TCP ACK Pull

draft-gomez-tcpm-ack-pull-00

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Motivation (I/II)

• Delayed ACKs allows reducing packet overhead under some conditions
• However, Delayed ACKs may be detrimental in some scenarios
• Assume segment carrying a message of up to 1 MSS
  – If the message does not elicit an application-layer response, and a 2nd data segment is not transferred earlier than Delayed ACK timeout, the ACK is unnecessarily delayed
  – Negative consequences…
Motivation (II/II)

• Using Nagle, a sender may be prevented from sending more data while awaiting the ACK
  – High underperformance in high bit rate environments (e.g. DNS stateful operations, RFC 8490)

• Internet of Things (IoT) devices
  – Memory resources cannot be released until the ACK arrives, might even lead to packet drops
  – Increased energy consumption (e.g. radio interface awake while awaiting the ACK)
  – ACK delay might be further exacerbated by layer two mechanisms in some IoT technologies
Solutions

• Disabling Delayed ACKs (if at all possible)?
  – No
    • The receiver may interact with a variety of devices, and Delayed ACKs may still be useful in many connections
    • A sender may offer a mixed traffic pattern, where Delayed ACKs may work as intended for part of it

• Per-segment granularity solution needed
ACK Pull mechanism

• Use of a TCP header reserved bit: AKP flag

A sender sets the AKP flag to request an immediate ACK for a data segment.

Upon reception of a data segment with AKP flag set, a receiver (conforming to this spec) MUST send the ACK immediately.
Post-cutoff discussion

• Feedback received on the mailing list (thanks!):
  – Reserved flag expensive. Use of MAD option suggested
  – Redefine PSH as having the AKP semantics
    • “A TCP MAY not delay ACKs for data segments with the PSH flag”, would be allowed by RFC 1122
    • Windows and Linux set PSH at the message boundary
    • Currently, neither Windows nor Linux send ACKs immediately upon receiving segments with PSH
  – Applications (RPC, web...) use small packets with PSH set and benefit from Delayed ACKs
    • Piggybacking ACKs and replies
    • Dedicated AKP flag would allow using Delayed ACKs in those cases while supporting immediate ACK when needed
  – Selfish devices might always want to use AKP...
Security considerations

• Possible DoS attack on a resource-constrained receiver
  – Attacker may send a large number of messages to a victim node, requesting an immediate ACK for each
  – Avoided by ignoring the AKP flag
Questions/Comments?

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