Dynamic and Differentiated Retry Mechanism for IEEE 802.11 Standard

Srinivas Kraleti

MSIT

Introduction

Unlike Ethernet, wireless networks are more prone to losses and have an inbuilt mechanism for retransmissions called ***retry mechanism***. Retry Mechanism ensures successful data transmission in wireless networks based on IEEE 802.11 Std. According to retry mechanism whenever there is a failure of RTS or DATA frame, that particular frame will be retransmitted. The threshold for number of retransmission attempts is called **"retry limit"**. So, retransmissions occur till this threshold in case of RTS or DATA frames.

The default scheme is not application dependent and it is not dynamic for retry mechanism which means ***retry limit*** is fixed for complete network operation. Hence a new scheme is proposed which modifies the retry limit at RetransmitRTS and RetransmitDATA. Additionally this scheme is made to behave in accordance with application type there by introducing the differentiated QOS service.

In RetransmitRTS,

```
If shortretrycount (ssrc_) >= ShortRetryLimit,
        Discard the packet.
Else
        Retransmit rts.
```

In RetransmitDATA,

```
If packet_size <= RTS Threshold
        Short retry limit is used.
Else
        Long retry limit is used.
```

T1 - Timeout
D1- Data Frame

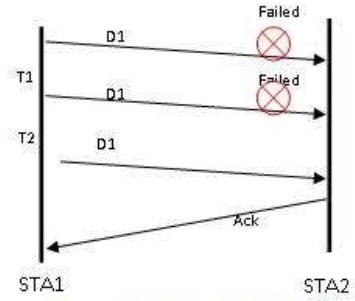


Figure1: Retry mechanism for IEEE 802.11

Methods

In lightly loaded networks frames would not experience much drops due to collisions so using a higher retry limit value is not always useful. It introduces the unwanted delay, unnecessary computations and state machines.

So a modified scheme is proposed to overcome these problems which are modifying the default fixed retry limit at RTS and DATA retransmissions. Here in the proposed scheme whenever a retransmission takes place the retry value is decremented by one and it is saturated at value one. Later based on the application type this retry limit mechanism is changed. Whenever there is retransmission of DATA then based on the traffic type its retry limit is decremented whether it may be short retry limit or long retry limit. A data packet takes short retry limit or long retry limit based on its size.

```
If shortretrycount (ssrc_) >= ShortRetryLimit,
        Discard the packet.
    Else
        Check for packet type.
            Get short retry limit and check
            If short retry limit !=0
                Decrementing short retry limit.
            Else
                Short retry limit =1.
```

Same is the modification in both RTS and DATA retransmissions but in DATA retransmission decrementing the retry limit depend on packet size. If it takes short retry limit then it will be decremented, if it takes long retry limit then it will be decremented.

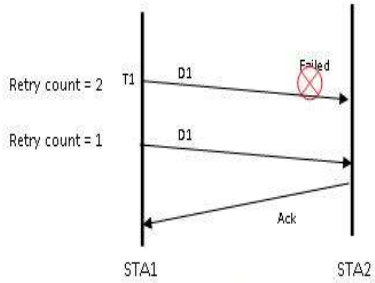


Figure2: Proposed Retry Mechanism for IEEE 802.11

Results

The proposed scheme is application based and dynamic. In this scheme four cases are tested to see the QOS parameters variation.
1.Default scheme
2.Proposed Scheme applied to CBR traffic only.
3.Proposed Scheme applied to TCP traffic only.
4.Proposed Scheme applied to all traffic.

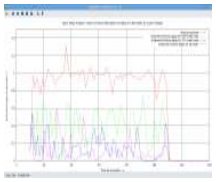
For CBR traffic even if loss is a little bit more than default it is tolerable since delay and jitter are more important parameters. For example, for a video streaming a little bit loss is tolerable but delay and jitter cannot be less.

For TCP traffic acknowledgment based operation is default. So we need not worry about acknowledgment for tcp traffic hence retry limit can be decremented.

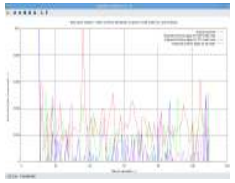
Because of proposed Scheme we can observe decrease in delay and jitter but a slight increase in loss and less throughput for smaller networks in the below graphs.

But for larger networks throughput is increasing.

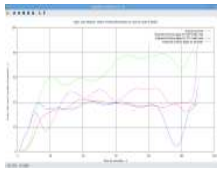
Note: All the below graphs are studied for 2pair of nodes.



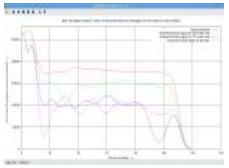
Delay



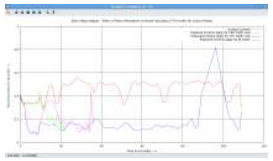
Jitter



Loss



Throughput



Round Trip Delay

Conclusions

Future Work:

In future the scheme can be enhanced to introduce the prioritized DATA transmission by changing the retry limits.

Conclusion:

We believe it is very important to have application dependent and dynamic retry mechanism when there is a prioritized data. Due to this mechanism smaller networks can reduce delay while operating by reducing unwanted computations and state machines and hence this can be used for real time applications.

Bibliography

1. The IEEE 802.11 Definitive Guide 2nd Editions.
2. Real-time retry limit - a system and method to maximize throughput and minimize packet loss of wireless local area networks - Qiong LI. http://www.freepatentsonline.com/EP1540889B1.html