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# Metrics for Congestion Control Mechanisms: Why Round-Trip-Time Fairness would be Bad for Congestion Control

**Abstract**

In TCP, bandwidth usage between competing flows is a function of the round-trip time, with short flows receiving more bandwidth than longer ones [F02] (Section 3.3). RTT fairness refers to a goal of equal bandwidth usage between competing flows with different round-trip times, for competing flows that share the same congested links. As an example, one way to achieve RTT fairness between TCP connections would be for each TCP sender to use a Constant-Rate window increase, increasing its congestion window by c*R^2 packets per round-trip time, for per-flow round-trip time R and some global constant c, instead of TCP's Increase-by-One method of increasing the congestion window by one packet per round-trip time [F02] (Section 3.3), [F91]. In this document we argue that the benefits of RTT fairness would be outweighted by the inherent costs, for congestion control mechanisms that don't involve explicit feedback from routers. We also give some suggestions of scenarios that could be used to explore some of the costs of congestion control algorithms designed to achieve RTT fairness.

## 1. Introduction

Discuss the various ways that congestion control mechanisms can be designed to give RTT fairness.

## 2. Potential Benefits of RTT Fairness

* Flows with longer RTTs receive more bandwidth that they would have otherwise.

## 3. Potential Costs of RTT Fairness

* Either the flows with RTTs of 10 ms and less are not aggressive enough to give satisfactory performance, or the flows with RTTS of 500 ms and more are too aggressive to give satisfactory performance.

## 4. Suggested Scenarios

* Explore performance for a congested link where most flows have a round-trip time of 200 ms or more.

* Then explore performance for a congested link where most flows have a round-trip time of 20 ms or less.

## Informative References

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[HK98] Henderson, T.R., E. Sahouria, S. McCanne, and R.H. Katz, "On Improving the Fairness of TCP Congestion Avoidance," IEEE Globecom '98, Nov. 1998.

## Authors' Addresses

Sally Floyd <floyd@icir.org>
ICSI Center for Internet Research
1947 Center Street, Suite 600
Berkeley, CA 94704
USA