Delay Responsive Multicast Protocol for Network Capacity Improvement in Multirate MANETs

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ABSTRACT –

In the recent years the prominence of real time multicasting applications in Mobile Ad-hoc Networks like live streaming, VOIP, live streaming, video-conferences and internet games require a minimum delay. In multicasting multiple devices share the information at the same instance. In this paper a delay responsive multicast protocol is proposed which satisfies the delay requirements of real time applications, selects the path with minimum delay for each destination and thus increasing the network capacity. The simulation results show the proposed protocol reduces the aggregate delay and thus increases the throughput.

INTRODUCTION

Mobile Ad hoc Networks are multi-hop wireless networks that are characterized by scarce resources and dynamic topologies. The inherent characteristics of ad hoc networks place two key demands on any routing protocol (unicast and multicast) designed for such environments: efficiency and robustness. The scarcity of the resources entail a very efficient low overhead protocol while the dynamic topology entails a robust protocol that does not require frequent route re-computations (or does route re-computation in a lightweight manner).The present trend for data sharing applications is to transmit packets as multicast. Multicasting in MANET can be defined as data transmission from source node to multiple receiver nodes simultaneously. Due to this characteristic of multicast routing in MANET, it reduces the communication cost in terms of utilization of channel bandwidth reduce processing of sender and router node, memory utilization and various types of delays. So it is very efficient to multicast data packets, than sending the data separately.

Nowadays there are an ever increasing number of uses (e.g., VoIP, live streaming TV, videoconference, and web based gaming) that depend on real-time multicast services. All these services require low end-to-end delay in order to maintain its interactive and streaming nature. In such cases using a delay responsive multi cast protocol will make the system more efficient. A multicast protocol is said to be delay-responsive, if the delay requirements of the requested multicast services can be satisfied with specified confidence levels, i.e., specified percentages of data packets whose end-to-end delays are smaller than some predefined values. In order to construct a delay responsive multi cast tree, one should have knowledge about both one-hop delay and end-to-end delay. While one-hop delay represents the time lag in transferring a packet between two neighboring nodes, end-to-end delay represents the delay caused in transmitting a packet from source to destination. To build an efficient system both these delays should be reduced.

There are some advanced wireless modulation technologies, such as 802.11a, 802.11b, and 802.11g, which can operate with multiple data rates, in order to utilize the limited resources of MANETs more efficiently. In MANETs as the same radio channel is shared by all of its nodes, when a host is transmitting a packet, all of it neighbors are forbidden to send packets. Thus no information about the neighboring nodes is available. Previously proposed routing/multicasting protocols designed for single-rate MANETs or multirate MANETs suffer from the hidden route problem (HRP) or the hidden multicast route problem (HMRP), as a consequence of failing to collect neighboring information. When HRP or HMRP happen, bandwidth or delay requirements of ongoing flows are not satisfied and the network performance degrades considerably. I suggest the idea of measuring the busy/idle ratio of the shared radio channel, a method for estimating the one-hop delay and end-to-end delay in multirate MANETs. A delay-responsive multicast protocol for multicast services in multirate MANETs is proposed for determining multiple delay-sensitive routes concurrently from a server to all clients. It not only can avoid HRP, but can avoid HMRP while permitting multiple flows concurrently.

In order to enhance the network performance, there should be a tradeoff between the data rate used and the number of blocked hosts. The proposed multicast protocol intends to minimize the sum of the total transmission time of the forwarders and the total blocking time of the blocked hosts by taking the neighboring information of the forwarders into account and properly adjusting the data rates of the forwarders, while constructing the multicast tree. A multicasting route with less total transmission time and total blocking time can reduce the resource consumption to the network so that the network capacity is increased, i.e., more flows are admitted into the network.

2. RELATED WORK

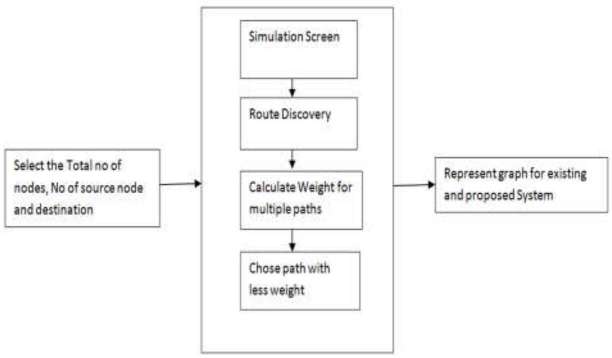
CEDAR is a calculation for QoS steering in specially appointed system conditions. It has three key parts: (a) the foundation and support of a self-sorting out directing framework called the center for performing course calculations, (b) the spread of the connection condition of stable high-data transfer capacity interfaces in the center through increment/diminish waves, and (c) a QoS course calculation that is executed at the center hubs utilizing just locally accessible state. Their starter execution assessment demonstrates that CEDAR is a hearty and versatile QoS directing calculation that responds adequately to the elements of the system while as yet approximating connection state execution for stable systems.

Not at all like CEDAR, most specially appointed directing calculations that we know about liberally utilize flooding or communicates for course calculation. As they had said previously, their experience has been that flooding in impromptu systems does not function admirably because of the wealth of covered up and uncovered stations. The specially appointed directing calculations in give a solitary course in light of a course question from a source; these calculations have low overhead however now and again utilize problematic and stale courses. It utilizes a spine structure for course calculation and support. While it gives ideal or close ideal courses relying on the idea of data put away in the spine hubs, it causes a vast overhead for state and spine administration. Past work on strategic bundle radio systems had prompted a considerable lot of the principal results in impromptu systems. It has proposed design like the center called the connected bunch head engineering yet it utilizes passages for correspondence between group heads and does not endeavor to limit the span of the framework. As is evident from our work, Qi Xue and Aura Ganz et al have utilized a significant number of the outcomes from contemporary writing. The thought of on-request steering, utilization of solidness as a metric to proliferate connect state data, bunching, and the utilization of group sets out toward neighborhood state total have all been proposed in past work in one shape or the other. They trust that our commitment in this paper is to propose a remarkable mix of a few of these thoughts related to the novel utilization of the center, increment/diminish waves, center communicate, and nearby state-based steering in the area of QoS directing. Thusly, they can figure great permissible courses with high likelihood and still adjust viably with low overhead to the elements of the system topology.

Qi Xue and Aura Ganz et al presented an asset reservation-based steering and flagging calculation, Ad hoc Qos on-request directing (AQOR), that gives end-to-end nature of administration (QoS) bolster, as far as data transmission and end-to-end delay, in portable specially appointed systems (MANETs). The expanding utilization of MANETs for exchanging sight and sound applications, for example, voice, video and information, prompts the need to give QoS bolster. To perform precise confirmation control and asset reservation in AQOR, they have created point by point calculations that enable us to assess the accessible data transfer capacity and end-to-end delay in unsynchronized remote condition. AQOR additionally incorporates effective instruments for QoS support, including brief reservation and goal started recuperation forms. The execution of AQOR is contemplated in detail by reenactment utilizing OPNET Modeler. The outcomes approve that AQOR gives QoS bolster in impromptu remote systems with high dependability and low overhead.

In this paper Qi Xue and Aura Ganz have presented Ad hoc Qos On interest Routing (AQOR) convention that gives per stream end-to-end QoS bolster in MANETs regarding transmission capacity and end-to-end delay. The execution and exactness of AQOR is examined by broad reproductions utilizing OPNET Modeler. Qi Xue and Aura Ganz characterized the accompanying execution measurements for QoS bolster in MANETs: movement affirmation proportion, end-to-end conveyance proportion, normal end-to-end delay, proportion recently parcel and standardized control overhead. Utilizing these measurements in the OPNET test system they infer that AQOR can effectively give maintainable QoS support to sight and sound applications. It can recuperate quickly from course breaks and channel weakening, limiting their impact on QoS streams. In light of its moment QoS infringement location and recuperation components, AQOR scales well with hub versatility up to 10 m/s with no noteworthy execution debasement. In expansive portable systems, AQOR powerfully modifies its confirmation strategy with the offered load and hub portability while keeping the conveyance proportion of the conceded stream stable at over 95%. The outcomes legitimize that AQOR's activity estimations and affirmation choices are precise and give high channel usage.

3. SYSTEM ARCHITECTURE



Selecting the Nodes:

Consider some number (for example 40) of nodes at random positions. In these nodes select the single node as a source node and multiple nodes as destination nodes for multicasting. Each node is assigned with random movement to different locations in simulation area. The node movement is adjusted so that the nodes will not go out of range of the simulation area.

Route Discovery:

First the neighbouring nodes of each node are detected. The neighbouring nodes are selected so that the nodes can communicate without loss of information in packets. The nodes are considered as neighbour if it is nearer to the position of its source node. After detecting the neighbouring nodes for each node a neighbouring nodes table is created.

Now each node is assigned with random weights. A higher weight indicates the node has a larger queue that can take more time to transmit the next packet through it. So the neighbours with lesser weights are considered for transmission of packets to the next forwarding node.

All the possible paths are calculated using dijkstra algorithm. The path with lesser weight is considered for transmission of information. Thus the selected path will have lesser waiting queue and results a lesser delay. The below algorithm can be used to calculate the path

for each $N_d \in H_d$ **do**

/* V is the set of all hosts. */

set $H_{i,d}=\emptyset$ for each $N_i \in V$;

set $w_{d,d}=0$ and $w_{i,d}=\infty$ for each $N_i \in V-\{N_d\}$;

apply Dijkstras algorithm to construct delay-sensitive minimal-weight routes from all hosts to N_d, with the following modifications:

1) $<N_i,N_j>$ is selected only if the addition of N_j to $N_d \rightarrow \ldots \rightarrow N_i$ does not cause delay violation to those routes that contain hosts in $H_{i,j}$ and

2) if $<N_i,N_j>$ is selected, then set $H_{j,d}=H_{i,d} \cup \{N_j\}$, and $w_{j,d}=w_{i,d}+w_j$.

}

determine $N_x \in F \cup D$ with $w_{x,d}=\min\{wj,d|N_j \in F \cup D\}$;

end for

Here N_i is i^{th} node (or host)

N_d is destination node

$W_{i,j}$ is weight of arc $<N_i, N_j>$

w_i is weight of N_i

F is collection of forwarders

D is collection of destinations

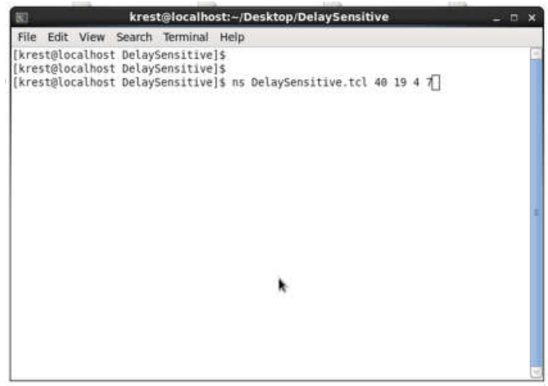
$H_{j,k}$ is set of hosts in an N_j to N_k route

Calculation of Delay:

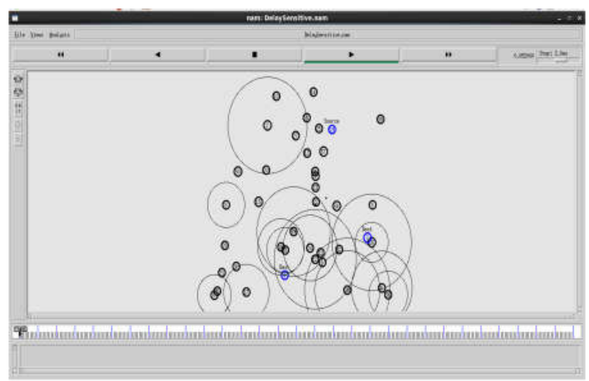
The packets are transmitted through the selected path. The Delay of one hop is calculated as difference between the sending time and replying time in the simulation of two neighbouring nodes. These one hop delays are added to get the total delay of transmission of the respective packet. Delay is calculated for the existing system and proposed delay responsive system for each packet transmitted. The average delay is calculated by considering some of the packets for comparing the existing and delay responsive protocol.

4. EXPERIMENTAL RESULTS

In this paper describing the concept to reduce transmission time in delay responsive (higher delay is not recommended) multicast protocol. In existing MAC layer technique all neighbors will be blocked till source data transmission to destination completed and other nodes that are in queue has to wait. To overcome from this problem we discover multiple routes to destination and form a tree and each path will be assign weight base on no of transmission pending, and the path with less weight will have less no of request and suitable for data transmission and can decrease delay and faster data transmission . The proposed algorithm accepts source and multiple destinations. Find the possible paths for destinations. Then choose path which has min weight path using dijkstraw shortest path algorithm.

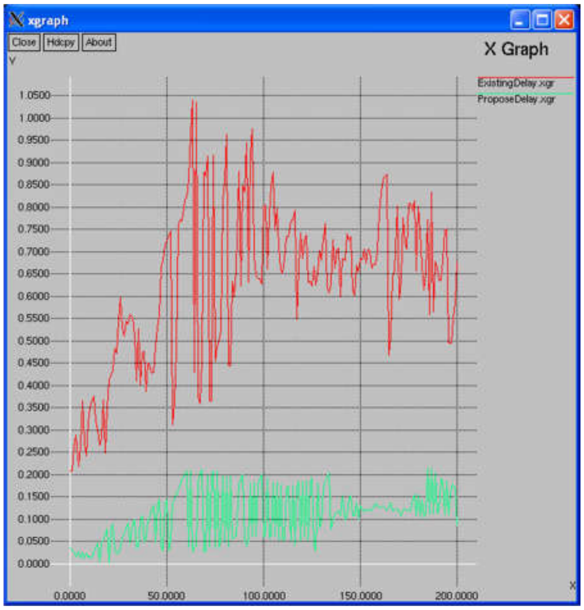


In above screen we are simulating existing MAC layer multicast technique using above command. 40 is total no of nodes and 19 is source node and 4, 7 are destination nodes.

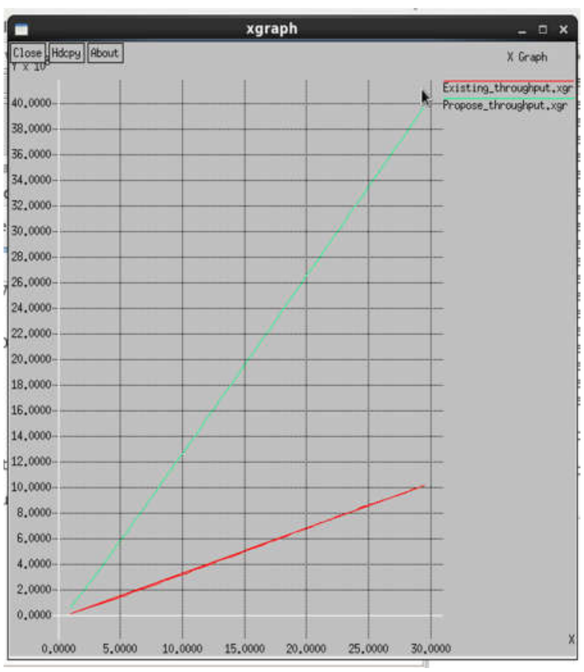


In above screen we can see discovery of neighboring nodes, path discovery and data transmission to destinations via multicast protocol.

In the below graph x-axis represents packet id and y-axis represents delay for that packet. Red line indicates existing delay and green line indicate propose technique. It can be seen that the proposed delay is very much lesser than the existing technique.



In the below graph X-axis represents time and Y-axis represents the throughput. The Red line indicates the graph for Existing throughput, and Green line indicates the throughput for the Delay responsive protocol. It can be clearly seen that green line is above the red line, indicating proposed throughput it more compared to the existing protocol.



5. CONCLUSION

Some of the existing multicast protocols are not delay dependent. They are not suitable for real time applications which require a lesser delay. A delay responsive multicast protocol is proposed which considerably minimizes the delay of transmission. The proposed delay responsive multicast protocol finds different possible paths to the destinations and selects the path with less overhead so that minimizing the total transmission time.

Since the delay is minimized the number of flows through the channel are increased in a specified time, thus increase in the channel capacity. The simulation results shows decrease in total delay of transmission and thus increase in the throughput. There are other factors can be considered to increase the channel capacity, some of them are Packet Drop Ratio (PDR), Bandwidth, Speed, and processing overhead of the routing.

REFERENCES

[1] R. Sivakumar, P. Sinha, and V. Bharghavan, “CEDAR: A core-extraction distributed ad hoc routing algorithm,” IEEE J. Sel. Areas Commun., vol. 17, no. 8, pp. 1454–1465, Aug. 1999.

[2] Q. Xue and A. Ganz, “Ad hoc QoS on-demand routing (AQOR) in mobile ad hoc networks,” J. Parallel Distrib. Comput., vol. 63, pp. 154–165, 2003.

[3] L. Chen and W. Heinzelman, “QoS-aware routing based on bandwidth estimation for mobile ad hoc networks,” IEEE J. Sel. Areas Commun., vol. 23, no. 3, pp. 561–572, Mar. 2005.

[4] P. Sinha, R. Sivakumar, and V. Bhanghavan, “MCEDAR: Multicast coreextraction distributed ad

hoc routing," in Proc. IEEE Wireless Commun. Netw. Conf., 1999, pp. 1313–1317.

[5] E. Pagani and G. Rossi, "A framework for the admission control of QoS multicast traffic in mobile ad hoc networks," in Proc. 4th ACM Int. Workshop Wireless Mobile Multimedia, 2001, pp. 61–68.

[6] A. Darehshoorzadeh, M. Dehghan, and G. Motlagh, "Quality of service support for ODMRP multicast routing in ad hoc networks," Lecture Notes in Computer Science, vol. 4686. New York, NY, USA: Springer, 2007, pp. 237–247.

[7] C.-C. Hu, E.-K. Wu, and G.-H. Chen, "Bandwidth-satisfied multicast trees in MANETs," IEEE Trans. Mobile Comput., vol. 7, no. 6, pp. 712–723, Jun. 2008.

[8] B. Zhang and H. Mouftah, "QoS routing for wireless ad hoc networks: Problems, algorithms, and protocols," IEEE Commun. Mag., vol. 43, no. 10, pp. 110–117, Oct. 2005.

[9] B. Zhang and H. mouftah, "QoS routing through alternate paths in wireless ad hoc networks," Int. J. Commun. Syst., vol. 17, pp. 233–252, 2004.

[10] J.-L. Hsu and I. Rubin, "Cross-layer multi-rate routing strategies in wireless multi-hop random access ne