Perspectives on Transport Benchmarking
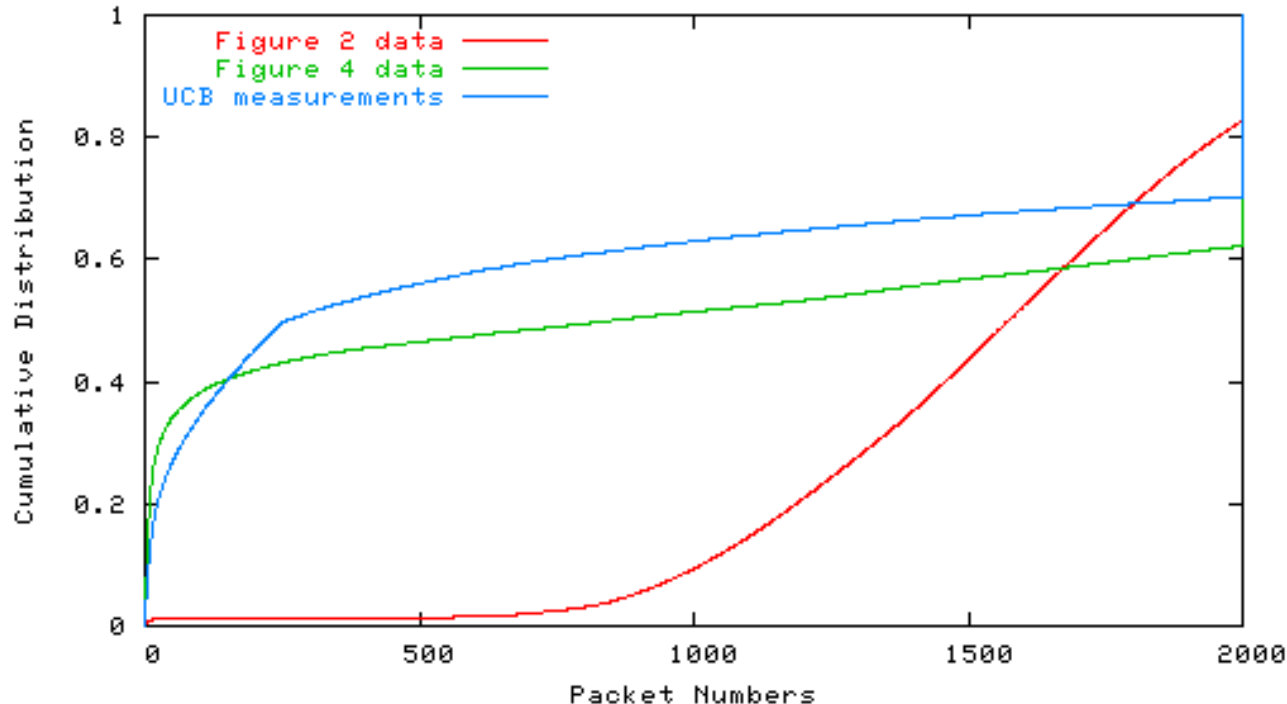
Panel for PFLDnet 2006

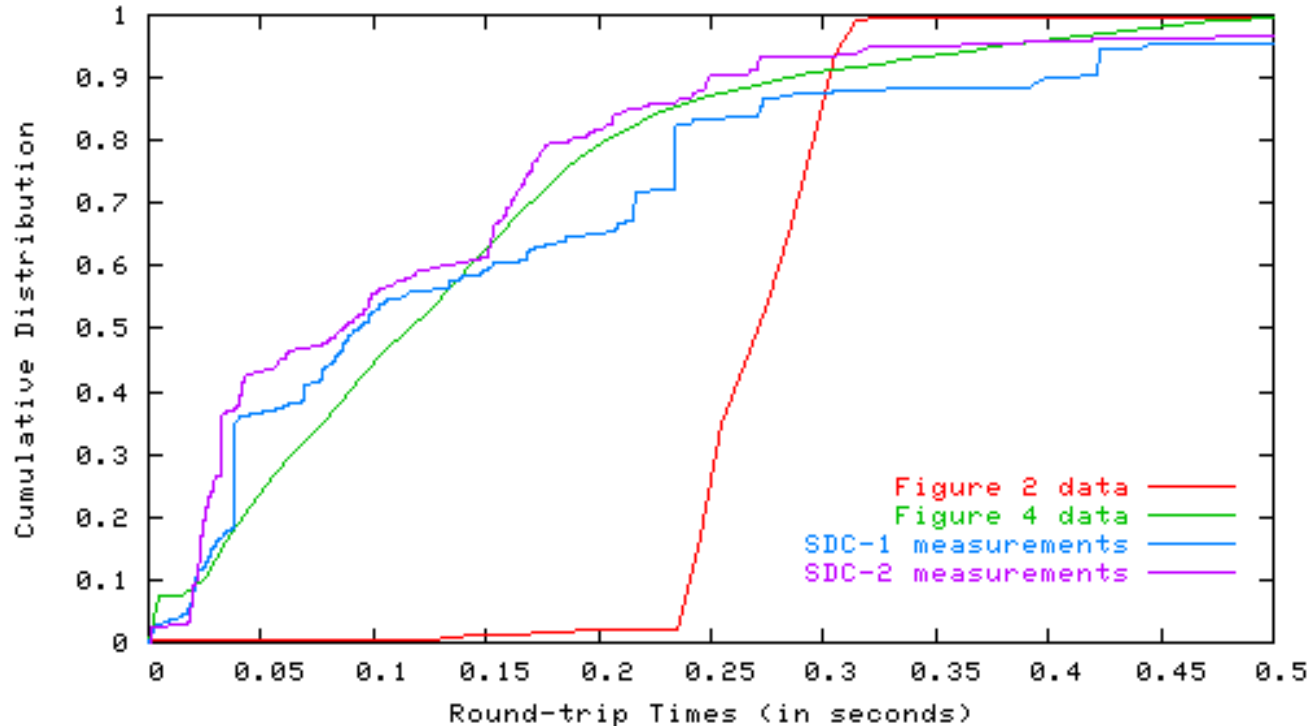*Nara, Japan*

February 3rd, 2006

So, what is the problem?

Distribution of Flow Sizes

- Distributions of packet numbers on the congested link over the second half of two simulations, with data measured on the Internet for comparison.

[Floyd and Kohler, 2002]

Distribution of RTTs

- Distributions of packet round-trip times on the congested link of two simulations, with data measured on the Internet for comparison. [Floyd and Kohler, 2002]

Panel

- Goal: *to get multiple perspectives on transport benchmarking*
- Composition
  - Richard Hughes-Jones, University of Manchester
  - Lachlan Andrew, University of Melbourne
  - Injong Rhee, NC State University
  - Doug Leith, Hamilton Institute
  - Aaron Falk, USC Information Sciences Institute
- Agenda
  - 15 minutes (firm) for each speaker
  - Questions at end of panel
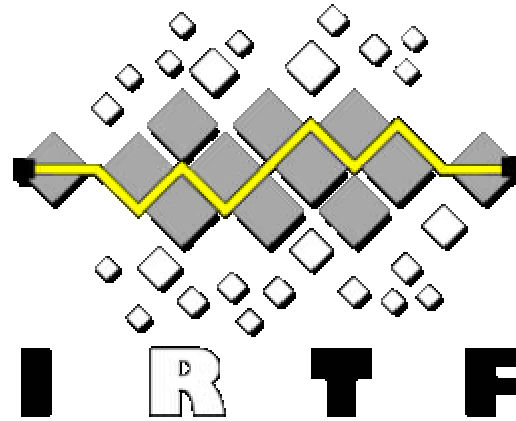
Transport Activities
in the
Internet Research Task Force

Aaron Falk

IRTF Chair

USC Information Sciences Institute

Internet Research Task Force

- Promotes research relating to the Internet using small, focused research groups (RGs)
- RGs are very autonomous
    - Most have open membership, various mtg schedules
- Oversight provided by the IRTF Chair and Internet Architecture Board (IAB)
- RG output
    - Standardization in IETF
    - Informational or experimental RFC publication
    - Academic papers (by participants)
- http://www.irtf.org

Internet Congestion Control Research Group

- Chartered late 2005, chaired by Mark Handley and S. Keshav
  - Just kicking off (1st messages today)
- *Goal: to move towards consensus on which technologies are viable long-term solutions for the Internet congestion control architecture, and what an appropriate cost/benefit tradeoff is.*
  - *Scope includes LFNs, global Internet, realtime apps*
- Open membership, 2-3 meetings per year (planned)

Strawman ICCRG Strategy

$\Rightarrow$ 1. Challenge document
- Current TCP limitations, long term requirements

2. Solution Proposals
- *Your solution here*

3. Discussion
- Themes, best-practices, consolidation, missing solutions

4. Consensus Formation
- Make recommendations

Transport Modeling Research Group

- Chartered in Fall 2005, chaired by Sally Floyd
- *Goal: improve methodologies for evaluating congestion control mechanisms*
  - Motivated by the lack of good models underpinning analysis, simulation, and testbed experiments
- Open membership, unlikely to meet f2f
- Two drafts published:
  - *draft-irtf-tmrg-metrics-01.txt*
  - *draft-irtf-tmrg-tools-01.txt*

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"Metrics for the Evaluation of Congestion Control Mechanisms"

- Goal: enable a broad view of strengths and weaknesses of newly proposed mechanisms
- Scope:
  - Define a consistent set of metrics
  - Consider relationships between metrics
    - E.g., delay vs. throughput
  - Describe network-, flow-, and user-based interpretations
  - Note application and transport goals
    - For some metrics, e.g., fairness, there is no agreement on goals

Metric Overview

- Throughput, Delay, & Loss Rate
- Response Times & Minimizing Oscillations
- Fairness & Convergence
- Robustness for Challenging Environments
- Robustness to Failures and Misbehavior
- Deployability
- Metrics for Specific Types of Transport
- User-based Metrics

This is a richer set of metrics than have been presented this week.

"Tools for the Evaluation of Simulation and Testbed Scenarios"

- Goal:
  - Enable construction of better scenarios, based on better underlying models.
    - Needed for analysis, simulation, and testbed experiments

- E.g., measurement tools allowing characterization of link aggregates & end-to-end paths

- If successful will allow comparison of key characteristics found in models vs. real world

Traffic Characteristics

- Link aggregate characteristics
  - Per-packet RTT distribution
  - Packet sequence number distribution
  - Packet size distribution
  - Forward vs. reverse traffic
  - Peak flow rates
  - Transport protocols

- End-to-end path characteristics
  - Synchronization ratio
  - Drop rates as a function of packet size.
  - Drop rates as a function of burst size.
  - Drop rates as a function of sending rate.
  - Degree of packet drops.
  - Range of queuing delay.

This is a richer set of scenarios than have been presented this week.

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Conclusions

- We're not ready to pick a winner

- Indeed, we still need firm definitions for some metrics and scenarios

- The TMRG is the place to do the work on baselining metrics and benchmarking

- The ICCRG is the place to do the work on comparing protocols

Thank you