

# MAC based Routing in IOT

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**Abstract:** *The purpose of this paper is to explain why the physical layer is important regarding the Internet Of Things, and show various routing metrics that were previously used. We first are explained how and why the MAC layer must interact with the routing metrics that we use. A complex and comprehensive analysis of these metrics is the done and then their performance comparison is executed. The better performing metric is found out and then a new Q metric is introduced which supersedes the performance quality of the previous metrics.*

**Keywords:** MAC, Routing, IOT, metrics

## 1. Introduction

Internet of Things is going to be all around us. It has applications in almost every walk of life, be it work related or home related. The idea of connecting all the devices around us and giving them the power of Artificial Intelligence is not only fascinating but also feasible in the near future, and advantageous as well. We can expect it to be present in every aspect of our life, wherein physical devices will be connected through an interface similar to the internet. Each device will have its own hardware, everything from curtains to AC's will be interconnected. For efficient communication between these devices we'll need to ensure good routing between them. As the performance parameters of the metrics depend on the MAC layer, we will need to define metrics that will work together with the MAC layer.

This is what is basically done by the authors of this paper. Different metrics are compared on the basis of their performance with correspondence with the MAC layer. New metrics are proposed that are better than the existing metrics, at least in theory. We must first understand what the people and researchers have done in accordance to this topic in the past, hence we will now study the work that is related to the original paper, and may even so form the background of the paper under consideration.

## 2. Related Work

Previously a considerable amount of work has been done in relation with this topic. As it is an important topic to be covered with respect to the IOT it is necessary that it must be one of the first topics that needs to be considered when we want to devise new routing protocols. A distributed adaptive system algorithm is devised using Markov model that uses chaining and makes the single hop network using star topology low powered in [1]. This model also proposes an automatic selection mechanism. [2] An automatic MAC layer selection process is suggested in this paper. No new modification is required for the IEEE standards that we use in this paper, in the methods mentioned above.[3] proposes a system which adapts according to the IEEE 802.15.4 layer. It was attested with due experimenting with respect to the field of medicine. [4] gives us an introduction to the Expected Transmissions Count(ETX) metric. [4] does not consider the performance of RPL, that is Routing Protocol for Low power and lossy networks.[5] suggested Back

Pressure Collection Protocol (BCP) which considers the back pressure on each node in the network and makes the routing decisions accordingly. Similarly, in the recent past, [6] work has been done over the routing issues that occur in the Internet of Things. This study is important because we have to understand the issues first and then we can work over the solutions, MAC layer routing issues are constantly changing and so are the issues in other layers, hence we have to optimize the advantages of the earlier metrics and we have to come up with better metrics to cope up with the increasing requirement of today's networks. That is why it is important that we study the work done with respect to the paper in the past. Because with that we will be able to provide data to our experimental analysis, as the authors have done in this paper. All the graphical and algebraic data regarding the performance of the previous metrics is taken into consideration while devising the metrics that the authors do in this paper.

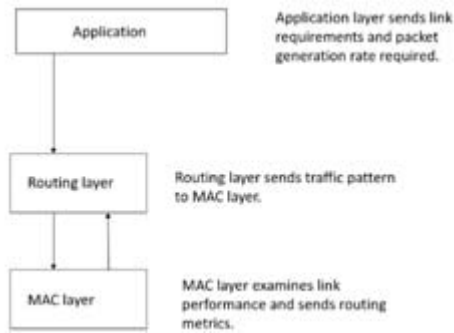
## 3. MAC and Routing Interactions

In this section the author of the paper in discussion tells us about how and why the interworking of the MAC layers and routing layer protocols is necessary for the smooth performance. The functions of various layers are given in this section. The application layer performs duties like setting some specific parameters of the lower layers and setting a generation rate for the network traffic. We have performance parameters that are working with the link strength and which are more important than speed. Energy consumption of the link, how well it performs with a low power environment, how much delay is there between transmission and reception and reliability of the link are some of the important link performance parameters taken into consideration. MAC layer tells the routing layer about the effect that the current metric has on the performance indicators and then the routing layers performs routing decisions according to the information provided by the MAC layer. If MAC layer is not taken into account then these parameters will have a value far from the value that is expected and desired. The MAC and routing layer interactions are done using the joint MAC routing model. Various things that are used in this model are Markov chain model, probability for a busy channel etc.

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#### 4. Metrics That We Use

In this section the author describes the metrics used for interfacing between the MAC layer and the routing layer.

Two metrics are proposed by the authors, R and Q metrics respectively. The ETX metric evolves into the R metric which is more advanced and adept at countering the drawbacks of the ETX metric. ETX fails to recognize the packet that are lost due to the contention, but R metrics takes care of this aspect as well. Then the Q metric is introduced, which also provides load balancing with all the previous features of the R metric. It also provides more reliability. A comprehensive comparison between all the metrics that are aforementioned is also done in the paper, with separate comparisons for the BCP and ETX metrics with respect to the performance parameters.

#### 5. Conclusion

Basically the dependence of the MAC layer with the routing layer is subjected to a comprehensive and complex experimental analysis by the authors. The existing metrics that took this interfacing into account are discussed and compared. Based on these discussions two new metrics were introduced by the authors in the form of Q and R metrics that supersede the shortcomings of the existing metrics. R metric provides reliable links and Q metric provides balanced load on each node.

#### 6. Future Scope

There is a lot of work that is yet to be done in this field, but for now optimizing and standardizing the novel metrics that are proposed by the authors would go a long way into advancing the MAC aware routing techniques. Perhaps it will be really helpful if the Q metric and the R metric are both subjected to serious considerations and then maybe implemented in the future on a large scale, because being more efficient than the other metrics these metrics are performing better so standardizing them is the correct decision.

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