Constrained Application Protocol (CoAP) Performance Measurement Option

draft-fz-core-coap-pm-00

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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 sQuare 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 **sQuare 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 sQuare Bit) can be defined.

- The PM Option Value can be defined with 1 bit or 2 bits. 2 bits are defined as follows:
  - sQuare 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 (sQuare Bit).
- It aims to meet the limited resources of constrained environment.

Welcome questions, comments

Thank you