Updates on Windows TCP

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Quick recap

• Recent TCP advancements on nearly 800 million+ devices running Windows 10
  • IW10
  • RACK + TLP
  • CUBIC
  • TFO (Limited websites, Aggressive fallback)
  • LEDBAT++ (Limited scenarios)
  • Reduced Delayed ACK timeout default
  • Higher ABC limit

• Server 2016 and 2019 deployment for online services at the edge
  • CUBIC
  • TFO
Improved Slow Start

• HyStart
  • Collect 8 RTT samples per round (previously 1 sample when timestamps off)
  • Delay Increase algorithm only
    • “Inter-packet arrival” algorithm has issues due to ACK compression

  \[ \text{Eta} = \min(8\text{ms}, \max(2\text{ms}, \text{LastRTT} / 16)) \]

• Limited Slow Start after HyStart exit
  • HyStart causes premature exit when RTT fluctuates (e.g. Wifi or congestion)
  • LSS based on RFC 3742
  • For each arriving ACK in slow-start

  \[ K = \text{int}(\frac{\text{cwnd}}{0.25 \times \text{ssthresh}}) \]
  \[ \text{cwnd} += \text{int}(\frac{\text{bytes}_\text{acked}}{K}) \]

• HyStart and LSS currently limited to just the initial slow start
RACK updates

• Compliant with draft-ietf-tcpm-rack-04
• In conjunction with traditional Dup ACK based loss detection

• Following optional portions not implemented:
  • DSACK based dynamic reorder window
  • “Reordering setting” timer
  • Optimization to sort sent packet list in time order
  • Ability to retransmit lost retransmits

• Request for moving forward with WGLC
Lower InitialRTO

• Windows default for InitialRTO was 3 seconds
• Total SYN retransmissions were capped to 2 resulting in 21 seconds total timeout
• Lowered InitialRTO to 1 second by default
• Total timeout kept at 21 seconds for app compat reasons
• The only TCP option removed for SYN retransmissions is TFO if it was attempted
Q&A