

Update on NADA Evaluation Results

`draft-zhu-rmcat-nada-05`

Xiaoqing Zhu, Rong Pan, Michael Ramalho, Sergio Mena de la Cruz, Charles Ganzhorn, Paul Jones, and Stefano DArondo

IETF 92, Dallas, TX, USA

March 25, 2015

Outline

Draft Update

Simulation Results for Basic Test Cases

- Test Settings

- Default Algorithm Parameters

- NS2 Simulation Results

Testbed-Based Evaluations

Open Issues and Next Steps

Draft Update

- ▶ Description of congestion control algorithm:
 - ▶ Non-linear warping of delay at receiver
 - ▶ Accelerated ramp-up at sender
- ▶ Description and discussions of receiver behavior:
 - ▶ Delay desnoising and estimation
 - ▶ Estimation of loss/marketing ratios
 - ▶ Estimation of receiving rate
 - ▶ Choice of feedback interval
- ▶ Re-ordered description for sender behavior
- ▶ Updated section on implementation status

Network Settings

- ▶ Single bottleneck
- ▶ Bottleneck queue type: DropTail
- ▶ Bottleneck queue depth: $\sim 300\text{ms}$.
- ▶ Default path propagation delay: 50ms
- ▶ Additional delay jitter: $\sim \mathcal{U}(0, 30)\text{ms}$.

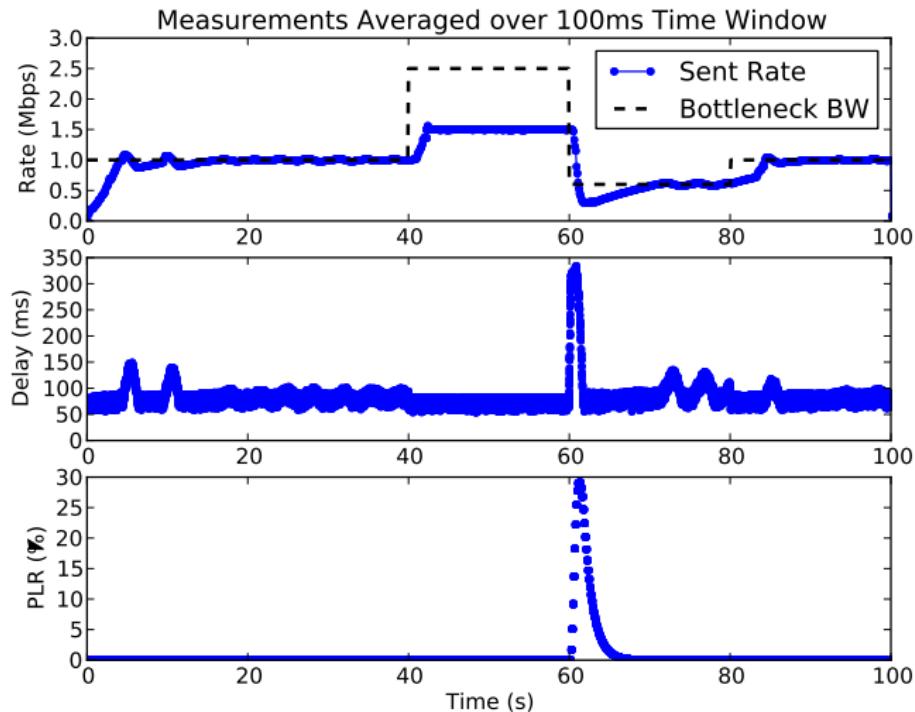
List of Basic Test Cases

- ▶ A. Single Flow w/ Variable Bottleneck BW
- ▶ B. Two Flows w/ Variable Bottleneck BW
- ▶ C.1 Bidirectional Flows
- ▶ C.2 Congested Feedback w/ TCP Backward Flow
- ▶ D. Multiple RMCAT Flows
- ▶ E. RTT Fairness
- ▶ F. RMCAT Flow vs. Long TCP Flow
- ▶ G. RMCAT Flow vs. Short TCP Flow
- ▶ H. Media Pause and Resume

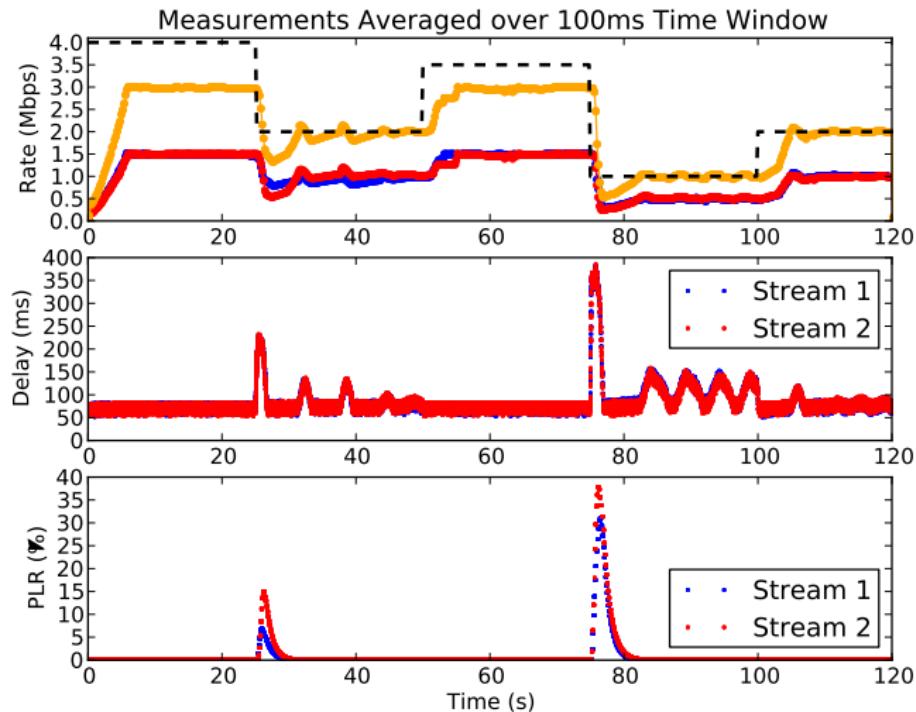
Default Algorithm Parameters

- ▶ Receiver report interval: $\delta_0 = 100$ ms.
- ▶ MTU size: 1000 Bytes
- ▶ Rate range: 150 Kbps \sim 1.5 Mbps
- ▶ Scaling parameters: $\kappa = 1.0, \eta = 2.0$.
- ▶ Upper bound on RTT: $\tau_o = 500$ ms.
- ▶ Reference delay: $x_{ref} = 10$ ms.
- ▶ Non-linear delay warping: $d_{th} = 50$ ms, $d_{max} = 400$ ms.
- ▶ Delay penalty for loss: $d_L = 1.0$ s.
- ▶ Delay penalty for marking: $d_M = 200$ ms.
- ▶ Accelerated ramp up: $T_{th} = 50$ ms, $\gamma_0 = 0.5$.

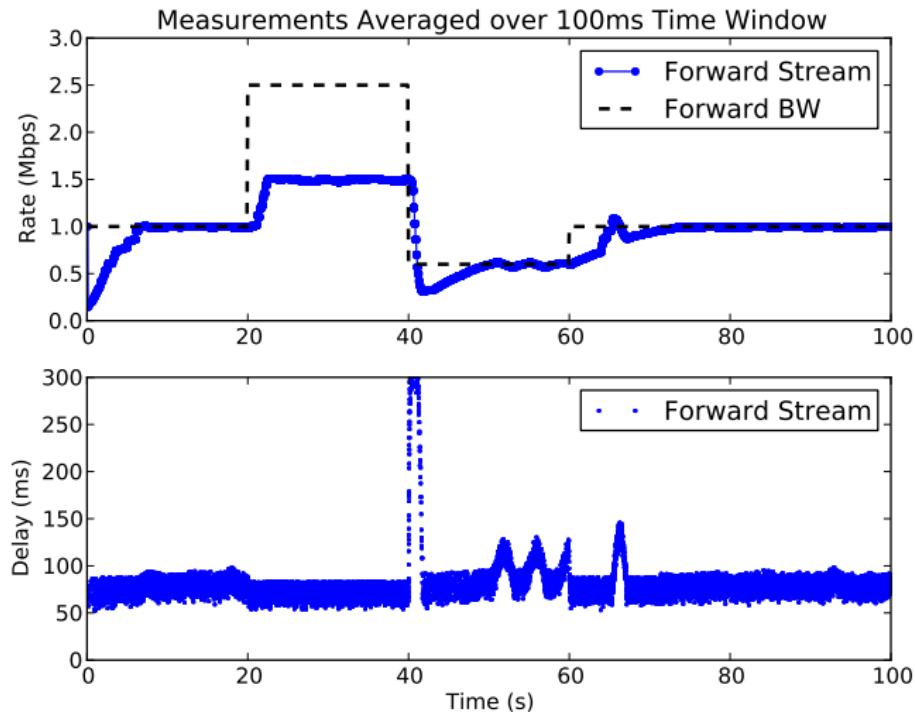
Test Case A: Single Flow w/ Variable Bottleneck BW



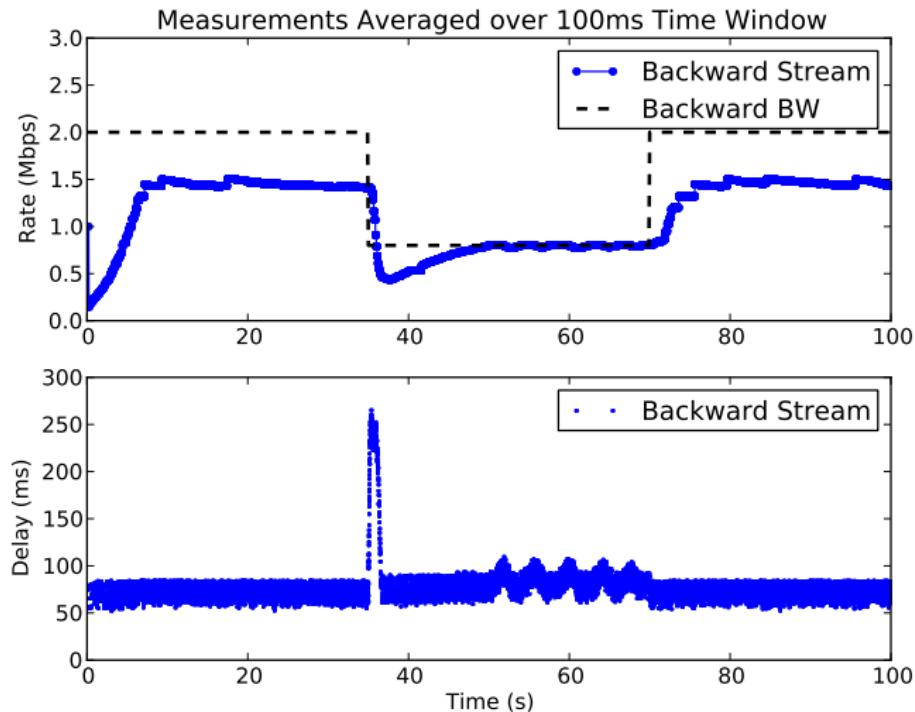
Test Case B: Two Flows w/ Variable Bottleneck BW



Test Case C.1: Bidirectional Flows — Forward Path

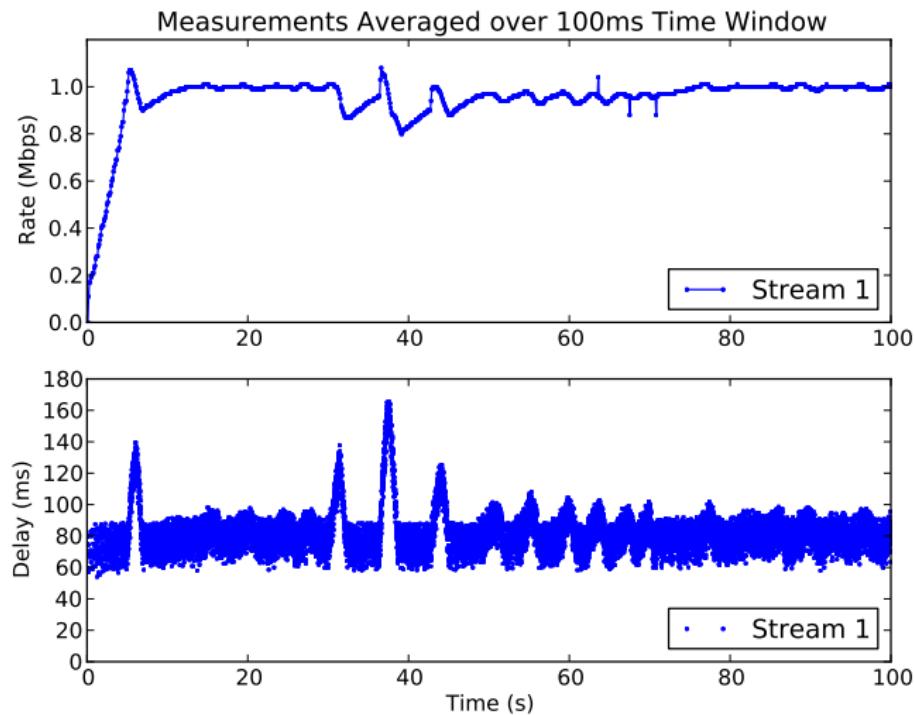


Test Case C.1: Bidirectional Flows — Backward Path

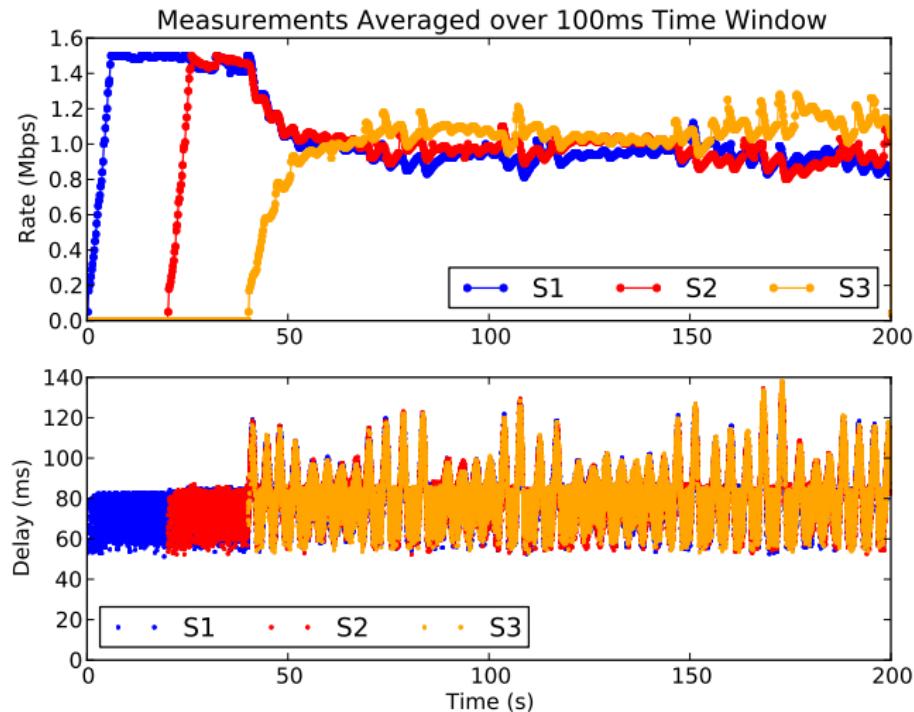


Test Case C.2: Congested Feedback w/ TCP

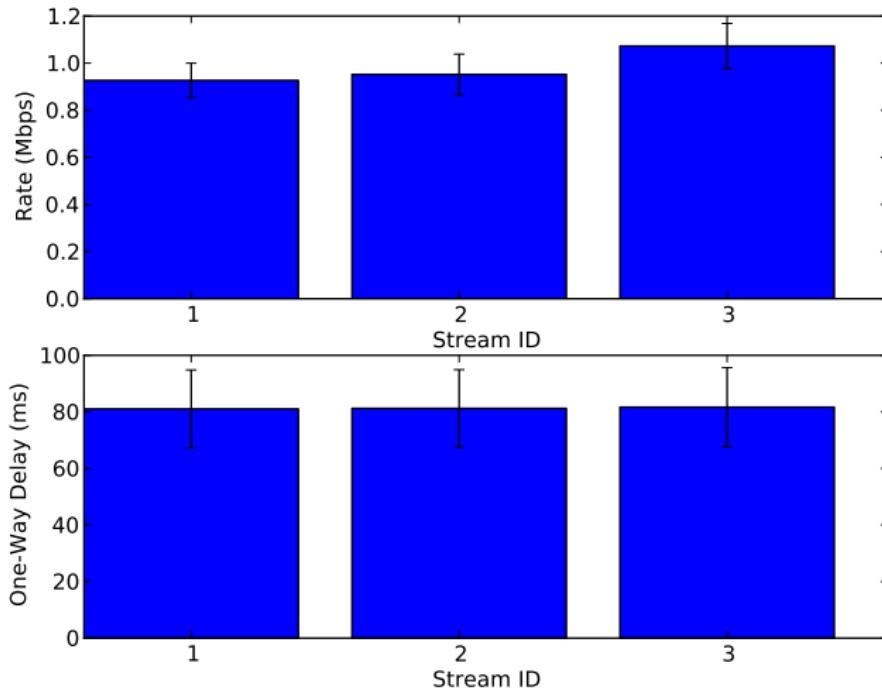
- ▶ TCP backward flow is active during $t = 30 - 70$ s.



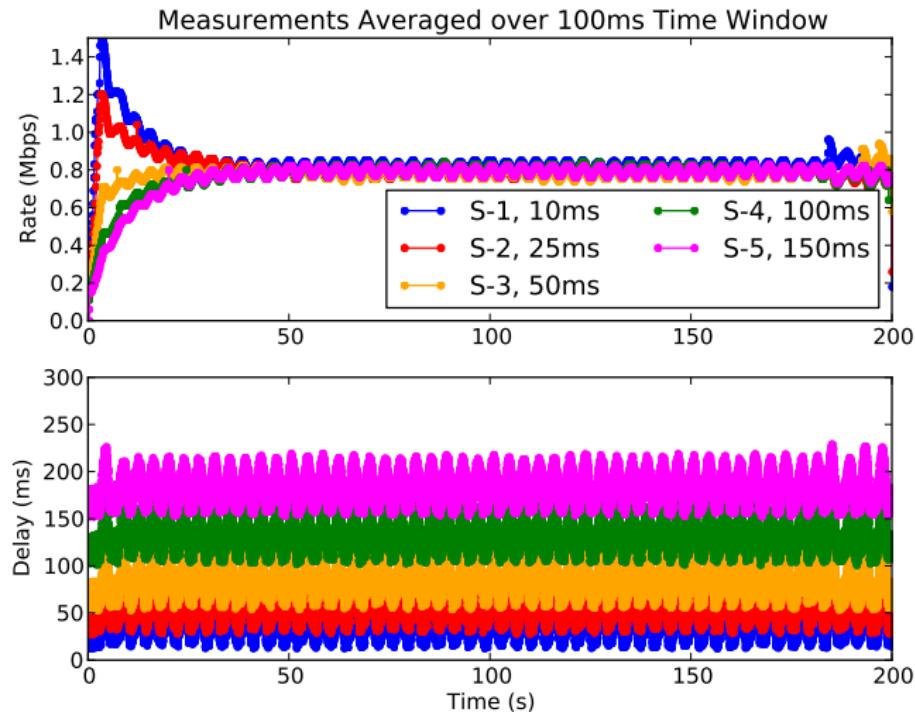
Test Case D: Multiple RMCAT Flows



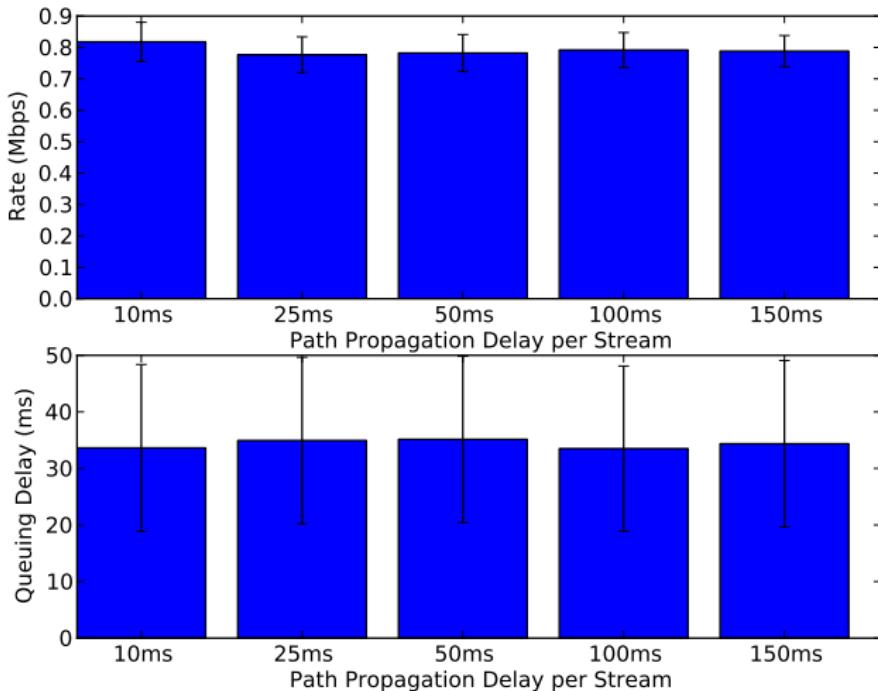
Test Case D: Multiple RMCAT Flows — Per-Flow Rates



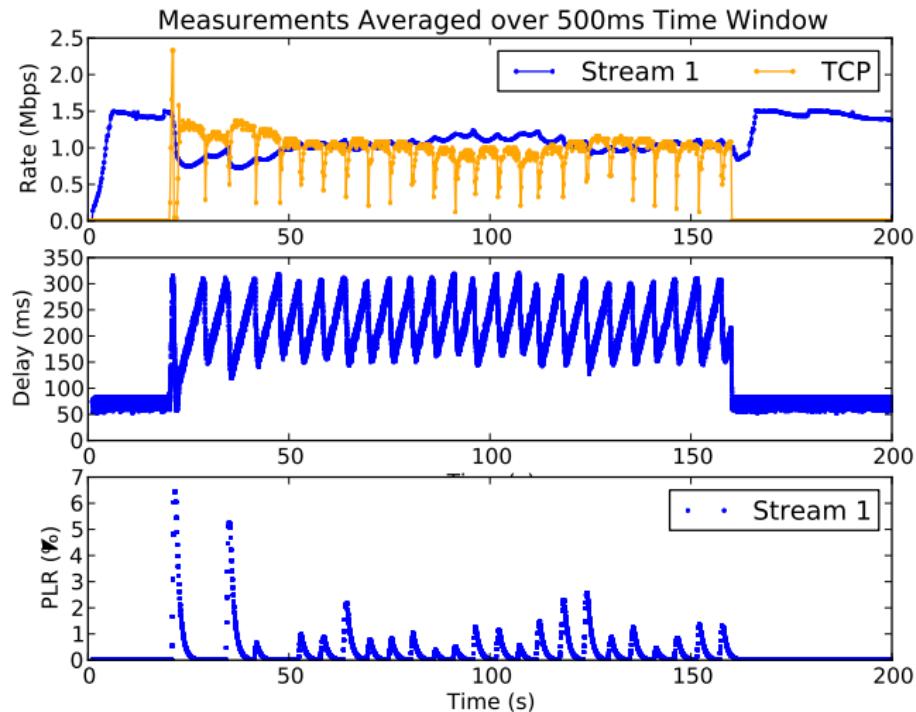
Test Case E: RTT Fairness



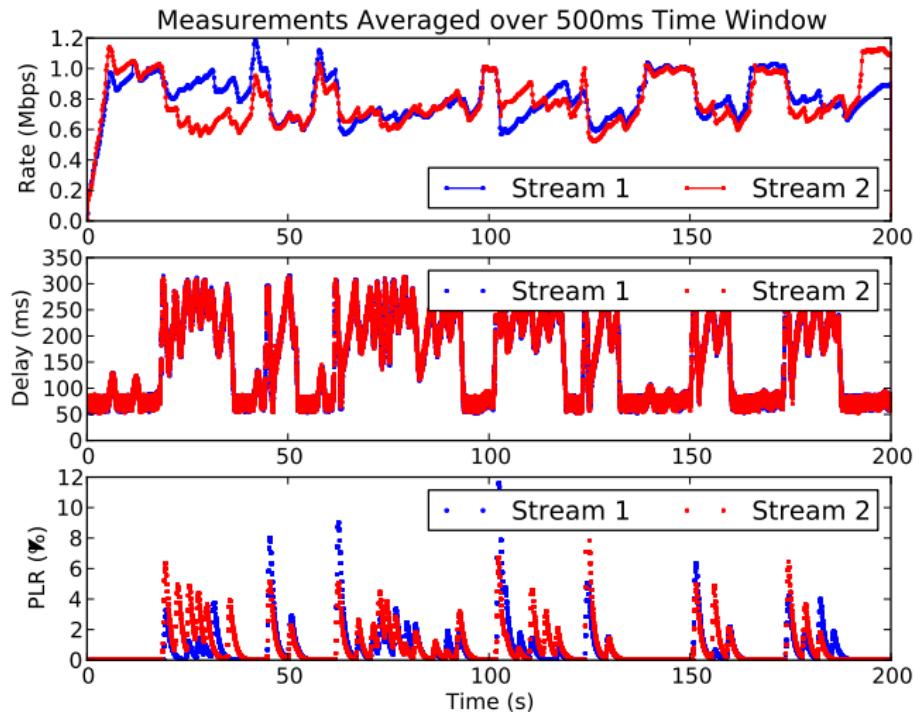
Test Case E: RTT Fairness — Per-Flow Rates



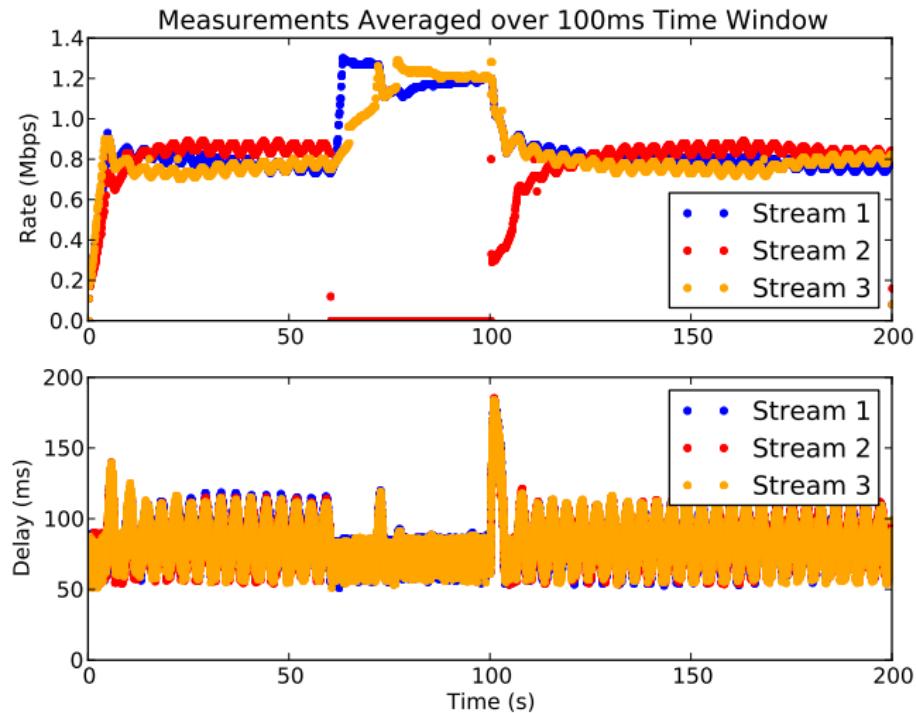
Test Case F: RMCAT vs. Long TCP Flow



Test Case G: RMCAT Flows vs. Short TCP Flows



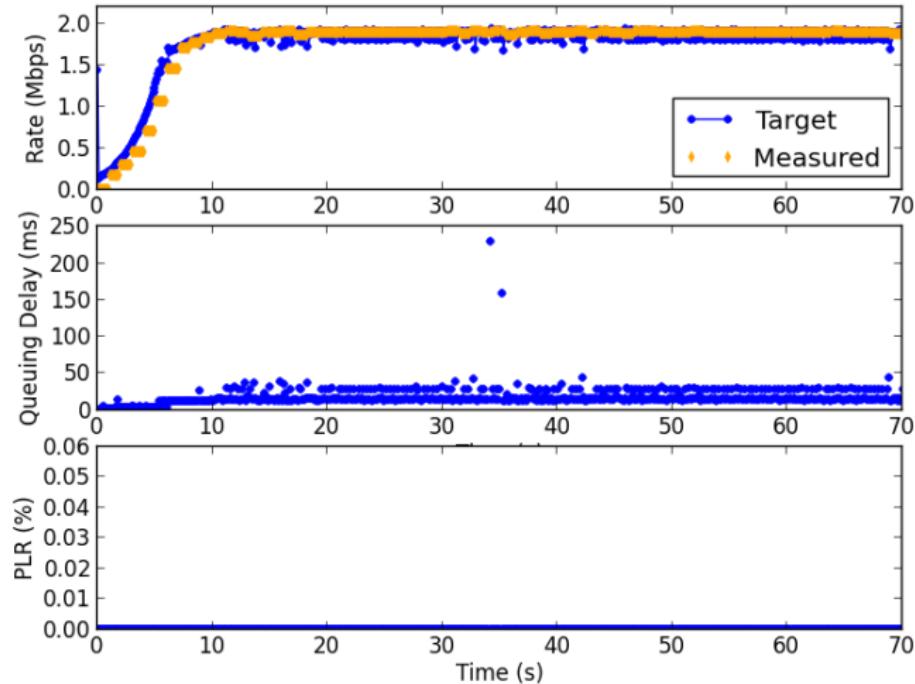
Test Case H: Media Pause and Resume



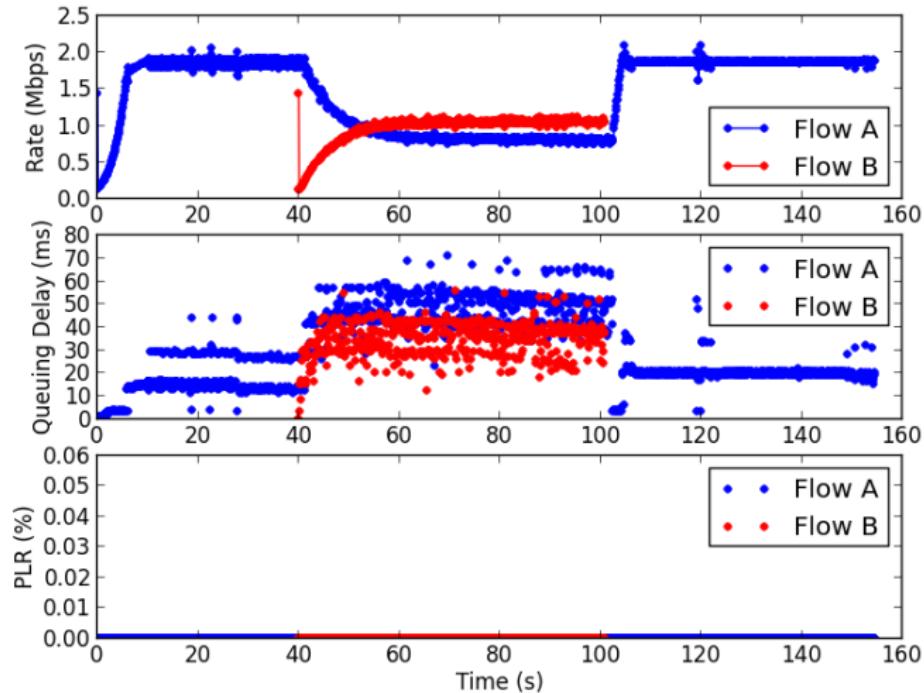
Testbed-Based Evaluations

- ▶ Testbed settings:
 - ▶ Bottleneck link capacity: 2Mbps
 - ▶ Path propagation delay: 0ms
 - ▶ Bottleneck queue depth: 500ms
 - ▶ VM-based sender and receiver
- ▶ Windows-based implementations of NADA:
 - ▶ Synthetic traffic source with no rate shaping buffer
 - ▶ Rate range: 120Kbps ~ 3.6Mbps
 - ▶ Target feedback interval: 100ms
 - ▶ *Update from last time: fixed timestamp granularity issue*

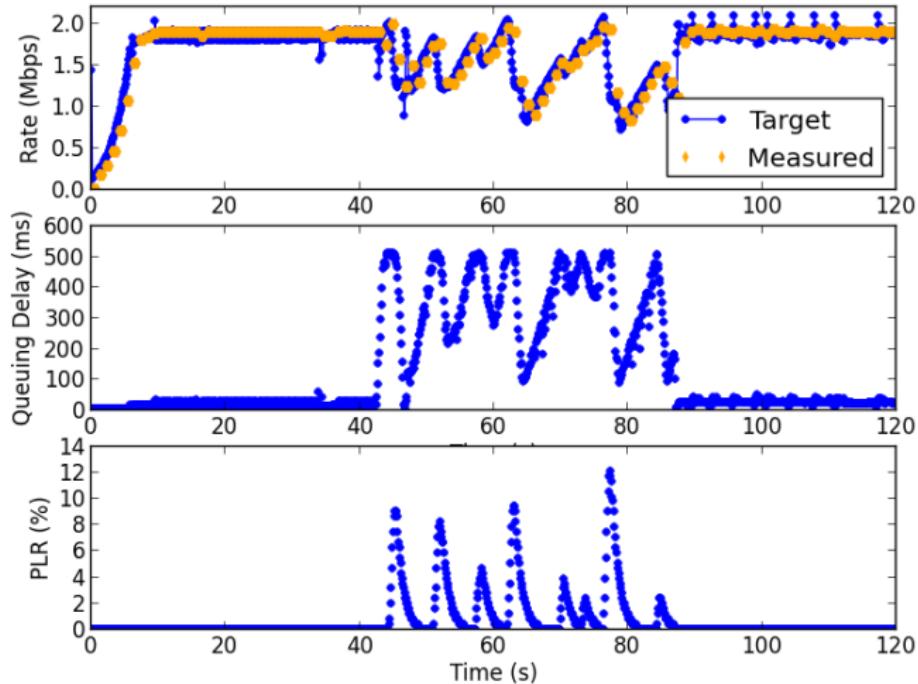
Testbed Result — One NADA Flow



Testbed Result — Two NADA Flows



Testbed Result — NADA vs. TCP

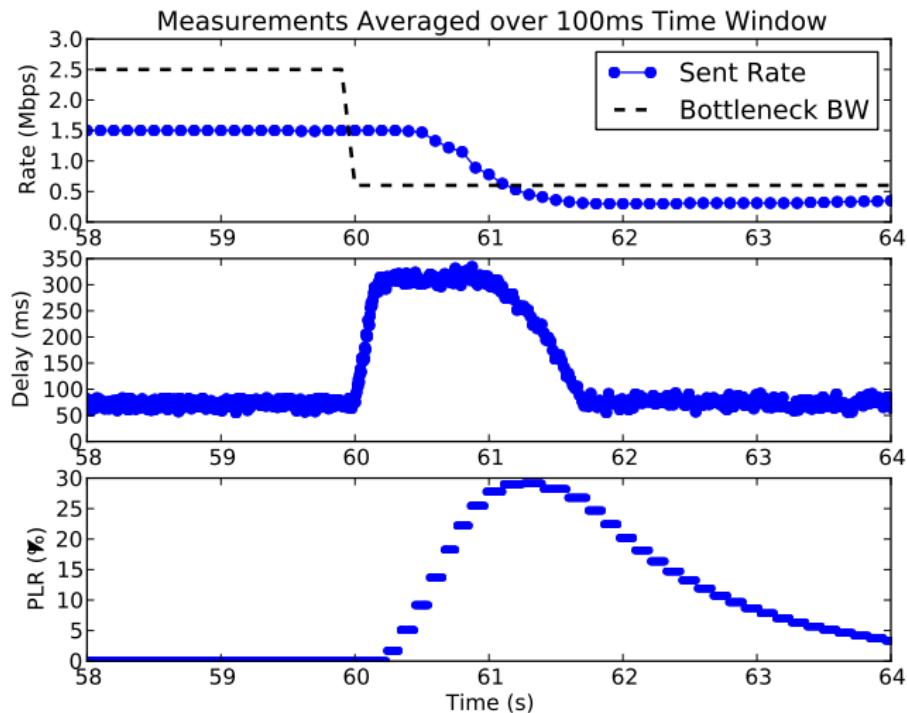


Open Issues and Next Steps

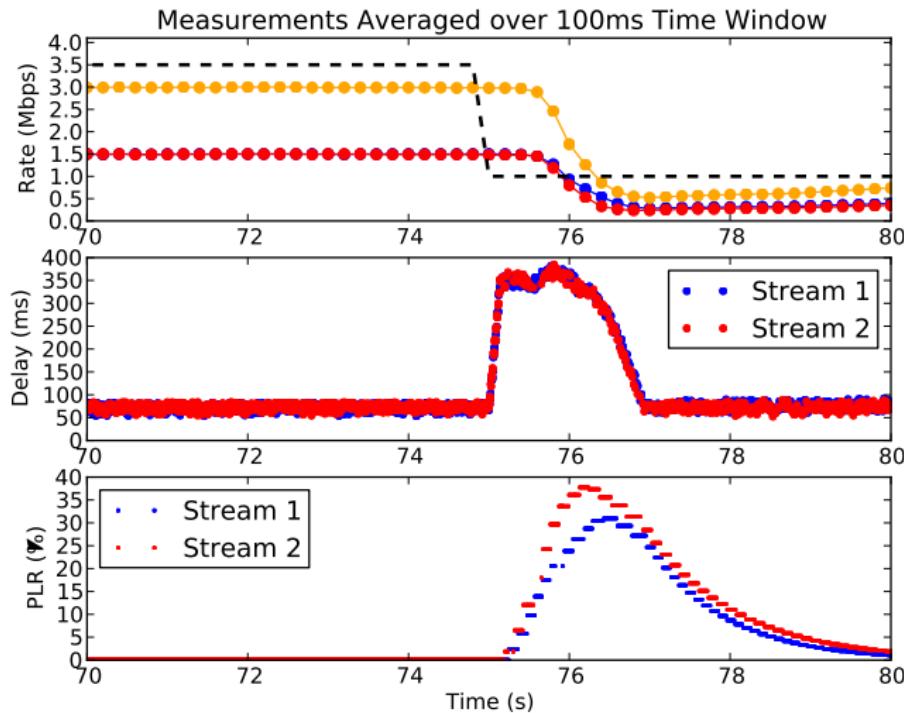
- ▶ Open Issues
 - ▶ May get locked in loss-based mode with high queuing delay
 - ▶ Vulnerable to mistakes in delay measurement
 - ▶ Lacking a "time-out" mechanism in the absence of feedback
 - ▶ Denoising filtering leads to a slower feedback control loop
- ▶ Ongoing Efforts and Next Steps:
 - ▶ TFRC-style packet loss ratio calculation
 - ▶ Guidelines on how to choose algorithm parameters
 - ▶ Testbed result with live video feed
 - ▶ More extensive testing in "noisy" network environments
 - ▶ Evaluation comparison with other schemes
- ▶ Call for Action from WG:
 - ▶ Adoption of NADA as WG item.
 - ▶ Feedback and suggestions on the draft and evaluation efforts

Backup Slides

Test Case A: Single Flow Zoom-In View



Test Case B: Two Flows Zoom-In View



Ongoing Investigation with TFRC-Style PLR Calculation

- ▶ Bottleneck link bandwidth: 1Mbps
- ▶ Forward path propagation delay: 40ms

