Estimating the qos parameters and enhancing performance by implementing cluster head in MANET

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Abstract:
In the MANET each node communicates with the other node temporarily and stops all the communication when all the data transfers done. Clustering (used in MANET) provides an effective way to allocate wireless channels among different clusters. Within a cluster a cluster head controlled token protocol (i.e., polling) is used to allocate the channel among competing nodes. The token approach allows us to give priority to cluster heads in order to maximize channel utilization and minimize delay. A cluster head should get more chances to transmit because it is in charge of broadcasting within the cluster and of forwarding messages between mobile hosts, which are not connected. The simulated results presented in the paper and compared with other papers [4, 5] and found that the proposed approach used in this paper shows that QOS improved well.

Keywords: RTS-CTS, MANET, Frequency distribution, PER, collision rate, E2E delay.

1. Introduction
MANETs are designed to function without fixed infrastructure and provide reliable communications to ground vehicles, ships, aircraft, or individuals and form a self-healing network that will enable continuous communications even when one or more of its nodes are disabled or temporarily removed from the network.

However, MANETs have proven more difficult to develop for large networks with hundreds or thousands of nodes than was originally anticipated. Early MANET designs assumed they could be scaled to very large topologically flat networks where every node in the network has equal capability and access to the wireless channel [1]. Two nodes can directly communicate with each other if they are within the radio range.

The QoS protocols for MANETs should be scalable and capable of efficiently utilizing scarce network resources. Therefore, because of the bandwidth and power limitations in MANET, minimizing network and QoS overheads should be a key objective for most network researchers and designers. In addition, the topology changes could also affect the available bandwidth and resources’ reservations. Therefore, minimizing the influence of the host mobility should be considered to support and provide the QoS in MANETs.

Recently, providing a desirable QoS in MANETs became an important design objective. It has been studied and investigated by different researchers and several proposals have been published to address how the QoS can be supported in MANETs. To provide better quality of Service we used RTS-CTS Approach and explained in the subsection.

2. RTS-CTS
The RTS–CTS access mode executes the same carrier sensing and random backoff procedure as in the basic mode. It also uses the same BEB algorithm to regulate the adjustment of the contention window. It enhances the basic access mode in two respects.

First, the RTS–CTS access mode enhances the basic mode two-way handshaking with RTS–CTS–DATA–ACK four-way handshaking shown in figure 1. When a node finishes the preceding carrier sensing and random countdown, instead of transmitting the data packet immediately, the node sends out a request to send (RTS) control packet to the intended receiver.
Upon correct reception of the RTS message in an idle state, the receiver responds to the sender with a clear-to-send (CTS) control packet. After receiving the CTS message, the sender then starts transmitting the real data packet, and waits for the ACK packet as the confirmation of a successful data exchange.

In the above sections, the simulation setup and Scenario of simulation has been described. The Random Waypoint Mobility Model (see figure 2) is a model used in the network scenario. In this mobility model, nodes move in varying directions and speeds, with a pause time between each movement and direction change.

![Figure 2: Scenario of MANET](image)

### 3. Simulated Scenario

Four-way handshaking decreases the chance of collision significantly since the RTS packet has much smaller length than the data packet. Even though collisions may sometimes occur, the resource wastage is minimized since collisions last only for the length of the RTS packet. Moreover, the RTS–CTS exchange can solve the hidden terminal problem. By setting the network allocation vector (NAV), which is a field of RTS/CTS control message, as the length of the ongoing packet transmission or larger, the no intended destination nodes, which overheard the RTS or CTS, are prevented from transmitting until the end of the current transmission. Thus the nodes within the radio transmission range of the receiver would not start transmissions that would cause collisions at the receiver of an ongoing transmission. The same benefit applies to the transmitter since the ACK message would not be damaged by the transmission from its neighbors.

### 4. Methodology Used

To develop the above scenario in this and communication between the networks we built the code in c++ and shown below in the figure 3.

```
//code built to provide QOS in MANET network
// supported IPv4 and IPv6
it sockfd; struct addrinfo hints, *servinfo, *p; int rv;
memset(&hints, 0, sizeof hints);
hints.ai_family = AF_UNSPEC; // use AF_INET6 to force IPv6
hints.ai_socktype = SOCK_STREAM;
= getaddrinfo("MANET.tcl", "http", &hints, &servinfo)
 != 0) {
printf(stderr, "getaddrinfo: %s
"gai_strerror(rv));
exit(1);
} for(p = servinfo; p != NULL; p = p->ai_next) {
if ((sockfd = socket(p->ai_family, p->ai_socktype,
p->ai_protocol)) == -1) {
 perror("socket");
 continue;
}
for(p = servinfo; p != NULL; p = p->ai_next) {
if ((sockfd = socket(p->ai_family, p->ai_socktype,
p->ai_protocol)) == -1) {
 perror("socket");
 continue;
}
connect(sockfd, p->ai_addr, p->ai_addrlen) == -1) {
 close(sockfd);
 perror("connect");
 continue;
}
freeaddrinfo(servinfo);
```
5. Performance Evaluation of MANET
We perform extensive performance evaluations to determine the effectiveness of the proposed scheme that is RTS-CTS technique with AODV protocol. The quality of the routes is determined by obtaining the TCP end-to-end delay and Throughput using ns-2 and comparing with papers [4, 5].

5.1 Packet Error Rate (PER)
The packet error rate in the wireless channel is significantly higher than the Wired counterpart. Unlike the wired links, two wireless links can experience a Dramatically different packet loss probability even in the absence of interference From other sources. The figure 4 shows of the IEEE 802.11 cause idle Times at the source when a packet loss is observed. Thus, the effective available Capacity at the higher layers is decreased due to collisions. Hence, transmitting the packet over stronger links will reduce the congestion level experienced by a Connection.

5.2 Collision Rate
The wireless medium is more error-prone than the wired medium, and collisions could occur more frequently. The problem of collisions will be resolved as nodes wake up, mobile nodes move in, of collisions are resolved and also to use the RTS-CTS technique to resolves hidden node problem and effectively used the channels and the figure 5 described below that there was less chances of collisions and improving QOS.

5.3 Frequency Distribution
The figure 6 shown below analyzed that more the frequency lesser the delay and lesser the frequency more will be the delay. As the NS2 analyzed the .tr file and shown the different spectrum of the frequency with the End to End Delay.

6. Conclusion
Mobility models have a significant influence especially on the performance of the protocols of
MANETs. The mobility model and the radio wave propagation model are very important components of mobile ad hoc network simulations. Each component on its own has strong influence on the network topology and therefore a strong influence on the overall network performance. We Shows that propose a quality based routing for Mobile Adhoc Networks to improve the PER, Collision Rate and E2E delay performance of Adhoc communications.

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