

Constrained Application Protocol (CoAP) Performance Measurement Option

draft-fz-core-coap-pm-02

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Motivation

A mechanism to measure the performance in CoAP can be useful to verify and meet the operational requirements.

- ✓ It must be a simple mechanism for network diagnostic to be developed on constrained nodes requiring just a minimal amount of collaboration from the endpoints.

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

- Performance Measurement in constrained environment needs straightforward methodologies!

Changes from -01

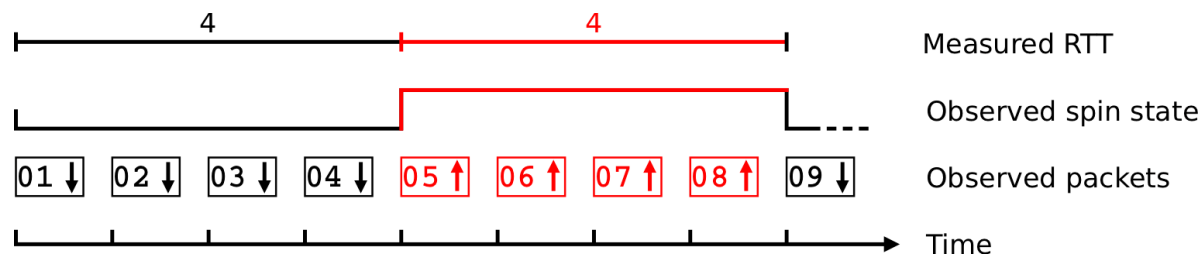
Most of the changes are to address the comments and inputs from Carsten Bormann, Christian Amsuess and Marco Tiloca:

- Clarified that the CoAP PM Option is Elective, Safe-to-Forward and it is not to be included in the Cache-Key (NoCacheKey is set)
- New detailed scenarios described:
 - Non-proxying endpoints
 - Collaborating or Non-collaborating proxies
 - OSCORE (Class E, I, U)
- Management and Configuration aspects
- Added DTLS and OSCORE cases in the Security Considerations

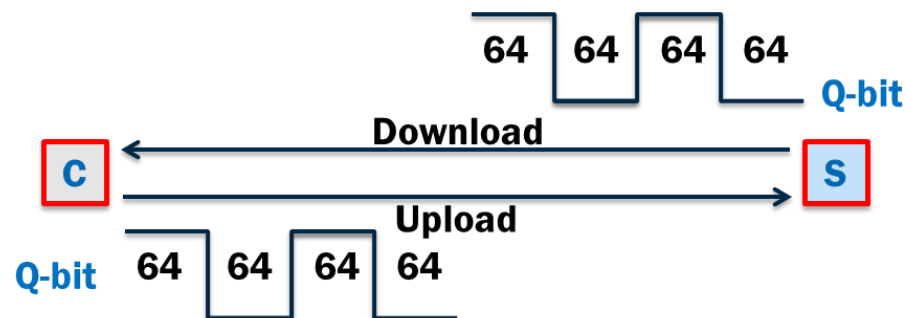
Spin Bit and sSquare Bit

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](#) (in WGLC)
- 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)

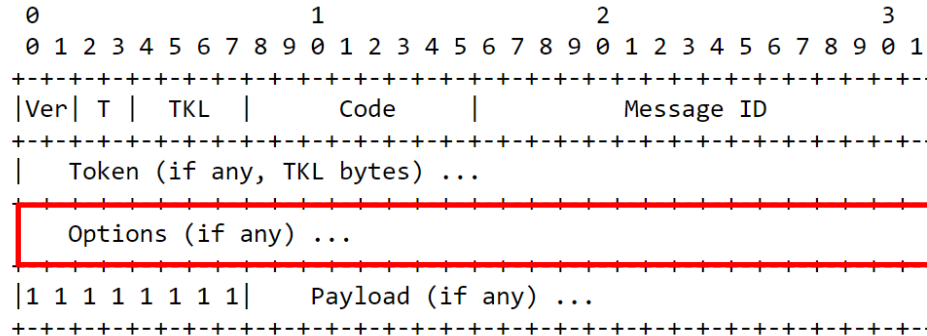


- The **sSquare bit** creates square waves of a known length as defined in the Alternate Marking (RFC8321). This can be used for packet loss (and delay) measurements.

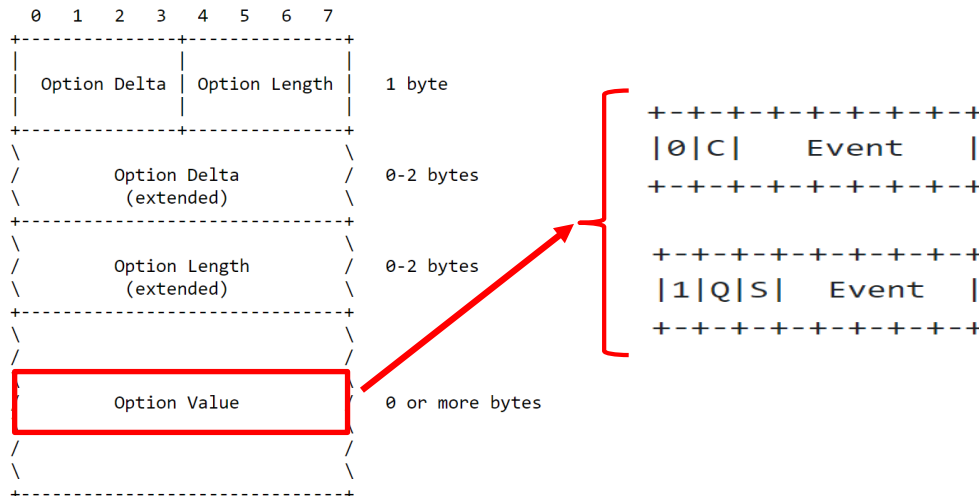


COAP PM Option

- A new option for CoAP carrying 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 directions.
 - Spin Bit (S) for RTT measurement. Combined sSquare Bit (C) can reinforce Q with Delay information.



Example: the Event bits can be divided into two parts: loss event bits and delay event bits.

- An end point can define different levels of thresholds and set the delay/loss event accordingly.

An on-path observer (Proxy or Gateway) knows the network condition by reading the Event bits.

- It MAY communicate with Client and Server to set some parameters based on the performance.

CoAP PM: Use Cases

The main usage of the CoAP PM Options is for end-to-end measurement between the client and the server

Split measurements are also allowed. The intermediaries or on-path observers could be:

- Network Functions or Probes that must be able to see deep into application.
- Gateway or Proxies, tasked by CoAP clients to perform requests on their behalf (RFC7252)

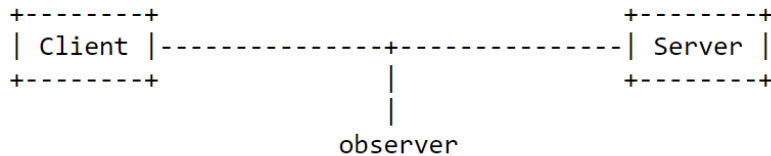
Different cases:

- Non-proxying endpoints
- Collaborating or Non-collaborating proxies
- OSCORE

Application Scenarios

➤ Non-proxying endpoints

The CoAP PM Option can be applied end-to-end between client and server and, since it is Elective, it can be ignored by an endpoint that does not understand it.

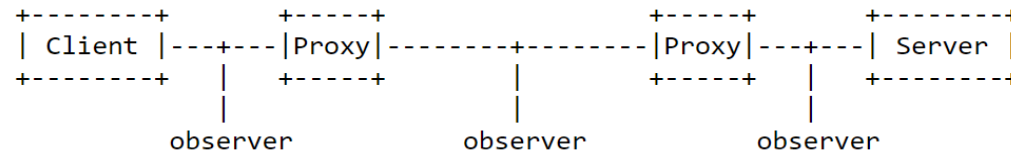


Measurements:

- e2e (Client-Server)
- on-path upstream and downstream (Observer)
- on-path intra-domain portion

➤ Collaborating or Non-collaborating proxies

The CoAP PM Option can be applied end-to-end between client and server (or between collaborating Proxies). Since it is Safe-to-Forward, it is intended to be safe for forwarding by a non-collaborating proxy.



Measurements *in case of collaborating proxies*

- e2e (Client-Server or Proxy-Proxy)
- on-path upstream and downstream (Observer and/or Proxy)
- on-path intra-domain portion

Measurements *in case of non-collaborating proxies*

- e2e (Client-Server)
- on-path upstream and downstream (Observer)
- on-path intra-domain portion

➤ OSCORE

- If the CoAP PM Option is sent as Outer Option, it allows both end-to-end and on-path measurements

Next Steps

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

Evaluate WG Adoption

Welcome questions, comments

Thank you