Validation Tests of unicast equation-based congestion control

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1 Introduction

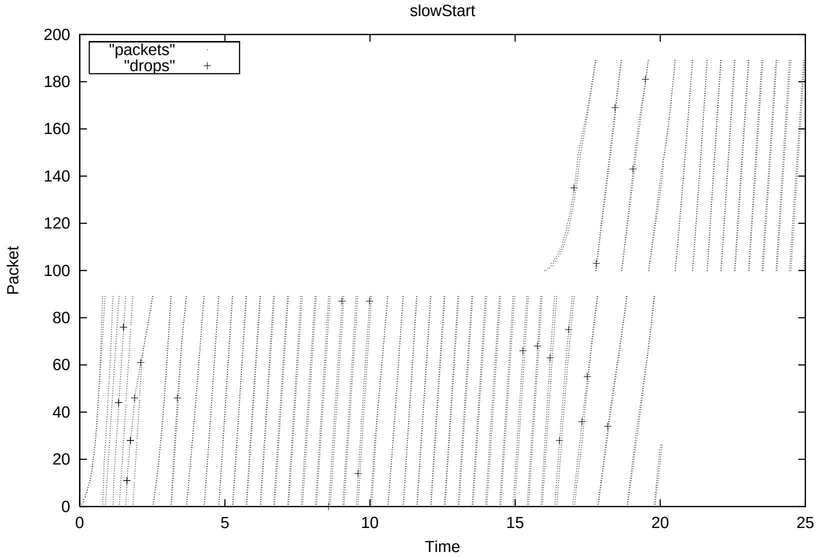
This document describes the validation test for the unicast TCP-friendly congestion control code in the NS simulator. This test can be run with the command "./test-all-friendly" in directory tcl/test of the NS simulator.

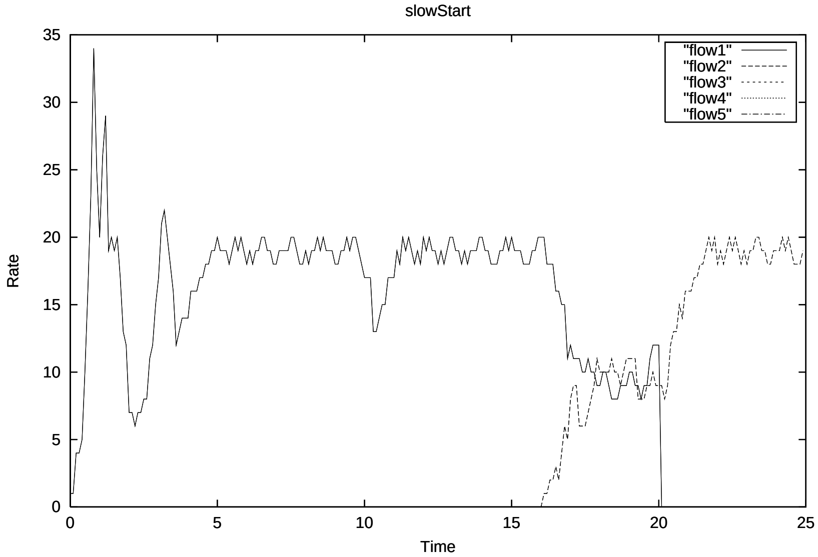
Each validation test is shown by two graphs. The top graph is the traditional time-sequence number plot with a dot for each packet transmitted by a flow. The x-axis shows the time, and the y-axis shows the packet number mod 90 for each flow. There is a dot for each packet arriving and departing from the congested gateway.

The bottom graph shows a line for each flow, showing the sending rate of each flow over 0.1-second intervals. (Or more precisely, for a TCP-friendly flow the bottom graph shows the number of packets transmitted, while for a TCP flow the bottom graph shows the number of packets acknowledged at the sender.)

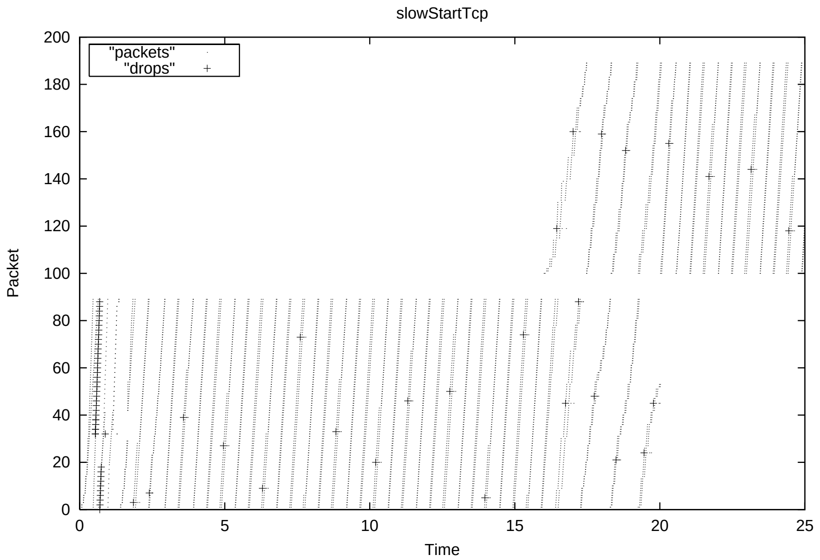
The network topology is described in the procedure Topology/net2 in the file test-suite-friendly.tcl in directory tcl/test. The congested link is a 1.5 Mbps link with a 20 ms propagation delay, RED queue management, and a maximum queue of 50 packets. The TCP flows use SACK TCP. The roundtrip propagation delay for a single flow ranges from 52 to 56 ms. This is not intended to be a realistic scenario, but is simply intended to be a simple scenario for validating the implementation in the simulator. The cross marks show dropped packets.

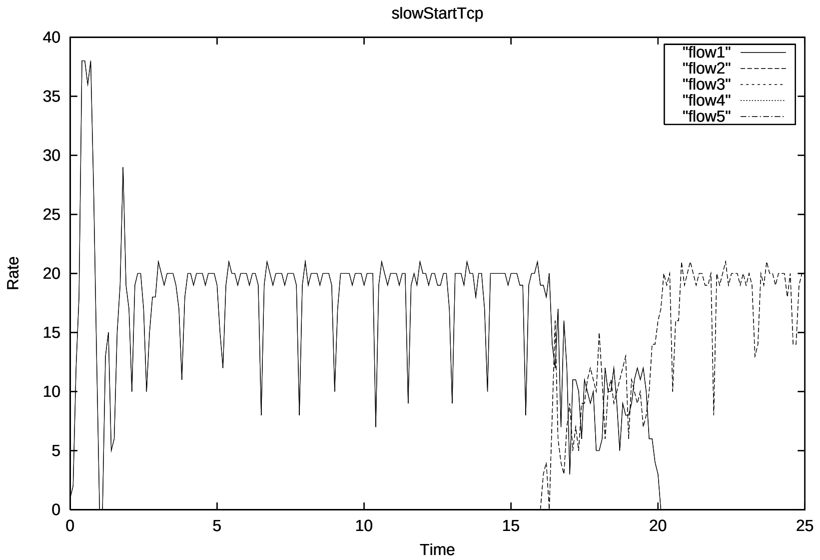
2 The validation tests



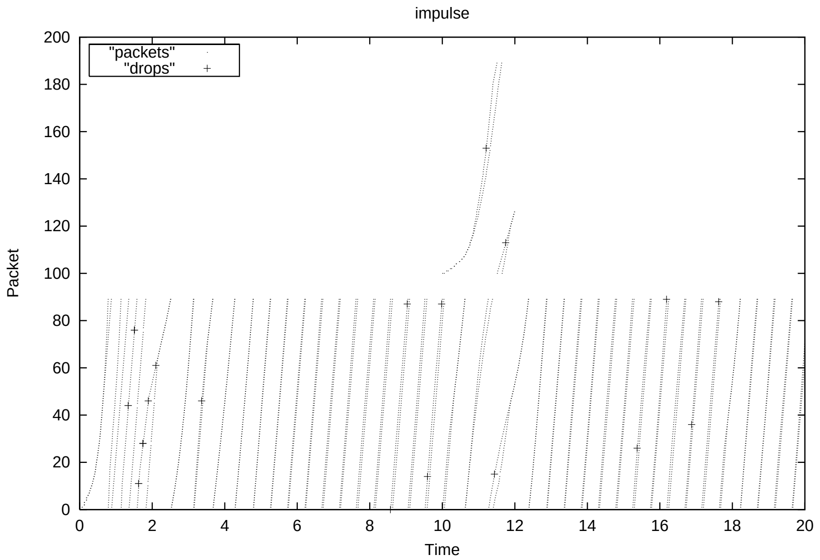


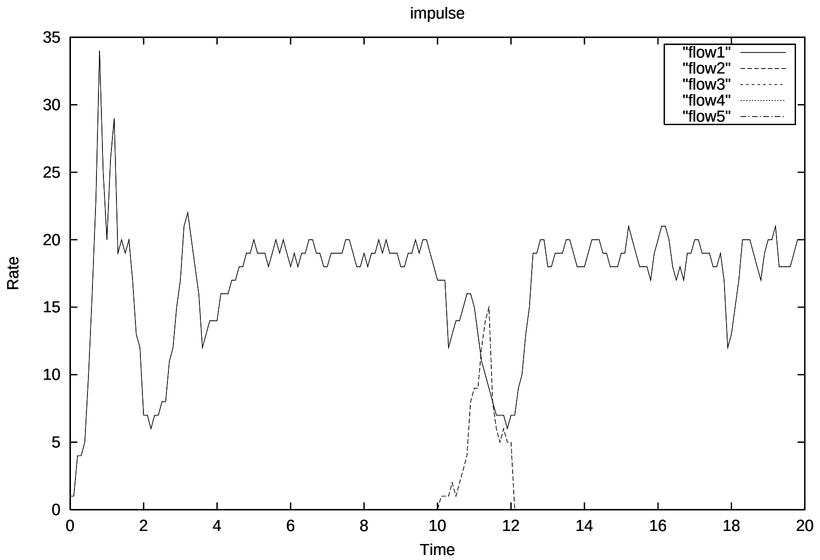
The slowStart test shows two flows using TCP-friendly congestion control. This test focuses on the slow-start behavior of the two flows. This test is run in NS, in the directory tcl/test, with the command "ns test-suite-friendly.tcl slowStart".



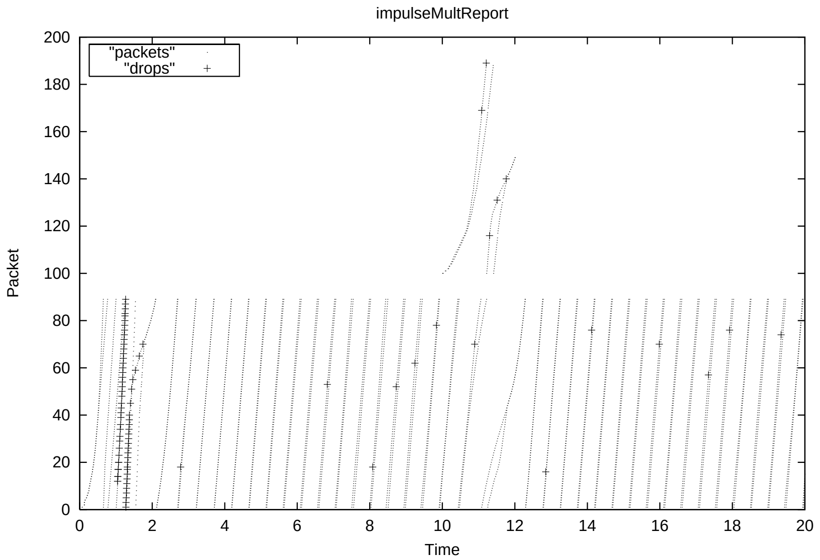


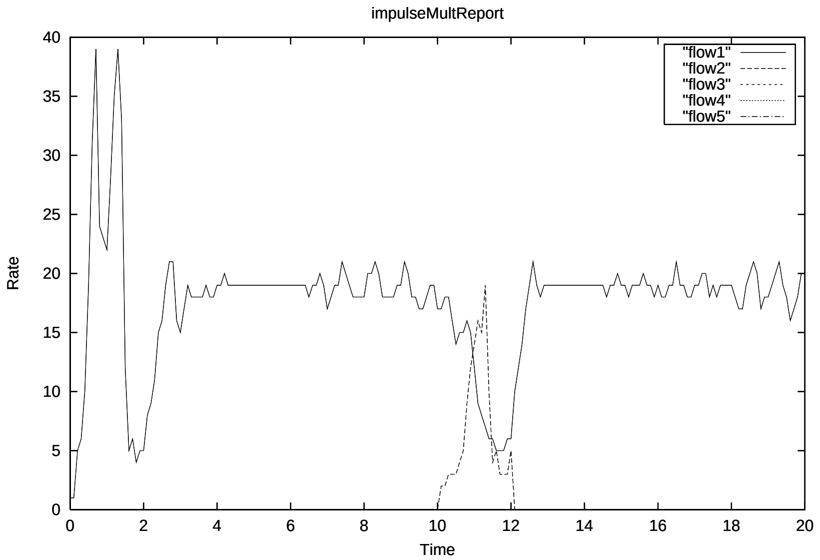
The slowStartTcp test is similar to the slowStart test, except it uses two TCP flows instead of two TCP-friendly flows. This test is run in NS, in the directory tcl/test, with the command "ns test-suite-friendly.tcl slowStartTcp". The oscillations are due to TCP's Fast Recovery, with the corresponding halving of the congestion window.



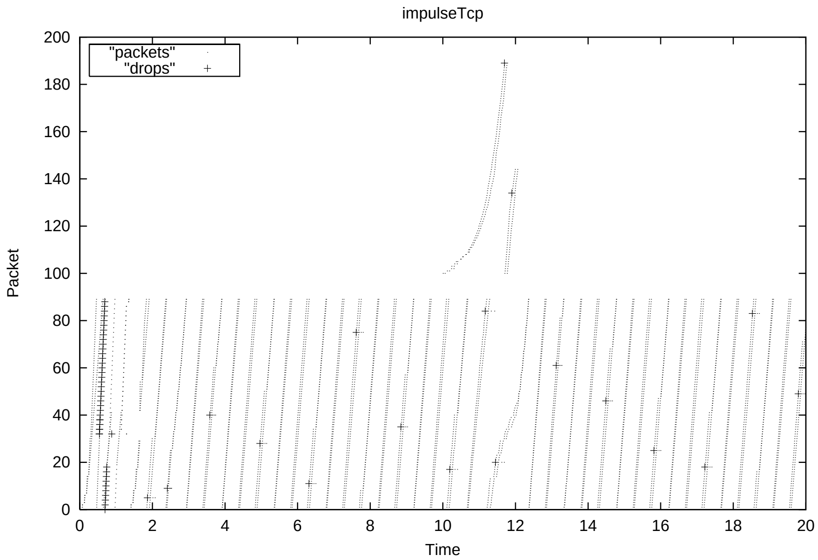


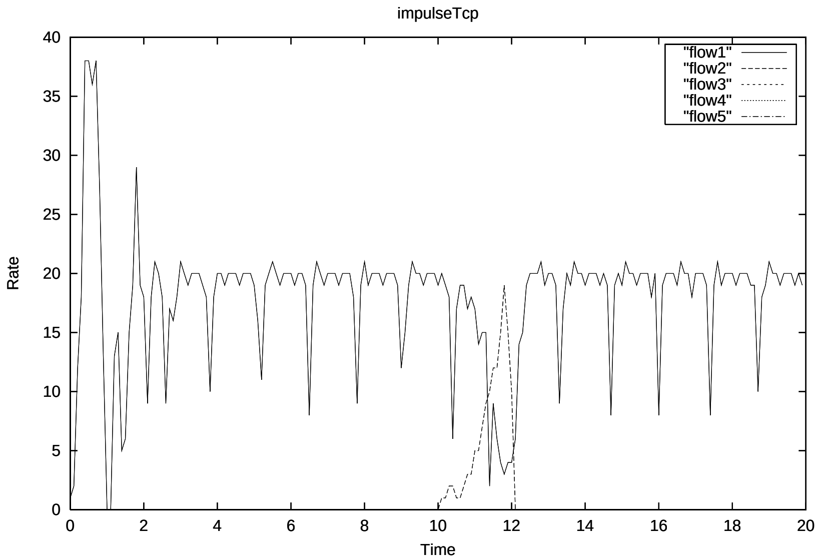
The impulse test shows a long-lived TCP-friendly flow reacting to the impulse noise of a short-lived TCP-friendly flow. This test is run in NS, in the directory tcl/test, with the command “ns test-suite-friendly.tcl impulse”.



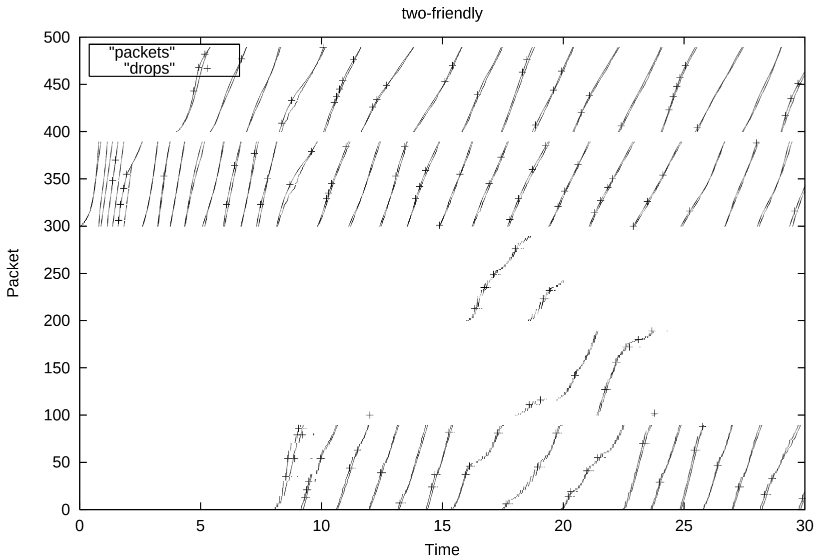


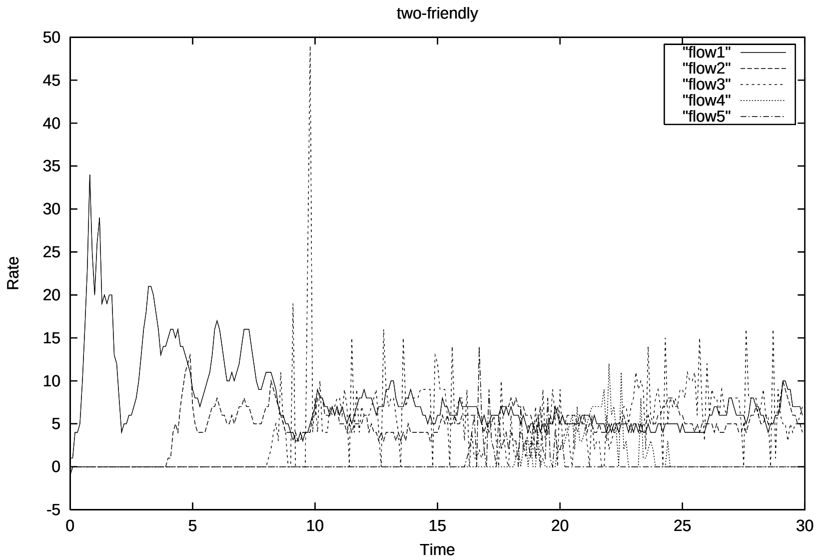
The impulseMultReport test is similar to the impulse test, expect the receiver sends feedback four times per roundtrip time, instead of once per roundtrip time as in the impulse test. This test is run in NS, in the directory tcl/test, with the command "ns test-suite-friendly.tcl impulseMultReport".



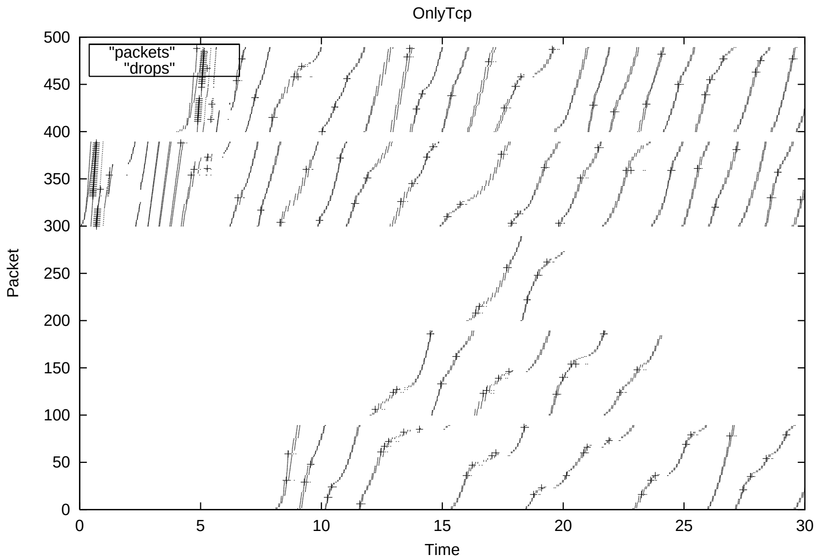


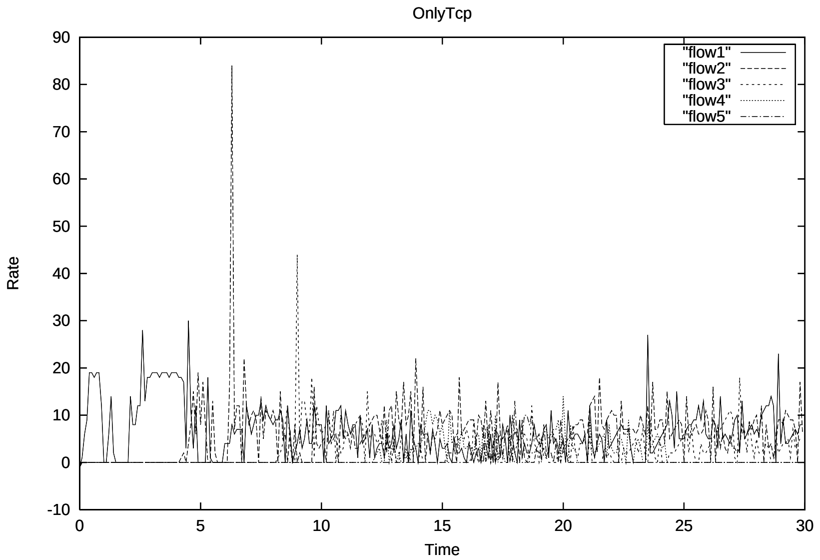
The impulseTcp test is similar to the impulse test, but with two TCP flows instead of two TCP-friendly flows. This test is run in NS, in the directory tcl/test, with the command “ns test-suite-friendly.tcl impulseTcp”.



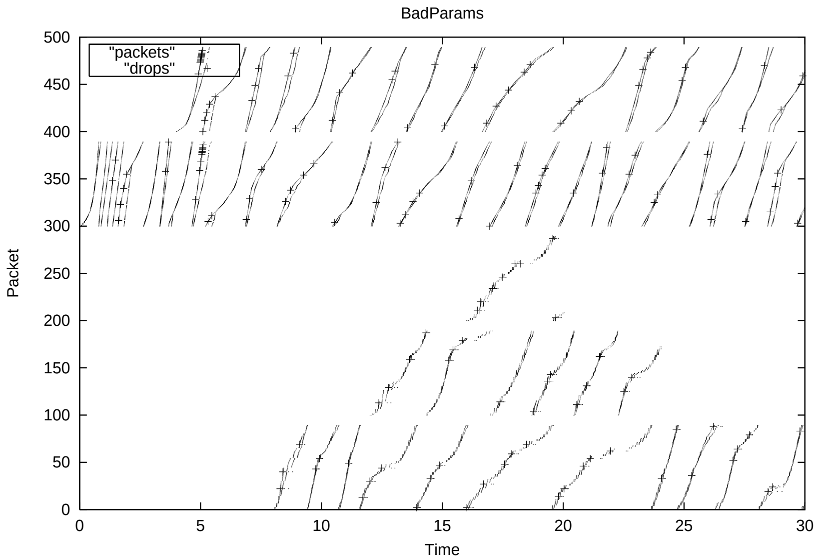


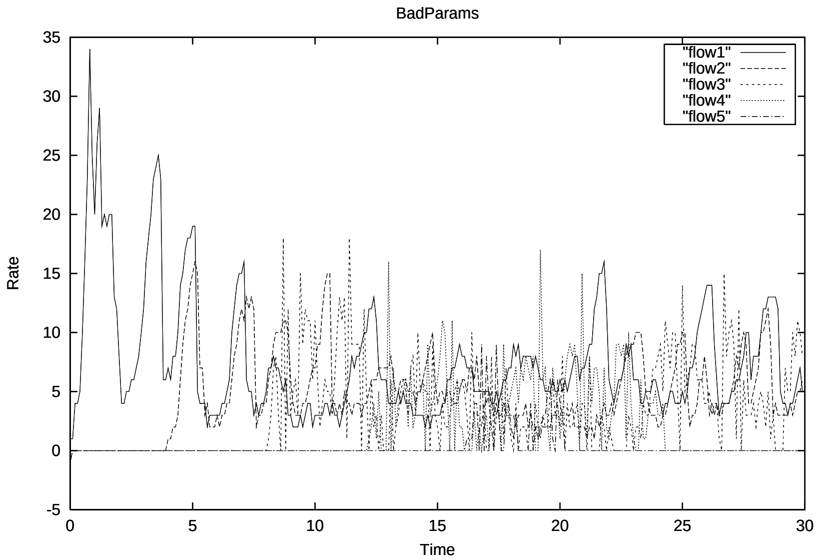
The two-friendly test shows two long-lived TCP-friendly flows responding to three shorter TCP flows. This test is run in NS, in the directory tcl/test, with the command "ns test-suite-friendly.tcl two-friendly".



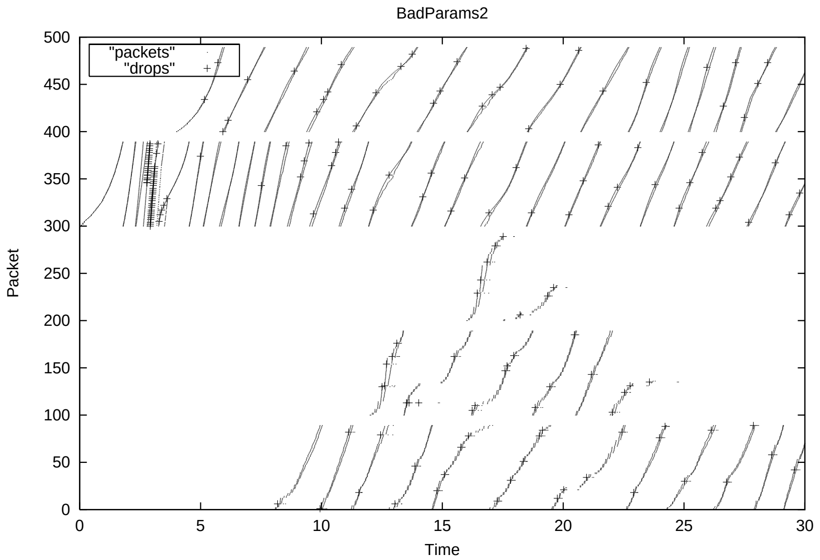


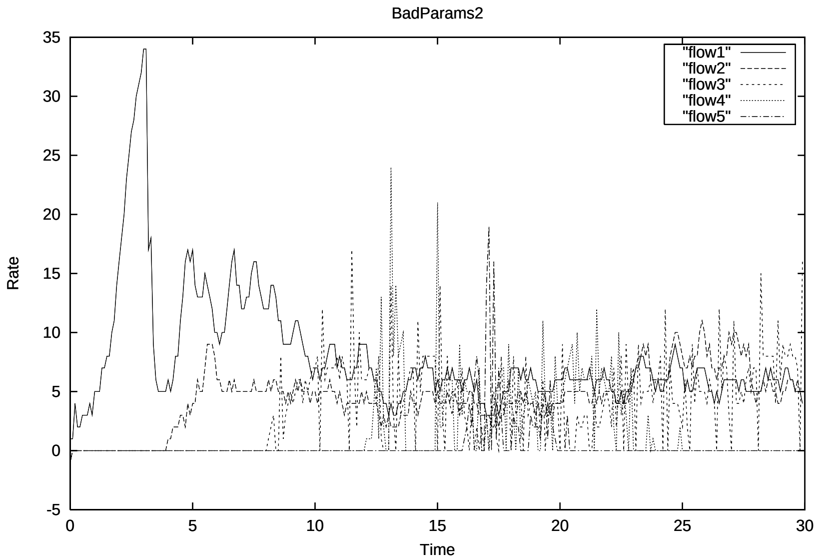
The OnlyTcp test is similar to the two-friendly test, except in this test all five flows are TCP. This test is run in NS, in the directory tcl/test, with the command “ns test-suite-friendly.tcl OnlyTcp”.





The BadParams test is similar to the two-friendly test, with a small measurement interval at the receiver for measuring the loss rate for encouraging oscillations. This test is run in NS, in the directory tcl/test, with the command "ns test-suite-friendly.tcl BadParams".





The BadParams2 test is similar to the two-friendly test, with a very slow increase rate to discourage the second TCP flow. This test is run in NS, in the directory tcl/test, with the command “ns test-suite-friendly.tcl BadParams2”.