International Journal of Current Trends in Engineering & Technology
www.ijctet.org, ISSN: 2395-3152
Volume: 08, Issue: 01 (January-February, 2022)

A survey on Light Load Path Selection Techniques for Control Congestion in MANET

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Abstract— *The Mobile Ad-hoc Network (MANET) is made up of a temporary network, without the need for central management or traditional support equipment available in a conventional network, thereby forming an infrastructure-free network. In order to ensure the future of mobile, ad hoc networks are built everywhere. Congestion, which is the crucial cause for a connection break due to undue network load, leads to node loss and a shift in the topology of the ad-hoc network. Excessive loading of the nodes causes the buffer overload, which further causes the packets to be lost. This triggers packet delay and affects the packet delivery ratio of the MANET protocol. Load balancing is a solution to avoid network congestion. If the load is balanced, it can efficiently network utilisation, reduce packet latency, and increase the packet distribution ratio. Transferring loads of congested routes to less congested routes increases overall network efficiency. Ad hoc On-Demand Multipath Distance Vector (AOMDV) chooses a path with a lower hop count and discards higher hop count paths. This paper provides a study of congestion management routing strategies to detect and prevent the risk of congestion in MANET.*

***Keywords*—Congestion, Multipath, Load balancing, MANET, Routing**

I. Introduction

Mobile Ad-hoc Networks Mobile (MANETs) are ideal for cutting-edge applications due to their mobility and lack of installed infrastructure. In order to create a MANET network, there are several obstacles and challenges to overcome. End-systems will collect information about each used path at the transport layer, including congestion state, capability, and delay. This information will subsequently react to network congestion by diverting traffic away from overburdened methods [1]. MANETs (Mobile Ad-hoc Networks) are visually stunning components for modern apps. In order to create a Manet network, there are numerous obstacles and challenges. One of the live challenges in MANET is congestion. If a sender node needs to send knowledge into a specific receiver, the initial broadcast routing packet onto the network and obtain destination through the shortest path (if we use AODV) or minimum intermediate hop (if we use DSR) once obtaining path sender sends actual knowledge t is a result, some scientific titles have been filed to reduce network congestion. This overview will concentrate on congestion step-down minimisation multipath routing in ad hoc networks and transport layer or rate analysis based on congestion management in MANETs. The sender provides data to the receiving node over many paths in the multipath technique, which improves network unit management performance. Once we assess the sender's information rate, we minimise the exploit rate using transport layer techniques if the sender's rate is higher than the receiver node's. Multipath routing is a way of discovering numerous routes among different providers and a single destination simultaneously as a single route discovery [2]. The multipath routing protocols will solve the current challenges in MANET, such as quantification ability, security, network period, and so on [3]. In MANETs, this protocol improves end-to-end throughput and provides load reconciliation.

II. Congestion in MANET

Congestion occurs in communication networks when large packets are present in the subnet. It also occurs when the number of packets sent to the network is greater than the network can handle. Congestion results in packet loss bandwidth degradation. On the Internet, congestion occurs typically in a single router, whereas the congestion in MANET affects the entire coverage area.

- Long delay: Congestion is severe when packets are received with a long delay. It is preferable to choose a new alternative path. However, the current protocol causes a delay in finding a new route.
- Packet Loss: Congestion is severe when packets are received with a long delay. It is preferable to choose a new alternative path. However, the current protocol causes a delay in finding a new route.

A. Congestion types

There are mainly four types of congestion described [4] as follows:-

- Instantaneous Congestion: This is produced by minor bursts of IP traffic, naturally occurring.
- Baseline Congestion: It appears to be caused by systematic network or hop capacity under-engineering (or due to simple source overflow described earlier).
- Flash Congestion: In a heavily used network, it refers to frequent but brief times of overload, where bursts from individual sources combine to cause severe packet loss hills.
- Spiky Delay: This is a circumstance in which no packets are sent for an extended period, causing packet transit delays to spike from a few milliseconds to tens of seconds.

B. Congestion Control

Congestion control refers to approaches and mechanisms that can either prevent congestion from occurring or eliminate congestion that has already

occurred. Congestion control mechanisms can be divided into two major categories: open-loop congestion control (prevention) (prevention) and closed-loop congestion control (removal). The issues are also observed with high data rates in other networks [5].

III. Overview of Queue Warning/Speed Harmonisation Process

The complete procedure for providing queue management and speed harmonisation from high-level Queue warning and speed suggestions will be developed using data from connected vehicles, infrastructure weather and traffic sensors, and mobile weather monitoring systems. Both infrastructure-based and connected vehicle-based systems are included in this data. After gathering data from numerous sources, it is processed and aggregated into a format that the algorithm's many components can use. The prototype will first determine whether the roadway is in a queued (i.e., following a breakdown where stop-and-go procedures are in effect) or congested state (i.e., before breakdown has occurred but where speeds are below free-flow conditions). The investigation will begin by looking at all lanes (i.e., the link level). If no queues or congestion are observed at the link level, the analysis will move to the lane level to look for queuing. For each circumstance, recommended travel speeds will be defined. Messages will be generated based on the research findings, including queue warnings and recommended travel speeds for motorists driving through the section. Both linked automobiles and infrastructure devices will transmit the data to a vehicle. This is a prototype dynamic speed harmonisation/queue warning system, so take it with a grain of salt. This prototype shows how connected vehicle data may improve the accuracy and timeliness of traffic control responses. This prototype shows various techniques to provide dynamic speed harmonisation and queue warning. This prototype isn't supposed to be the final product. Other techniques to provide queue warnings and dynamic speed suggestions in congested and queued states may be viable in an entire deployment situation.

IV. Literature Survey

This section describes related research in congestion control and reliable route discovery with different methods. These works are unique, which helps to develop a new module for congestion control in MANET.

Gagandeep Singh *et al.* [6] "Effective Congestion Control In MANET" This title describes an improved technique to congestion management in MANETs using Ad-hoc On-Demand Multipath Distance Vector Routing. The source in the suggested method chooses a better neighbour node from a group of neighbours with a sufficient queue size to participate in the routing operation. The crowded node sends a warning message to the source of the route reply queue and efficiently monitors congestion. The proposed solution provides a higher level of service quality (QoS) than the present research.

Dimitris Kanellopoulos [7] "Congestion control for MANETs: An overview" This title discusses TCP upgrades for wireless links are discussed in this title. It examines the issues of designing an upgraded transport protocol and proposes MANET congestion control techniques. There is no need to establish any infrastructure in a MANET to allow nodes to connect. MANETs have specific characteristics that make congestion control more difficult. The typical TCP congestion control mechanism cannot deal with the unique characteristics of a shared wireless multi-hop channel. The shared nature of the wireless channel and the frequent changes in network topology present substantial issues.

Geetika Maheshwari *et al.* [8] "A Survey on Congestion Control in MANET" In this title, This title's goal is to compare and contrast several potential congestion control strategies. A mobile ad hoc network is an ad hoc network that can move around and reconfigure itself on the fly. Wireless connections are used to connect multiple networks in MANETs. A mobile ad hoc network faces several concerns and challenges. In a mobile ad hoc network, congestion control is a difficult task. When demand outnumbers available resources, congestion arises; various strategies have been proposed to overcome the congestion in the mobile ad hoc network. Congestion control systems work to alleviate congestion either before or after it occurs.

Shaik Arshiya Anjum *et al.* [9] "Congestion Avoidance Methods Using Caching Information Technique in IoT and MANET" This article provides an overview of the various congestion control approaches utilised in MANETs. Congestion can occur, resulting in increased transmission latency and packet loss—more extensive networks with higher network traffic and high mobility necessitates dynamic topology face a more severe problem. We propose a bandwidth-aware routing method (BARS) to address these difficulties by monitoring residual bandwidth capacity in network pathways and available space in queues to cache information. Before sending messages, the quantity of available and spent bandwidth and residual cache must be calculated. The BARS use a feedback mechanism to inform the traffic source, adjusting the data rate based on bandwidth and queue availability in the routing path.

S.Sheeja *et al.* [10] "Effective Congestion Avoidance Scheme for Mobile Ad Hoc Networks is a term used to describe a congestion avoidance scheme for mobile ad hoc networks. We proposed developing the Effective Congestion Avoidance Scheme (ECAS) in this study, which includes congestion monitoring, effective routing establishment, and congestion-free routing. Congestion monitoring determines the total level of congestion. We offer a contention meter in terms of the packet queue length, overall congestion standard, packet loss rate, and packet dropping ratio during route establishment to monitor the congestion situation. Congestion-less based routing is designed based on the congestion

standard to reduce packet loss, excessive overhead and long delays in the network.

Harsh Pratap Singh *et al.* [11] "Congestion Control In Mobile Ad Hoc Network: A Literature Survey" In mobile ad hoc networks, congestion is a significant issue. Every node in such a network act as a router and can send packets from correspondent to respondent. Because of the bandwidth's limited capacity, every node may transmit a packet simultaneously, resulting in congestion, which causes long delays and substantial packet loss, lowering the network's performance. This network has a shared behaviour and a dynamic topology; it automatically constructs it for transmission purposes. Many solutions have been proposed in the past to address these issues. This title provides an overview of existing approaches and compares different congestion control techniques.

Khalid A. Alattas [12] "A Novel Method for Avoiding Congestion in a Mobile Ad Hoc Network for Maintaining Service Quality in a Network "In this title under the mobile ad-hoc network The main reason for congestion in this title under the mobile ad-hoc network system is the limited availability of resources. The standardised TCP-based congestion control mechanism, on the other hand, is unable to control and handle the significant features of a shared system of wireless channels. Through the process of determining the mechanisms of congestion on a comprehensive basis, it has an impact on the design of appropriate protocols and protocol stacks. Furthermore, compared to traditional TCP systems, the primary environment associated with mobile ad hoc networks is considered more problematic overall. On the other hand, an agent-based mobile congestion strategy is being designed and developed as part of ad-hoc network systems' efforts to prevent congestion.

S. Shanthini [13] "Red Congestion Control with Energy-Aware Auction Based Route Selection in MANET" In mobile ad hoc networks, congestion is a significant issue. To address this problem, MANET has several congestion control techniques. One of the congestion control techniques is the RED algorithm. It decreases packet loss and controls transmission delay by increasing the queue's buffer size. The suggested technique uses the red algorithm to control congestion after fine-tuning the energy-aware auction-based route selection.

Veguru Gayatri [14] "A Study on Congestion Control in Mobile Ad-hoc networks" The subject of congestion control in mobile ad-hoc networks is discussed in this title (MANETs). TCP does not perform correctly with the particular effects in MANETs because of the differing structures. TCP was created for the Internet, a network with unique characteristics. As a result, effective congestion control is often a significant challenge for MANETs. The multipath approach is also used in the hybrid approach in MANET [15].

S.TamilSelvi. *et al.* [16] "A Novel Scheme for Congestion Control in Mobile Ad Hoc Networks" To improve the energy efficiency of the nodes, we created Energy Efficient Scheme for Congestion Control (EESCC) in this title to avoid congestion, multipath routing is required. By estimating the data energy level and acknowledgement packets, retransmission of packets is minimised. With the help of intensive modelling, this approach achieves low latency, low energy usage, and a high packet delivery ratio.

Remya A *et al.* [17] "A Review on Congestion Control Methods in Mobile Ad-hoc Networks" This article provides an overview of the various congestion control approaches utilised in MANETs. MANET (Mobile Ad hoc Network) is an ad hoc network whose nodes are mobile smartphones. There will be no centralised infrastructure. Multi-hop communication and dynamic topology are only a few of the features. It does, however, have limited resources and security. The network may become congested due to resource constraints.

V. Proposed Congestion Control Approach

The Nodes are free to travel randomly and arrange themselves arbitrarily; thus, wireless topology networks can change quickly and unpredictably. Congestion is the crucial issue of node collapse. A combined protocol is thus necessary to provide solutions to all of the problems mentioned above. For mobile ad hoc networks, mutual broadcast media is used. In all nodes in a collision domain, medium power is shared, which is inadequate. Multicast connectivity is essential for these networks when transmitting data to different destinations, as it helps save money. Group contact is applied to this broadcast medium, an intrinsic characteristic of many proposed MANET applications. Therefore, it is necessary to prevent the collapse of congestion in wireless multi-hop networks to manage congestion effectively. The research proposal is essential for the following purpose:- proposal works under the mobile ad-hoc environment with load aware and loads balancing routing strategies, so we distribute routing load to each mobile node when some are heavily loaded. In this paper, we have identified the problem based on our literature review and set the objective to overcome some of the issues found in previous work. The proposed work under the multipath routing strategies provides fast and congestion-free communication. It provides reliable and low overhead and increases the throughput of the network. It's provided load balancing and load awareness for the network in the MANET environment. Most of the latest protocols have individual load balancing, congestion, or fault-tolerance solutions. So to provide solutions to all the above problems, a combined protocol is required. This paper proposes a congestion control approach to achieve load balancing and prevent network congestion.

VI. Conclusion and Future Work

This article reviewed congestion management strategies to accomplish load balancing and avoid network congestion. As the total load of the current connection increases above the threshold and the remaining battery capacity of the node reduces below the threshold, it distributes the traffic over disjoint multipath routes to reduce the traffic load on the congested link. Algorithms for discovering multipath

routes quantify multiple fail-safe paths that include all intermediate nodes on the primary path with multiple routes to the destination. The Survey has been told that if we minimise congestion by selecting uncongested routes for sending RREQ and data packets and moving loads to higher hop count, alternative paths, nodes, or routes will be congestive. Various strategies are proposed for those relevant to pace, alternative direction, and identification and multipath provision. AOMDV came up with the benefit of finding multiple routes and picking the path with the lowest hop count value, yet again enduring the downside of the route discovery source on the loss of the node.

The potential delay-based solution to congestion management helps to reduce congestion in MANET. These protocols can prevent traffic congestion by executing a good path discovery strategy, balancing the load on account of congestion that will avoid node errors and increase the packet distribution ratio, latency, decreased packet delay and packet drop efficiency metrics.

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