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An Adaptive Rate Aware Session Admission Control for Mobile Ad Hoc Networks

K.C.Suresh[1], S.Prakash[2], Priya.A.E[3]

[1]Department of Computer science and Engineering, Tagore Engineering College

[2]Department of Electronics and Communication Engineering, Jerusalem College of Engineering

[3]Software Engineer, HCL Technologies Ltd, Chennai

Abstract*— Providing quality of service (QoS) guarantee in a mobile ad hoc network (MANET) is not easy due to node mobility, contention for channel access, a lack of central synchronization, and the unpredictable nature of the wireless channel. A QoS-aware routing (QAR) protocol and an admission control (AC) protocol are two of the most important mechanism of a system attempt to provide QoS guarantees in the face of the above mentioned difficulties faced. Many Quality aware based admission Control Protocol and AC-based solutions proposed, but such network layer solutions are often designed and studied with lower layer model.. This means that presented solutions are not considered for dealing with practical phenomena such link quality-dependent variation of link transmission rates

Keywords— ***MANET, Admission Control, Reservation, QoS, MAC***

I. Introduction

A Mobile Ad Hoc Network, also called a MANET, is an independent collection of mobile nodes able to communicate with each other over wireless links form a dynamic wireless network. The administration of such a network is decentralized, i.e. each node acts both as host and router and frontwards packets for nodes that are not within communication range of each other. A MANET provides a rapidly build a decentralized communication network in areas where there is no existing infrastructure or where temporary connectivity is needed. This property makes these networks highly flexible. QoS is the performance level of service presented by a network to the user. The aim of QoS is to achieve a more deterministic network behavior so that the information carried by the network can be better delivered and the resources can be better utilized. QoS routing is the process of provided that loop free paths to make sure the required QoS parameters are met [6].

II. Admission Control Protocol

Admission control mechanisms is used to estimation the network's resources and thus to decide which application sessions can be admitted without promising more resources than are available and thus violating earlier made guarantees. The intention of AC is either to admit only those sessions whose QOS requirements can be satisfied without violating those of earlier admitted sessions. Admission control mechanisms basic functionality is estimate resources and contention for the resources. The AC mechanism decide to admit or reject a session based on the obtainable resources and the contention for the resources. Admission control protocols [3] categorized based on Mac layer and routing layers. Our proposed protocol is an extension of the existing Admission control protocols like StAC (Staggered Admission control), MACMAN (Multipath Admission Control) andCACP(ContentionAwareAdmissionControl).

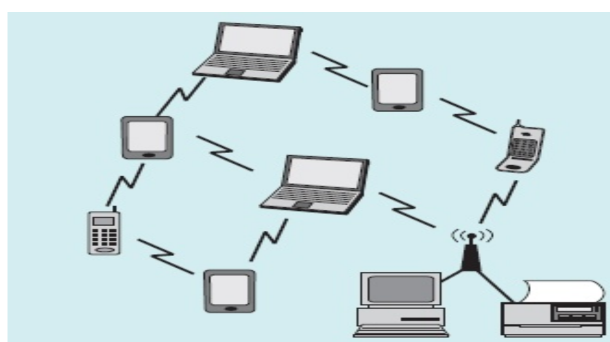

Fig 1.1 Mobile Adhoc Network

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StAC is coupled from the routing protocol. StAC takes collision rates due to additional session into reflection without estimating it. StAC admits each session gradually after performing some initial AC tests. Sessions should begin at the lowest possible data rate and gradually increase the rate up to the desired value over a period of time which is a fraction of the considered session duration. This technique is called as Staggered Admission Control. MACMAN [2] is a routing coupled admission control protocol. MACMAN protocols both discover and maintain many paths that can provide the necessary quality of service between the source and the destination. This allows a source to quickly switch to an alternating path that can support the flow if the present path becomes not viable. The drawback of MACMAN protocol is that it considers all offered routes from source to destination as backup routes. So it regularly floods RCQ packets in the network cause traffic overhead in the network.

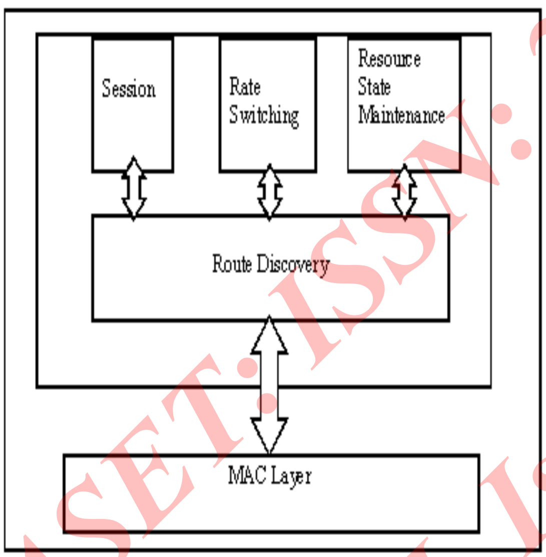

Fig 5.1 System Architecture

III. SYSTEM MODEL

Staggered admission control protocol (StAC) is based on passive monitoring of the AC protocol, which ensures that the performance requirement of the session is maintained in multi-hop mobile ad-hoc networks. This protocol focuses on collision, because it not only wastes the channel time due to retransmission but leads to high back off time. Nodes check their local resources through CITR mechanism. StAC is partially related to DSR, using its basic routing functionality. StAC protocol is implemented in three phases. In first phase, the application agent in the source node creates the Session Request (SREQ) packet fulfilling the requirements of the information flow. The network layer receives the SREQ packet and checks the local available capacity whether it can handle the flow or not. The session is rejected if it does not support the flow else broadcast the SREQ in the form of Route Request (RReq). All intermediate nodes check their local resources and add the information with the RReq packet. When RReq reaches the destination node it also checks the local resources and sends Route Reply (RRep). All routes are cached at the source nodes.

Due to wireless channel, mutual contention and mobility it is very challenging to provide better QoS. The proposed protocol Multi-rate Admission Control for Mobile Ad-hoc Networks MACMAN deals the mobility issue of MANETs. MACMAN provides multiple paths/routes for the same data flow and thus improve the QoS. Its basic functionality is similar to CACP and PAC to achieve the desired QoS to the flows in MANETs. MACMAN uses source routing protocol between source and destination to discover alternative routes. All these routes are stored in source node and whenever congestion occurs then the data flow can switch from one route to another. The source node select best route on some specified criteria and transmit the flow. Route Capacity Query (RCQ) messages are transmitted periodically to check the reliability of the alternative routes. It contains information of current route and of the required bandwidth for the data flow. Each node on the alternative route checks its local capacity to determine whether it can support the flow or not.

IV. SESSION RATE AWARE ADMISSION CONTROL

A. Route Discovery

The Route Discovery is used whenever a source node needs a path to a destination node. First, the source node looks up its route cache to determine if it already contains a route to the destination. If the source finds a valid path to the destination, it uses this route to send its data packets. If the node does not have a suitable route to the destination, it initiates the route discovery procedure by dissemination a route request. The route request contain the address of the source and the destination, and a single identification number.An intermediary node that receives a route request searches its route cache for a path to the destination. If no route is found, it append its address to the route record of the

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Parameter	Value
Simulation area size	1660m x 1660m
No. of nodes	100
Node spatial distribution	Random(uniform
Node speed when mobile	1-16m/s
Node pause time when	10s
No. of traffic sources	50
Session desired throughput	75kbps
Session duration	60s
Simulation time	800s
Results averaged over	10 runs
Data packet size	1024 bytes
Traffic source type	Constant bit-rate(CBR)
Average Transmission	250m
Average Carrier-sensing	500m
MAC protocol	802.11 DCF

message and forwards the message to its neighbors. The messages propagate through the network until it reaches either the destination or an intermediary node with a route to the destination. Then a route reply message, containing the proper hop sequence for reaching the destination, is generated and unicast back to the source node.

B. Session's Capacity Estimation

The 802.11 standard [1] , MAC control frames and headers are transmitted at one of the rate which is the set of rates support by all nodes.In our work for each CS-neighbour of the in progress node on the route [5], the channel time engaged by the MAC layer overhead must first be considered assuming the basic rate and the standard expression of $c_{cont} = |N_{cs} \cap R|$.

C. Rate-Switching Mechanism

802.11 supports several transmission [1] rates and these are achieve by modulation method and error-correction coding rate. Rate switching mechanism adjust transmission rate based on channel's situation. In HARF mechanism [7] RSSI (Received Signal Strength indicator) of last received packet determine the increasing or decreasing rate. Transmission rate increased-acknowledgement successfully received in a row. Transmission rate decreased-Acknowledgement misses occur. In rate switching mechanism, the last received packet's power is compared to the receive thresholds for the various rates.

D. Resource State Maintenance

SRAAC uses a source route header extension [4] to carry a source node's view of the available residual capacity at the nodes on a session's route. While forwarding a data packet, if a node detects any difference in source view, an update packet is sent. All nodes forward the update packets add their own updates, so that a given node always has up-to date information about the residual capacity of all nodes passing through the route. In SRAAC, this enable updates to be trigger by a change in a link rate.The link rates are averaged so that overly frequent updates are avoided. When SRAAC is combined with StAC-backup (which does not use the update packets), the backup route maintenance scheme detects any change in link rates that would render a backup route's capability insufficient for its session.

Table 1 Simulation Setting

E. Multiple Backup Routes

The SRAAC protocol can have their character joint into a protocol called the multirate-backup protocol. This protocol as the functionality to test multiple backup routes per session. In DSR, all detect link failures are reported to affected source nodes by Route Error Message. These communications are received by all nodes observing the channel, thereby informing them of route failure. Only sessions that already have elected primary and (secondary) backup routes can be assign another routes. The tertiary route and its CS neighbours are then tested for adequate capacity to serve the testing session in the same manner as backup routes are tested. If a session's primary route fails, it is replaced by its alternate route.

5. SIMULATION

A. Performance analysis

The Result of our simulations we presented here, we used to compare our SRAAC protocol with different number of session. In Fig 2 the graph shows that the throughput of normal routing protocol in that protocol cannot tolerate if we admit more number of session. But where in fig 3 SRAAC protocol tolerate session even we admit more number of session. Hence the result give average throughput of SRAAC

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improved than the normal routing protocol. Similarly we compare SRAAC delay constrains with normal routing protocol. The end to end delay result of SRAAC and Normal routing protocol are shown fig 4 and fig 5 respectively that clearly shows that SRAAC gives minimized end to end delay

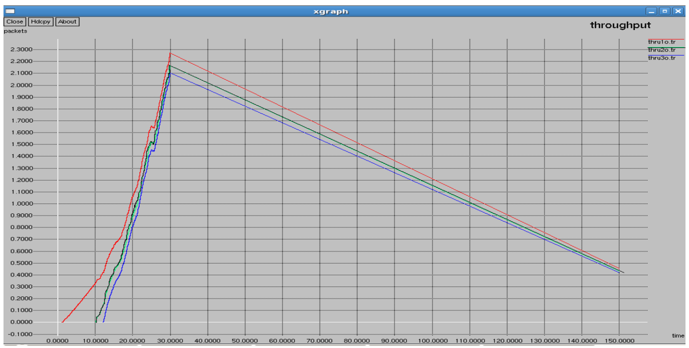

Fig.2 Throughput before session

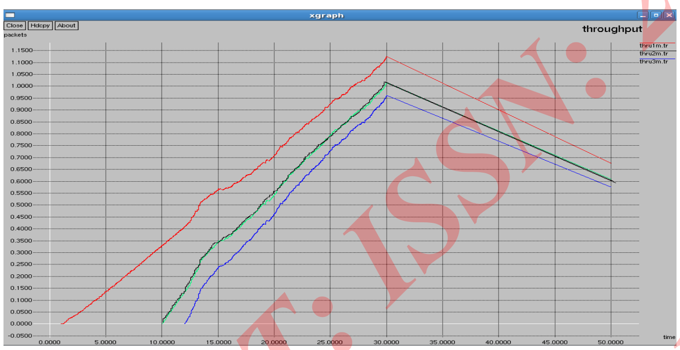

Fig 3Throughput after Session admitted.

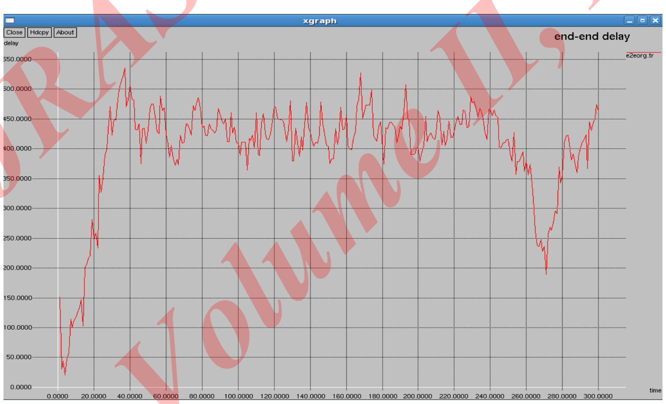

Fig 4End to end delay before Session admitted.

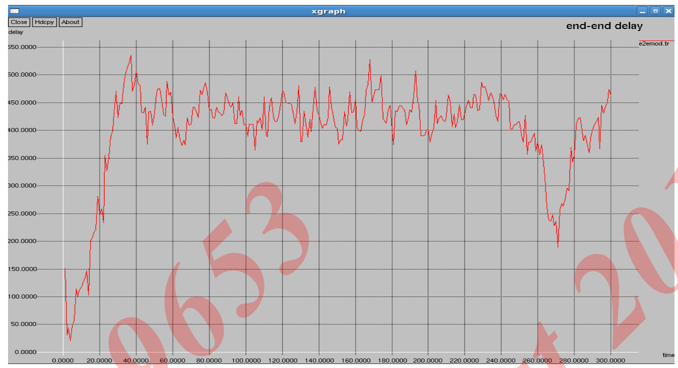

Fig 5End to end delay after Session admitted

V. CONCLUSIONS

The proposed SRAAC protocol adds various link transmission rate awareness to the AC and routing process. This approach with end-to-end redundancy in terms of backup routes, as embodied by the proposed SRAAC protocol, mitigate this effect, and produces the most reliable protocol among those studied. Since it can be concluded that the network capability is sufficient to support the admitted total of traffic. However, the throughput QoS of admitted sessions can be considerably improved by the proposed protocols compare to the formerly proposed StAC protocol

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BIOGRAPHY

[1]**K C Suresh-** received his M.E from the Department of Computer Science and Engineering, Anna University, Chennai, INDIA, in 2008. He received his B.E from the Department of Computer Science and Engineering, Anna University, Chennai, INDIA, in 2006. He is currently doing Ph.D in the Department of Information and Communication engineering, Anna University, Chennai, INDIA. Currently Working as Assistant Professor, Department of Computer Science and Engineering in Tagore Engineering College, Anna University, Chennai, INDIA. He published research paper in International journals and conference. His current research interests are MAC layer, Routing Layer of MANETs.

[2]**S Prakash**received his PhD from the Department of Memory System, IIS-Bangalore, INDIA, in 1997. He received his M.E from the Department of Instrumentation and Control, BIT-Mesra, INDIA, in 1992. He received his B.E Degree in Electronics and Communication Engineering at M.K.University, INDIA in 1990. He is currently a professor in Department of Electronics and communication and Engineering, Jerusalem College of Engineering, Anna University, Chennai, INDIA. He has been active in research for more than 15 years and has authored and co-authored papers in refereed international journals and conferences. His Research areas are Memory Systems, Wireless Networks.

A.E.Priya- She received B.Tech CSE at sri sidhardha Inst Of technology, A.P, and M.E CSE at PERI Inst Of Technology Chennai, Currently working as software engineer in HCL Technologies in chennai