Improving the Performance during Route Discovery for QoS Flows Using Various Policies over Mobile Ad Hoc Networks

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ABSTRACT

The hosts are used as routers for transmitting data from origin to the sink over Mobile Ad Hoc Networks (MANETs) thus, eliminating the necessary for infrastructure. Due to the flexible nature of this wireless channel can cause path failures thus enforcing Quality of Service (QoS) in MANETs which is not easy to achieve. The QoS path finding is used to investigate routes which hold QoS prerequisites using the data from network got from path detection. In case the necessity for QoS exceeds the capacity of network, the arriving QoS requests are rejected thus evading the weakening of other QoS flows. The choosing of QoS flows insights the necessity of policies. Here, different QoS policies for overcoming the weakening of QoS are given along with the results.

INTRODUCTION

The most complicated and complex network to work on is Mobile Ad Hoc Networks (MANETs). These networks provide an expansive range of capabilities for applications like location awareness and communications among the vehicles but not limited to. Most commonly these applications utilize real time traffic for which they require Quality of Service (QoS). Due to the flexible nature of MANETs along with hindrance caused by other wireless communication it is quite difficult to provide QoS. In order to provide better QoS in Mobile Ad Hoc Networks an architecture containing these factors as architecture are to be considered as analyzing the resources, admission control and segregation of traffic.

A1. Analyzing Resources:

The term is used to denote the mode of resource sharing among the mobile nodes. The flow propagation is determined based on the allocated resources. Here, depending upon the methods used different wireless access techniques like TDMA, CSMA, CDMA are used. Here, the focus is upon the networks utilizing CSMA/CA is used representing the familiar Medium Access Control (MAC) 802.11 standard.

A2. Control over Admission:

The term serves as a means for providing dependable QoS in Ad Hoc Networks. Here the QoS flow is managed by the control over admission in the following way. An investigation for existing resources for carrying out QoS is conducted without interfering with the ongoing sessions of QoS. Based on which they can either be selected or rejected. The control over admission is carried out in distributed manner during route discoveries between the nodes that are participating.

A3. Segregation of Traffic:

The term aims to categorize the flow based upon the QoS assurance they require and creates a scheme based on priority. The MAC layer in wireless networks is responsible for this process. Different priorities are generated for traffic classes which assigns different contention window sizes as in CSMA / CA. These priority schemes are highlighted using priority queuing technique. Commonly for a single flow the existing workflows assigns an exclusive admission based on the analysis carried out for resources at an instance of time t. The succeeding time t + rt, where the quantity of resources available for the flow is seriously low. The controller of admission shall react accordingly as,

- The condition for services is reduced to effort which performs well.
- The transmission rate for multimedia is reduced.
- It is possible to pause the session until a new path is discovered for QoS.
- The session can be terminated forcefully.

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The QoS ruin can pass on more likely than one QoS flow through the mobile nodes. It is suitable to select the flow of QoS to weaken according to a defined set of priority rules. In wireless sensor networks the power consumption is serious so the flow in terms of power consumption is to be weakened first. Depending on the progress the approved strategy is different if the goal is to advance the global performance.

The paper focuses to develop a scheme which aims to estimate the threats in deprivation of QoS in MANETs in terms of both mobility and traffic. Policies for variance in QoS are needed to select the QoS flow to weaken. As added various simulations are performed for examining these policies on the overall performance of network in terms of providing QoS.

Definition of Problem:

B1. Analysis of Resources:

The study of existing resources provides serious information about the current state of the resources that can make approximate choices for admission control. These studies are performed in accordance to the standards of lower layer. The resource utilization differs in accordance with the traffics over the carrier sensing region in mobile carrier sensing networks. The main aim of resource analysis explains the effects of mobility in resource analysis over mobile carrier sensing networks.

B2. Carrier Sensing:

The important role is played by MAC design in determining the QoS routing. The wireless communication networks utilize CSMA protocols which uses carrier sensing and handshaking technique for minimizing the rate of collision that can occur due to terminal problems. The nodes resources are shared by the MAC layer with other nodes within the range of carrier sensing area. Generally, the transmission range will be smaller than the carrier sensing range since the amount of the existing resource of a mobile node thereby requires the transmissions happening external its range of communication. MAC 802.11 provides a clear channel assessment for delivering the information necessarily related to the state of the channel for measuring the resources at the mobile node. The influence of transmission range of a mobile node on the bandwidth of the correspondent node is also considered in accordance to the provision of QoS of previously admitted calls. Better option can be provided by capturing the bandwidth of correspondent node and reducing it with its own. The sensing is not performed by the correspondent node due to which overlapping of transmissions occurs. Estimation for the available bandwidth is done for ensuring no hindrance along with current QoS flows at the cost of wasting some resources. The estimation of the existing resources within the carrier sensing networks some existing approaches are performed using the parameters which differ with time and location. It is possible to provide QoS for a particular duration of time and therefore occurs loss of QoS assurances.

QoS Policies:

For minimizing the wastage of bandwidth and improving the performance, the existing approaches weaken the QoS given up to a particular limit concluded by the application layer. The selection of an approach for the QoS flow to weaken is not yet been studied for multi-hop wireless networks. Here, the methods for the weakening of QoS flow are explained in accordance to the requirements. As added, different resolution policies are also studied for improving the performance in accordance to the priorities in the network.

C1. Approaches for Sudden Flow Hindrance:

The common technique is simply to weaken the effort that was conducted best for traffic in the event where hindrance to flow happens. A threshold is attained beyond which further weakening is not possible where the effort for best traffic is suspended. During this it is needed to obtain extra action for maintaining the different flows that passes through the node. Various policies are used to neutralize the sudden hindrance in flow as, Suspending the QoS flow until a best QoS condition is achieved while the rest just accept the weakening of QoS and then adjust the related applications. Here, the traffic sources are noted in both the cases.

C1.1. Weakening:

The resources are to be set free to other flows before suspending the actual traffic flows it is encouraging for selecting a flow of traffic for weakening. The techniques for weakening the traffic flows are explained below as,

- Minimizing the bandwidth to a flow by dropped packets.
- Minimizing the bandwidth to a flow by dropped packets and putting them into a queue.

The first case (Figure 1) indicates that the packets are dropped for maintaining the overall period of information transmission the same thereby reducing the number of received packets. This is attained by every third packet.

The successive case indicates that the bandwidth allotted for a flow falls down since the transmission rate of a packet is minimized by placing the packets into a queue. The transmitted packets reach the destination with a longer time period. These actions taken depend on the traffic type carried by a node. There are different classes of applications available.

Every traffic group possesses different comparison to latency, jitter and loss of packets. For instance the data transfers likely have elevated
tolerance to delay and jitter and small bandwidth and null tolerance to packet losses. This weakening method suits best.

Fig. 1: Packet Loss during Information Transmission.

C1.2. Suspending Flow:
Some sort of weakening is required for estimate the quantity of weakening before no weakening is possible. Meanwhile, there can happen a situation where a part of network is deeply used so that the flow must be suspended and re-routed instead of being weakened. In parallel the type of traffic are also to be considered. For illustration, a two way voice flow is weakened which makes the communication not possible in such cases it is re-routed to a further QoS yielding path or else terminated.

C2. Various Policies:
Here, different resolution policies are described. Each and every technique discusses the merits and demerits that meet the requirements. The struggling node is described as the mobile node where the loss in QoS assurance is observed. The assumption is made only for two groups of traffics.
• Flow requiring QoS
• Efforts for best traffic.

The flows in QoS are classified into two various sub – groups wherein each case the group with low priority is weakened.

C2.1. Most Recent Policy:
This policy weakens the previous session that has been influenced by the loss of assurance in QoS. This policy is used to suspend only spoiled sessions thus safe guarding the other sessions offering QoS. It is necessary to preserve the information for flow for minimizing the size of routing table and avoiding additional processing.

The main limitation of this policy is that the previously spoiled sessions are even more going to be weakened thus risking complete failure of associated applications. These techniques suits best to the networks that carry most suitable applications. It is only applicable to suitable QoS flows where large weakening is tolerable.

C2.2. Time Policy:
The policy consists of suspending the flow that is predecessor or successor. Upon minimizing the current flow wherein the lengthy flows are related with high challenging QoS applications thereby spoiling last flow priorities or the current. It might easier for a flow to keep its QoS constraint for previously suspended networks at the cost of weakening the lengthy flows. For the current technique the blocking in the network results in complete obstruction for fresh flows.

C2.3. Source Policy:
This policy is likely to be related with the QoS policy. It consists of choosing a source for traffic depending on the quantity of utilized resources by each flow at the stressed node. There occur two possibilities.
• Choosing the highest or lowest cost flows for resources.
• Electing a weighty flow that makes sure of discharging utmost resources thus reducing the possibilities of loss in QoS assurances that could occur again.

The origin of a suspended flow faces difficulties in choosing another QoS path for attaining destination due to the necessity of large resources needed. For quicker session revival the best practice is to weaken the less weighted flows. It is necessary to make sure about the resultant quantity, if resources given out are enough for avoiding cyclic QoS disagreements along the same node. Sometimes it is needed to face danger by both the techniques since the session revival process finds a new route at high cost than the previous one.

C2.4. Energy Policy:
The policy is necessary since the Mobile Ad Hoc Networks suffers power constraints for QoS. The flow is suspended when it consumes more energy eventually the node suffers greater loss in QoS assurances. It can be overcome by selecting the route which consumes most of the energy and thus allowing them to utilize the energy of global network instead of the node’s power. It must be focused that the re – routing should not be done through routes which consume more energy. This is performed to make the policy useful since it plays a significant
role in resource utilization. It is possible to make use of energy policy for optimizing the routing protocols for energy restricted Ad Hoc networks. The session suspension is performed automatically in case of node’s power running down below the fixed value and thereby equalizing the energy utilization over the network thus increasing the lifetime of the network.

C2.5. Policy for Delayed Input:

The term focuses to reduce the delay in input for which it selects the QoS flow based on a condition where the source is near to the stressed node. If there exist number of hops in the route there is a chance that occurs multiple routes between the source and destination. Existence of minimum hops in the route there is a chance of only few re – routing chances thus involving a lengthy suspension period for the current flow. For attaining better performance a trade- off should be considered between total number of jumps in the route and the origin.

C2.6. Connection Based Policy:

The policy signifies the objectives of the network for assuring the QoS. The energy utilization of sensor networks is more when compared to QoS thus fulfilling the aims of the networks. Possibility is attained by utilizing information over the globe rather than current state information. This policy allows only for selecting best routes for re-routing.

D2. Simulations:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission rate</td>
<td>450 kbps</td>
</tr>
<tr>
<td>Traffic Sources</td>
<td>10</td>
</tr>
<tr>
<td>Simulator</td>
<td>NS2</td>
</tr>
<tr>
<td>Packet</td>
<td>CBR</td>
</tr>
<tr>
<td>Topology</td>
<td>700m x 700 m</td>
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<tr>
<td>Pause Time</td>
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<tr>
<td>Initial Velocity</td>
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</tr>
<tr>
<td>Maximum Velocity</td>
<td>1 ms⁻¹</td>
</tr>
<tr>
<td>Nodes</td>
<td>20, 40, ….., 100</td>
</tr>
</tbody>
</table>

D3. Parameters:

The results are analysed using four parameters for different QoS policies.

D3.1 Packet Delivery Ratio:

It measures the packet delivery. More clearly the ratio of packets received should equal the quantity of packets sent. The effectiveness of the policies is high if the PDR rate is high. The throughput provided by the QoS methods during extinction of QoS is monitored using channel throughput. The QoS is best if it provides channel throughput of 450 kbps or more.

D3.2 End – to – End Delay:

It denotes the average differences in time between the packets transmitted by the source to the destination.

D3.3 Packet Drop

It denotes the average QoS packets dropped on the channel during simulation. The case of packet dropping due to mobility and session suspension are not taken into account for simulation.

RESULTS AND DISCUSSIONS

The graphs are generated by considering no policies and no session suspension. These results have been drawn to show the necessity of QoS in Ad Hoc Networks. Figure 2 depicts no strategy and the results for throughput, PDR and packet drop are shown. Due to the usage of QoS packets the medium always provides a quicker reaction at the cost of weakening the effort of best traffic. The preservation of end – to – end delay for QoS packets are achieved. Figure 2a depicts that the session suspension creates larger delays when blocking in QoS occurs. Added delays are caused due to re-routing. The suspended session requires a considerable quantity of resources.
thus making the re-routing much harder. Meanwhile the failing of QoS assurances adds more setback to the flow. Figure 2b depicts the throughput of average channel for better process of QoS policies. The throughput provided by the channel has no influence on traffic load for QoS. Figure 2c is the obtained results.

Figure 2 Results for QoS flows of 450 kbps

Fig. 2a: QoS Messages.

Fig. 2b: Average Throughput.

Fig. 2c: Obtained Results.

Fig. 2d: Packet Delivery Ratio.

Figure 2d depicts the results of PDR. The PDR drops proportionally with the QoS loads. Whenever the session is suspended the current packets are dropped until it finds a new route. With bigger load in QoS the session time is maximized thereby minimizing the PDR. Figure 2e produces similar results are produced due to suspension expect most recent policy which produces a good PDR in heavy QoS load situations. These mechanisms are used for
safe guarding the QoS assurances for maintaining their QoS during flow.

**Fig. 2e:** Results for QoS Suspension.

**Conclusion:**

The paper fully focuses on the necessity for policies for QoS under heavy loads where weakening of QoS is non-negligible. Different QoS policies are been studied using various suspension schemes to insight their importance on providing QoS. The last based policy plays a significant role but the connection, time and energy based policies requires more attention. The future work is planned to focus on methods with dropping probabilities and analysis can be done to obtain more accurate outcomes.

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