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Control bit Based Congestion Control in Mobile Ad-hoc Network using OLSR Protocol

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Abstract:MANET is mobile ad-hoc network having various mobile nodes moves from position to the other position. While moving they can be at different speeds. Such that sometimes they are neighbor of given node and some time they become neighbor of other node. Each time the neighbor lists get changed. So each time each node has to upgrade the neighbor list. Each source node identifies the route by broadcast the route request. In congestion control mechanism in current research control bit is used. Before sending any data packet control signal will be send. If this control bit will be acknowledged then path is assumed to be cleared from congestion and send the packet on the route. Else alternative route will be selected. While this technique performance will be measured on the basis of different parameters like end to end delay, packet Delivery Ratio, Success rate and throughput. Under current research someparameter has improved compared to the previous mechanism. This we have tested over to the OLSR protocol and compared it with AODV based existing technique.

Key terms: *MANET, Control Bit, Congestion.*

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I. INTRODUCTION

Mobile Ad hoc network (MANET) provides extremely flexible technology for communication between the mobile wireless devices (nodes). The infrastructure less network is supported by the MANET and it has no requirement for the fixed infrastructure. MANET have very enterprising use in emergency scenarios like military operations & disaster relief operation or some temporary requirement like conference & seminar at new place where there is no earlier network infrastructure exist and need alternative solution. In MANET each mobile node acts as an intermediate switch and extends the transmission range of mobile nodes and act as transceivers also.

The routing is the primary task by all mobile nodes for transmission of packets to the destination nodes. In MANET, routing packets in an efficient manner is the challenging task .It is very important and complicated one. In the last decades wireless technology has tremendous growth in all fields. The wireless communication technology takes two forms of communication between the devices; Fixed (infrastructure) wireless communication and ad hoc (infrastructure less) wireless communication. In Fixed (infrastructure) wireless communication as shown in Fig. 1, the packet transmission and communication is done between the wireless nodes by the Access Points (AP), but not directly between in wireless nodes. The AP act as a bridge for both of the wired and wireless networks.

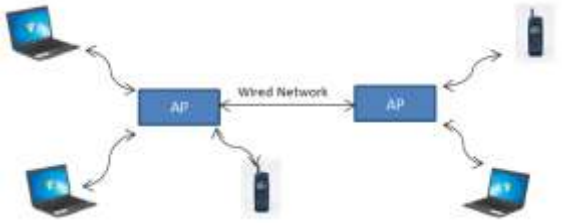

Figure 1: Infrastructure wireless communication

Each of these wireless nodes has their own logical link to the Access Point (AP) as shown in the Fig. 1. The AP plays a major role, because it controls all of the network functionality. In the Ad hoc wireless networks, it is shown in Fig. 2, there is no AP and each node communicates directly with each other and does not needing any infrastructure. In this network complexity to each node is very higher. Each node needs to implement the medium access mechanism, mechanism for hidden/terminal problem, priority mechanisms, providing QOS, forwarding data.

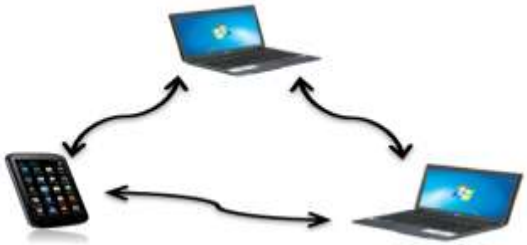

Figure 2(MANET Connection)

The direct communication between the mobile devices is allowed in ad hoc network as shown Fig.2, but it not provided by the fixed infrastructure network. Hence in the direct communication the routing plays main role for data packet transmission to the destination. In the next section it is discussed about various types of routing protocols and their routing functionalities about how well Mobile ad hoc networks (MANETs) are networks without infrastructure and having mobile nodes communicating with each other through multi hop wireless links. In mobile ad hoc networks, devices are self-organizing which makes its communication setup and maintenance completely different from other networks. Each node in MANET's can act as both a router and a host. Hence mobile ad hoc network can be deployed easily with a high degree of freedom and low cost.

MANETs are considered to be resource limited, for example, low wireless bandwidth, limited battery capacity and computing power and dynamic in nature, for example topology changes and channel fading. Recent advances in wireless technologies have resulted in a large number of wireless devices participating in the ad hoc network. Some real time scenarios like military, civil applications and sensor networks may involve thousands of nodes. These applications may take advantages of self-organization of large-scale ad hoc networks.

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ROUTE ESTABLISHMENT

A node that seeks communication with the other node in the network starts a path discovery unless the node has route entry of the destination node in its neighbor table. Path discovery process is initiated by generating a Route REQuest (RREQ) packet. In AODV protocol the RREQ packets are broadcasted by every node in the network until the destination is reached which creates channel contention and congestion problems thus by reducing the network performance. To overcome this problem, in our algorithm, the generated RREQs are not blindlyflooded; instead they are selectively broadcasted as illustrated in figure

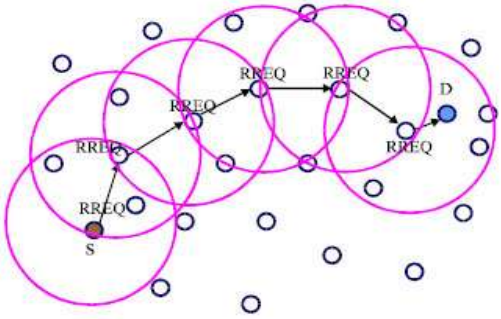

Figure 3(path Establishment in MANET)[13]

Of n neighbors a node, n/k farthest neighbors are chosen for rebroadcasting the RREQ packets, where k is the reachability parameter since the node density in the network is considered to be high, the probability of reaching the destination through selective/border node retransmission is very high. This has been thoroughly studied by Sankar and Sankaranarayanan (2010). Alternate paths (if any) are constructed during the route reply phase and maintained by every node that handles the RREQ packet.

II. RELATED WORK

Congestion Control is an advanced area in research and new development in mobile ad hoc network. Congestion occurs when resources are limited and demand is more. In this paper, they have proposed a new approach named as CRAODV for congestion control in MANETs and compare the same with the EDMR algorithm [1].

A new Proposed Modified Hybrid approach is the variant of Hybrid-TCP (H-TCP) and TCP Reno. Proposed Modified Hybrid–TCP variant consider the rate of increment parameter based on signal strength and noise factor to estimate a accurate retransmission time. Proposed Modified Hybrid-TCP is simulated using NS2 simulator and evaluated according to size of congestion window, packet delivery ratio, throughput withrespect to mobility factor (speed of node). Performance observation concludes that proposed Modified Hybrid-TCP variant raises significant performance improvement during transmission over traditional TCP variants [2].

Consuming less energy to evenly distribute the traffic load defines a major task for efficient routing protocols in Mobile Ad hoc Networks (MANETS). Indeed, this process can avoid congestion, increases the network lifetime and maintains consequently green communications [3].

MMDSR is very efficient algorithm for video streaming which can be embedded with this framework to enhance the performance. In this proposed framework traffic is sorted into categories according to their QoS requirements and priority. Admission of each flow drives through a special module which controls admission by traffic differentiation and prioritization of it. Resource adaptation module in framework is responsible for manage the resources and congestion control. Proposed framework may enhance the performance of MMDSR by managing entertained traffic in very regulated and mannered way [4].

Congestion detection is quite difficult in wireless network, because there are several reasons behind packet drop. In mobile networks, unsuccessful delivery could be due to the route breakdown as well because of the mobility of nodes. So congestion is not the only reason for packet losses. The congestion control approaches that are used in wired network cannot be directly applicable in wireless networks. This paper contains a survey on various existing congestion control techniques [5].

ArvindKushwahaprovides a novel solution to transfer server load from one server to another server. Energy efficiency is a critical factor for operation of ad-hoc networks. Proposed algorithm will divert the load from low energy node to high energy node. The complete proposed solution will work to discover multipath routing for and congestion control and load balancing for MANET[6].

Weight-based clustering algorithm in ad hoc network is an on demand clustering algorithm for multi-hop packet radio network. These types of networks are ad hoc networks and dynamic in nature due to mobility of nodes. Clustering in mobile ad hoc network can be defined as various partitions into various groups. It is an important concept of VANNET, because clustering makes it possible to guarantee of system performance, such as throughput delay and also security issues[7].

In vehicular Ad-hoc network safety is one of the major issues for the researcher and it depends on the delivery of the information among the vehicles. Due to the recent advances in the hardware and technology the researcher has concern to improve vehicle and road safety, traffic efficiency, and convenience as well as comfort to both drivers and passengers [8].

III. ALGORITHM

For Congestion control various steps are being followed. These steps are being considered as flow for the activity to perform.

Step1: Set the network with different number of nodes. First distribute them randomly in the specific sized network.

Step2: Set the routing protocol as OLSR to identify the optimized routing protocol.

Step3: Send the control bit over to the selected path.

Step4: If the control bit is acknowledged then path is assumed to be clear from the congestion. Else route will be having congestion. And send to the step 3

Step5: Send the packets over to the path once path is free from congestion.

Step6: Identify the performance parameters.

Step7: End

IV PSEUDOCODE

Step1: Set the network with Different Number of Nodes

Step2: Identify the route from source to destination using optimized link

Step3: Send the control bit to know the congestion over the network.

If (ack. Bitis not received)

Goto step2

Else

Send the data packet onto the set route.

End

V RESULTS AND DISCUSSIONS

5.1 Network Configuration

Parameter	Value
Number of Nodes	40
Routing Protocol	OLSR
Communication Protocol	TCP,UDP
Application	FTP,CBR
If Queue Length	50
Packet Size	512 Bytes
Delay	2 ms

Table 1

5.2 Performance Parameter

1. *End to End Delay:* It is the total delay that has been produced while sending the data packet from source to the destination. It is generally the difference between the receive time and the sent Time.

End to End Delay= Receive time - Sent time

2. ***Packet Delivery Ratio:***It is the ratio of packets successfully sent at destination and total packets Sent.

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Pdr= Packets Received/Total Packets

3.*Success Rate:* It is the success rate at which packets are being sent from source to the destination.
Successrate=(PacketSent-PacketDropped)/(Total Packets)
4. ***Throughput.:***It is total packets sent per unit interval of time.

Throughput=Packets Received/Total Time

5.3 Nam Animation of Network

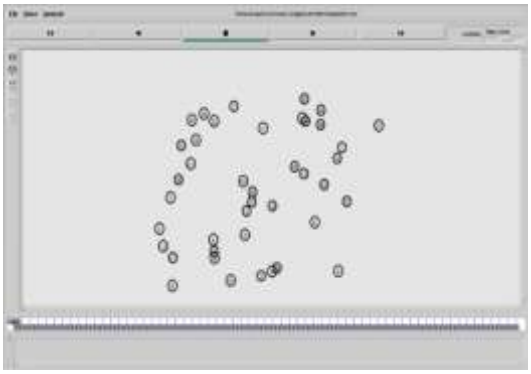

Figure4

This snapshot shows the 40 nodes network. These nodes are wireless nodes. Inter communicates to each other. We can consider any node as source node and other as destination node.

5.4 Nam Animation for Communication between Nodes

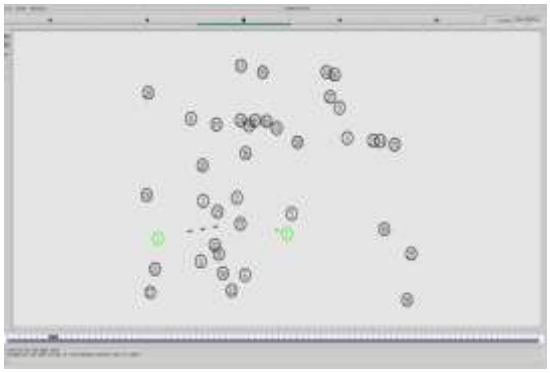

Figure 5

5.5 End to End Delay

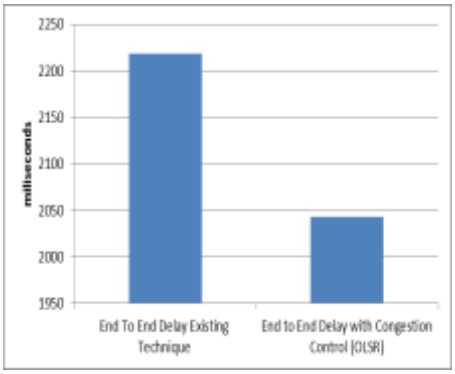

Figure 6

This graph shows the comparison of End to End Delay between two cases that is with existing congestion control and with OLSR based congestion control. When congestion is controlled end to end delay will be reduced to some extents.

5.6 Packet delivery ratio

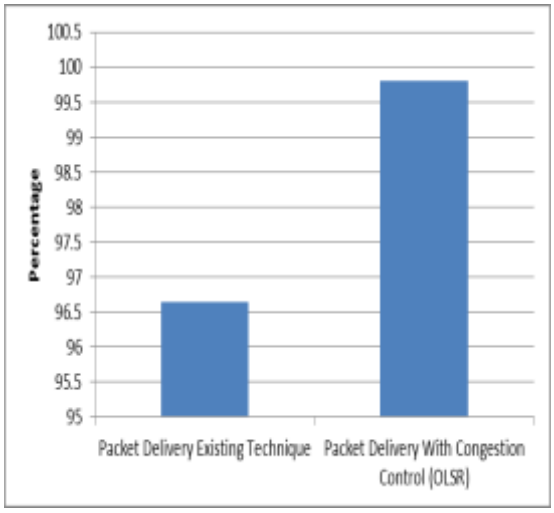

Figure 7

This figure shows the comparison graph for both the cases.There is a improvement with congestion control. That means while congestion is controlled the packet Delivery ratio will be improved.

5.7 Success rate

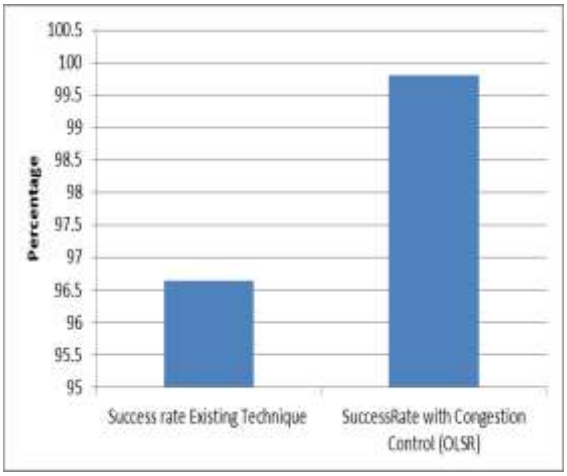

Figure 8

This graph shows the success rate comparison of two situations. The success rate has shown the improvement.

5.8 Throughput

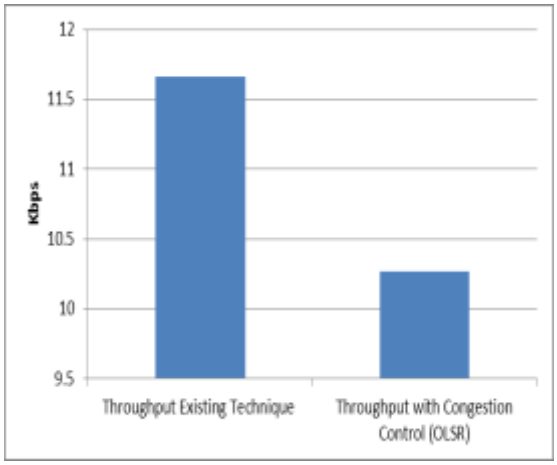

Figure 9

This graph shows the throughput comparison of two situations that is existing technique and technique with OLSR congestion control.This throughput can be enhanced if it doesn't include the time taken to establish the path from source to the destination in optimized link state technique.

VI. CONCLUSION

MANET is the network having very less infrastructure. This type of network is ad-hoc in nature. It is having property of easy to set network. Due to the reason there is no central controller node, there is a high vulnerability to have congestion in the network. This congestion can leads to the network performance downgraded. Using congestion control mechanism that is control bit any node which is generating the congestion can be known in time so that the alternative route can be identified. That previous route will remain out till its previous traffic gets cleared. While doing so various factor measured to know the performance of the network like end to end delay, packet delivery ratio and success rate has shown the marked improvement. So overall we can say MANET can be efficient from congestion with various congestion control mechanism.

VII. FUTURE WORK

In current research the OLSR protocol has been taken into considerations. In the existing solution by using OSLR resulted throughput is dipped somewhat. So, in future work there can be enhanced performance of the OSLR. Later this research can further be enhanced by considering another hybrid category of protocol.

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