# A novel algorithm to optimise the Quality of Service in Mobile Ad-hoc Network

Dr Srinivasa Gowda Dr Sunil Jacob

## Abstract-

A wireless Ad-hoc network is established with group of nodes without any fixed infrastructure. Each node in MANET acts as a router as no central control unit. A MANET works in independent infrastructure less mode or it may work with internet.it plays critical role when neither wire network embellishment easy nor critical to install it. there are many applications with MANET such as short-term events, battlefield communications and disaster relief activities etc. Due to various limitations with MANET such as mobility, link bandwidth, energy of nodes, providing QoS guaranty is a big challenge. So, it is needed to consider optimal design of MANET for best QoS. Though many approaches have been proposed for MANET QoS optimisation, a few addressed challenges of message transmission protocols. In this paper, we addressed many issues affecting QoS and also the challenges of QoS in MANET. In the line, we then suggest an algorithm to enhance the QoS in mobile Ad-hoc network.

**Keywords**-Mobile Ad-hoc Network; Quality of Service (QoS); network topology; reliability;

## I. INTRODUCTION

In mobile ad-hoc networks, Quality of Service (QoS) is essential to assure guarantee network services for critical wireless applications. But, QoS depends on network parameters such as delay, jitter, packet rate, bandwidth, etc. which vary in MANET. To enhance QoS in MANET, different approaches are used such as traffic prioritization, resource reservation, control mechanisms.in this research, message prioritization mechanism is introduced with the novel algorithm.

In MANET [1], all nodes are responsible for the establishment of communication in network nodes with distributed protocols. the control and management of the network is distributed among the nodes, because no centralised control system. Mobile nodes perform node functions along with network functions as a router. So, usually user nodes and routers are indistinguishable in MANET. As the mobility of nodes, the routing and security functions are implemented by teaming up the nodes. MANET routing algorithms are usually single hop or multi-hop depending on link layer attributes and routing protocols.

The nodes in MANET are mobile, so they move with different speed at a different time with random topology. Their connectivity changes and vary with time. The routing connection among nodes is established with routing algorithms and forming their own network at most of the time.

The QoS parameters in MANET changes with time and topology. To keep QoS service assure for wireless applications against these changes, estimation of network parameters is important.in other hand, prioritising messages according to message types is a mechanism used to improve the QoS. A design and implementation mechanism with less overhead in the network to prioritise messages is essential to optimise QoS; The merit of QoS based prioritization is to ensure efficient use of the network resources like the bandwidth while serving the needs of completely different the various} services requiring different QoS. The disadvantage of QoS prioritization is device centric and we need some measures that are more user centric.

Quality of Service (QoS) [2] means that the network should provide some kind of guarantee or assurance about the level or grade of service provided to an application. QoS refers to satisfying certain requirements of

a connection, in terms of a set of constraints. Due to the mobility, limited resource, less security, dynamic topology, infrastructure less and wireless nature, it is complicated to sustain real-time applications with appropriate QoS. in operation orientated MANET, QoS cooperative function between application and network resource management that uses dynamic priority allocation derived from task priorities established by commanders within echelon hierarchies (3).

QoS is most important in time critical applications. In this paper we have proposed a novel algorithm that can produce a good QoS for mobile ad hoc network with prioritizing the messages.

The remaining of this paper is organized as follows. In section II, we presented theories related to QoS in ad-hoc networks and its various challenges. We present our algorithm in section III. In section IV we give the simulation results. Finally, we say about the future scope in section V and conclude in section VI.

## II. QUALITY OF SERVICE IN MANET

Quality of service refers to several related aspects of a network or a system is a kind of assurance that ensures a certain degree of service that the system should provide. It is some specific requirement of an application which depends upon some parameters. If the requirement is fulfilled, then the system is said to be providing some assurance to maintain the quality of service of the network.

Due to node mobility and scarcity of resources such as energy of nodes and bandwidth of wireless links, it is much more difficult to provide QoS guarantee in MANETs than in the wired network. In fact, guaranteeing good QoS in mobile

Ad-hoc network may be impossible if the nodes are too mobile [4,5]. The ability of a network to provide a specified quality of service between a set of mobile nodes depends upon the inherent performance properties. Generally, the level of service is based on some parameters or constraints, often known as QoS parameters or QoS constraints. These parameters or QoS constraints are - end to end delay, throughput, jitter, drop packets, latency, loss rate, error rate of stations, the traffic load within the network, reliability, bandwidth etc. Security is one of the most important parameter of QoS. Some other parameters are the control algorithms operating on different network layers and its complexity and energy consumption.

If the requirement is fulfilled, then the system is said to be providing some assurance to maintain the quality of service of the network. For example, an application that is delay sensitive may require the QoS in terms of delay guarantees. Some applications might need that the packets ought to flow at bound minimum information measure. In that case, the bandwidth will be an important QoS parameter [5, 6]. Certain application may require a guarantee that the packets are delivered from a given source to destination reliably, then, reliability will be a parameter for QoS. Here we are mainly concerned with two aspects of it: • Retransmission policy - where we are mainly concerned with the arrival of the data packet at any cost. We go on retransmitting the packet until it is received at the other end. • Time factor - here there is no possibility of delay in receiving data packet at the receiver. So, if the packet does not arrive on time then they cannot be accepted. In case of achieving Quality of Service of MANETs the characteristics of an ad-hoc network cause several challenges in the stipulation of QoS [7, 8, 9]. Broadcast nature of the communications• Limitations obligatory by quality. Volatile network topology makes the algorithm much more complex. Lack of mobility awareness by system. Limitations of the Mobile Computer. Limited power resources (battery life) limited capacities. Limited physical security

## III. OUR ALGORITHM

We propose to keep a coordinator node to govern the entry and exit of any external node in the network and to prevent the network from partition. As we know the computational capacity of mobile nodes are not very

high so we should apply a less complex scheme with less computational overhead. Our scheme is a light weight one. To maintain or enhance the QoS of any MANET, we propose an algorithm by applying which any network can improve its quality when it is in degradable cases. Our algorithm is flexible and it can be configured according to the need and application of the network. Our algorithm is based on the following assumptions: I. Network is planar ii. Nodes are connected and each node is aware of the whole network. There is a coordinator node whose duty is to hold back network from network partition iv. Weightage of QoS parameters are configurable v. Each node is aware of the total number of other nodes in network VI. Nodes can move directionally. In the following diagram we now show how the node or network problem can be handled by our algorithm to maintain a certain level of QoS.

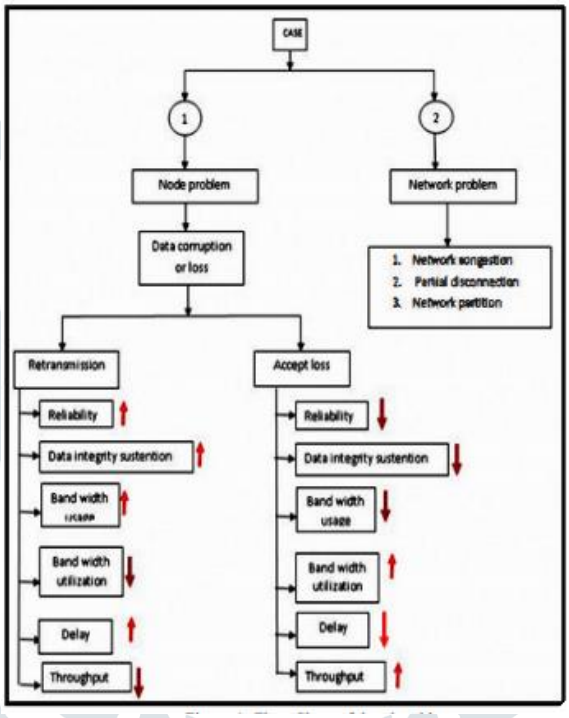


**Figure 1**. Flow Chart of the algorithm

The algorithmic steps are: (the algorithm will be set for a certain number of periodic intervals T)

- Select the problem mode (node or network)

• IF node problem Select the message mode

• IF message type "imp" o THEN set the QoS parameters in mode' A'

• ELSE (IF message type "un imp") o THEN set the QoS parameters in mode ' B'

• ELSE (IF network problem) • THEN set the QoS parameters in mode ' C'

• MODE A: Important data content

• Need maintain reliability than any other QoS Metric,

✓ Go for Retransmission (mode A)

• Reliability will be maintained

• Data integrity achieved

- Band width usage will be high
  - Delay will increase
  - Band width utilization will be low
  - Throughput will decrease
  - So efficiency will fall

MODE B: Data content is unimportant

• Where time metric is consider we can accept loss of less important data packets ,
/ Accept loss (mode B)

- Band width usage will be less.
- Delay will decrease
- Band width utilization will. increase
- Throughput will increase.
- So efficiency will improve.
  - Reliability not maintained
  - Data integrity not achieved

• MODE C:

• When Network congestion, Partial disconnection or Network partition occur

✓ Monitor node will control the causing node to come inside the network to stop network partition (mode C).

## IV. RESULT OF SIMULATION

We have checked the result with our algorithm in different scenario using our designed simulator. Different results obtained after simulation are given below.

| Sl no | Total number of packets transmitted | Quality of service with algorithm | Quality of service without algorithm |
|---|---|---|---|
| 1. | 20 | 18 | 10 |
| 2. | 50 | 45 | 25 |
| 3. | 100 | 50 | 50 |
| 4. | 150 | 135 | 75 |
| 5. | 200 | 180 | 100 |
| 6. | 300 | 270 | 150 |
| 7. | 400 | 360 | 200 |
| 8. | 500 | 450 | 250 |
| 9. | 1000 | 900 | 500 |
| 10. | 1500 | 1350 | 760 |

**Figure2:** TABLE 1

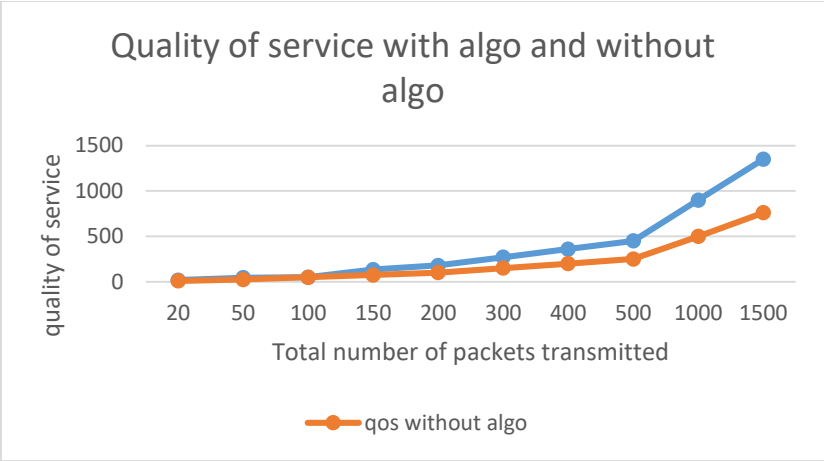


Figure 3: GRAPH 1:

TABLE 1: Column 2 gives us the ideal values of QoS factor using algorithm and colmnn 3 gives values without algorithm.

GRAPH 1: The above diagram gives us a vivid idea about the nature of the graph during ideal case when we use our proposed algorithm. It is basically a 2-D plot of the number of packets send across the network against the quality of service factor.

| Sl no | Total number of packets transmitted | Quality of service theory | Quality of service with algorithm |
|---|---|---|---|
| 1. | 20 | 18 | 15.4 |
| 2. | 50 | 45 | 39 |
| 3. | 100 | 50 | 79 |
| 4. | 150 | 135 | 117 |
| 5. | 200 | 180 | 160 |
| 6. | 300 | 270 | 240 |
| 7. | 400 | 360 | 330 |
| 8. | 500 | 450 | 430 |
| 9. | 1000 | 900 | 875 |
| 10. | 1500 | 1350 | 1340 |

Figure 4: TABLE2: The above table shows the comparative study of the formulated values (theoretical) vs. the actual values that we get practically.

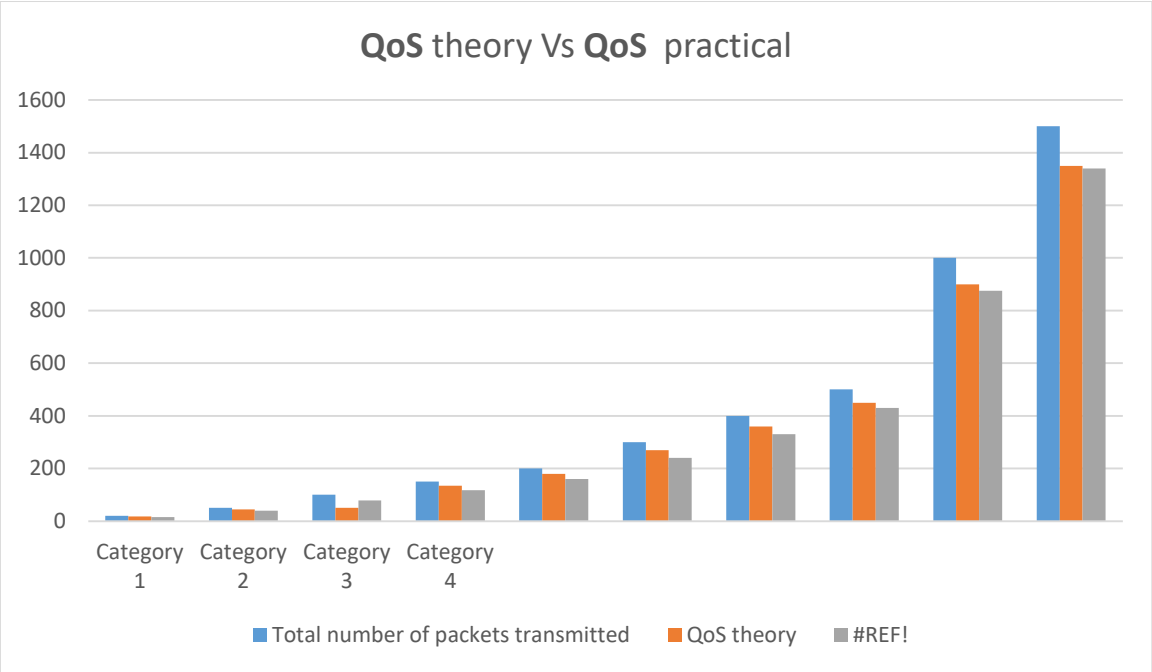


Figure 5: GRAPH 2

GRAPH 2: The above graph is the graphical representation of the given table 2. It compares the theoretical value of the quality of service factor with its corresponding practical values. From the diagram it is perceptible that with the increase of packets the efficiency of our algorithm also increases which means with the increase in number of packets the result converges with the ideal value.

| Sl no | Total number of packets transmitted | QoS factor (for different output) |
|---|---|---|
| 1. | 20 | 20 |
| 2. | 50 | 50 |
| 3. | 100 | 100 |
| 4. | 150 | 150 |
| 5. | 200 | 200 |
| 6. | 300 | 300 |
| 7. | 400 | 400 |
| 8. | 500 | 500 |
| 9. | 1000 | 1000 |
| 10. | 1500 | 1500 |

Figure 6 :table3

TABLE3: The table above shows the vanatlOn of the QoS with the increase in the number of packets sent through the network. So from the above observations we can conclude that we can tend to the ideal values as we increase the number of packets in the network.

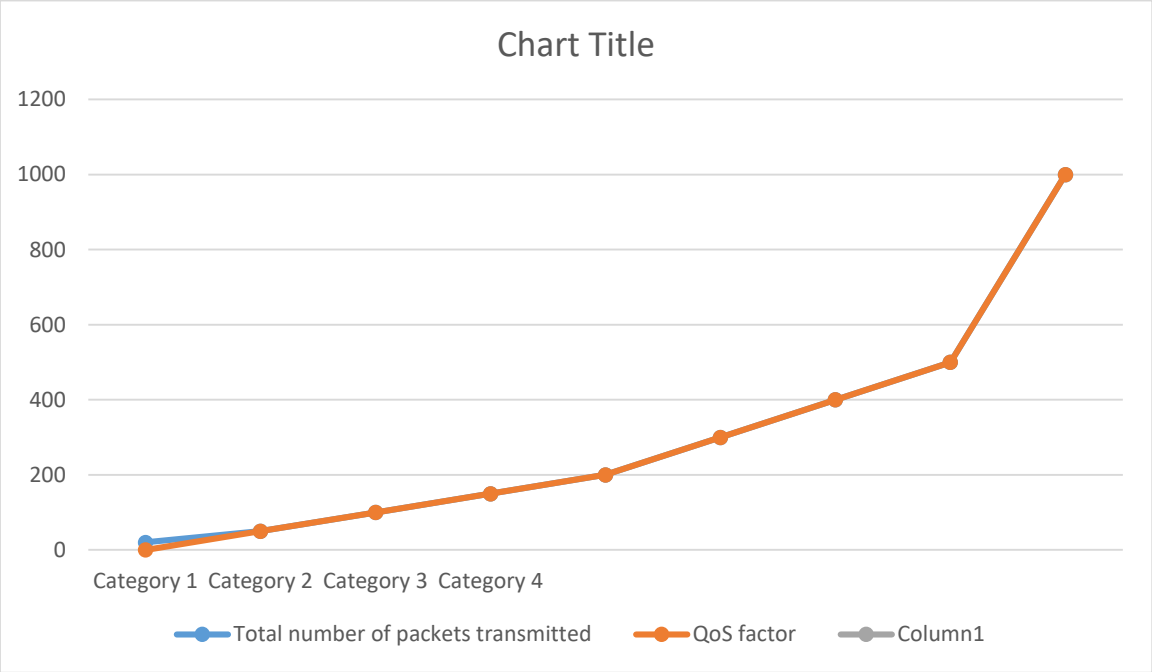


Figure 07: GRAPH 3

GRAPH 3: This graph shows that the quality of service will tend to the ideal case with the increase in number of packet transmissions. This proves the convergences of our algorithm.

## V. FUTURE SCOPE

MANETs are likely to expand their presence in future communication infrastructure. The need of QoS in MANETs thus becomes an important issue. In this section we discuss some of the most important issues that still need further investigation and more research in the area of QoS provisioning in general and in QoS routing in MANETs in particular. Despites of various advantages and unlimited application chances, MANETs are still far from being deployed 358 on large scale commercial basis [10]. This is because of some fundamental Ad-hoc networking problems either remain unsolved or need more optimal solution. Several important research issues such as multi class traffic in network, different operational conditions, mobile nodes position identification, packet prioritization, mobility model, layer integration, intemet-MANET interaction remain to be addressed to facilitate QoS support in MANETs.

## VI. CONCLUSION

The design of ad-hoc network protocols is significantly more challenging than in the wired domain because of the interference between wireless links. This is especially true if one wishes to guarantee quality of service to flows in an ad-hoc network. A flow on one link can have its quality disrupted by an increase of flow on a neighbouring link. In this paper we propose an algorithm which can enhance the quality of service in MANET by using intelligent messaging. As per our algorithm, we can implement either the retransmission policy i.e., we want the packet send to be received at the receiver end or we might implement fast transmission where delay cannot be incorporated at any cost. So, QoS can be improved at the cost of one factor, both cannot be implemented together. The key to support QoS in MANETs is QoS routing. QoS routing in MANETs is a growing area of research. Future work can address the above mentioned unexplored challenges.