

# **Constrained Application Protocol (CoAP) Performance Measurement Option**

**draft-fz-core-coap-pm-00**

Online, Nov 2021, IETF 112

Giuseppe Fioccola (Huawei)  
Tianran Zhou (Huawei)  
Mauro Cociglio (Telecom Italia)  
Fabio Bulgarella (Telecom Italia)  
Massimo Nilo (Telecom Italia)

# Motivation

- In case of CoAP reliable mode, reliability is provided by marking a message as Confirmable (CON)
  - There are Message IDs and ACKs that can be used to identify packets and measure RTT. But it is resource-consuming for constrained nodes since they have to look at IDs and take timestamps.
- In case of CoAP unreliable mode, a message that does not require reliable transmission can be sent as a Non-confirmable message (NON)
  - No easy way to do measurements

It is resource consuming to read IDs / sequence numbers and store timestamps for constrained nodes.

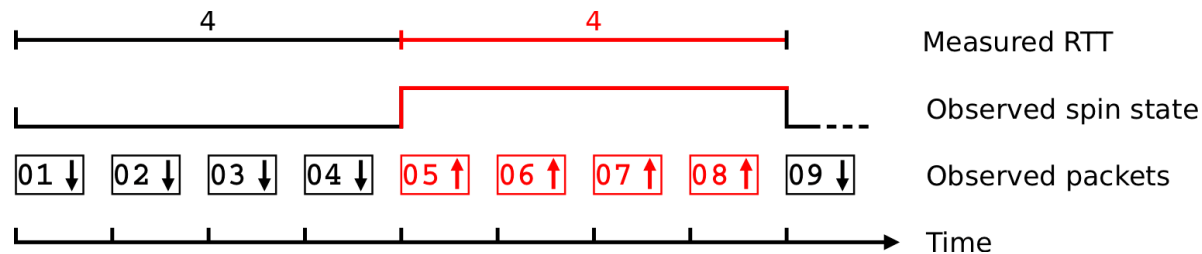
Performance Measurement in constrained environment needs simplified mechanisms!

# Spin Bit and sSquare Bit

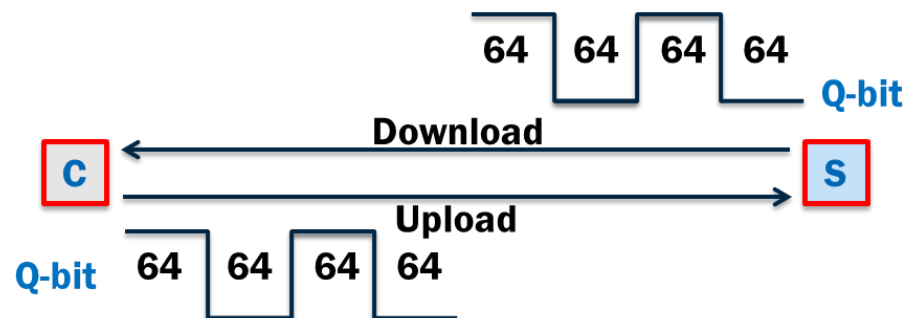
Explicit Flow Measurement (EFM) techniques employ few marking bits, inside the header of each packet, for loss and delay measurement.

These are described in [draft-ietf-ippm-explicit-flow-measurements](#), just adopted in IPPM

- The **Spin bit** idea is to create a square wave signal on the data flow, using a bit, whose length is equal to RTT. It is optional in QUIC (RFC9000)

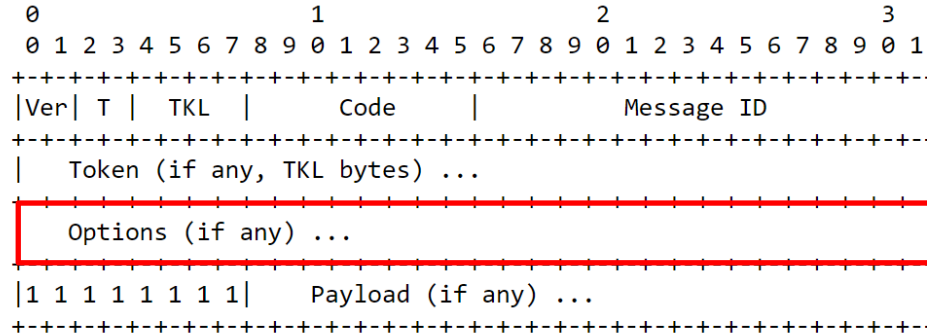


- The **sSquare bit** creates square waves of a known length as defined in the Alternate Marking (RFC8321). This can be used for packet loss measurements.

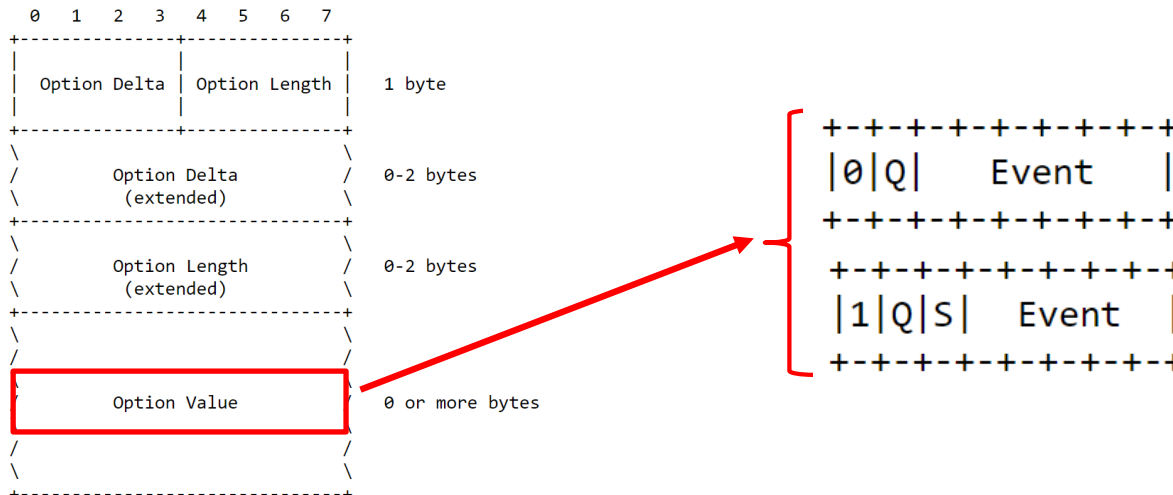


# COAP PM Option

- A new option for CoAP carrying Performance Measurement (PM) bits (in particular Spin bit and sSquare Bit) can be defined



- The PM Option Value can be defined with 1 bit or 2 bits. 2 bits are defined as follows:
  - sSquare Bit (Q) for Packet Loss measurement in both Client-Server and Server-Client directions and for RTT measurement. It can be used alone.
  - Spin Bit (S) can also be added for RTT measurement (reinforced by the Q bit)



# Key Points and Benefits

- No IDs/sequence numbers for packet loss and flexible timestamp handling to measure RTT. The method is simple to meet the requirement of constrained nodes.
  - Equip the CoAP with Performance Measurement bits to enable RTT and Loss metrics.
- Proposal to improve the Q bit mechanism and find a synergy with S bit in order to simplify the application. Q bit can also be used alone to measure loss and delay.
  - Constrained nodes need simple way to do performance measurements
- Possible advanced usage:

Addition of event signaling bits for on-path observers. The on-path observer can be the Proxy or a Gateway to interconnect disjointed CoAP networks.

  - This information could be used to adjust protocol parameters (e.g. timeout values) based on the real network performance.
  - It could also be possible to decide whether to use reliable or unreliable message transmission based on network conditions

# Next Steps

- This draft is based on well-known methodologies applied in RFC9000 (Spin Bit) and RFC8321 (sSquare Bit).
- It aims to meet the limited resources of constrained environment.

Welcome questions, comments

Thank you