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Shyna Grover
M.Tech (Student)/PG Scholar
Department of Computer Science and Engineering
GZS Campus College of EngineeringAnd Technology (MRSPTU), Bathinda, Punjab, India

Prof. Dinesh Kumar
Professor
Department of Computer Science and Engineering
GZS Campus College of Engineering And Technology (MRSPTU), Bathinda,Punjab, India

Correspondence:
Shyna Grover
M.Tech (Student)/PG Scholar
Department of Computer Science and Engineering
GZS Campus College of EngineeringAnd Technology (MRSPTU), Bathinda, Punjab, India

Efficient Energy Based Reliable Protocol for Real Time and Non-Real Time Data Transmission in Multicast Streaming in MANET

Shyna Grover

Abstract
While communication they use buffer at the intermediate node. Such that frequently asked data can be send from intermediate node as non-real time data. If buffer is about to fill, intermediate node sends signal to the sender node, it will slow down the transmission of data. Overall the data can be of two types one is real time data and another is non real time data. Real time data will be sent directly from the source node, and non-real time data will be sent from the intermediate node.The weighted value of the incoming data packets is determined by the priority manager and accordingly the data priority is assigned. The calculation of the cumulative weight is calculated based on no. of hops, deadline and waiting time. Trust factor is established so that those paths can be selected which has higher trust factor. The technique has been compared to the previous research on different parameters like end to end delay, packet delivery, latency, packet reliability rate, packet stability rate etc. such that all the parameters has shown the improvement with different percentages. Packet delivery has improved by 22.44%, end to end delay has improved by 55.47%, and latency has improved by 27.49%. Itself.

Keywords: MANET, Buffer Management Protocol, Real Time Data, Non Real Time Data

Introduction

What is MANET?
Mobile ad hoc network (MANET) is a collection of mobile nodes connected with wireless links. Deployment of MANET does not require any fixed existing infrastructure or any centralized administrator. There is no need of any static infrastructure or base station for communication. As all the nodes in a MANET are wireless in nature, they are free to move randomly. MANET can be implemented in different application areas ranging from military battle field to disaster management. It can be implemented wherever it is not feasible to establish a physical infrastructure. However, MANETs have some limitations also such as unreliable communication medium, dynamic topology, limited bandwidth, battery power and lifetime etc. Multicast Routing is also a challenging task in a MANET.

What is Buffer?
Buffer is defined as any kind of space which helps to store data temporarily that is being moved from source and destination. Buffers are mainly used in conjunction with Input/ Output Devices. The main purpose of buffer is to act as holding area which store data for some amount of time.

What is Multicasting?
Multicast is defined as a communication between senders and receivers. The communication between nodes can be one to one and one to many nodes. This is very beneficial in routing because we can send large amount of data from source to destination.

Buffer Management Protocol
Buffer management protocol is used for sending and receiving of data in multicast group. In

this buffer space is divided into two parts: Real time and Non-Real time.

Real Time: if the requested video data are directly send from source to destination then that data is called real time data of traffic.

Non-Real Time: if the frequently requested video data are send from intermediate nodes to destination then that data is called non-real time data or traffic.
After that real time and non-real time data are placed into respective partitions and cumulative weight of received packets are calculated according to their distance, number of hops and waiting time. Based on that estimated cumulative weight transmission priorities are assigned. Buffer space is dynamically adapted based on number of multicast receivers.

Releted Work

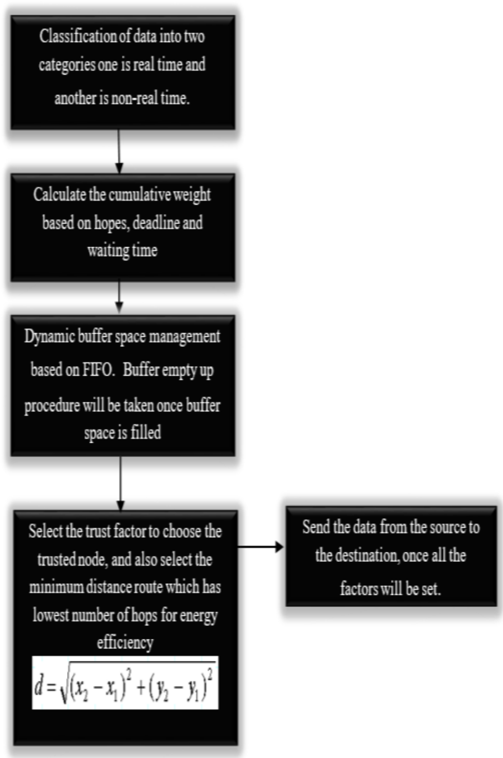
[*1*]*Kavitha Subramaniam*(*2016*)* et al*: In Mobile Ad-hoc Networks***(***MANET***)*** multicast streaming is handled by various buffer management techniques since it involves real-time data. From source to destination, the video data can be buffered in all the intermediate nodes. Buffer management protocols are used to manage and streaming of data in multicast group. After receiving the packets at destination, they are divided into two groups: real-time and non-real time and then are placed in queues respectively. Cumulative weights of the packets in real-time buffer are calculated and then transmission priorities are assigned. The buffer space is adapted according to the number of nodes present in source and destination. This buffer management protocol increases the packet delivery ratio and reduces the latency and energy consumption.

[2]* S. Gopinath*(*2015*)* et al*: Mobile Ad-hoc networks ***(***MANET***)*** is a infrastructure less network which results in less packet forwarding ratio and large amount of overhead. Residual Energy based Reliable Multicast Routing Protocol ***(***RERMR***)*** is a protocol which helps in high packet forwarding ratio. Trustworthy path is chosen among all available paths and data packets are forwarded on that path. The best path is chosen based on high residual energy. This protocol will increase the network stability rate and reliability rate.

Algorithm

1. Initially when a multicast tree is developed, at every intermediate node, a buffer is created.
2. The buffer space is divided into two divisions: real time ***(***RT***)*** and non-real time ***(***NRT***)*** buffer space.
3. When an incoming data arrives at an intermediate node, the classifier classifies into either real time or non-real time traffic.
4. The buffer space is adjusted by the Queue size manager by borrow or push out technique.
5. When the RT buffer space is full and there exists a free space in the NRT buffer space, then the RT buffer space temporarily borrows some free space from the NRT buffer space so as to avoid discarding the incoming RT traffic.
6. When the entire buffer is full, then the push out process is followed when a new data arrives.
7. The weighted value of the incoming data packets is determined by the priority manager and accordingly the data priority is assigned. The calculation of the cumulative weight is calculated based on no. of hops, deadline and waiting time.
$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
8. Trust factor is established so that those paths can be selected which has higher trust factor.
9. For Energy efficiency route will be selected which has lowest number of hops out of many routes.
10. When the partition is full and if a new packet arrives for RT, then as the used space for NRT is still larger than the threshold, NRT will push out lower-priority packets at the tail, thus generating space for RT to borrow.

Flowchart



Simulation Parameters

Latency: Latency is defined as extra amount of time required by a node to send data from source to destination. For any multicast communication latency should be less.

Latency=Received time-Sent time

Packet Delivery Ratio: PDR represents ratio of total received packets at the destination to total initiated packets from source node. It represents both the completeness and correctness of the routing protocol.

$$PDR=\frac{\sum CBR\_RCV}{\sum CBR\_SND} X100(\%)$$

End to End Delay*:* This is the average of total summation of time taken by each packet to reach from source node to destination. The average is calculated by dividing with the total number of received Packets

$$AVR\_DLY = \frac{\sum (TIME_{CBR\_RCV\_i} - TIME_{CBR\_SND\_i})}{\sum CBR\_RVD} (ms)$$

Simulation Configurations

Simulation Parameters	
COVERAGE AREA	800m x 641m
PROTOCOLS	AODV
NUMBER OF NODES	100
SIMULATION TIME	100 seconds
TRANSMISSION RANGE	250m
MOBILITY MODEL	RANDOM walk Model
LOAD	1000 Bytes
MOBILITY SPEED*(variable)*	*(4)*Seconds
TRAFFIC TYPE	CBR, UDP, FTP, TCP
PACKET SIZE	1000 Bytes
PAUSE TIME	10 ms

Results and Anlysis

a. Latency

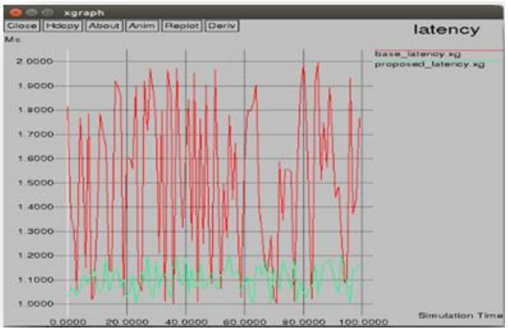


Fig.4.1: Latency

This xgraph shows that the latency of real with buffer and without buffer. The red color shows the latency of base technique and green shows the latency for proposed technique. The latency in current research is low compared to the previous research.

Comparative Graph for average latency

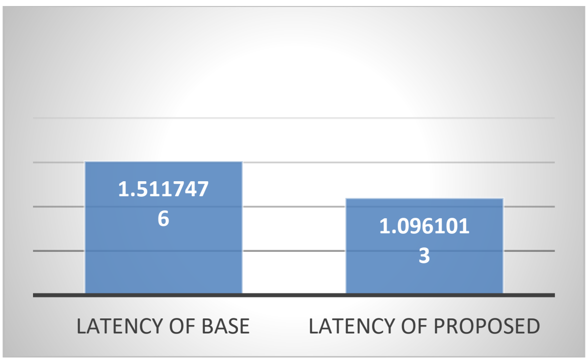


Fig. 4.2: latency graph

This graph shows the latency comparison of both base and proposed technique. In proposed it is clearly shown that the latency is less than the base latency. There is an improvement of around 27.49%.

b. End to End delay

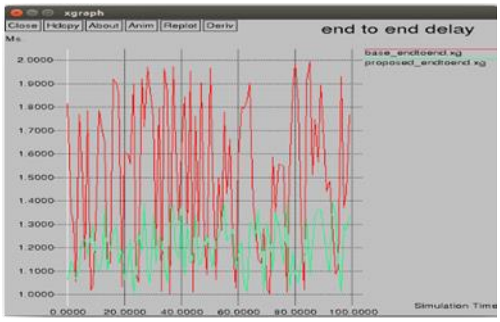


Fig 4.3: End to end delay

This xgraph shows end to end delay comparison of both base research and proposed research. Red line shows the base end to end delay and green line shows the proposed end to end delay. Proposed end to end delay is tremendously less than the base end to end delay.

Graph for comparing average end to end delay

Fig. 4.4: Average end to end delay

This graph shows the comparison of end to end delay for both base research and proposed research. Proposed research has improved end to end delay. The result has improved by around 20.44%.

c. Packet Delivery

Fig 4.5: Packet Delivery.

This figure shows the packet delivery for previous and new research. Red line shows the packet delivery for base research and green line shows the packet delivery for proposed. In case of proposed the packet, delivery has improved.

Graph for packet Delivery

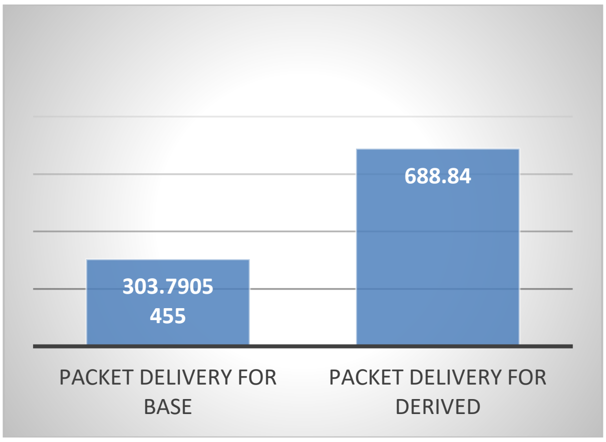


Fig 4.6: Packet Delivery

This graph shows the packet delivery for both the scenario. Such that proposed system has improved the packet delivery ratio. The result has improved around 55.89%.

Percentage Improvement

Parameter	Percentage
End to End delay	55.89%
Packet delivery	20.44%
Latency	27.49%
Packet Reliability Rate	18%
Packet Stability Rate	same

Values shows the all the factors have improved with different percentages. So real time with buffer management in MANET is suitable for multicast streaming of large data.

Conclusion

MANET with real time data transfer by using buffer management at the node level is most suitable technique. Buffer management is to meet the requirement to match the fast sender and slow receiver. Sender and receiver speed can be handshake using buffer at the source and the relay node. So that extra data can be stored at these respective nodes. The technique has been compared to the previous research on different parameters like end to end delay, packet delivery, latency, packet reliability rate, packet stability rate etc. such that all the parameters has shown the improvement with different percentages. Packet delivery has improved by 22.44%, end to end delay has improved by 55.47%, and latency has improved by 27.49%. Itself. On the whole, we can say buffer management for real time data transfer is suitable technique. In future, this technique can be tested on other routing protocols. So that global best technique can be identified. Various performance parameters can also be tested in those scenarios.

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