congestion control In MANET is explained. In section IV, overview of fuzzy logic for congestion control. Previous work is explained in the section V. At last conclusion is in section VI.

II. TYPES OF ROUTING PROTOCOLS IN MANET

Categorization of routing protocols can be done in many ways but most of these are depending upon routing strategy and network structure. In MANET, there are different types of routing protocols each of them is applied according to the network circumstances for example Proactive, Reactive, Hybrid routing protocols. These are followed as:

A. PROACTIVE OR TABLE-DRIVEN PROTOCOLS

Proactive routing protocols are also called as table driven routing protocols. In this every node maintain routing table which contains information about the network topology even without requiring it. This feature although useful for datagram traffic, incurs substantial signalling traffic and power consumption . The routing tables are updated periodically whenever the network topology changes. Proactive protocols are not suitable for large networks as they need to maintain node entries for each and every node in the

routing table of every node. These protocols maintain different number of routing tables varying from protocol to protocol. There are various well known proactive routing protocols [2]. Example: DSDV, OLSR, WRP etc.

B. REACTIVE PROTOCOLS(ON-DEMAND)

Reactive routing protocols are also known as on demand routing protocol. In this protocol route is discovered whenever it is needed. Nodes initiate route discovery on demand basis. Source node sees its route cache for the available route from source to destination if the route is not available then it initiates route discovery process.

The on- demand routing protocols have two major components: Route Discovery and Route Maintainence [2]. A number of different reactive routing protocols have been proposed to increase the performance of reactive routing for example DSR, AODV, TORA and LMR.Here, we mainly discussed AODV and DSR, and these are followed as:

1. AODV

Ad hoc On-Demand Distance Vector (AODV) routing is a routing protocol for mobile adhoc networks and other wireless ad-hoc networks. It is jointly developed in Nokia Research Centre of University of California, Santa Barbara and University of Cincinnati by C. Perkins and S. Das. It is an on-demand and distance-vector routing protocol, meaning that a route is established by AODV from a destination only on demand. AODV is capable of both unicast and multicast routing. It keeps these routes as long as they are desirable by the sources. The AODV routing protocol is based on DSDV and DSR algorithm. It uses the periodic beaconing and sequence numbering procedure of DSDV and a similar route discovery procedure as in DSR. However, there are two major differences between DSR and AODV. The most distinguishing difference is that in DSR each packet carries full routing information, whereas in AODV the packets carry the destination address. This means that AODV has potentially less routing overheads than DSR. The other difference is that the route replies in DSR carry the address of every node along the route, whereas in AODV the route replies only carry the destination IP address and the sequence number. The advantage of AODV is that it is adaptable to highly dynamic networks. However, node may experience large delays during route construction, and link failure may initiate another route discovery, which introduces extra delays and consumes more bandwidth as the size of the network increases [4].

2. DSR

Dynamic Source Routing (DSR) is a reactive protocol based on the source route approach. In *Dynamic Source Routing (DSR)*, the protocol is based on the link state algorithm in which source initiates route discovery on demand basis. The sender determines the route from source to destination and it includes the address of intermediate nodes to the route record in the packet. DSR was designed for multi hop networks for small Diameter [2], because the DSR protocol requires each packet to carry the full address (every hop in the route), from source to the destination. This means that the protocol will not be very effective in large networks, as the amount of overhead carried in the packet will continue to increase as the network diameter increases. Therefore in highly dynamic and large networks the overhead may consume most of the bandwidths. However, this protocol has a number of advantages over routing protocols such as AODV, LMR and TORA , and in small to moderately size networks (perhaps up to a few hundred nodes), this protocol may perform better. An advantage of DSR is that nodes can store multiple routes in their route cache, which means that the source node can check its route cache for a valid route before initiating route discovery, and if a valid route is found there is no need for route discovery. This is very beneficial in network with low mobility. Since they routes stored in the route cache will be valid longer [4]. Another advantage of DSR is that it is a beaconless protocol in which no HELLO messages are exchanged between nodes to notify them of their neighbours in the network[2].

C. Hybrid Protocol

Hybrid protocols combine features from both reactive and proactive routing protocols, typically attempting to exploit the reduced control traffic overhead from proactive systems whilst reducing the route discovery delays of reactive systems by maintaining some form of routing table [3]. This is mostly achieved by proactively maintaining routes to near by nodes and determining routes to far away nodes using a route discovery strategy. Most hybrid protocols proposed to date are zone-based, which means that the network is partitioned or seen as a number of zones by each node. Others group nodes into trees or clusters [4].

III. CONGESTION CONTROL IN MANET

Manet are applicable where no infrastructure is available. In Ad-hoc networks, since there is no fixed infrastructure and there are no any separate network elements called routers and hence the mobile nodes themselves act as routers (i.e. they are responsible for routing the packets). In ad-hoc network topology may change occurs when nodes moves. Due to changing in network topology, congestion in routing in Manet is a main problem in Manet. Congestion may occur when load on the network is high. Congestion defined as when packets across the networks greater than the capacity of the networks and hence, network becomes congested. Mainly congestion occurs when number of nodes shared same resources for example: bandwidth, queue etc. congestion is a cause of packet losses, high delay etc. so, congestion control is a challenging issue in mobile ad-hoc network. The task of congestion control is essential in Manet. Many approaches or algorithms have been proposed for congestion control in Manet. Main purpose of any congestion control mechanism is to balance the traffic to increase throughput of the network. Also it is possible to maximize nodes transfer, packets delivery ratio, less energy consumption and minimizes traffic congestion, minimize end to end delay and network performance can be improved. It must be pointed out that all the congestion control methods are able to inform the source about the congestion problem because they use Transmission Control Protocol (TCP) [6].

IV. OVERVIEW OF FUZZY LOGIC FOR CONGESTION CONTROL

A network system is a large distributed complex system, with difficult often highly non-linear, time varying and chaotic behaviour. There is an inherent fuzziness in the definition of the controls (declared objectives and observed behaviour).Dynamic or static modelling of such a system for (open or closed loop) control is extremely complex. Measurements on the state of the network are incomplete, often relatively poor and time delayed. Its sheer numerical size and geographic spread are mind-boggling. For example, customers (active services) in the 10s of millions, network elements in the 100s of million, and global coverage. Therefore, in designing the network control system, a structured approach is necessary. The traditional techniques of traffic engineering, queuing ana1ysis, decision theory, etc. should be supplemented with a variety of novel control techniques, including (nonlinear) dynamic systems, computational intelligence and intelligent control (adaptive control, learning models, neural networks, fuzzy systems, evolutionary/genetic algorithms), and artificia1 intelligence. Computational Intelligence (CI) [5], [8] is an area of fundamental and applied research involving numerical information processing (in contrast to the symbolic information processing techniques of Artificial Intelligence (AI)).Nowadays, CI research is very active and consequently its applications are appearing in some end user products. The definition of CI can be given indirectly by observing the exhibited properties of a system that employs CI components [5]: "A system is **computationally intelligent** when it: deals only with numerical (low-level) data, has a pattern recognition component, and does not use knowledge in the AI sense; and additionally, when it (begins to) exhibit

- computational adaptivity;
- computational fault tolerance;
- speed approaching human-like turnaround;
- error rates that approximate human performance.

The major building blocks of CI are artificial neural networks, fuzzy logic, and evolutionary computation."
While these techniques are not a panacea (and it is very important to view them as supplementing proven traditional techniques), we are beginning to see a lot of interest not only from the academic research community [9], but also from telecommunication companies [10].

V. RELATED WORK

S.A. Jain [12] et al, performed a work "An Improvement in Congestion Control Using Multipath Routing in MANET". Here the author described the ad-hoc connections, which opens many opportunities for MANET applications. Christian Lochert [13] et al, performed a survey "A Survey on Congestion Control for Mobile Ad-hoc Networks". Here the author described that the congestion control is a key problem in mobile ad-hoc networks (MANET). The standard TCP congestion control mechanism was not able to handle the special properties of a shared wireless multi-hop channel. . In this paper, author gives an overview of existing proposals, explain their key ideas and show their inter relations.

Andreas Pitsillides[14] et al performed a work " fuzzy logic based congestion control". In this paper we have reviewed existing literature on IP and ATM congestion control. We have presented an illustrative example of using CI intelligence to control congestion using Fuzzy Logic. This and the literature we review on CI methods applied to ATM networks show that CI can be effective in the control of congestion. There is no doubt that we will see more and more use of these techniques, including their use in the IP world. We also expect that, as in other commercial products, CI techniques will finally make it into real products in this area, and we expect with tremendous success.

L. khoukhi [15] et al performed a work "Intelligent solution for congestion control in wireless ad-hoc network". Here authr presented approach includes a fuzzy logic techniques for buffer threshold management in order to show the ability of fuzzy threshold to adapt to the dynamic condition over the classical flexible thresholds.

Essam Natsheh [16] et al, performed a works" Fuzzy Active Queue Management for Congestion Control in Wireless Ad-Hoc" In this study, a novel AQM algorithm (Fuzzy-AQM) based on fuzzy logic system was suggested. This algorithm for early packets dropping is implemented in wireless ad-hoc networks in order to provide effective congestion control by
achieving high queue utilization,low packet losses and delays. The proposed scheme is contrasted with a number of well-known AQM schemes through a wide range of scenarios.

Gasim Alandjani [17] et al, performed a survey "Fuzzy Routing in Ad Hoc Networks". In this paper, we have presented two fuzzy logic routing protocols for ad hoc networks. These protocols buildupon the route discovery mechanisms developed for previous MANET routing protocols, such as DSR and SMR,
to identify as many disjoint paths from source to destination as possible. A fuzzy logic controller then determines,based upon traffic importance and network status, how to use these paths for the offered traffic: split the traffic over the paths for load balancing, send the traffic simultaneously over a plurality of the paths, or even reject the traffic due to cost/benefit considerations.

VI. CONCLUSION

In this paper we defined Manet nodes moves without any infrastructure.There is no any router so, nodes are themselves act as the router.In Ad-Hoc network congestion control is a main issue.In Manet congestion is occure when transmission of packets is greater than capacity of the network.Due to congestion performance of the network have to be decreased. Network performance can be increased by controlling the congestion in Manet.

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