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Removing TCP's Initial Congestion Window

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Abstract

This specification removes the specification of TCP's initial

congestion window.

Terminology

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The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#), [RFC 2119](#) [[RFC2119](#)].

1 Introduction

TCP connections may choose the initial value of the congestion window (cwnd) and are not beholden to [[RFC6928](#)] or previous specifications of the initial cwnd, provided that:

- (1) The 3WSH MUST complete without a retransmission.
- (2) For initial windows of more than 10 segments, the initial window of segments MUST be paced evenly across the first round-trip time (as measured during the 3WSH).
- (3) Since the initial cwnd has no relationship to the available capacity of the network path, in the case of loss within the initial window of segments sent, the cwnd MUST be set to $SMSS * ((IW - R) / 2)$ instead of simply halving the cwnd. Here, the IW is the size of the initial cwnd (in segments) and R is the number of retransmitted segments within the initial transmission window.
- (4) The initial cwnd MUST be bounded by the receiver's advertised window.

2 Reasoning

The reasoning behind this proposal is mostly taken from [[LAJW07](#)].

- (a) The author thinks that talking about the initial window for the better part of two decades is probably enough. And, definitely boring.
- (b) Traffic is heavy tailed and most TCP connections cannot use an overly large IW as they are short.
- (c) An overly aggressive IW is likely to congestion local networks before burdening remote portions of the path.
- (d) Routers should be using Active Queue Management [[RFC2309](#)] to protect from overly aggressive flows.
- (e) Receivers cannot be overrun as they can exercise control via the advertised window.
- (f) TCP's congestion control algorithms remain in force and

therefore even if a sender transmits too aggressively, this aggression will not be a prolonged event.

(g) Ultimately, being egregiously overly aggressive will not be in

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the sender's best interest---e.g., there will be a fight for local resources among the sender's own connections---and therefore there is an incentive to be reasonable.

3 Security Considerations

A large IW allows TCP to send a large burst of traffic, but an attacker that can tune a TCP to do this can also simply send a large amount of traffic.

Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[RFC6928] J. Chu, N. Dukkupati, Y. Cheng, M. Mathis. Increasing TCP's Initial Window, [RFC 6928](#), April 2013.

Informative References

[LAJW07] Dan Liu, Mark Allman, Shudong Jin, Limin Wang. Congestion Control Without a Startup Phase. Workshop on Protocols for Fast Long-Distance Networks (PFLDnet), February 2007.

[RFC2309] B. Braden, D. Clark, J. Crowcroft, B. Davie, S. Deering, D. Estrin, S. Floyd, V. Jacobson, G. Minshall, C. Partridge, L. Peterson, K. Ramakrishnan, S. Shenker, J. Wroclawski, L. Zhang. Recommendations on Queue Management and Congestion Avoidance in the Internet, [RFC 2309](#), April 1998.

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