Avoiding Interactions of Quick-Start TCP and Flow Control

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IETF 68 - TSVWG
One Usage Scenario of RFC 4782

Host 1 -> Router: SYN

Router -> Router: QS request

Router -> Host 2: QS response

Echo

Host 2

New ACK

Standard algorithms

Rate pacing

Rate!

Rate?
Flow Control Issue #1: Buffer Allocation

Buffer Space Autotuning

Linux 2.6.17, Data rate 10Mbit/s, RTT 200ms

- Quick-Start only effective for immediate large receiver buffer
- Reasonable buffer size can be determined from approved rate
- Recommendation for modified buffer allocation
Flow Control Issue #2: RWND Scaling

Problem: RFC 1323 Window Scaling

- Window scaling required when receive window is larger than 65kB
- BUT: "Window field in a SYN (i.e., a <SYN> or <SYN,ACK>) segment itself is never scaled."

➤ Maximum receive window of 65kB in <SYN> and <SYN,ACK>

Consequences for Quick-Start

- If Quick-Start is included in <SYN> segment
  - At most 65kB sent during rate-pacing phase
  - Maximum congestion window after Quick-Start phase is 65kB
- No problem otherwise

Possible Solutions

1. Scale RWND with Quick-Start options, thus violate RFC 1323
2. Signal true value of RWND, if required
Flow Control Issue #2: RWND Scaling

Proposed Solution: Additional Acknowledgement

- Send additional acknowledgement if RWND is larger than 65kB
- Not necessarily back-to-back with <SYN,ACK>
Conclusions and Next Steps

Conclusions

- TCP flow control should be optimized when using Quick-Start
- Possible interactions
  1. Currently deployed buffer size auto-tuning mechanisms
  2. RFC 1323 window scaling signaling

Not discussed in RFC 4782

Next Steps

- Further elaborate on buffer dimensioning for Quick-Start
- Experimental RFC?
- Errata to RFC 4782?
- Discuss effects of adjusting RFC 1323 <SYN,ACK> behavior in future